

Aberystwyth University

Exploring the Concept of Navigability for Virtual Learning
Environments

by

Emmanuel Ehimare Isibor

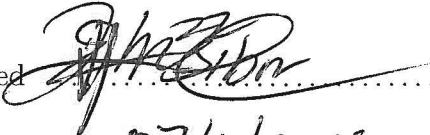
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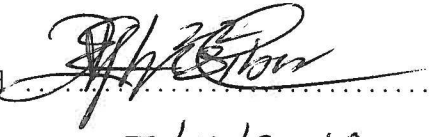
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Abstract

The use of virtual learning environments (VLEs) in Higher Education has brought about interesting implications both for learning and teaching. VLEs have provided the users with a mixed bag of benefits as well as challenges that are associated with their uses. This thesis presents an investigation into the **User Experience** of a VLE using a social science methodology in analysing the different users' requirements of a VLE. The research was designed to explore how best to configure a VLE within an institution for an enhanced **User Experience**.

The study which was conducted at Aberystwyth University with a diverse group of virtual learning environment (VLE) users, was designed as a mixed methods study based on the findings of a pilot study earlier conducted by the researcher at the same institution. Transcripts from the interviews of the main study with students, teaching staff, administrative staff, directors of studies and a member of the e-learning team were analysed according to the classic grounded theory methodological approach (Holton and Walsh, 2017). This involved the development of codes and their classification into categories and the choice of **Navigability** as a core category. Using the constant comparison technique, theoretical codes emerged that led to the development of a theoretical framework of **Navigability** for VLEs.

The results revealed that **Navigability** is critical to **User Experience** with specific reference to Blackboard in Aberystwyth University. Users were found to have difficulties with finding materials and tools on the VLE due to poor navigation mechanisms inherent in the VLE. Some of the users complained of not knowing where to find certain functionalities, or things not being where they expected them to be. They preferred direct access rather than having to perform several clicks in order to locate features on the VLE.

Kear (2007) noted that "it is important that VLEs have straightforward navigation, use clear terminology, and are based on structures and processes that make sense to students." Though the results are similar, the work of Kear (2007) spanned four different universities and four VLEs, but only involved lecturers, while the study presented here was in a single university based on a single VLE but with a mixed group of students, teaching staff, administrative staff, directors of studies and the e-learning team. This has extended the work of Kear (2007) by not only confirming directly from students that navigation is an issue but that students also experience navigation problems based on how teaching staff use the VLE. It further revealed that staff experienced more navigation challenges owing to their primary roles as content creators.

The resulting framework provided an explanation for the phenomenon surrounding the navigation experience of Blackboard users in Aberystwyth University. The most important finding is that the barriers to the use of VLEs have been better articulated in greater depth than existing knowledge base.

This study offers some ways through which VLE developers in conjunction with all the stakeholders in Higher Education can improve the navigation of VLEs in order to enrich the experience of users.

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Chapter 1

Introduction

The use of technology in Higher Education as a tool has redefined the way and manner that learning and teaching take place. Institutions in Higher Education are always exploring innovative and effective ways to deploy technology in their learning and teaching. This has led to the intervention of technology in student engagement with interesting implications.

The rapid deployment of virtual learning environments (VLEs) across Higher Education institutions has provided a means through which universities engage students with respect to their modules vis-a-vis assessment, feedback, examination results, lectures notes and lecture capture. The value of technology-enhanced learning (TEL) is increasingly being recognized by the HE sector in the UK given that universities have placed technology at the centre of learning, teaching and assessment. (Kirkup and Kirkwood, 2005). The adoption of TEL by these institutions has redefined the way and manner that students are engaged in Higher Education. This has led to the provision of a one-stop online platform for students of Higher Education institution. The use of virtual learning environments enable teaching staff to create and manage course materials, communicate with students, and evaluate performance on a large scale beyond the boundaries imposed by physical classrooms.

According to the TEL survey report of 2014 in the UK conducted by Universities and Colleges Information Systems Association (UCISA) (Walker et al., 2014), the top three drivers for considering the use of TEL by UK universities are: enhancing the quality of learning and teaching, meeting student expectations and improving access to learning for students off campus. This research work seeks to evaluate the intervention of technology in student engagement, specifically the VLEs and how the **User Experience** can be improved.

1.1 Statement of Problem

This study is about investigating the **User Experience** of VLEs and how it can be improved.

1.2 Motivation

The purpose of this study is to identify the solutions to the challenges faced by VLE users and to make recommendations in order to enhance their **User Experience**.

1.3 Research Questions

This study was driven by one research question:

How should a VLE be configured in order to enhance the **User Experience** of students and staff within an institution

1.4 Aims of the study

The aims of this study are:

- To explore individual experiences, perceptions and expectations of the use of virtual learning environments in Aberystwyth University;
- To investigate the phenomenon of how people use the VLE within Aberystwyth University;
- To identify subject- and institution-specific requirements on a VLE as perceived by different users.

1.5 Objectives of the study

The objectives of this study are:

- To develop a conceptual understanding of the use of the virtual learning environments in Aberystwyth University;
- To develop a framework that explains the phenomenon taking place in the various settings of the users of Blackboard in Aberystwyth University;
- To proffer a method for configuring a VLE that would enhance **User Experience**;
- To compare the results of the interviews with the data analytics on students in order to draw some conclusions on the configuration of a virtual learning environment.
- To make recommendations on using an off-the shelf VLE and building a customized brand new VLE;
- To draw conclusions on how people use the VLE and how to resolve requirements conflicts within the VLE during configuration.

1.6 How the study was conducted

This thesis is made up of two studies namely pilot study and main study. The pilot study is presented in Chapter two while the rest of the thesis is devoted to the main study. The diagram below shows how both studies were conducted.

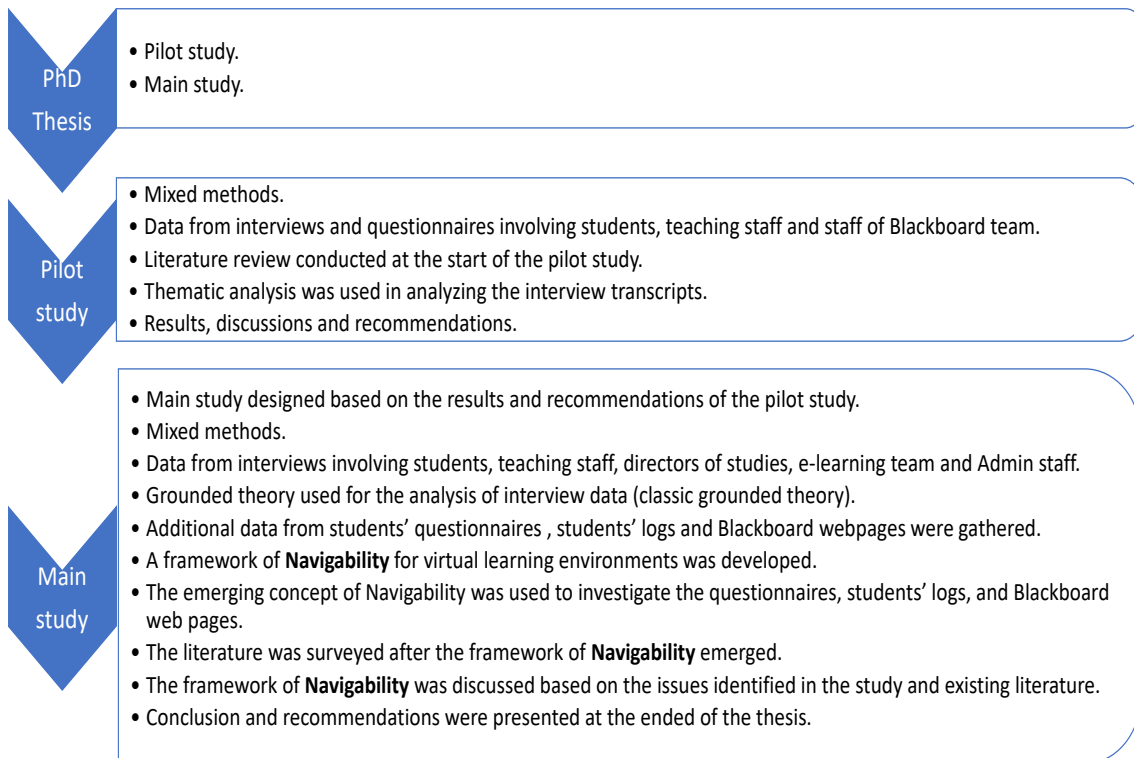


Figure 1.1: The methodological processes of the studies presented in this thesis

1.7 Background

1.7.1 Technology-enhanced learning

According to Kirkwood and Price (2014) technology-enhanced learning (TEL) refers to the application of information and communication technologies to teaching and learning. The value of technology-enhanced learning is increasingly being recognized by the HE sector in the UK (Kirkwood and Price, 2014), with universities placing technology at the centre of learning, teaching and assessment. According to Johnson et al. (2015) the key trends accelerating technology adoption in Higher Education as contained in the New Media Consortium (NMC) Horizon Report of 2015, Higher Education Edition are advancing cultures of change and innovation, increasing cross-institution collaboration, growing focus on measuring learning, proliferation of open educational resources, increasing use of blended learning and redesigning learning spaces.

1.7.2 Virtual learning environments

The use of virtual learning environments (VLEs) is now common practice among Higher Education providers globally and are now deemed critical to the provision of Higher Education Browne et al. (2006), Costello (2013). Virtual learning environments are online platforms that provide for interactions between students and tutors with such interactions are of various kinds such as e-learning (Everett, 2002). The Joint Information Systems Committee (JISC) through the MLE Steering Group defined VLE as the components in which learners and tutors participate in online interactions of various kinds, including online learning (Everett, 2002). Jackson and Fearon (2014) defined a VLE as “an internet-based system that supports traditional face-to-face teaching (does not consist of the educationalist being physically located in a different setting from the student) and assists educationalists (including administrators) in developing and managing educational resources for students.” A virtual learning environment has also been defined as a web based software system made up of a collection of tools and applications that enable online communication, collaborative learning, uploading of instructional content, student assessment and feedback and course administration (Cassidy, 2016). A standard VLE is expected to provide controlled access to learning materials and provide a channel for online communication and assessment, as well as tools for monitoring student usage and progress, and links for interfacing with other administrative systems. Another name for a VLE is learning management system (LMS) Costa et al. (2012) and examples of VLEs include Blackboard, Canvas, Desire2learn, Moodle and Sakai.

While it is a good practice to deploy VLEs in universities, one might want to ask if such VLEs are delivering the best experience for the students and teaching staff. Towards this end, this study will focus on identifying and then removing real and perceived barriers to VLE usage. In addition, recommendations will be provided on how best both the teaching and learning experiences of teaching staff and students can be enhanced respectively. For instance, Chowdhry et al. (2014) noted that the challenge with using VLEs becomes greater and more pronounced due to the differences between how individual institutions, faculties and the way teaching staff engage with it. A good consideration of these differences in the design and implementation of a VLE will bring about a better experience for all users of VLEs. This study will proffer answers to the question of how best to design a VLE as no one size fits all.

Given the numerous challenges facing the use of VLEs, some researchers such as Weller (2009), Stiles (2007) have questioned if the VLE is dead. No doubt, the adoption of technology enhanced learning by universities has implications for the students and teaching staff. This has given rise to some challenges with respect to how best a VLE should be designed, how the requirements of a VLE should be analysed and the question of whether a university should adopt a generic VLE or build a customized one. In response to these problems, this study investigated the challenges associated with technology-enhanced learning in universities with a view to proffering solutions to the identified challenges. Specifically, this study investigated the notion of how best to design a VLE with respect to enhancing

the **User Experience** in an institution.

1.7.3 No one size fits all

Some of the challenges associated with the use of VLEs can be traced to the differences between a proprietary VLE and the context of the institution as no one size fits all. Suess (2010) asserted that working with a proprietary VLE can be challenging if the generic nature of the VLE does not suit the individual requirements of a course. Hence overcoming the difficulties occasioned by the differences is instructive. Alhogail and Mirza (2011) noted that “without an effective implementation that addresses the users’ needs and requirements, failure could be expected.” This suggests that much planning is required for localizing and customizing a VLE in order to suit the peculiar needs of institutions and disciplines. For instance, Beckton (2009) reported that there were peculiarities and structures of the University of Lincoln that were ignored by Blackboard. This underscores the fact that generic and proprietary VLEs require some forms of adaptation based on the peculiarities of each institution and the subject areas. Just as every institution is different so also is every discipline different. For instance are the needs of Life Science students in Aberystwyth University different from the needs of Computer Science students? A generic VLE is not likely to match the structure of every institution. Beckton (2009) described how the University of Lincoln adapted the “out-of-the box” version of the Blackboard virtual learning environment to meet the various requirements of the different teaching departments. His paper described how the University of Lincoln reworked the Blackboard virtual learning environment by modifying the snapshot extracts to create Blackboard sites for the purpose of adapting them to suit the peculiar needs of teaching departments, rather than attempting to impose a single model on the University. According to Beckton (2009), the concept of “lumping” referred to the process of creating a site out of several modules with a view to facilitating delivery of content to students across multiple awards. “Splitting” in contrast referred to the creation of special interest groups within modules based on data from the University’s MIS systems. The report of Beckton (2009) was similar to that of Suess (2010) in a study conducted at School of Architecture and Landscape in Kingston University. They also had to reconfigure Blackboard by reworking the structure and interface to align with the pedagogic requirements of an Architecture school (Suess, 2010). The experience of University of Lincoln as presented by Beckton (2009) and that of Kingston University as presented by Suess (2010) only goes to re-enforce the need to develop customized VLEs to meet the peculiar needs of each institution, department and modules; as no one size fits all. Against this background, one begins to wonder what level of attention is paid by the VLE developers to the needs and preferences of the users in their locality? This begging question indicates that there is a research gap in this area. This demonstrates that each institution requires a strategy that is tailored to its specific needs and peculiarities in order to enhance the **User Experience**. Marshall and Mitchell (2002) asserted that achieving efficiency and effectiveness with e-learning systems is a difficult task owing to the fact that the creation, utilisation and support of e-learning facilities

requires a balancing of tensions between technical, organisational and pedagogical considerations. The mere deployment of VLEs should not be misconstrued to translate into an improved quality of the learning experience of student. Ellis et al. (2009) asserted that “we cannot assume that the mere existence of e-learning activities and materials supporting a face-to-face experience of learning will improve the quality of the experience.”

The users of VLEs remain the greatest stakeholders in the use of VLE for learning and teaching, and therefore the VLE rises and falls on them. Beckton (2009) argued that the greatest key to successfully implementing VLEs hinges on identifying and paying careful attention to the needs of the users of the system while giving them the liberty to express those needs rather than focusing on what the system could do for them. For instance, carrying the teaching staff along and allowing them the freedom to adapt the technology in their preferred ways will result in them owning the VLEs and seeing to its success will naturally be the order of things as far as the implementation and sustainability of VLEs are concerned.

In the same vein, Chowdhry et al. (2014) argued that the use of VLEs requires a comprehensive strategy which needs to be implemented with caution. Chowdhry et al. (2014) believed that the challenge with using VLEs becomes greater and more pronounced due to the differences between how individual institutions, faculties and teaching staff engage with it. In their work, Cassidy (2016) argued that the design and implementation of a VLE needs to be pragmatic and sensitive to the contextual demands of a specific learning instance. It is rather interesting that not much research has been done in the area of adapting VLEs to suit the specific needs of institutions and disciplines (Aydin et al., 2016). Issues with the VLE are longstanding because although several studies have been carried out, the VLE is still not easy to use and thus, constitutes a gap in research. This research work focused on filling the gap with respect to localizing and configuring VLEs for enhanced User Experience.

1.8 Contributions of the study to the body of knowledge

The contributions of this study to the body of knowledge are as follows.

- (i) The main contribution of this study is that a robust articulation of the barriers of VLE Navigability has been presented in a greater depth compared to what has been previously done.
- (ii) The framework of Navigability for virtual learning environments which was developed through the analysis of the data, provides an explanation of the phenomenon that exists among the users of Blackboard in Aberystwyth University. The framework holds the promise of assisting developers in configuring a VLE that best fits the needs of diverse kind of users within an institution. Through this contribution, the first and second aims of this research work as outlined in section 1.4 were achieved.

- (iii) Analysis of interviews of a large set of diverse participants has been conducted in order to extract a framework using a social science methodology known as classic grounded theory. The analysis of the data of the study and the processes leading to the emergence of the framework of *Navigability* for virtual learning environments are presented in Chapter 5 of the thesis. This application of the classic grounded theory has been used to analyse different users' requirements in order to identify how best to configure a VLE within an institution. This is a promising approach for configuring complex software systems that will help to meet the real requirements of different user groups as opposed to using hypothetical requirements. This has justified the need for developers to be well acquainted with the users of the VLE as opposed using an imaginary set of users when building a VLE. Through this contribution, the second and third aims of this study as specified in section 1.4 were realized.
- (iv) Also analysed were the logs of students activities on the VLE in Aberystwyth University and the results were compared with that of the interview transcripts in order to ascertain if they supported or contradicted the transcripts. The results of the data analytics were presented in Chapter 6.
- (v) Recommendations were provided for improving both tailored and off-the shelf VLEs.
- (vi) Devised a method for analysing VLE requirements of diverse kind of users while resolving requirements conflicts.

1.9 An overview of the thesis structure

This section presents the reader with the layout of the thesis and what to expect in each chapter. It outlines the summary of all the chapters in the thesis.

Chapter 1 provides the introduction of the thesis consisting of the statement of problem, motivation of the study, research question, aims and objectives of the study, the significance of the study and the contributions of the study to the body of knowledge. It also presents an overview of the whole study as set out in each chapter of the thesis.

Chapter 2 reports on the pilot study that was conducted to evaluate the use of Blackboard in channelling information to students of Aberystwyth University. As it was conducted prior to the main study, grounded theory use not used for it rather the data were analysed using thematic analysis. The results of the pilot study became the basis for the main study. It influenced the research question as well as the interview questions that participants were asked. Through the pilot study, the research gap – the disconnect between VLEs and users of such VLEs was identified. The need to fill this gap became the motivation for the design of the study.

Chapter 3 presents an overview of the methodology of the study and outlines the reasons for choosing the grounded theory approach in answering the research question. The abbreviated version of grounded theory methodology was used

in the analysis of the interview transcripts. The use of the abbreviated version became necessary due to the fact that the data had already been collected before the decision to use grounded theory was made. Consequently and also due to time constraint, the researcher employed the use of the abbreviated version of grounded theory in analysing the transcripts. Specifically the classic grounded theory approach was used in the analysis of the interview transcripts.

Chapter 4 reports on the results of the analysis of a set of sample data from the interview transcripts. Given that the researcher was new to grounded theory, it was considered necessary to carry out a sample analysis using a small set of the interview transcripts. This process became a learning curve for the researcher as it provided an opportunity to learn, use, review and use again. The results of the sample analysis were presented during the Association for Learning Technology conference in September 2017.

Chapter 5 presents the full analysis of the study. It captured the analysis of the interview transcripts using the classic grounded theory. It explains the open coding process, selective coding, theoretical coding, memoing, sorting of memos and the emerging framework of the study. This chapter provides a detailed description of how the theoretical framework of *Navigability* emerged from the analysis of the transcripts.

Chapter 6 presents the results of data analytics of students usage of Blackboard. The e-learning team of Aberystwyth University gathers data on students' use of Blackboard. It was therefore thought necessary to analyse the log files of students activities on a module with a view to draw comparison between what students said in the interviews and their actual pattern of use of Blackboard.

Chapter 7 provides the literature review of the study. This was set this way because in the use of classic grounded theory, the rule is to delay the literature review till the data has been analysed and the theory has emerged. So this chapter provides the theoretical background of *Navigability* in virtual learning environments. Consequently, the work of other researchers in relation to *Navigability* on the web and virtual learning environments were reviewed. This chapter was concluded by the researcher situating this piece of work within the discourse of different schools of thought on *Navigability*.

Chapter 8 presents a discussion of the key issues that emerged from the results of the analysis of the data that were presented in Chapter 5. These issues included navigation, the three-click rule, usability, solutions to the challenges of navigation and the framework of *Navigability*.

Chapter 9 presents the conclusions of the study and some discussions of the framework of *Navigability* and its implications for Software Engineering. The chapter ends with the contributions and recommendations for configuring VLEs in order to enhance the *User Experience*.

1.10 Chapter summary

This chapter has provided the reader with an overview of the thesis by presenting the contextual background to the study, the research problem and the purpose of

the study including aims and objectives, justification for the research, the significance of study and the contributions. The chapter has also provided an overview of the thesis structure.

Chapter 2

Pilot Study: An evaluation of the use of AberLearn Blackboard in channelling information to students of Aberystwyth University

2.1 Introduction

This chapter provides the report of a pilot study that was conducted in the summer of 2015 prior to undertaking the main study of the thesis. The study was centered on the evaluation of the use of Blackboard in channelling information to students of Aberystwyth University. It is important to point out here that the pilot study was not part of the main study. Rather it was designed to inform the research design of the main study. The pilot study assisted in identifying key concepts and the research gap in the literature with respect to the use of VLEs in Higher Education. The research question of the main study was developed from the pilot study and this was used to design the interview questions for the different groups of participants. The pilot study was also used to determine the aims, objectives and scope of the main study. Furthermore, the pilot study provided the researcher with the much needed background information in order to be able to conduct a study in the area of investigation. The pilot study and main study were different in many respects such as methodology, scale and size of participants. The report of the pilot study is presented under the following main sections as shown below:

- Abstract.
- Introduction to the pilot study.
- Literature review.
- Methodology of the study.
- Data analysis of the study.

- Results and discussions.
- Conclusions and recommendations.

2.2 Abstract

Virtual learning environments (VLEs) are increasingly being used by universities and colleges globally to facilitate teaching and learning. So, in line with the trend and best practice in Higher Education, Aberystwyth University adopted Blackboard as its virtual learning environment in providing quality education for its students. This report of the pilot study provides a literature review of VLEs and also an investigation of how AberLearn Blackboard has been used to channel information to students of Aberystwyth University. The results show that while Blackboard has been effective in providing information to students, there is room for improvement in order to enhance the learning experience of the students of Aberystwyth University.

2.3 Introduction to the pilot study

Advancement in technology especially in the area of Internet and World Wide Web has redefined the way and manner education providers deploy learning tools. With the realities of living in a global village, and blurred boundaries, education has gone beyond the four walls of an institution. This has necessitated the use of tools to meet the needs of students as well as enrich their learning experiences. Consequently, this has led to a paradigm shift from the traditional form of learning to a mix of traditional and virtual learning platforms. Virtual learning environments have become standard tools for learning in globally reputed institutions.

2.3.1 Research questions

The study was driven by two research questions (RQ).

- RQ1: To what extent, is AberLearn Blackboard an effective learning tool for students?
- RQ2: To what extent, is AberLearn Blackboard an effective teaching tool for staff?

2.4 Literature review

In order to be able appreciate the import of virtual learning environments, it was important to conduct a literature review of the tool. The following subsections provide a review of the theoretical background of the topic.

2.4.1 Virtual learning environments.

The use of virtual learning environments (VLEs) is now best practice among Higher Education providers globally Costello (2013). VLEs are online platforms that provide for interactions between students and tutors in educational institutions. Everett (2002). The Joint Information Systems Committee (JISC) MLE Steering Group defined VLE as the components in which learners and tutors participate in online interactions of various kinds, including online learning (Everett, 2002). Jackson and Fearon (2014) defined a VLE as “an internet-based system that supports traditional face-to-face teaching (does not consist of the educationalist being physically located in a different setting from the student) and assists educationalists (including administrators) in developing and managing educational resources for students.” A virtual learning environment has also been defined as a web based software system made up of a collection of tools and applications that enable online communication, collaborative learning, uploading of instructional content, student assessment and feedback and course administration (Cassidy, 2016). A standard VLE is expected to provide controlled access to learning materials and provide a channel for online communication and assessment, as well as tools for monitoring student usage and progress, and links for interfacing with other administrative systems Everett (2002), Kennedy (2009). Other names for a VLE include learning management system (LMS), course management system (CMS), and e-learning courseware Bennett (2011) and examples of VLEs include Blackboard, Canvas, Desire2learn, Moodle and Sakai.

2.4.2 Blackboard in Aberystwyth University

Like most UK Higher Education Browne et al. (2006), Aberystwyth University uses a VLE called Blackboard Learn, a product from Blackboard Inc. Blackboard Learn is one of the major learning management system leading brands in Higher Education. Blackboard Learn has been in use at Aberystwyth University for several years as a virtual learning environment for all its students. Having used the tool for such a long time and with increasing growth in the sector, it is instructive to understand how tools like Blackboard are being deployed with a view to evaluate how it is being used in channelling information to students and its impact on users (both students and teaching staff). With respect to the use of VLEs, Blackboard has redefined how students learn and how the teaching staff engage with students. During the Blackboard annual teaching and learning conference at University College Dublin held between 29th April to 2nd May 2014, Mary Jacob of Aberystwyth University talked about how the Blackboard Exemplary Course Programme Rubric was being used as a way of changing their learning and teaching practices. (Parkinson, 2014). The traditional face to face method of teaching is increasingly being complemented with the virtual learning environments resulting in a blended learning. Lameris et al. (2012), Renau Renau (2012) This development has impact and implications on the students as well as the teaching staff which for the most part, cannot be ignored.

2.4.3 Implications of VLEs on learning in Higher Education

There are implications that come from the adoption of VLEs by institutions in Higher Education. They are worth addressing in order to have a successful implementation of VLEs.

2.4.3.1 Perception of students

Students are major stakeholders in the VLE initiative and as such, their perceptions of VLEs are very important because they can impact the success or otherwise of the deployment of VLEs in institutions. According to JISC (2007), the present generation of students (Veen, 2007, von der Heiden et al., 2011) in institutions of Higher Education have high expectations of how they desire to learn by selecting the technologies and learning environments that best meet their needs with a mind-set of how to manipulate such tools to their advantage. This perception of students is shaped by the fact that they are digital natives Prensky (2001) and as a result of these high expectations, institutions in Higher Education are kept on their toes with respect to providing the best form of technology-enhanced learning. Prensky (2001) argued that the digital natives who grew up in digital environment and have spent their entire lives surrounded by and using computers, video games, digital music players, video cams, cell phones, and all the other toys and tools of the digital age are radically from the older generation. The implication of this development according to Prensky (2001) is that today's students think and process information fundamentally differently from their predecessors based on this ubiquitous environment and the sheer volume of their interaction with it. This has led to a disconnect between the students and the universities (Kennedy, 2009). As Prensky (2001) puts it, "Today's students are no longer the people our educational system was designed to teach." In their study on the utility of online learning components in hybrid courses, DeNeui and Dodge (2006) noted that these new technologies have resulted in a paradigm shift regarding the nature of learning in general and that the networked collaborative learning model has redefined how students learn and teachers teach.

In their work, (Oblinger and Oblinger, 2005) noted that

Educating students is the primary goal of colleges and universities. However, reaching that goal depends on understanding those learners. Only by understanding the Net Generation can colleges and universities create learning environments that optimize their strengths and minimize their weaknesses. Technology has changed the Net Generation, just as it is now changing higher education. p.27 (Oblinger and Oblinger, 2005)

On their part, Tapscott and Williams (2010) argued that "universities are losing their grip on higher learning as the Internet is, inexorably, becoming the dominant infrastructure for knowledge—both as a container and as a global platform for knowledge exchange between people—and as a new generation of students requires a very different model of higher education." Consequently, Tapscott and

Williams (2010) argued that change was imperative both in the value created for the students and in the model of production for how that value was being created if the universities were going to be able to successfully overcome the challenge posed by the digital natives. In this regard, Tapscott and Williams (2010) contended that, firstly, the old industrial model of pedagogy needed to be replaced with a new model they described as collaborative learning. And secondly, they advocated for an entirely new *modus operandi* for how the subject matter, course materials, texts, written and spoken word, and other media with respect to the content of Higher Education were created.

As should be expected, the notion of the digital natives and how technologically savvy they are, how different they are from the previous generation and how the universities needed to change radically in order to be able to accommodate them (Prensky, 2001, Oblinger and Oblinger, 2005, Tapscott and Williams, 2010) has not been left unchallenged. Bennett et al. (2008) described the debate surrounding the notion of digital natives as an academic form of a ‘moral panic’ (Cohen, 2011) as opposed to being empirically and theoretically informed. Bennett et al. (2008) asserted that such claims lacked solid empirical evidence and were more of common sense appeal and that the attempt to lump every one into a single mode of behaviour with respect to the digital natives could not stand. This assertion was corroborated by Gallardo-Echenique et al. (2015) in their study by declaring that “Most of the studies that were used to support the digital native concept were either methodologically suspect or relied excessively on anecdotal data.” On the claim that the digital natives Prensky (2001) were immersed in technology and technology savvy, (Bennett et al., 2008) argued that on the contrary, recent research into how young people in post-compulsory education access and use technology, revealed a more diverse view of the role of technology in the lives of young people. In a study conducted across 13 institutions in the United States involving 4374 students, Kvavik et al. (2004) reported that although the new generation of technology-savvy students currently attending institutions of higher learning possesses unprecedented level of IT skills, their study revealed that these students had only a moderate preference for technology in the classroom. The students had just enough IT skills to get by and did not explore the technologies deeper. It was instructive to note that Kvavik et al. (2004) reported that these skills needed to be acquired in the classroom settings as there were little or no other source for training in instructional IT. Another interesting finding by Kvavik et al. (2004) was that the digital natives students are not a monolithic population across any dimension of behaviour, including IT usage. They noted that many of the digital natives in their study were skeptical IT users.

In another research conducted across five universities in the United Kingdom, Jones and Ramanau (2009) sought to investigate whether there was a distinct Net generation (Oblinger and Oblinger, 2005) amongst first year UK university students and if there were significant differences attributable to age, gender or disciplinary differences. The research which was designed to cover key aspects of the students’ use of technology in their studies surveyed demographic characteristics of the respondents, access to technology, use of technology in university studies in general and course-specific uses of technology. The researchers reported

that a total of 596 students made up of full time students and distance learning students completed the survey covering 14 courses over a range of subject and disciplinary areas. Although Jones and Ramanau (2009) found significant age-related differences, they were reluctant to conclude that there was a clear disconnection between a Net generation composed of digital Natives and older students. They cautioned against distinguishing a specific generation and reckoned that although there were age differences, there were additional factors differentiating students, specifically gender and disciplinary differences. This position was reiterated by Helsper and Eynon (2010) in their study and showed through the analysis of a nationally representative survey in the United Kingdom, that generation was only one of the predictors of advanced interaction with the Internet. They noted that breadth of use, experience, gender and educational levels were also important, indeed in some cases more important than generational differences, in explaining the extent to which people can be defined as a digital native. (Helsper and Eynon, 2010). Similarly, Gallardo-Echenique et al. (2015) reported that besides age, there were a number of other parameters that may help reveal the nature of students' use of digital technologies.

In their conclusion, Jones and Ramanau (2009) argued that whilst there were significant changes taking place amongst first year undergraduate students in the UK they were far more complex than the idea of a single new generation would suggest. This supported the earlier position of Kvavik et al. (2004) who reported that the digital natives students are not a monolithic population across any dimension of behaviour, including IT usage.

Against the backdrop of the digital natives being immersed in technology and technology savvy and apparent disconnect with universities, Jones and Shao (2011) argued that there is little evidence that students enter university with demands for new technologies that teachers and universities cannot meet. In a report titled "The impact of Blackboard software on education globally over the past 10 years" with a focus on the measurable benefits from using Blackboard Learn software and related technologies, Katsifli (2010), Dr. Demetra Katsifli, a Senior Director Academic Innovation at Blackboard Inc., noted that, students in Higher Education expect to interact with VLEs during their programmes in institutions of higher learning. The report from Katsifli (2010) opined that Higher Education students were well disposed to the use of a VLE and expect that technology such as the Blackboard system will naturally be incorporated into their learning experience in the universities and they were convinced that VLEs will enhance and complement their studies. This corroborated the earlier reports of JISC (2007) that students in Higher Education have high expectations of using technologies to support their learning and also corroborated that of JISC/Ipsos Mori (2008) that "prior to starting university, the vast majority of students expected to have to use the internet or online databases more than they had to date to complete their work at university". In the same vein, (Everett, 2002) mentioned that students in Higher Education expect more than the traditional form of learning that is characterized by face to face communication.

In a study on the perceived usefulness of a virtual learning environment that was created with Blackboard for group interaction and the use of learning re-

sources, it was reported by Leng et al. (2006) that students indicated that the VLE complemented face-to-face interaction in the preliminary discussion and in the reporting phase but however did not stimulate computer-mediated distance interaction during the self-study phase. The study also revealed that the use of multimedia in case presentations led to a better quality of group discussions compared to an exclusively text-based case presentations, even as the students agreed that the information resources whose links were provided in the VLE aided their consultation of those resources during self-study though not during the reporting phase.

In another related study by Ellis et al. (2009) it was reported by the authors that at the level of groups of students, significant differences were found amongst students in terms of their perceptions, approaches to study and achievement. In their study, Ellis et al. (2009) sought to investigate the key aspects of e-learning that might be related to how university student approached their studies. The purpose was to have a better understanding of the internal mechanism of those aspects. The empirical evidence revealed that students who had negative perceptions of the quality of teaching, design, interactivity and workload were inclined to view their studies in the course in a comparatively poor way and consequently performed relatively poorly online (Ellis et al., 2009). For example, Ellis et al. (2009) reported that “about a third of the students (cluster 1, $n = 43$) did not perceive the value of the submissions made by other students, nor of the interaction with the teacher online and of the learning process facilitated by online activities.” Consequently, Ellis et al. (2009) emphasised the need to address students’ perceptions about what the e-learning experience involved and how it can be useful for learning was important. They argued that such awareness would be a useful teaching strategy in improving the quality of e-learning.

In the light of the discourse above, Creighton (2018) recommended that with respect to designing and configuring the virtual learning environment, program designers and instructors must be cautious of arguments for changes in virtual pedagogy based on unverified parameters such as age as in the case of digital natives. Creighton (2018) advised that Educational leaders must exercise additional caution with surfacing positions that assume the digital learner brings advanced technological skills because of prior use of a variety of leisure and communication skills.

2.4.3.2 Perception of teaching staff

Although virtual learning environments have been adopted by nearly all UK Higher Education institutions (Browne et al., 2006), the available research suggests that acceptance by individual academic staff is more varied and usually lower, with academic staff seemingly less passionate than management and support staff. The reasons for this trend can be traced to how the teaching staff perceive such VLEs. Just like the students, the teaching staff represents a major stakeholder in the VLE initiative, and to a large extent, the success of VLE rises and falls on them. These perceptions are based on a number of reasons as addressed below:

The adoption of VLEs in Higher Education institutions has created skill gaps

on the part of the lecturers. According to Young and Duncan (2014) because these new technologies have redefined the teaching and learning approaches, many lecturers cannot adequately use and maximize the VLEs in delivering high quality teaching as anticipated during the deployment of such VLEs. This has negatively shaped how some teaching staff perceive VLEs. It goes without saying that a lecturer that is not comfortable with the use of a VLE is unlikely to want to engage with students using such a tool. This underscores the need for tutors to cultivate new skills in order to be more effective with the use of technology for the purpose of enriching the learning experience of their students. Young and Duncan (2014) argued that since Online teaching is quite different from face to face teaching, new skills are required on the part of the teaching staff, stressing that there is a need for tutors to find and develop online teaching strategies that will aid their communication with students. This new skills will reflect in their teachings and delivery of lectures as well as how they engage with the students. Chowdhry et al. (2014) claimed that the deployment of VLEs in Higher Education can be complex and daunting because it requires institutions to provide the necessary infrastructure while also demanding that the teaching staff develop a new skill set. Ocak (2011) asserted that the difficulty associated with the adoption of new technologies on the part of teaching staff remains a major challenge with the use of VLEs in institutions. Another related issue from the perception of teaching staff is the notion that students may use VLEs to access notes rather than attend lectures which will negatively impact their learning. Cader and McGovern (2003) recommends that staff should counter this trend by making the classes very interesting such that students can appreciate why they need to attend and actively participate in classes as opposed to just accessing lecture notes. This position was supported by Young and Duncan (2014) who argued that it was imperative for instructors to find new ways to communicate, to establish strong and trusting relationships with students, to develop fair ways to assess tasks in the course, and to find engaging ways to deliver course material as that will encourage the students to be more active in classes.

All in all, it can be deduced from the above submissions that in order to improve the quality of learning provided via VLEs, there is a great need to pay attention to the perceptions of the teaching staff as regard the use of VLEs while finding creative ways of addressing the challenges resulting from their deployment. It can be reliably said that the way and manner these challenges are managed by each institution will to a large extent determine the success or failure of a VLE.

2.4.4 Benefits of using VLEs

There are lots of benefits that come with using virtual learning environments in Higher Education both for the teaching staff and students. For instance, Virtual learning environments allow teaching staff to create resources quickly and without the need to develop technical skills (O'Leary and Ramsden, 2002). This implies that the teaching staff do not have to worry about developing the necessary tools for administration and management of their courses rather, they produce and share their resources on the virtual space that has been provided by the insti-

tution. This also allows for easy dissemination to the students. As web-based platforms, VLEs provide an integrated set of tools, that supports easy upload of materials and offer a consistent look and feel that can be customised by the user (O’Leary and Ramsden, 2002). Raftery and Risquez (2018) noted that VLEs provide a reliable means for sharing learning resources, managing assignments and student communications just as Barker and Gossman (2013) reported that the use of VLEs promotes reflection, accommodates the needs of students, increases enthusiasm and confidence, improves readiness to learn, and supported improved course assessment performance.

According to (Bradford et al., 2007) Blackboard offers numerous benefits such as increased availability, quick feedback, improved communication, tracking and skill building. They pointed out that these are very tangible benefits which the students can relate with and are excited about when it comes to using Blackboard. The use of VLEs serves several purposes including report lists, notes, module handouts, module handbooks, assessments, feedback, practice tests, student produced materials, commercial or other learning materials, PowerPoint presentations, links to external sites, staff resources, embedded video clips, extension lessons and electronic portfolios (Office for Standards in Education, 2009). The fact that the tool can be accessed at anytime and anywhere there is Internet access is a major reason why students appreciate VLEs. DeNeui and Dodge (2006) rightly pointed out that one of the main benefits to students is the unfettered access to virtually anything an instructor provides in the classroom. For example, students have can access to every resource be it syllabi, course notes, interactive demonstrations, handouts, audio or videotaped lectures as they can all be provided by the teaching staff via the VLE.

In a study at Queensland University of Technology Australia, titled “Blackboard as an Online Learning Environment: What Do Teacher Education Students and Staff Think?” conducted by (Heirdsfield et al., 2011), they pointed out that as a group, students viewed Blackboard favourably, particularly in terms of accessibility of learning materials. Having learning resources available in a central location and accessible 24 hours a day was perceived as valuable in terms of efficient use of time and also valued as a resource for revision and examination preparation. This point by (Heirdsfield et al., 2011) totally agrees with previous research works (DeNeui and Dodge, 2006, Bradford et al., 2007, Heirdsfield et al., 2007), on the use of Blackboard, emphasizing that the ability of students to access learning resources and materials at any given time was well received by students. Also worth noting here is that the relevance of improved communication cannot be over emphasized as students are encouraged to communicate among themselves. A high level of interaction is also available between the students and lecturers through emails, announcements and discussion boards on VLEs platforms such as Blackboard. Another benefit outlined by Bradford et al. (2007) was the tracking tool. Blackboard has a feature for tracking students’ usage of the software. A tutor of a particular module is able to see how well each student uses the Blackboard tool. In cases where the tutor needs to follow up a student that is falling behind, it is easier and quicker to achieve. This also helps to track the submission of students’ assignments. Also worthy of mentioning here as pointed out by Brad-

ford et al. (2007) is the benefit of skill building, noting that the deployment of Blackboard has indeed opened new opportunities for both students and teaching staff to build skills ranging from organization to time management and communications skills Bradford et al. (2007). In a study that was designed to identify the impact of implementing a virtual learning environment (VLE) in English as a foreign language (EFL) courses at a public university in Colombia, Mosquera (2017) reported that the use of a VLE motivated students to perform their tasks better while allowing them to gain confidence to develop their linguistic skills.

2.4.5 Customization of VLEs

Another interesting implication of deploying the VLE in Higher Education is that for generic VLEs, there is always a need to customize them to the peculiar needs of the institution. In their work of deploying Blackboard at the University of Lincoln, Beckton (2009) reported that they ran some pilot programmes which was set up in four departments at the University of Lincoln. The development team in charge of the project in conjunction with the human resources department of University of Lincoln, ran a very comprehensive programme of introductory workshops for users. The idea was to raise awareness of Blackboard within the university. Beckton (2009) noted that “most of those who attended actually found Blackboard very easy to use, but were more critical of the idea of using the module as the basis for each Blackboard course. What we discovered very early on was that people were very interested in some of the affordances of Blackboard but they did not want to use it in the ways we anticipated.” For example, they reported that there were many courses within the university that did not actually teach using modules and there were those courses for which modules had little practical value. Also, the way that some of these courses were structured in the Academic Registry unit and departments like Art and Design and Social Work was quite different from what Blackboard had developed. Beckton (2009) explained that these peculiarities and structures of the University of Lincoln were ignored by Blackboard while emphasizing the need to pay attention to the end users of the system. Through running these workshops, it became crystal clear that they urgently needed to do some more work on configuring Blackboard. So based on these concerns, a user group was set up made of academics, Registry, ICT support, Business systems and the development team from Centre for Educational Research and Development who were developing support for users and trying to create a strategy for use of Blackboard and managing the pilots. The activities of the user group provided Beckton (2009) with an excellent perspective on the emerging challenges and what could be done to resolve them. Beckton (2009) reckoned that “perhaps the most valuable lesson we learned was to focus on what users of the system wanted and to give them plenty of opportunity to articulate those needs rather than us focusing on what the system could do for them. The very intensive programme of staff development we offered gave everybody a chance to attend and to raise any concerns they might have about how Blackboard would affect their practice.” The creation of the user group proved to be most effective as it provided them with a way to articulate the needs of the users as well as to meet

them. Beckton (2009) concluded by saying that “to successfully roll out a major change you need both data about the way people are already working, and about how they are adapting to using it, and most of all an effective method of acting on that data that is sanctioned by representatives of all those involved.” The position of Beckton (2009) was corroborated by that of Suess (2010) in a study conducted at School of Architecture and Landscape in Kingston University, London. They reported how a proprietary VLE like Blackboard was reconfigured to provide a holistic structure and interface to align with the pedagogic requirements of an Architecture school (Suess, 2010).

2.4.6 Technology versus Teaching

There are arguments that suggest that too much emphasis is being placed on the technology of VLEs rather than on teaching itself. According to Kirkup and Kirkwood (2005), when the research focus is on the technology rather than the teaching activity, attention is diverted from important changes that are taking place as teachers modify and improve their practice, grounded in the interconnections of teaching activity systems. For example in a study conducted by Chowdhry et al. (2014) at Edinburgh Napier University on 257 students spanning 3 Modules across Law, Electrical Engineering and Mechanical Engineering departments, to ascertain the impact of the use of VLE on the final marks obtained by students, it was revealed that the number of VLE visits by each student did not have a direct impact on the final marks obtained by the students. However and interestingly, they noted that the study for one of the modules indicated that there was some correlations between the final marks obtained by the students and the way the modules were structured around the VLE. This underscores the fact that how both the students and teaching staff use the technology makes a huge difference in their experience. This suggests that that the mere deployment of a VLE in Higher Education should not be automatically expected to translate into an improved quality of the learning experience of students. Chowdhry et al. (2014) argued that the deployment of a VLE requires a comprehensive strategy which needs to be implemented with a great deal of circumspection. At best, the VLE remains a tool. The way and manner it is structured and used by the teaching staff will in the long run determine the quality of the learning experience or otherwise. It was the submission of Chowdhry et al. (2014) that universities need to continuously seek ways of improving the TEL skills of the teaching staff with a view to enhancing the learning experience of students.

In the same vein, Beckton (2009) advocated for the need for management to carry the teaching staff along during the design of VLEs while giving them the freedom to adapt the technology in their preferred ways. He argued that such initiatives will result in the teaching staff assuming ownership of the VLEs and will naturally see to its success as far as the implementation of VLEs is concerned.

2.4.7 VLEs as tools for building social community

Given the nature of virtual learning, it is imperative for social community to be developed so that students are not disenfranchised. VLEs provides for such tools for developing an interactive community of teachers and learners. Agosto et al. (2013) were of the view that tutors needed to promote collaboration and discussion in online environments with the expectations that this will lead to greater student engagement, with some critical learning gains thereby enriching their experiences in the process. Failure to promote collaboration in e-learning environments among students and between tutors can cause students to feel disenfranchised and isolated. Agosto et al. (2013) reported that an online interactive feature like a blog could be successfully used to promote increased collaboration and build a sense of community among students that are engaged in online education. In their opinion, blogs were well-suited to sharing course-related knowledge, and had few technical barriers in its use. The blogs they reckoned would help both students and staff to maximize the virtual learning environments.

2.4.8 Comparison between Blackboard and Moodle

In a report by Logan and Neumann (2010) titled “Comparison of Blackboard 9.1 and Moodle 2.0” the authors pointed out that essentially the difference between Blackboard and Moodle based on features was marginal. This submission was based on the fact that instances where certain functionalities weren’t inbuilt, add-ins (in the case of Blackboard) and plug-ins (in the case of Moodle) provided for such functionality to be achieved. According to them, the differences between Blackboard and Moodle were in their general usability, underlying course, file structure, support and community behind each product. These differences are examined below:

2.4.8.1 Overall comparison

Blackboard is a commercially developed tool with a flexible interface that allows easy navigation with features like instant messaging, audio visual recording. Blackboard 9.1 has a drop-down menu on its menu interface that provides for individual tools to be found within the page menu without navigating away. Blackboard 9.1 also has a mobile version and has also embedded a social media tool that allows users to access Blackboard through Facebook. Moodle on the other hand, is an open source which makes the software to be free though the user is expected to provide hosting facilities or pay for a dedicated hosting service. According to Logan and Neumann (2010) Moodle 2.0 has a folding menu system that provides for easy navigation for the course as well as the course tool. They pointed out that Moodle has an integrated system for accessing and sharing resources through the incorporation of file API, Repository API and Portfolio API. With these provisions, Logan and Neumann (2010) noted that tutors and students can access a centralized shared repositories as well as external resources from other repositories such as YouTube and Flickr. They also pointed out that Moodle was also able to interface with SharePoint as a result of the support provided by Microsoft.

2.4.8.2 Pedagogy

In terms of pedagogy - the method and practice of teaching, Blackboard is perceived by some tutors as a linear pedagogy. This view was corroborated by Herrington and Bunker (2002) in alluding that “Blackboard tends to encourage a linear pathway through the content, but with some forethought, materials can be easily structured to support a problem-based approach to learning.” With respect to the Pedagogy on which Moodle was developed Logan and Neumann (2010) posited that Moodle supports a social constructionist view as affirmed by Dougiamas (2010). This is very important in VLEs given that a major impact of the internet is its capacity for social learning (Brown and Adler, 2008). So there are expectations for social interactions during learning on the part of students in Higher Education. According to Brown and Adler (2008) “social learning is based on the premise that our understanding of content is socially constructed through conversations about that content and through grounded interactions, especially with others, around problems or actions.” They pointed to the fact that the focus is not so much on what is being learning but on how the students are learning (Brown and Adler, 2008) In the same breadth, Logan and Neumann (2010) noted that this social interaction was self-evident in the way that Moodle allows students to develop personal profiles with a picture for each students; which accompanies their posts and comments as well as being able to see other online users from their course and recent activity. Still on Moodle pedagogy, Logan and Neumann (2010) asserted that Moodle support for constructionist pedagogy is further demonstrated through the provision of wiki’s and other tools that allow the production of collaborative artifacts. Logan and Neumann (2010) noted that this social aspect and feature of Moodle is very popular and highly appreciated among students and tutors. (Brown and Adler, 2008). But in a recent study by Finnegan and Ginty (2019) based on a case study analysis of Moodle use in Teaching and Learning in an Irish Higher Educational Institute, their main finding from the study indicated that Moodle does not facilitate social constructivism principles in the group of participants involved in their study to any great extent. They however reported that, there was evidence that Moodle does facilitate limited scaffolding and in particular, conceptual scaffolding. Finnegan and Ginty (2019) identified a number of barriers to using Moodle to facilitate social constructivism principle. These were listed as a lack of training and time, availability of alternative technologies, more effective face to face social interaction and student inhibitions. On the other hand, though Blackboard Inc. has added some social aspects in Blackboard 9.1, such as recent activity, Logan and Neumann (2010) argued that Blackboard is still lacking other aspects such as system-wide and activity-integrated user profiles.

2.4.8.3 Usability

According to the report by Logan and Neumann (2010) tutors that are familiar with Blackboard and Moodle acknowledged that they found not much difference between the VLEs once a user knows his/her way around the tool. They viewed both VLEs as being intuitive.

2.4.8.4 File and course structure

On file and course structure, Logan and Neumann (2010) were of the view that Blackboard is designed with a multilevel folder like structure very similar to Windows, which they argue limits tutors into certain pedagogies, and could lead to disorganized modules given that a lack of structure in a module can be disguised by the apparent structure of the folders. Moodle's single page unit based structure has been described as allowing more freedom and incentive to tutors. This provides them flexibility with respect to the pedagogy they like to use. Another interesting submission by Logan and Neumann (2010) was that, Moodle being an open structure encourages good housekeeping practice as it is obvious when the course structure becomes messy.

2.4.8.5 Community and support

Blackboard is closed and paid for while Moodle is open and free. This distinction obviously and fundamentally affects how each product is developed and the type of support that the community of users get. Blackboard has reliable support structures in place for its users. Hence its users can expect to receive continuous, fast and reliable support during the life time of Blackboard learn. For Moodle, the case is different. It is supported by a large international community of users and developers. This large international community which is committed to providing support is quite strong and robust as is typical of any open source with a large following. An advantage of this open source software, and in common with open source software that has a strong following, is the community support. This usually leads to speedier resolution of bugs and other things too.

In a related study, Bremer and Bryant (2005) pointed out that a trial was conducted at Otago Polytechnic to ascertain whether Moodle should be given a more formal consideration as an alternative to the institution's then use of Blackboard as an LMS tool. The results of the trial showed that Moodle gained some support for further consideration at Otago Polytechnic. This decision to push for more consideration was based on a number of factors:

- (i) The developers incorporated constructivist thinking into Moodle as its pedagogy right from the onset and not as afterthought.
- (ii) They were also pleased with the fact that the GNU Public License (GPL) licensing provides opportunities for localized integration of Moodle with other systems
- (iii) It was a relatively straightforward LMS to sustain in spite of the maintenance and administrative overheads that are associated with its use.

It is interesting to note that these findings resonated with those of Machado and Tao (2007), Kumar et al. (2011) that were conducted based on users' experiences involving both Blackboard and Moodle. Other studies have also shown that Moodle is increasingly becoming a preferred choice for most Universities and Colleges (Subramanian et al., 2014, Sachan and Singh, 2015). It is however pertinent

to mention that Blackboard Learn is still the most used enterprise or institutional virtual learning environment (VLE), across the UK (Walker et al., 2014). This could majorly be attributed to its security which Blackboard is very good with as opposed to Moodle which is an open source.

The literature review above has provided a comprehensive outline of VLEs by examining the implications and benefits of deploying VLEs in Higher Education with reference to students, teaching staff and institutions in Higher Education. Also highlighted in the review were students' and teaching staff's perceptions to the use of VLEs while carefully noting how, the technologies of VLEs were impacting learning and teaching in Higher Education.

2.5 Methodology of the study

The research was designed as a mixed method study (Creswell, 2014). Hence, both qualitative and quantitative data were gathered for the study. The interview transcripts were analyzed using thematic analysis. (Creswell, 2014). Interviews were conducted at Aberystwyth University in Wales, United Kingdom. The aim of the interview was to ascertain how effective AberLearn Blackboard was both as a learning tool and as a teaching tool in Aberystwyth University with the students and teaching staff respectively. The purpose of the study was to investigate how the experiences of students and teaching staff corresponded or otherwise to the literature review of the pilot study. The method of thematic analysis (Braun and Clarke, 2006) was used in the analysis of the interview data. Thematic analysis was chosen for the pilot study given that it is regarded as a foundational method for qualitative analysis and for the flexibility that it offers to qualitative researchers (Braun and Clarke, 2006). Also, thematic analysis was chosen for the pilot study because it comes highly recommended. Braun and Clarke (2006) noted that it should be the first qualitative method of analysis that researchers should learn, as it provides core skills that will be useful for conducting many other forms of qualitative analysis. Thematic analysis has also been described as a method with potential for research synthesis Thomas and Harden (2008). Nowell et al. (2017) argued that thematic analysis as a qualitative research method has wide applications across a range of epistemologies and research questions. Another reason for choosing thematic analysis for this study was that as a method, thematic analysis is useful for identifying, analyzing, organizing, describing, and reporting themes found within interview transcripts Braun and Clarke (2006). So following the method of thematic analysis, the transcripts were surveyed for themes that were related for the research questions. Codes were then generated for the chunks of such transcripts and the codes were later grouped into categories based on their similarities for synthesis. The interview questions also had some Likert scale question which were administered at the same time to the participants.

The Likert scale questions were designed to measure the experience of the participants with AberLearn Blackboard with a view to presenting the findings in descriptive forms. The results of the analysis of both the interview transcripts and Likert scale questions were combined to draw conclusion for the study.

2.5.1 Research ethics

As the standard practice is in Aberystwyth University, ethical clearance was sought from the Research ethics of Aberystwyth University and approval was given for the study to be carried out and for people to be interviewed.

It is important to mention that even though the researcher was close to the research environment, the research strove to be objective and open minded at all times in the conduct of the study. Walliman (2016) noted that researchers should give due ethical consideration to research participants. For example, voluntary and informed consents were obtained by the researcher from the participants while giving them the freedom to opt in and opt out of the study at any stage of the study. And also, the confidentiality of the participants was maintained and their transcripts anonymized in order to preserve their identities.

2.5.2 Selection of participants for the study

Upon receiving the ethical clearance to conduct the study, letters of recruitment were written and sent out to students, teaching staff and staff of the Blackboard team via emails. Positive responses from the prospective participants led to interviews being scheduled and conducted.

2.5.3 Groups of participants involved in the study

In order to be able to capture the experiences of the students and staff of Aberystwyth University, it was necessary to develop a survey covering all the stakeholders in the with respect to the use of AberLearn Blackboard. This gave rise to three groups of participants namely: students, teaching staff and members of the Blackboard team of Aberystwyth University.

- (i) Students as participants: The students of Aberystwyth University were interviewed in order to get their perception of AberLearn Blackboard system. A total of 8 MSc (taught masters) students of the 2014/2015 academic session participated in the study.
- (ii) Teaching staff as participants: The teaching staff of Aberystwyth University were interviewed to get their perceptions of AberLearn Blackboard system. A total of 11 teaching staff took part in the study.
- (iii) Blackboard team staff as participants: The staff of the Blackboard team in Aberystwyth University were also interviewed to get their perception of the VLE with respect to how students and staff engaged with the Blackboard system. Specifically, the survey sought to know the extent to which the set objectives of deploying the AberLearn Blackboard system has been met, what more was expected of the students and staff towards a full realization of the set objectives of Blackboard (Aberystwyth University, 2014a; 2014b; 2014c) and the future direction of the use of Blackboard. A total of 3 staff of the Blackboard team participated in the study.

In all, 22 participants took place in the study.

Category of participants	Number of participants
Students	8
Teaching staff	11
Blackboard team staff	3
Total	22

Table 2.1: The number of participants that took part in the study in each group of participants.

2.5.4 Recording the interviews

The interviews were recorded in audio recording form and were later transcribed for the purpose of data analysis. The transcribed documents were stored in a secure location.

2.5.5 Consent forms

The aims of the study and the interview were clearly explained to participants and a consent form was provided for each participant to sign. Signing the consent form was taken as an informed consent for the data to be used in the study. It was explicitly made clear that participation in the study was entirely voluntary. All responses to the questions were anonymous and participants were informed of this before completing the survey and it was also explained to each participant that audio recording would be made of the interview and that they could withdraw from the study at any point. There were no benefits or rewards for the participants and there were no risks associated with the study.

2.5.6 Research instruments

The research instruments included three sets of surveys for the three groups of participants. For the students and teaching staff, the questions were designed around their interactions with AberLearn Blackboard system. For the staff of Blackboard team, their questions were structured around their management of AberLearn Blackboard and interactions with students and staff. The answers from the students, teaching staff and staff of Blackboard team to the questions they were asked formed the data for the study.

2.5.6.1 Students' interview questions

There were ten questions for the students with one out of the ten questions having some sub questions. Six out of ten questions for the students were designed on a 5-point Likert scale while the rest four questions were open-ended. A 5-point scale was chosen to capture all the possible options of the respondents. The questions for the students are in the appendix of this thesis.

2.5.6.2 Teaching staff's interview questions

Similarly, there were ten questions for the teaching staff with two out of the ten questions having some sub questions. Five out of ten questions for the staff were designed on a using Likert scales using both a 5-point Likert scale and a 6-point Likert scale. A 6-point Likert scale was used after it was discovered that some of the teaching staff had not used the tools to be able to answer the questions. At this point, the "Never" option was included in the Likert scale. The remaining five out of the ten questions were open-ended. The questions for the teaching staff are in the appendix of this thesis.

2.5.6.3 Blackboard team staff's interview questions

The questions for Blackboard team staff were twenty each with two out of the twenty questions having some sub questions. Three out of the twenty questions for the staff of Blackboard team were designed on a 5-point Likert scale. The questions for the staff of the Blackboard team are in the appendix of this thesis.

2.6 Data Analysis of the study

The data collected during the interview were analysed using thematic analysis (Braun and Clarke, 2006). The views of participants were analysed to see the common themes in each of the group of participants. Agreement and disagreement within and across the different groups of participants on common issues were identified, compared and analysed. The research questions of the study were taken into account during the analysis of the data. Towards this end, codes were generated from the chunks of transcripts that were related to the research questions and labelled.

2.6.1 Codes

The coding of the transcripts was guided by the research questions as the transcripts were examined by the researcher while paying attention to the points raised by the participants. Interesting points or issues addressing the research questions were noted and given codes. The students' transcripts were first of all surveyed, followed by the teaching staff and the Blackboard team staff.

2.6.1.1 Students' codes

Codes were generated from the student participants based on their opinions in addressing the research questions. Some examples of the codes that emerged from the coding and the chunks of the students' transcripts include:

- Accessing the VLE: *I am always going for seminars and I have to read before going for seminars. It's like that is where the announcement and everything [are]. So, I will have to check, read*

my articles and whatever book is suggested before I go [for my seminar.] So, it's very frequently.

- Always go back to it: *What I like about it is that I can always go back to it. Like after lectures, I could go back... Everything is on Blackboard. So it is kind of an advantage for me. In case I miss my lectures or even if I am in class, when I don't... It is uploaded online. So that is the main reason why I like it.*
- Availability: *I think because the professors sends [lectures] content to us through Blackboard instead of email. So then there is no loss of content. Like I can just go to Blackboard always to find what I want instead of email because email can get lost.*
- Benefits: *So it helps me and I think it is very good. The good thing about Blackboard and they always say it all the time once we are done with a session, they say "you can get it on Blackboard" which I do.*
- Difficulty: *It was a bit different because when, it took me like one month or two to actually understand it because I'm new here. So, after which I really had no challenge.*
- Finding things: *I had a problem in which I had a resit in my module I keep working for it. Then what happened was they put it into the next year 2015/16, I was looking at 2014/15 after a couple of weeks, I just felt they can tell me oh it is there, I don't know where it is. I went to the officer, go on my system if you can find it I am here. Then it is on me. So they went and it was on the next year.*
- Help from friend: *I have not attended any AberLearn Blackboard [training]. I have a different issue. I came in really late, three weeks after everybody have started their seminars. So my friends helped me with it.*
- Impact of teaching staff: *Occasionally. Because most of the time I use it when the module instructor tells us. Yes; the materials are online and he will like us to download to or when I have to turn in assignments.*
- Use Blackboard for more: *I feel they could use Blackboard system for a lot more.*
- User-friendly: *I easily find what I want. So I wouldn't say I have any problem.*

65 codes were generated from the coding of the students' transcripts. The complete list of these codes is in the appendix of the pilot study.

2.6.1.2 Teaching staff's codes

The transcripts of the teaching staff were also surveyed and codes were generated from them. Some examples of the codes that emerged from the coding of the

transcripts of the teaching staff include:

- A progressive step: *I guess it's kind of been a progressive step. I mean for many years in the department, we have had a web page where we can put all our course materials, all our coursework upon. You had to kind of go into the directory, you have got to be check you had put everything in there at the right time. It [didn't] have facilities for things like timing assessments and setting things up for a certain amount of time. So, I guess using Blackboard now, we have moved to personal course teaching and assignments have gone up as well. And I think not so much of course teaching but... recording of lectures and things like that. You can actually put up lecture with the lecture slides, which actually is quite useful. So, I guess the integration of that into Blackboard has helped. But what really makes a difference I think is putting in assignments, where you put them online. You can get the deadlines... and the progression of things...*
- A lot to offer: *The platform has got a lot to offer both to the students and the teaching staff.*
- A one-stop shop: *It is a one-stop shop for each module. Provides link to other resources.*
- Another thing to learn: *More challenging. The learning curve I have using Blackboard is similar to these learning curves that students themselves have. So as a virtual learning environment, they often, they too have to learn how to use it. Learn how to navigate it, find their way around. So, it can in itself be more challenging because not only do they have to pay attention in lectures, they have to learn how to use the tool as well. Nothing new. Sure, it is new. There is something more you have to learn. It's not, you know there are certain parts of Blackboard that you have to remember how you used it from experience. It is not always intuitive how you do things. It is another thing to learn.*
- Complicated interface: *It's a learning curve. Once you have got the idea of where you are supposed to put things, that's fine... you can put them here, you can put them somewhere else, it can be a bit confusing. So long the students can know... For things like marking, for stuff like that, once you get... that bit, it's quite complicated for them to fix. There's a lot of stuff in there that you can't use. I think for myself, by all means, just a small part of that. But once you get to know the small part that you want to use, then it is well relatively straight forward but there are issues.*
- Constrained to use Blackboard: *It would be great but unfortunately, I am being told by those people that I have to use Blackboard in a certain way.*

- Driver's seat: *They are using AberLearn Blackboard as a way to abdicate rather than as a way to engage. I think the problem is when you put students on the driver's seat which AberLearn Blackboard does, then you get loads of students who are not going to do it. Then at the end of the day we are short of the student we have produced.*
- Easy to use: *Quite easy to use but what makes it difficult to use is when it has not been set up by the people putting the content there.*
- Enriched experience: *I think on the whole being able to record the lectures. Like I said on the last question, I don't think it has changed my teaching but probably it has enriched their experience. The fact that we are able to have lecture recordings and they become part of the record of the package that students get, that has helped me to meet the students' needs.*
- Useful tool: *It's a useful tool. Having access to all the lecture notes and recordings is very useful. But I think it is used as a good thing by a lot of the staff. In terms of functionality, it is very good. Having all that materials in one accessible place is very useful and beneficent to students.*

121 codes were generated from the coding of the transcripts of the teaching staff. The complete list of the codes is presented in the appendix of the pilot study.

2.6.1.3 Blackboard team staff's codes

The transcripts of the Blackboard team staff were also surveyed and codes were generated from the process. Some of the examples of the codes that emerged from the coding of the transcripts of the Blackboard team and the chunks of their transcripts include the following:

- Consult with staff and students: *We have also decided this year to consult with staff and students on approaches to the course copy process. Currently, we simply make a copy of everything that is in last year's module, but that can result in retaining some out-of-date material if the staff don't remove or hide it. We want to know whether it would be better to copy over only certain items or to give staff an empty course as a blank slate. In conjunction with this, we have had some feedback from users that the current entry page which has several modules boxes with different kinds of alerts is not heavily used and can be confusing, so we want to ask staff and students what they would prefer for an entry page. Some of these changes are expected to take place next year, with the collecting of information and planning happening this year.*
- Engaging stakeholders: *We ran a series of dialogue were we invited a group of staff and students. We worked with the student*

union to get students to come along staff and students from the same department and same institute and sitting on the table and the most comment that came from the students we left that seat for the students based on the consultative committee, a particular discussion where the staff and students are on equal basis. They go around the table on what comment was raised and what action is to be taken and that was really useful.

- *Making it better: Like I said earlier, we try to put information on blackboard on the student learning page. We also create videos on effective submission of assignments for example. So, the video we tell the staff to put the videos in but this year, we put the videos in both in English and in Welsh. Having an assignment link as opposed to staff putting the link.*
- *Making the system easier: Our aim is always to make the system easier to use as well as richer in useful content. We want to apply principles of good design and feedback from users to make the welcome pages for staff and students simpler and easier to navigate. We are hoping to work with the Student Union to collect further feedback from students on this..*
- *Perception of BB staff: Happy with those that are using it and frustrated by those who are not using it. Sometimes, they resist it, they don't come for consultations. The Turnitin has so many ways it can be used. Sometimes they come to us in the last minute if they had come to us earlier, we would have given them advice on time. So, we don't have much time to help them. But it is not their fault because we know that lecturers are under a lot of pressure.*
- *Resistance to BB: Our biggest challenge is where there is a resistance. We stand emails and some of the staff don't read the emails they delete the emails because they get too many emails.*
- *Students' surveys: We have a yearly IS-user survey and we had focus groups with students and information services about their users in virtual learning environments, they all seem to like it. They find it very intuitive.*
- *Support for teaching staff: We are doing centrally now rather than expecting staff to do it. So they don't have to spend time doing it. But they should be going to blackboard anyway and putting their coursework there and organized properly. We are happy to provide help and support for that. Since somethings will be done for them, we expect they will be happy.*
- *Training sessions: We have training sessions, bespoke session, we have training with departments and institute. We contact every institute every year over the summer to try to arrange information session. I have done the one for IMPACS. To encourage all the*

people to come to the training this what they are doing. We have training session every Friday from 9am in the morning. We are available by telephone and email to provide support.

- *Voice in the department: We do this thing with the institute and technology enhancement group, and people (academic staff representing the people in the group) are meant to go back to their institute to promote it to take ownership of it because staff have a voice in the department they are and how they implement it and they go to promote. The TEL is supposed to be in the teaching and learning group sitting in the committee in the institute. as peer to peer which is more effective.*

A total of 89 codes were generated from the coding of the transcripts of the Blackboard team staff. The complete list of the codes is presented in the appendix of the pilot study.

2.6.2 Themes

Inherent in qualitative data are important concepts and it is the responsibility of the researcher to discover these data and analyze them. Some of these concepts may have a common pattern associated with them. In this case, they are referred to as themes. A theme represents an important point about the data with respect to the research question, and represents some level of patterned response or meaning within the set of transcripts (Braun and Clarke, 2006). According to (DeSantis and Ugarriza, 2000, p.362) “a theme is an abstract entity that brings meaning and identity to a recurrent experience and its variant manifestations. As such, a theme captures and unifies the nature or basis of the experience into a meaningful whole.” A theme is not necessarily dependent on quantifiable measures but rather on whether it represents something important in relation to the overall research question of the study (Braun and Clarke, 2006). Hence, as the researcher read through the transcripts, searches were made for themes or patterns both across and within the different groups of transcripts made up of students, teaching staff and the Blackboard team staff. The criteria for identifying these themes was that they had to be addressing the research questions that the researcher was investigating as stated in section 2.3.1.

2.6.2.1 Classification of pilot study codes into themes

The next step was to sort the codes into the themes that fitted them for further analysis. At this point, the researcher looked out for agreements and disagreements on these themes within and across the different groups in the interview transcripts. The themes that were generated from the analysis were based on the issues that dominated the transcripts. These themes are discussed below:

- (i) **Accessibility:** This theme was made up of issues surrounding the accessibility of the VLE as identified in the transcripts. The fact that students could access the VLE for their learning was evident in the transcripts as

there was a common pattern. So all the codes that were about users accessing the VLE were sorted into this theme. Some of the codes and the chunks of transcripts are shown below:

- Easy access

I could easily gain access to most of the materials that the instructor used during the class session. Student ST1

- Availability

I think because the professors sends [lectures] content to us through Blackboard instead of email. So then there is no loss of content. Like I can just go to Blackboard always to find what I want instead of email because email can get lost. -Student ST3

- Accessing the VLE

I am always going for seminars and I have to read before going for seminars. It's like that is where the announcement and everything [are]. So, I will have to check, read my articles and whatever book is suggested before I go [for my seminar.] So, it's very frequently. -Student ST4

- Accessible

I like the fact that you can access it remotely from whenever. My first experience with it was back in Nigeria. I went through it and I think it helps. And I also got to know from the library that I can, if I have VPN, I can still access all my modules just as if I'm here. That helps. Accessibility. It is very accessible so long you're online. -Student ST6

- (ii) **Advantages:** In this theme, the participants talked about the benefits that they derive from the use of the VLE. All the codes that captured the benefits that the users derive from using the VLE were grouped under this theme. Samples of the codes and the chunks of transcripts supporting them are provided below:

- Always go back to it *What I like about it is that I can always go back to it. Like after lectures, I could go back... Everything is on Blackboard. So it is kind of an advantage for me. In case I miss my lectures or even if I am in class, when I don't... It is uploaded online. So that is the main reason why I like it. - Student ST5*

- Benefits

It has aided me in so many ways. Because, first of all, let's say we have been given an article and books to read, and then for, let's say for a particular assignment, and then if I need [that] information again for another assignment, I can always refer back and it is always there for me. Yeah, that has really helped me a lot. Yeah, for instance I had my presentation on...

and I have had articles on that from my... already and then I'm doing something on... my dissertation. So, I have again referred back to those articles and they have been really been helpful. - Students ST4

- Beneficial to students

The slides and whatever else allow you to bring all the materials together in one place. It is convenient as it is in one place. Beneficial to students. The discussion forum is good, but students don't like engaging with it except when there is assignment. They are very assignment focused. -Teaching staff TS3

It's as far an interactive learning environment. It is a way for your students to have access to your teaching materials in advance of you delivering your lecture, seminar or tutorial. It is a shared space, a virtual space for you and your students. It makes it easy to organize content according to module, according to academic year. - Teaching staff TS9

I think it is the same answer with the first question. It has helped me to get things that I have missed. Also, sometimes lecturers like upload videos that or, not really videos, that's for statistics, those videos are just self-explanatory. Sometimes also in class, videos are recorded, and it's uploaded, and we can always go back and listen to it and yeah, it has helped my learning experience. -Student ST5

- Enriched experience

I think on the whole being able to record the lectures... I considered in saying that to the last question but I don't think it has changed my teaching, but I think it probably has enriched their experience. So, the fact that we are able to have lecture recordings and they become part of the record, you know of the package of stuff that students get to see. I think that has helped me to meet the students' needs. -Teaching staff TS4

- Useful features

They have found most of the features useful. We get back feedback files, electronic submission, they found the materials... they like it. -Blackboard team BB2

- Useful tool

It's a useful tool. Having access to all the lecture notes and recordings is very useful. But I think it is used as a good thing by a lot of the staff. In terms of functionality, it is very good. Having all that materials in one accessible place is very useful and beneficent to students. -Teaching staff TS2

(iii) **Attitude:** This theme covered the attitudes of the participants to the VLE as they talked about their use of the tool. These attitudes were captured and analyzed with a view to draw some meaning from them. All the codes that were related to the perceptions of the participants were brought together under this theme. Samples of the codes and their transcripts are shown below:

- Like

I like the fact that I can access my courses there, that I can access my lectures from there, the slides and everything. I like that. -Student ST2

First of all, I like the notification feature of it which notifies you of your module, like they give announcement on that so that you would know what to read before you go for seminars. That is very good. And then again, I like the Turnitin on there, so you don't like moving from manually sending in assignments and like things like that in a digital way which you can do at any time really. So, I like, like both of those features on the [AberLearn] Blackboard. -Student ST4

- Perception

I think Blackboard has been good so far and the system has been very efficient, it has helped me to get the materials I needed to do well in my course, so I think I am happy. -Student ST1

- Perception of teaching staff

This is something I have not yet done. This year I will be doing that. When you have just written a new lecture, you are a little bit scared of videoing it the first time but now that I have gone through it. I think it's really powerful for first year students, especially students from sides of our borders, international students who may be don't understand your tone, sometimes they want to re-listen to what you are saying. So I'm going to be putting up Panopto from now on -Teaching staff TS 6

As I was saying one of the things we could do and personally I feel is that while I agree with the basic presence of Blackboard, I think increasingly it's becoming much more I don't know like a directive, you have got to do this, you have got to do that. And I think it is better if staff are allowed to adapt Blackboard to suit their purposes. One of the examples for instance is this idea that you must record all lectures. Now I have always used lecture capture even before it became compulsory for those elements I thought it was important. -Teaching staff TS 7

It has been a mixed blessing for me. It has changed the way I have taught. I am not sure I have always wanted to change

it that way or felt comfortable with that. And in some ways, I have felt that AberLearn Blackboard has forced me to teach in ways that I would prefer not to. But it has never the less been an efficient way of giving out handouts, and power point slides and things like that to the students. -Teaching staff TS 8

Some of the staff might do the very basic minimum that is required, they don't do more than that for whatever reason. That is fine. It is very variable. Some staff are maximum enthusiastic, they have got a lot of information on Blackboard, a lot of interactive activities, some staff have a lot of wikis, they have got a lot of quizzes, they have got things students can upload on a continuous basis, activities for the formative quiz, some of the formative quiz so that, some staff may put handbooks, contact details, e-submission links, minimum interaction really. That is some staff. We are trying to encourage staff like the students tell us they want the staff to use it more and use . I think the staff are doing what is best for the students. -Blackboard team BB2

- Perception of BB staff

Happy with those that are using it and frustrated by those who are not using it. Sometimes, they resist it, they don't come for consultations. The Turnitin has so many ways it can be used. Sometimes they come to us in the last minute if they had come to us earlier, we would have given them advice on time. So, we don't have much time to help them. But it is not their fault because we know that lecturers are under a lot of pressure. -Blackboard team BB1

(iv) **Challenges:** This theme was centred on the challenges that the students and the teaching staff faced in their use of the VLE. The Blackboard team staff also expressed some challenges that they face in the administration of the VLE. This theme contains all the codes that represented the challenges that users had in their engagement with the VLE. Some of the codes and the chunks of transcripts supporting them are provided below:

- Another thing to learn

More challenging. The learning curve I have using Blackboard is similar to these learning curves that students themselves have. So as a virtual learning environment, they often, they too have to learn how to use it. Learn how to navigate it, find their way around. So, it can in itself be more challenging because not only do they have to pay attention in lectures, they have to learn how to use the tool as well. Nothing new. Sure, it is new. There is something more you have to learn. It's not, you know there are certain parts of Blackboard that you

have remember how you used it from experience. It is not always intuitive how you do things. It is another thing to learn.
-Teaching staff TS9

- Difficulty

It was a bit different because when, it took me like one month or two to actually understand it because I'm new here. So, after which I really had no challenge.-Student ST5

- Logging in issues

Except with the logging in, I have never had issues. -Student ST4

- Lots of clicks

It is okay. Quite useful to use. Takes lots of click to use for something that should take less. Teaching staff TS3

- Redundant features

I really haven't had any challenges. It's just that I find that there are lots of features that don't really help much in terms of what they do. There are some tasks, some features there will talk about some tasks but then you never see any task or it is just there being idle. -Student ST1

- Marking issues

Whilst with Blackboard from my understanding, and again maybe it's better than this, but my understanding is that I would need, that each student, I will have to put feedback in for separately. I can't link them. Which is really, it's not just that it's more work, it also makes it much easier to be inconsistent between the students. I try really hard to, and you know when you are marking a hundred and twenty things, it's really important to be consistent. -Teaching staff TS4

(v) **Ease of use:** The ease of use of the VLE was a common theme that ran through the transcripts with the students, teaching staff and the Blackboard them. For instance, while some students agreed that the VLE was easy to use, others disagreed. The same pattern was seen with teaching staff with some agreeing that it was easy to use while others disagreed. The Blackboard team expressed their commitment to making the system better for greater usability. All the codes that have something to do the ease of use or otherwise of the VLE were grouped under this theme. Some of the codes and their chunks of transcripts are shown below:

- Easy to find

Usually I find what I want whenever I go there like looking for course content, downloading materials for my modules. I easily find what I want. So I wouldn't say I have any problems.
-Student ST1

- Easy to use

I mean you don't need much skills to navigate [through it]. But then if you don't know, things are not not easily found, like say where the announcement is, it is just a clock you know. So, I just go in there because I see something pop up like I have five messages. I mean if somebody doesn't know what that means, the person will just ignore it and wouldn't read the lecture notes before the seminar or something like that. -Student ST4

Quite easy to use but what makes it difficult to use is when it has not been set up by the people putting the content there. As long as all the files are well organized properly, all course names labelled clearly... -Teaching staff TS2

- Good system

I don't think there is any change. I think it is good and I can't think of any new change to the software. I think it's okay. It's good. -Student ST5

- Complicated interface

It is a complicated interface with lots of stuff out there that you can't use. I use a small part of it. Once you get that small part, it is relatively straight forward but there are issues. -Teaching staff TS1

- Inconsistencies

Some of the students use the survey to tell us about lots of positive comments. They find some inconsistencies between modules, they don't like that. We try to promote consistency as best practice and most especially they like it... -Blackboard team BB2

- Lots of things

It has a lot of things in it. Like most systems, so it's not immediately so easy to use because it has got so many options. -Teaching staff TS6

- Not easy to find things

It is a good system but then students don't always find things easily. One thing that has made it challenging is no real search. It is interesting that talking to a lot of students, they want search. Lack of search slows down the ability to find stuff. -Teaching staff TS3

- Simplify the process

We have simplified the process for putting the lecture capture to blackboard. Up to this year, the lecturer had to obtain the... record the lecture and put the link into blackboard. We have done the first step for them. Starting from this academic year,

all the modules have been provided centrally so all they need to do is to record the lecture and put in the link where they want the lecture to go. -Blackboard team BB1

- Too many clicks

It's 6 clicks to what one needs. It could be done more easily. It seems the system was in the early internet late 1990's and desperately needs upgrading to make it user-friendly. The app version is much more friendly with the user-interface compared to the PC version. I believe the limitations of that is what you can actual do with that. Some students including myself say that interface is easier. I will probably give 3 out of 10. - Teaching staff TS5

- Too many sign-ins

When you login after Ctrl+Alt+Delete and then you go in, I think if I open a page or Blackboard page, if it [was] made in such a way that I don't need to put my password again, then it would be much more better. But then you have to put your password again on every step of the way. For logging in, you put your password, webmail you put your password, primo you put your password. I think it is quite too many. I think a central login that will offer all these will be good. The university computer systems are like history of what you have done so. If you can add that one to the basket, it will be good. -Student ST6

- (vi) They lack good organization

I think the one thing I do find a little disappointing is not what they put in Blackboard but the way, it is organized. We see a lot of Modules often answering questions from staff, from students and it is not just intuitive. The students say they find it difficult. -Blackboard team BB3

- (vii) **Training** The participants talked about how they went about getting the right skills to master the VLE and how they got trained to use. The transcripts revealed that while some were trained by the Blackboard team, others learned to use the VLE on their own or through other users. All the codes that captured the training of the users with respect to the use of the VLE were grouped under this theme. Some of the codes and the chunks of transcripts supporting them are provided are below:

- Blackboard support

What I find hard is lecture capture. Probably because I don't use it enough. But it is actually easy. The Blackboard team has been very good, coming out to the department to teach us how to do things, always willing to support us and the students

*haven't had any complaints. They normally find it easy to use.
-Teaching staff TS8*

- Help from friend

I have not attended [any training]. I came really late, like three weeks after everybody [has] started, so my friend helped me. - Student ST4

- Relevant Training

And training therefore is very useful. And not just training in a generic level but coming up with a specific question and inviting one of these learning teams or one of your colleagues and say how do you set up this? And letting them show you how to set up what you are looking for. Because there is a lot of stuff in there that may well be useful, but it is not useful for me. -Teaching staff TS6

To be honest I attended it a very long time ago when the features [weren't] exactly the way they are now. Okay it was the first time I was using the Blackboard interface, so I needed to learn it. So, I would say yes as at that time I did find it useful. I haven't attended any recently, so I can't say. But having said that, the reason why I haven't attended any recently is that often what I want is very specific information and I not quite sure if it a good use of my time to have that lot of time to go and learn one thing if you know what I mean. So because it is kind of trying, once you are already used to it or you have used it the first time, you just want to add on, I want to learn how to use a blog, or I want to , that is all I want to know and I am not quite sure that I am prepared to go to a long training session where I am going to be "taught again" things that I already know when all that I want to know is something very specific. So, to that extent, I keep wishing we had more tutorials on Blackboard itself so if I wanted to do a blog, I just put it on and watch it and do it without having to formally book a time to go and learn it. -Teaching staff TS7

- Self-taught

Learnt it [Blackboard] on my own. -Student ST3

- Staff support

We actually do quite a lot of work. So, in terms of day to day, we run an email help service, telephone and online chat. Lots of work practical files, put it in. we do it bilingually, so everything is translated to welsh, we have started using videos so that people can watch videos. So in terms of day to day practical stuff we are always anybody can meet us, email us any time, see us any time, we, I think provide a good support. So far,

we are doing quite a lot of work on using e-learning in teaching generally. Pedagogical approach, how you actually design, say how you promote learning, you promote engagement, we do training sessions, drop-in sessions, confrontation, we might go to work with somebody independently work on a particular project or on the thing they are working with. -Blackboard team BB3

- Trained by tutor

My tutor took me through [Blackboard]. -Student ST5

- Training and advice

By training and provide advice, they can get legal and authoritative advice, legal and that advice is from the Higher Education source about copyright and how to use images and also we have a copy right officer whom we direct people to and people sometimes still are not confident, so we also talk about copyright materials use, creative comments, this is how you can find it, this is how you can use it. That it is meant to be used and shared so they don't worry about that. So we embed that in our training and advice staff. -Blackboard team BB1

(viii) **VLE administration** This theme had to do with the administration of the VLE and the university policy that guides its use in Aberystwyth University. All the codes with respect to the administration and management of the VLE by the Blackboard team were grouped under this theme. The transcripts revealed that there is a university policy which has expects the teaching staff to have the required minimum presence on the VLE. This ensures that the baseline information is provided for students of Aberystwyth University by the teaching staff on Blackboard. Some of the codes and the chunks of transcripts supporting them are shown below:

- BB exemplary course

We look at the Higher Education Academy, we look at the Blackboard exemplary course programme which has a very detailed and descriptive of what an exemplary module would look like and we embed good practice when teaching. -Blackboard team BB1

- Changes

We try to talk to them in advance, if it falls into a policy, if we can we get their feedback and get staff who are actors/active within our areas to say oh we have tried this, this is really good, this much better, it works, we can then speak to their colleagues on our behalf. I give lots of information to the people I support once changes have taken place with e-submission, we will literally even for very straightforward queries, we will literally

stroll down to somebody's office and say look we will sit with you and go through this with you. -Blackboard team BB2

- Engaging stakeholders

We work with the student union. We work perfectly well with the education of the student union. We do quite a lot of promotional work with students through videos, emails, we use lots of mechanism. We also work with committees. I think the students are happy with how things are going. -Blackboard team BB3

- Introducing changes

If we are introducing new changes, we tend to do it at a slow approach rather than a big bang everybody... doing it with a department or module. -Blackboard team BB3

- IS surveys

We have got the IS user survey which is a yearly user survey that actually asks students specific queries and questions about every facets of information services including AberLearn Blackboard. So that goes to students and staff and we know if it is a student that is filling this in and they would say specifically what makes it AberLearn Blackboard have had issues and as the person responds to the survey, they can now say this is completely none of us or if you have answers or comments to any of my questions, you can get back to me. So we extract it. The comment could be considered negative or seems to work on and if there is an individual that we can get back, we get to them on a personal basis if not we build in goals and observations into what we are doing and see how we can improve. -Blackboard team BB2

- Required minimum presence

We have control over the required minimum presence, we work closely with the technology and enhancement learning group. Before we had institutes, we had a representative from every department and now representative from every institute. We draw up a graph and had discussion with them about what should be the required minimum presence, we looked at the Blackboard exemplary course programme, we looked at feedback from students, we drew up and identified which item from that rubric most useful for what students have said so that it will be okay for all. -Blackboard team BB1

- We give guidelines

You probably have seen the required minimum presence. We do give guidelines but well I ... I think when they don't know where to find things it is frustrating and that is my view that

they don't engage in things because they don't really know what they are doing. We do have a template for everybody to use, that is the frustrating thing. We have put a template there, but people change it. -Blackboard team BB3

2.7 Results of the data analysis of the pilot study

The results of the data analysis revealed the following:

- (i) Seven students agreed that it has helped their learning in one way or the other while one did not answer the question.
- (ii) Nine out of the eleven teaching staff provided lecture slides via the VLE. The provision of lecture notes through the medium of AberLearn Blackboard. Of these nine teaching staff, seven of them found the process of uploading lecture notes to be very easy/easy while the remaining two teaching staff rated the process as average.
- (iii) Seven out of the eight students that took part in the pilot study rated AberLearn Blackboard to be user friendly.
- (iv) Both students and staff agreed the VLE had positive impact on the learning and sharing of teaching resources. They agreed that it enhanced learning and teaching in Aberystwyth University. The provision of a central virtual space for providing learning resources was highly commended by both students and staff.

I think Blackboard has been good so far and the system has been very efficient. It has helped me to find the materials I needed to do well in my course. -Student ST1

It's a good reference point. Like when you have had your lecture and want to go back to what the lecturer said in class, you could easily go back to the slides and read from there. At times we could always see the lecture [slides] beforehand and you read through before you go to class. So I think that is fine. -Student ST2

I think because the professors sends [lectures] content to us through Blackboard instead of email. So then there is no loss of content. Like I can just go to Blackboard always to find what I want instead of email because email can get lost. -Student ST3

The slides and whatever else allow you to bring all the materials together in one place. It is convenient as it is in one place. -Teaching staff ST3

It is useful to have an online location where students can find all the materials for a course. It enables me to put not just my lecture slides there but links to other materials, reading, videos and the library system that we have and to record all my lectures and for it to be in one place. -Teaching staff ST5

In terms of the fact that I can upload stuff teaching materials unto Blackboard, I find it useful for surveys where you want students to reply you immediately in class or stuffs like that. I have also found it useful for recording some of my lectures through Panopto which I think has been good. To some extent yes, it has provided some framework for teaching with students having easy access to materials wherever they are. There are certain aspects where I find them useful. -Teaching staff ST7

It's as far an interactive learning environment. It is a way for your students to have access to your teaching materials in advance of you delivering your lecture, seminar or tutorial. It is a shared space, a virtual space for you and your students. It makes it easy to organize content according to module, according to academic year. -Teaching staff TS9

I think the staff are doing what is best for the students. There is a big difference in how they use Blackboard between departments and within departments and institutes. It is changing, people are making more use of it now. It is changing especially the sharing in departments, examples of good practice and members of staff are sharing with colleagues what they are doing, and the staff says what could I... -Blackboard staff BB 2

Just looking at the sheer amount of resources that are now available electronically it has opened up so many more possibilities and making that available to students. It is highly designed for your teaching. -Blackboard team BB 3

And increasingly the use of it has moved up in time and when you think of it in the last three years there is much more use of it and more staff are trying to accept it. -Blackboard team BB 3

- (v) Despite the benefits that both students and teaching staff derived from using AberLearn Blackboard, there were some complaints from the users about some of the things that they did not like in the VLE. Some of the participants offered ways that the use of AberLearn Blackboard could be improved upon. These will be discussed in the next section.

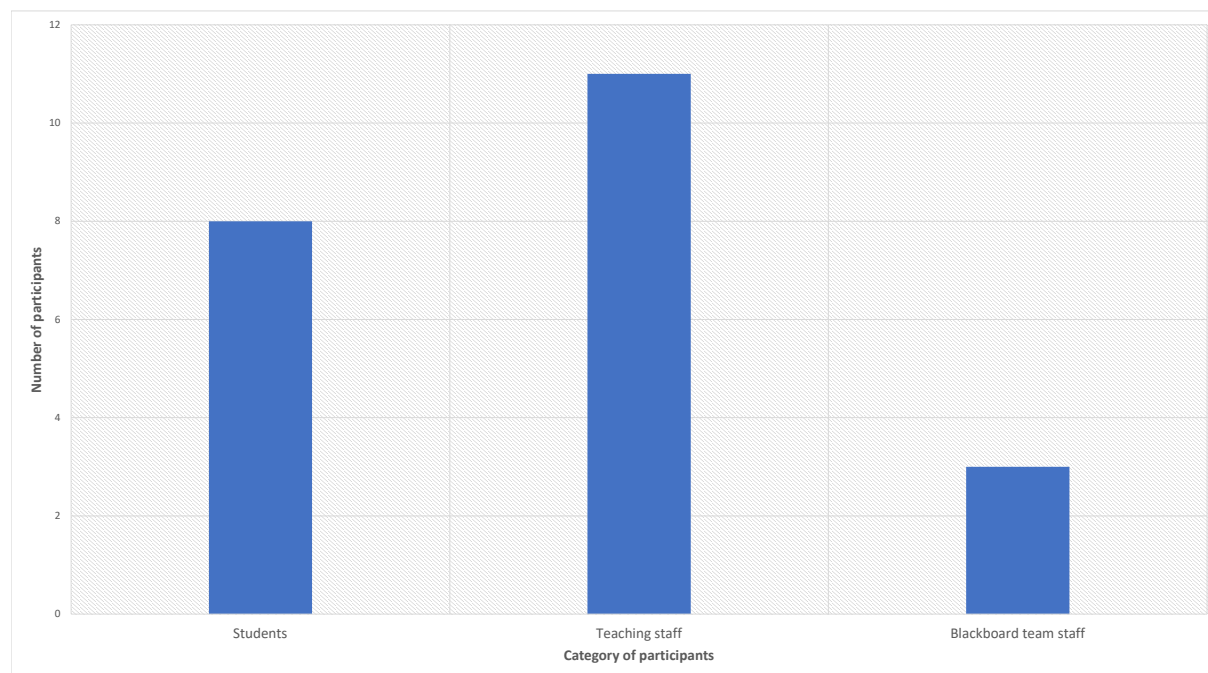


Figure 2.1: A representation of the categories of participants that took part in the study

2.8 Discussions

The themes that were generated from the thematic analysis of the interview transcripts of the pilot study captured the entire experience of the users of AberLearn Blackboard. The six themes that emerged from the analysis of the transcripts are Accessibility, Attitude, Challenges, Ease of use, Advantages and Training. These themes that emerged from the pilot study, covered the benefits and as well as the challenges of using AberLearn Blackboard. Some of the challenges and the expectations of the users are presented below.

On the issues of redundant features on the VLE, a students had this to say:

Well I think there are lots of redundant features there which don't serve a lot of purpose. So I think they could be taken down. The direct access to course materials will be good - Student ST1

Both students and teaching staff agreed that there was a need to provide users with only relevant information as opposed to the current state of overwhelming users with information overload.

It was also discovered that students and staff both complained of multiple logins with respect to AberLearn Blackboard. They argued that a single login should suffice for the multiple systems used by the university.

When you login after Ctrl+Alt+Delete and then you go in, I think if I open a page or Blackboard page, if it [was] made in such a way that I don't need to put my password again, then it would be much more

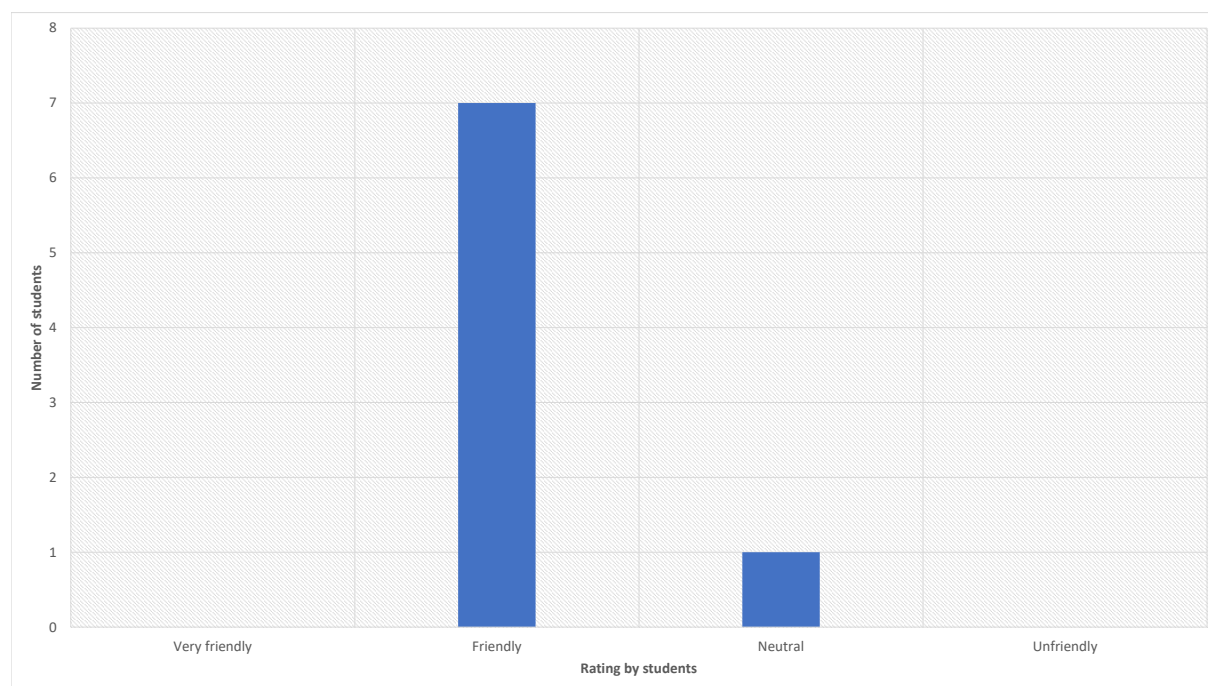


Figure 2.2: Students' rating of the user friendliness of AberLearn Blackboard

better. But then you have to put your password again on every step of the way. For logging in, you put your password, webmail you put your password, primo you put your password. I think it is quite too many. I think a central login that will offer all these will be good. The university computer systems are like history of what you have done so. If you can add that one to the basket, it will be good. -Student ST6

The way it has made my lecture challenging is that it takes a lot of time to login into it at the start of the lecture. So, I have to login into Panopto and I have to login into Panopto through Blackboard login into the system anyway and then open the slides, otherwise it hasn't, it is fine. -Teaching staff TS10

For logging in, you put your password, webmail you put your password, primo you put your password. I think it is quite too many. I think a central login for all these will be good. - Student ST6

On the improvement of the VLE, some of the participants expressed their expectations as to what they would like to see in the VLE.

I will like to see a revamp of the system or a replacement for blackboard in the 21st century like you have in Facebook where with a single click, you get things done. -Teaching staff TS5

The reorganization of the home page of modules to make it more useful. A Better way of having the students interact with the system to ask questions because there are forums they have at the moment that are really terrible. -Teaching staff TS10

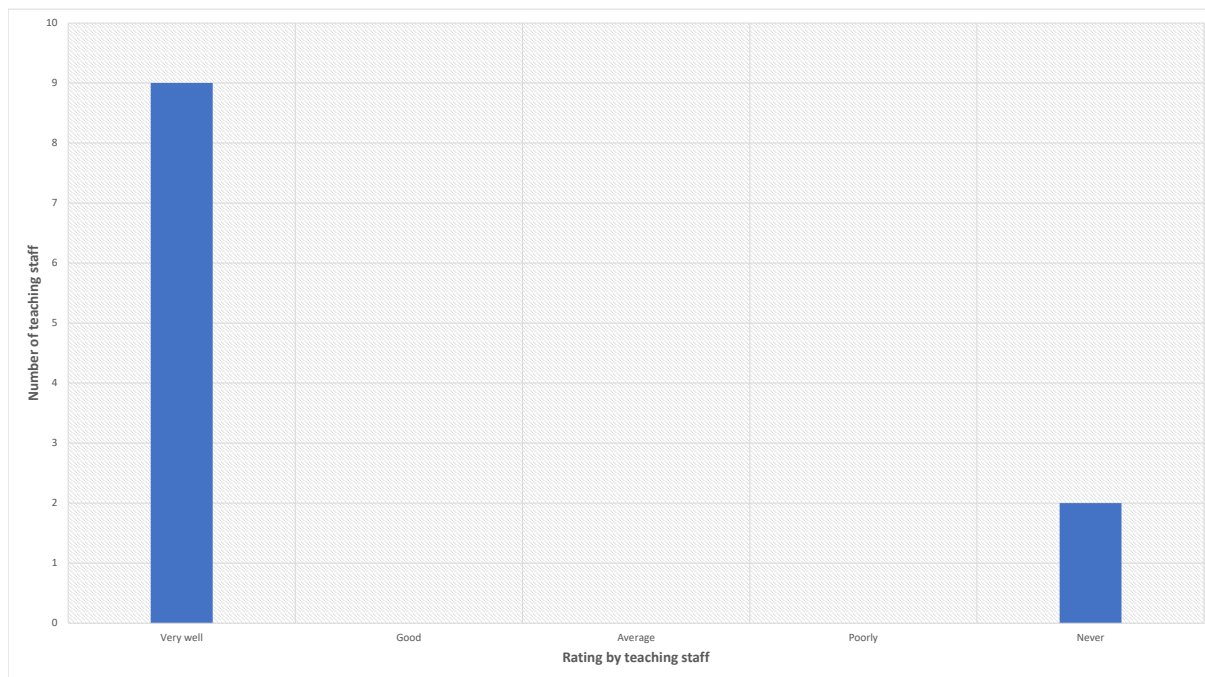


Figure 2.3: Provision of lecture notes by teaching staff via AberLearn Blackboard

The Blackboard team acknowledged that fact that they were committed to improving the usability of AberLearn Blackboard.

Our aim is always to make the system easier to use as well as richer in useful content. We want to apply principles of good design and feedback from users to make the welcome pages for staff and students simpler and easier to navigate. -Blackboard team BB1

It was also discovered that the level of proficiency of the teaching staff in the use of AberLearn Blackboard varied. According to one of the students interviewed, various lecturers were found to have different levels of proficiency with respect to the use of AberLearn Blackboard. In the student's own words,

Some of them you can tell, they have no idea of what they are doing. -Student ST8

The student advocated the need for such lecturers to be trained. On the issue of training, the members of the Blackboard team were keen on providing training for students and teaching staff, both at individuals and groups levels. They indicated their readiness to provide training for groups of lecturers at departmental levels. It was also discovered that some self-help materials have been provided by the team through the AberLearn Blackboard platform. Perhaps students and staff need to be made aware of these training resources even as a teaching staff advocated for some specific video tutorials to be provided for users.

Another interesting finding from the study was that while members of the Blackboard team were of the opinion that teaching staff were not being compelled

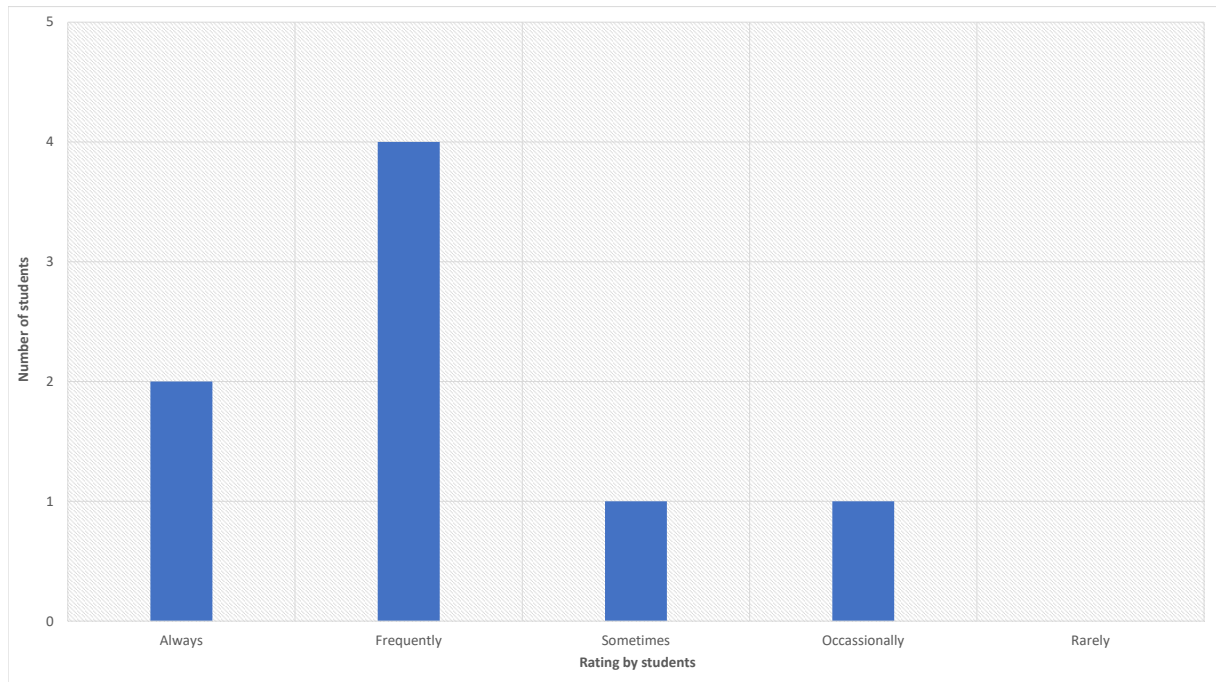


Figure 2.4: Frequency of students' use of AberLearn Blackboard during term time

to make use of AberLearn Blackboard in teaching, a teaching staff was of the opinion that lecturers were indirectly being forced to use AberLearn Blackboard as students were likely to rate lecturers who fail to use AberLearn Blackboard low the during annual ratings.

On the use of lecture capture, while all the students interviewed embraced the idea, there were disagreements among teaching staff on the use of lecture capture in their modules. Those that disagreed on the use of lecture capture argued that it would lead to a decline in class attendance and passive learning on the part of the students. They claimed that the provision of lecture recordings for students would not help them in developing the requisite skills such as listening, note-taking and critical thinking. They were of the view that they would prefer to use the lecture capture in other ways such as providing an introductory lecture on a new concept. Below are some of the direct quotes from the teaching staff on lecture capture:

I don't think it has really been challenging. I think it would be interesting to find out what students think about this. Because lecturers feel some students think they don't need to go to the lectures. They can just listen to the lectures. And in that way, that will be making it more challenging. Because of two things. 1. They are wrong. There are a lot of things they need to know if they haven't been there more than just watch the recording. It makes it more challenging because I have to add more things for them to come to class. Make the lecture more appealing because otherwise why would they go when they can just watch the recording. -Teaching staff TS4

There is a potential that by providing lecture notes and videos, they

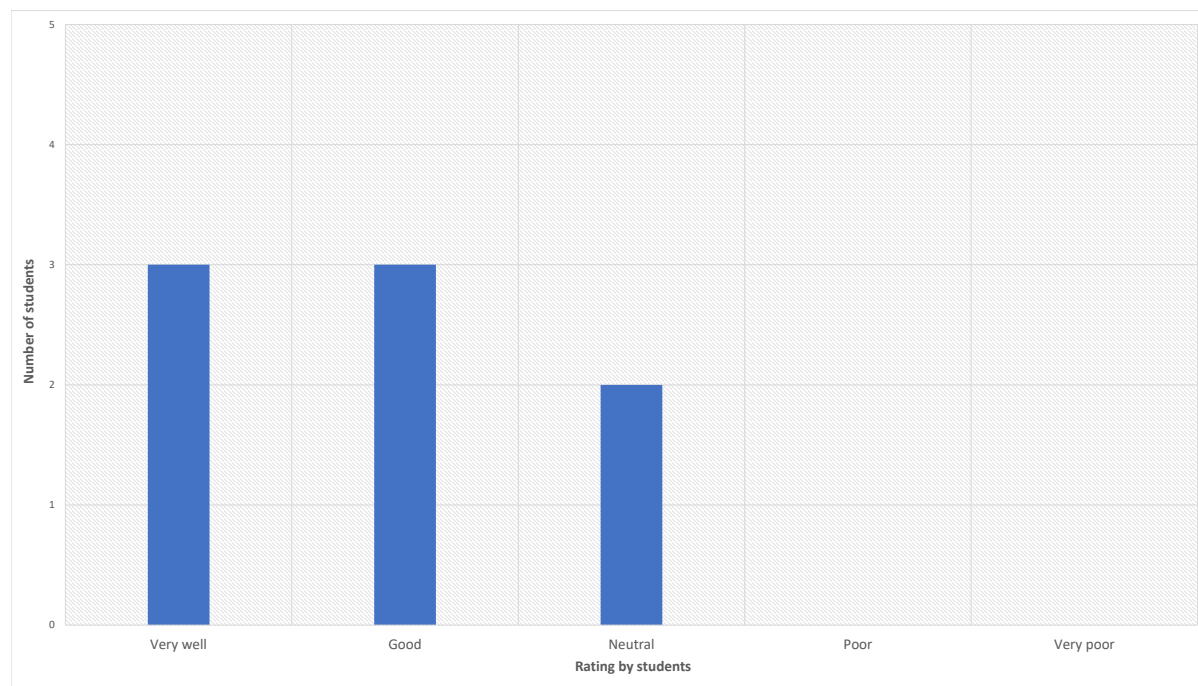


Figure 2.5: How well the learning needs of students have been met via AberLearn Blackboard

may not turn up. But I am not convinced that, that is a real thing. So I haven't come with any ways it has made it worse. -Teaching staff TS6

Now I have always used lecture capture even before it became compulsory for those elements I thought it was important. But I also think that listening skills are also important for students especially the students I teach. And if we have taught them not to listen, they can always go back and rely on recorded videos, what happens when they go into the real world? How do they sort that out? In the real-world things are always recorded if you go to a meeting, if you go to a court, things are recorded. So, you do need students to learn how to listen for two hours and make notes. So here I think it is the sort of adaptability where we balance the broad range of skills that we want students to learn as well as the benefit the technology does add. I think sometimes we over emphasize the technology and my experience has been students don't use a lot of that technology as much as we think and the use of multimedia like Panopto for lectures, perhaps more need to be done about looking into how that actually affects the development of skills and stuff. -Teaching staff TS7

And the goal of Higher Education is not to give information. You can get that out of books, offline, online and get that anywhere, get that from the world and get that from their your own experience. Our job is to shape their experience, shape that knowledge, to shape that information and so it is turned into learning, it is turned into knowledge

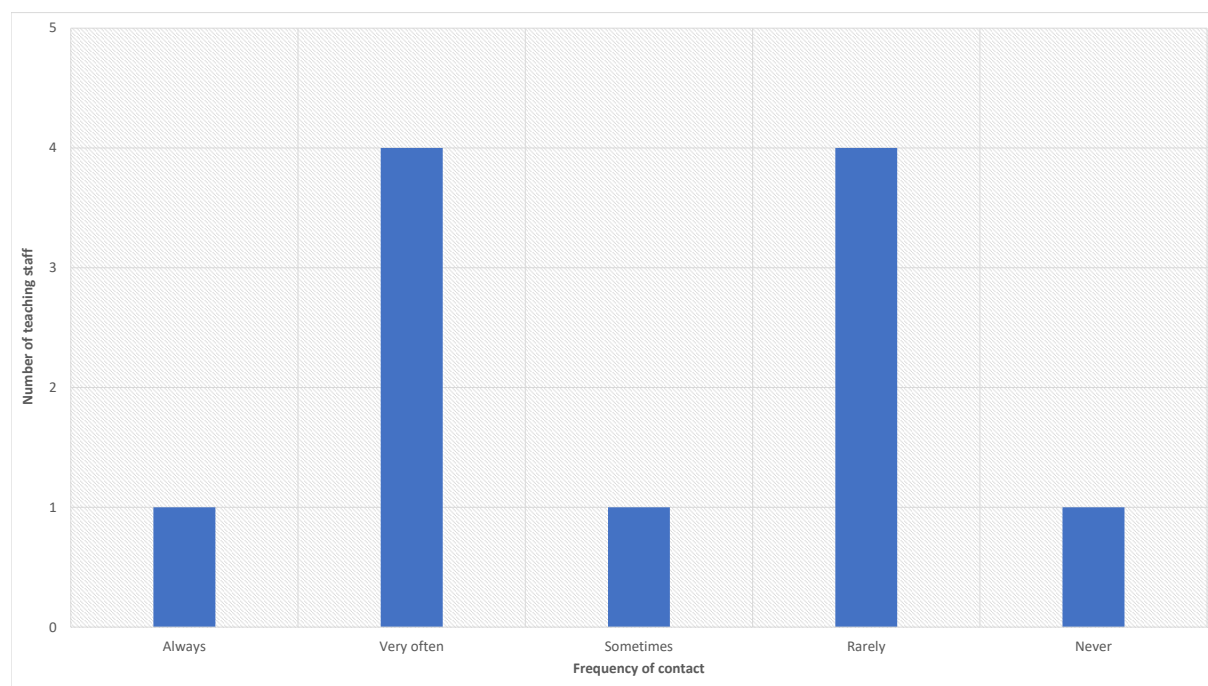


Figure 2.6: The rate at which teaching staff contact the Blackboard team for support

that will be useful later in life. So, Blackboard is just a way of providing information. It is not a way of ensuring that learning has taken place. So for me just that lecture or seminar, one of the things AberLearn Blackboard, I am sure those that developed Blackboard will tell me that I am wrong. But there is evidence to suggest that when you put information on Blackboard like lecture notes, students don't turn up for the lectures. Now the lecture is where they do the learning, well as for me I like them to not by reading notes. But reading notes never decides turning up. But the students don't realize that. -Teaching staff TS8

The analysis of the interview transcripts also revealed that some of the teaching staff would like to use the VLE in their preferred ways. Below are some of the comments of the teaching staff:

As I was saying one of the things we could do and personally I feel is that while I agree with the basic presence of Blackboard, I think increasingly it's becoming much more I don't know like a directive, you have got to do this, you have got to do that. And I think it is better if staff are allowed to adapt Blackboard to suit their purposes. One of the examples for instance is this idea that you must record all lectures. -Teaching staff TS7

It has been a mixed blessing for me. It has changed the way I have taught. I am not sure I have always wanted to change it that way or felt

comfortable with that. And in some ways, I have felt that AberLearn Blackboard has forced me to teach in ways that I would prefer not to. But it has never the less been an efficient way of giving out handouts, and power point slides and things like that to the students. -Teaching staff TS8

What I disagree with is spoon feeding students with the actual lecture and lecture notes. I just think it is discouraging. It is discouraging from being attentive and active learner. Students don't take notes anymore. They if you hear something, write it down, you know. Not just write it down but process it and write it down in a way that you are going to understand it. It is how education has worked for years and years. And I don't understand why suddenly, that is all going away. People listen and take notes. We have got to give them rather than them writing it for themselves. So that is my view. That is why I am not a fan of Blackboard in terms lecture notes and recording of lectures. If I was allowed to use AberLearn Blackboard differently which is using the same technology and if the students will play ball with me, by using that information. That is what I like to see AberLearn Blackboard turn into. Not lecture delivering but lecture support system. -Teaching staff TS8

From the above discussion, it is evident that VLEs have benefits as well as challenges associated with their deployment. Hence, there is a need to address these challenges in order to provide good usability for both students and teaching staff with respect to the use of VLE in Aberystwyth University.

The results of the pilot study were also compared with the findings from the literature review in order for the researcher to draw some conclusions. One of such issues that emerged from the literature review is that there challenges associated adapting VLEs to suit the specific needs of institutions and discipline. Beckton (2009) argued that for VLEs to be successfully implemented, the specific needs of users should be identified and taken into consideration rather than focusing on what the system could do for them. This indicates that further study needs to be done in this area as it is clear from the literature survey that most of the challenges associated with the use of VLEs can be traced to adopting it hook, line and sinker. Not much thought is paid to it being localized and customized to suit the peculiar needs of institutions and disciplines as no one-size-fits-all. This indicates that further study needs to be done in the area of adapting VLEs in higher education to meet the peculiar needs of institutions and disciplines; and it is worthy investigating to ascertain how best it can be achieved.

2.9 Conclusions and recommendations

The adaptation of VLEs to institutions specific needs is quite essential. Beckton (2009) argued that the greatest key to successfully implementing VLEs hinges on identifying and paying careful attention to the needs of the users of the system

while giving them the liberty to express those needs rather than focusing on what the system could do for them. This position corroborates what majority of the teaching staff said during the study. For instance, some of the lecturers believe that they were being compelled to use AberLearn Blackboard which have no doubt changed and limited their teaching styles. They prefer to drive the VLE rather than they being driven by it. They would prefer to be more involved in the process of articulating the policies guiding e-learning implementation in Aberystwyth University; and not just at the stage of execution and advocacy. It is believed that by so doing, staff will naturally assume responsibility for the success of VLEs which will bring about a new attitude and enthusiasm that will ultimately lead to the disappearance of the wall of resistance being put up by some teaching staff. This clamour for need-specific VLEs is also popular among students. For instance some of the students who participated in the study were of the view that that they were overwhelmed with too much information. They argued that some of the information that they had to deal with every time when they logged in were not relevant to them. They would prefer to see only information that is related to the module they are interested in per time. Beckton (2009) narrated how the University of Lincoln reworked the Blackboard virtual learning environment by modifying snapshot extracts to create Blackboard sites for the purpose of adapting them to suit the peculiar needs of teaching departments, rather than attempting to impose a single model on the University. The experience of University of Lincoln goes to show why VLEs ought to be customized to meet the peculiar needs of each institution, department and modules; as no one-size fits it all. Speaking in the same vein, Ocak (2011) posits that the challenge with using VLEs becomes greater and more pronounced due to the differences between how individual institutions, faculties and the way teaching staff engage with it. Ocak (2011) opined that a good consideration of those differences in the design and implementation of a VLE will bring about a better experience for all users.

Relating above submissions to Aberystwyth University, the use of AberLearn Blackboard in channelling information to students has to a large extent has helped the students to be more effective in their learning and assisted the teaching staff in providing quality teaching and learning resources for the students. However it still leaves much to be desired as majority the students that participated in the study believe that the experience with use of AberLearn Blackboard can be improved upon - a claim that was equally shared by the teaching staff.

The idea of considering the peculiar needs of the respective disciplines within the university and tailoring the implementations of VLEs accordingly will improve the usability of the VLE for both students and staff. This implies that for the purpose of a VLE to be fully achieved, there is a need to design and deploy such a VLE around the needs of the students and as well as the teaching staff. Most of the adoption and use of VLEs have focused directly on boosting the students' experience without carrying the teaching staff along at the design stages of VLEs. Furthermore, the localization of VLEs in an institution like Aberystwyth University will bring about wider acceptance on the part of the teaching staff and consequently provide a more effective and robust learning experience for the students. It is expected that such strategy will yield better results. This point

resonates clearly with the argument that the mere deployment of a VLE cannot in itself translate into an improved quality of the learning experience of students Ellis et al. (2009).

2.10 Limitations of the study

The fact that only eight students were interviewed during the study imposed a limitation on the study. There is the possibility that having a larger dataset would give a broad representation of the users and perhaps a different set of results.

Another limitation of the study was that only taught postgraduate students of Aberystwyth University of the 2014/2015 academic session were interviewed. This was as a result of the fact that the study was conducted during the summer period when the undergraduates were not around. It is believed that extending the study to cover undergraduate who engage more with Blackboard by virtue of taking more modules compared to postgraduate students, would likely yield a different set of results that will be better appreciated.

2.11 Chapter summary

This chapter has discussed the pilot study that was conducted to set the stage for the main study. Based on the results and recommendations, the main study was designed to provide solutions to the problems that have been identified in the substantive area of virtual learning environments. The next chapter on methodology discusses the methodologies of the main study and how the issues that were raised in the pilot study were addressed during the research work. The recommendations from this study became what was used to design the PhD thesis. Chapter 3 presents the methodology of the main study.

2.12 Epilogue on the pilot study

Given that this chapter is a report of the pilot study as a separate study that was conducted in the summer of 2015, some new references were used by the researcher in the course of presenting the pilot study here. The new literature that were added did not change the design or results of the pilot study. The additional references were only used to support and strengthen the existing argument of the pilot study. Below is the list of the new references that were used.

1. J. Barker and P. Gossman, The Learning Impact of a Virtual Learning Environment: Students' views, *Teacher Education Network Journal*, 5(2):19-38, 2013, <http://insight.cumbria.ac.uk/1455/1/146-574-1-PB.pdf>, Accessed: 02.09.2019.
2. S. Bennett, *Learning Management Systems: A Review*. Auckland: AUT University, 2011, <https://eclass.teicrete.gr/modules/document/file.php/>

TP271/Reading%20material/3_LMSreview%28AUT%20Univ.-2011%29.pdf, Accessed 04.05.2019.

3. S. J. Bennett and K.A. Maton and L.K. Kervin, The 'digital natives' debate: a critical review of the evidence, *British Journal of Educational Technology*, 39(5):775-786, 2008.
4. V. Braun and V. Clarke, Using thematic analysis in psychology, *Qualitative Research in Psychology*, 3:77-101, 2006, doi: <http://dx.doi.org/10.1191/1478088706qp063oa>
5. J. S. Brown and R. P. Adler, Minds on fire: open education, the long tail, and learning 2.0., *EDUCAUSE Review*, 43(1):16-32, 2008.
6. S. Cassidy, Virtual Learning Environments as Mediating Factors in Student Satisfaction with Teaching and Learning in Higher Education, *Journal of Curriculum and Teaching*, 5(1):113-123, 2016.
7. E. Costello, Opening up to open source: looking at how Moodle was adopted in Higher Education, *Open Learning: The Journal of Open, Distance and e-Learning*, 28(3):187-200, 2013.
8. T. B. Creighton, Digital Natives, Digital Immigrants, Digital Learners: An International Empirical Integrative Review of the Literature, *ICPEL Education Leadership Review*, 19(1):132-140, 2018.
9. J. W. Creswell, *Research design: Qualitative, Quantitative, and Mixed methods approaches Fourth Edition*, 2014, SAGE Publications Ltd, London, United Kingdom.
10. L. DeSantis and D. N. Ugarriza, The Concept of Theme as Used in Qualitative Nursing Research, *Western Journal of Nursing Research*, 22(3):351-372, 2000, doi: <http://dx.doi.org/10.1177/019394590002200308>
11. M. Finnegan and C. Ginty, Moodle and social Constructivism: Is Moodle Being used as a Constructed? A case study analysis of Moodle use in Teaching and Learning in an Irish Higher Educational Institute, *All Ireland Journal of Teaching and Learning in Higher Education (AISHE-J)*, 11(1), 2019.
12. E. E. Gallardo-Echenique and L. Marques-Molias and M. Bullen and J. Strijbos, Let's Talk about Digital Learners in the Digital Era, *International Review of Research in Open and Distributed Learning*, 16(3):157-187, 2015.
13. E. J. Helsper and R. Eynon, Digital natives: where is the evidence?, *British Educational Research Journal*, 36(3):503-520, 2010, doi: <http://dx.doi.org/10.1080/01411920902989227>
14. S. Jackson and C. Fearon, Exploring the role and influence of expectations in achieving VLE benefit success, *British Journal of Educational Technology*, 45(2):245-259, 2014, doi: <http://dx.doi.org/10.1111/bjet.12029>

15. JISC/Ipsos Mori, Great Expectations of ICT: How Higher Education Institutions are Measuring Up, (JISC–Ipsos Mori Full Report) London, 2008, <http://www.jisc.ac.uk/publications/research/2008/greatexpectations.aspx> Accessed: 04.05.2019
16. C. Jones and R. Ramanau. The Net Generation enters university: What are the implications for Technology Enhanced Learning? In M-2009: Proceedings of the 23rd ICDE World Conference on Open Learning and Distance Education including the 2009 EADTU Annual Conference, 7-10 June 2009, Maastricht NL, 2009.
17. C. Jones and B. Shao, The Net Generation and Digital Natives: Implications for Higher Education, Higher Education Academy, York, 2011.
18. D. J. Kennedy, Virtual Learning Environments (VLEs): here to stay, or on the brink of demise? *The Plymouth Student Educator*, 1(1):58-66, 2009.
19. R. B. Kvavik and J. B. Caruso and Glenda Morgan, ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control, EDUCAUSE Center for Analysis and Research, Boulder, Colorado, <http://www.educause.edu/ir/library/pdf/ers0405/rs/ers0405w.pdf>. 2004 Accessed: 06.05.2019
20. P. Lamerias and P. Levy and I. Paraskakis and S. Webber, Blended university teaching using virtual learning environments: conceptions and approaches, *Instructional Science*, 40(1):141-157, 2012.
21. L. H. Mosquera, Impact of implementing a Virtual Learning Environment (VLE) in the EFL Classroom, *Ikala, Revista de Lenguaje y Cultura*”, 22(3):479-498, 2017, doi: <http://dx.doi.org/10.17533/udea.ikala.v22n03a07>
22. L. S. Nowell and J. M. Norris and D. E. White and N. J. Moules, Thematic Analysis: Striving to Meet the Trustworthiness Criteria, *International Journal of Qualitative Methods*, 16:1–13, 2017, doi: <http://dx.doi.org/10.1177/1609406917733847>
23. D. G. Oblinger and J. L. Oblinger. Is it age or it: First steps toward Understanding the Net Generation. In D. G. Oblinger and J. L. Oblinger, editors, *Educating the Net Generation*, chapter 2, pp.85-91. EDUCAUSE, Washington DC, 2005. <http://www.educause.edu/ir/library/pdf/pub7101.pdf> Accessed: 04.05.2019.
24. R. O’Leary and A. Ramsden. Virtual learning environments. In P. Davies, editor, *The Handbook for Economics Lecturers*, volume 2889. University of Bristol, Bristol, 2002. doi: https://www.economicsnetwork.ac.uk/handbook/printable/vle_v5.pdf Accessed: 01.09.2019.
25. B. Parkinson, Blackboard Teaching and Learning Conference 2014, 2014, <https://elearningyork.wordpress.com/2014/05/14/blackboard-teaching-learning-conference-2014/>, Accessed: 12.04.2019

26. D. Raftery and A. Risquez, Engaging students through the VLE: comparing like with like using the #VLEIreland student survey, *Irish Journal of Technology Enhanced Learning*, 3(2):24-34, 2018, doi: <http://dx.doi.org/10.22554/ijtel.v3i2.42>
27. M. L. Renau Renau, Effective learner-lecturer interaction working with a virtual learning environment, *Sino-US English Teaching*, 9(7):1300-1305, 2012.
28. E. Suess, Painting over the Blackboard – Customisation of a Proprietary VLE, *The Higher Education Academy*, 2010 <https://www.heacademy.ac.uk/knowledge-hub/painting-over-blackboard-customisation-proprietary-vle>, Accessed: 08.05.2019
29. D. Tapscott and A. Williams, Innovating the 21st century university: It's Time, *Educause Review*, 45(1):17-29, 2010.
30. J. I. Thomas and A. L. Harden, Methods for the Thematic Synthesis of Qualitative Research in Systematic Reviews, *BMC Medical Research Methodology*, 8(45), 2008, doi: <http://dx.doi.org/10.1186/1471-2288-8-45>
31. W. Veen, Homo Zappiens and the Need for New Education Systems. Paper presented at OECD seminar on Digital Natives and Education. Florence, Italy: OECD-CERI, 2007, <http://www.oecd.org/edu/ceri/38360892.pdf>, Accessed: 04.05.2019
32. B. von der Heiden and S. Fleischer and A. Richert and S. Jeschke, Theory of Digital Natives in the Light of Current and Future E-Learning Concepts, *International Journal of Emerging Technologies in Learning*, 6(2):37-41, 2011.
33. N. Walliman, *Social Research Methods 2nd Edition*, 2016, Sage Publications Ltd, London.

Chapter 3

Methodology

3.1 Introduction

This chapter provides a description of the research design of the study and the application of a social science methodology referred to as classic grounded theory (CGT) in the context of Software Engineering in this research work.

3.2 Changes undertaken after the pilot study

Prior to undertaking this study, a pilot study was carried out to evaluate the use of Blackboard as a virtual learning environment in Aberystwyth University in the summer of 2015. A summary of the recommendations of the pilot study as earlier provided in Chapter 2 of this thesis include the following.

1. Using a larger data set: It was the view of the researcher that the further research on the area of investigation of the pilot study could benefit from a larger data set of participants.
2. Using a broader data set: This implied that there was the need to expand the pool of participants by including undergraduates and university administrators in further investigations of the issues surrounding the use of VLEs in higher education.
3. Comparative study: Extend the study to other universities in Wales for the purpose of a comparative study
4. Further area of research: The pilot study highlighted the need to investigate how best a VLE could be designed to reflect the strengths of an institution and discipline in particular with emphasis on paying attention to the needs and preferences of VLE users.

The above recommendations from the pilot study informed the design of the main study in terms of the aims and objectives, research question, interview questions and those to interview. The pilot study was separate from the main study as the result of the investigation was only used to design the main study. While the

pilot study was a general investigation, the main study focused on how the **User Experience** of the VLE could be enhanced. Another difference between while the pilot study and the main study was that thematic analysis was used in analyzing the interview transcripts of the pilot study whereas grounded theory was used in analysing the interview transcripts of the main study.

3.3 Study design

With respect to the method of data collection, this study was designed as a mixed methods (Creswell and Plano Clark, 2018). Johnson and Onwuegbuzie (2004) defined mixed methods research “as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study”. According to Creswell and Plano Clark (2018), for a research to be classified as a mixed methods, the work of the researcher must be characterized by the following:

- *collects and analyses both qualitative and quantitative data rigorously in response to research questions and hypotheses,*
- *integrates (or mixes or combines) the forms of data and their results,*
- *organizes these procedures into specific research designs that provide the logic and procedures for conducting the study, and*
- *frames these procedures within theory and philosophy.*

(Creswell and Plano Clark, 2018), p 9

Johnson and Onwuegbuzie (2004) described mixed methods as an expansive and creative form of research and not a limiting one. They asserted that it is inclusive, pluralistic, and complementary, and it indicates that researchers take an eclectic approach to method selection and the thinking about and conduct of research. Mixed methods involves the use of consequently, both qualitative and quantitative methods have been utilised (Johnson and Onwuegbuzie, 2004). Accordingly, a mixed-methods approach made of sequential qualitative and quantitative stages was adopted for the study to provide answer to the research question. A major reason for adopting the mixed methods approach was to harness the strengths of both qualitative and quantitative research; and minimizing the weakness associated with both methods at the same time in this research (Johnson and Onwuegbuzie, 2004). Another reason for using mixed methods in this work, was for the researcher to carry out some form of triangulation in research. Triangulation in research implies the use of more than one approach to get richer data and provide a way to validate the results of the research (Wilson, 2014). This mechanism provided a way of cross-checking results of the qualitative method with that of the quantitative method. The mixed methods approach provides a more complete and corroborated set of results. Qualitative research and quantitative research provide

different perspectives, and each has its own limitations Creswell and Plano Clark (2018). A key feature of mixed methods research is its methodological pluralism or eclecticism, which frequently results in superior research compared to mono method research Johnson and Onwuegbuzie (2004).

With the above in mind and coupled with the recommendations from 3.2, this study was designed to include all classes of users of VLE and administrators in Aberystwyth University. The pool of participants was then structured to include students, teaching staff, directors of studies, administrative staff and the e-learning team. The administrative staff only became included in the main study after it was discovered that some departments in Aberystwyth University had administrative staff that use the VLE to support learning and teaching in such departments. It was also decided to extend the study to five other universities within Wales in addition to Aberystwyth University. These other five universities were a mix of new and older universities in Wales namely: Cardiff University, Swansea University, Bangor University, Cardiff Metropolitan University and University of South Wales.

Based on the mixed methods design of the study, data was collected by both qualitative data and quantitative methods. Both data were collected at the same time as the interview and Likert scale questions were on the same question sheet. Only the students had the elements of Likert scale questions. Additional quantitative data were also collected from the e-learning team with respect to how the students used the VLE in a module. This was designed with a view to analyzing their behaviour on the VLE in order to compare and contrast with the results of the analysis of the interview transcripts.

3.4 The emergent design flexibility of the study

It is not uncommon to find out that the direction of research changes in the light of new development during a research study. Martin (2008), Morgan (2008) When this happens, the researcher is expected to take responsibility and remedy the situation. Such a situation is known as Emergent Design flexibility Patton (2002), Creswell and Plano Clark (2018). According to (Pailthorpe, 2017), emergent design refers to the ability to adapt to new ideas, concepts, or findings that arise while conducting qualitative research. The flexibility that comes with the emergent design no doubt gives the researcher the opportunity to adequately deal with the challenges that were thrown up during the research. Patton (2002) noted that

Emergent design flexibility refers to openness to adapting inquiry as understanding deepens and/or situation change; the researcher avoids getting locked into rigid designs that eliminate responsiveness and pursue new paths of discovery as they emerge. (p. 40)

And according to (Morgan, 2008) "this flexible approach to data collection and analysis allows for ongoing changes in the research design as a function of both what has been learned so far and the further goals of the study." Hence, the researcher can make key decisions in the course of the study and move the research forward as opposed to getting stranded along the way. Wright (2009) noted that

The label emergent methodology does not signify a failure to plan ahead; rather a more sophisticated recognition that data analysis is a core element in the research design. It implies a researcher who is aware of multiple possibilities in the early stages, who selects appropriate strategies as s/he assimilates the material and begins to understand its significance and makes iterative adjustments throughout the process. (p. 64)

Consequently, in the course of this study, the adoption of the emergent design approach became necessary for some pragmatic reasons. These changes are discussed and outlined below:

- (i) Given that this study was a mixed study (Creswell and Plano Clark, 2018), the initial plan was to use Dedoose software for the analysis of the data. However, the researcher later realized that Dedoose could not be used because the researcher was required to share a copy of the transcripts on the Dedoose online platform. The participants had been assured that only the researcher and those directly involved with the research work will have access to the raw transcripts. So in order not to be in breach of General Data Protection Regulation (GDPR) as they had not given consent with sharing their data with any online platform, the idea of using Dedoose was dropped. At this point, it became imperative for the researcher to review the methodology of the study with specific reference to how the data gathered would be analysed. This led to adopting the emergent design approach for the study (Patton (2002), Creswell and Plano Clark (2018)).
- (ii) The next most important question at this stage was the choice of a methodological technique to be used in the analysis of the interview transcripts. Consequently, various qualitative methods (Creswell, 1994, Patton, 2002) were considered and after a close examination of the different methods, grounded theory (Glaser and Strauss, 1967) was selected as the methodology to be used in the analysis of the data from the interviews. A full discussion of the decisions on the qualitative research methods and the choice of grounded theory is presented in section 3.7.
- (iii) It was also decided that the Likert scale questions should be analysed based on the emerging results of the analysis of the interview transcripts (Busetto et al., 2017, Creswell and Plano Clark, 2018). The results of the Likert scale were then analysed with a view to using them to compare and contrast the results of the analysis of the interview transcripts. Though the responses of the Likert scale questions were separated from the interviews, in cases where participants choose to make comments in addition to the selection of Likert scale options, such comments were taken as part of the qualitative study given that the interview questions and Likert scale questions were administered in the same session of the interview.
- (iv) Another key decision that was made in the course of the study, was to increase more the number of participants in Aberystwyth University in order

to make up for the lack of participants from the other universities. Five other universities namely: Bangor University, Cardiff University, Cardiff Metropolitan University, Swansea University and University of South Wales had been approached for participation in the study. But out of these five universities, only Cardiff University and Cardiff Metropolitan University responded to the researcher. While Cardiff university declined the request, only one student from Cardiff Metropolitan University took part in the study. At this point, the decision to focus on recruiting more participants from Aberystwyth University was taken. Also, it was decided that though the single student from Cardiff Metropolitan University was not enough to draw conclusions on Cardiff Metropolitan University, the transcripts should be analysed and see how it agrees or disagree from the results of the study at Aberystwyth University.

- (v) Given that the researcher was new to grounded theory, it was decided that a small sample of the transcripts should be analyzed in the first instance before using the methodology on the whole set of transcripts of the study. That way, the researcher was able to master the grounded theory methodology techniques and gained a first hand experience of the methodology before applying it on the whole transcripts. This provided the researcher with the requisite skills and enough confidence to analyse the full transcripts. The sample analysis and results are presented in Chapter 4.
- (vi) Another issue that came up in the course of the study, was the discovery of the fact that there were administrative staff who used the VLE in supporting learning and teaching in Aberystwyth University. The decision to expand the scope of interviews by including this set of administrative staff was then made and they were interviewed. Their transcripts were analysed alongside with those of students, teaching staff, directors of studies and e-learning team.
- (vii) Towards supporting or contradicting results of the analysis of the interview transcripts, a crucial decision was made to get and analyse the logs activities of students on a the VLE in a large cohort in Aberystwyth University. The results of the analysis of the interview transcripts was used as a guide to investigate the students' logs with a view to drawing some conclusions.

3.4.1 Exploratory sequential design

The mixed method design strategy used in this study was the exploratory sequential design (Creswell and Plano Clark, 2018). According to Creswell and Plano Clark (2018), the exploratory sequential design begins with the collection and analysis of qualitative data in the first phase. Building from the exploratory results, the researcher conducts a development phase by designing a quantitative feature based on the qualitative results. This feature may be the generation of a new variables, the design of an instrument, the development of activities for an intervention, or a digital product, such as an app or website. Finally, in the

third phase the investigator quantitatively tests the new feature. The researcher then interprets how the quantitative results build on the initial qualitative results or how the quantitative results provides a clear understanding because they are grounded in the initial qualitative results (Creswell and Plano Clark, 2018). The mixed methods designs have core designs that can be used by mixed methods researchers. Creswell and Plano Clark (2018) described these core designs as convergent, explanatory and exploratory. Given that the researcher was interested in the exploration of the phenomenon surrounding the **User Experience** of VLE users in Aberystwyth University, the exploratory sequential design was used for this study. According to Creswell and Plano Clark (2018), the exploratory sequential design begins with the collection and analysis of qualitative data in the first phase. Building from the exploratory results, the researcher conducts a development phase by designing a quantitative feature based on the results of qualitative study. And in the third phase the investigator quantitatively tests the new feature. The researcher then interprets how the quantitative results build on the initial qualitative results or how the quantitative results provides a clear understanding because they are grounded in the initial qualitative results (Creswell and Plano Clark, 2018). However, the exploratory sequential mixed methods design was adopted with some flexibility in this research. This design was made up of both qualitative and quantitative methods with more priority given to the qualitative data. The flexibility of the researcher in the design of the study was supported by Johnson and Onwuegbuzie (2004) who argued that the researcher should be creative and willing to explore more user specific and more complex designs and not be limited by existing designs. Furthermore, Johnson and Onwuegbuzie (2004) noted that sometimes a design may emerge during a study in new ways, depending on the conditions and information obtained. A tenet of mixed methods research is that researchers should mindfully create designs that effectively answer their research questions (Johnson and Onwuegbuzie, 2004). In the first phase this PhD research, an exploratory form of qualitative work was carried out. This led to the discovery of **Navigability** as being crucial to the **User Experience** of VLE users in Aberystwyth University. A conceptual framework was then developed, and propositions made for solving the problem of navigability identified in the study. In the second phase of the study, these propositions were then investigated and clarified by the analysis of the quantitative students' data. In other words, **Navigability** was explored further in the quantitative data of the students to see if they supported the results of the qualitative data or otherwise. In the third phase of the study, these propositions were then explored further using the students' click data and the hierarchical design of the selected module. The strategy for the study was that of the exploratory sequential design. Even though, the Likert scale questions were administered the same time as the interview questions, they were not analyzed until the qualitative data had been analyzed. And also, during the analysis of the quantitative data, the results of the qualitative data was used to analyse the quantitative data. The click data were collected after the interviews.

In this research work, many data collection methods were utilized: the semi structured and opened interviews, Likert scale questions, the data clicks of students in a module and inspection of the hierarchical user interface design of the

module. Like in some other studies (Bentahar and Cameron, 2015), and particularly with GT studies (Tie et al., 2019), the exploration processes were not linear. It was made up of iteration, recursiveness and constant movement between the emerging framework and transcripts and other sources of data used in the study in order to adjust the emerging framework and ensure the reliability of its relationship with the empirical data.

As pointed out by Spring et al. (2007), researchers can benefit from adopting a flexible approach to research design and at the same time, take advantage of the emerging reality. The use of the results of analyses from the Likert scale, students' click data and hierarchical user interface design of the module; have contributed in no small measure to the emerging concepts and provided very useful prepositions in the development of the Navigability framework for configuring a VLE in order to enhance the **User Experience**.

3.4.2 Research ethics

As the standard practice is in United Kingdom, ethical clearance was obtained from the Research Ethics Committee of Aberystwyth University for the study. It was only after approval for the study to be carried out had been obtained that participants and universities were contacted. The ethical approval is at the appendix of this thesis. It's also worth mentioning here that before the administrative staff became included in the study later on, approval was also obtained.

Given the proximity of the researcher to the research environment (Aberystwyth University), objectivity and professionalism were employed to guard against bias in the selection of participants, analysis of transcripts and interpretation of the findings. Walliman (2016) advised that research participants should be treated with due ethical consideration, both on their own part and on the part of the information they provide. Given the proximity of the researcher to the research environment (Aberystwyth University), objectivity and professionalism were employed to guard against bias in the selection of participants, analysis of transcripts and interpretation of the findings. For example, the participants were recruited without coercion as they voluntarily took part in the study and gave informed consent. They were given the liberty to opt in and opt out at any stage of the study. Confidentiality was also maintained and the transcripts were anonymized, encrypted and stored in a secure location. The researcher kept an open mind devoid of preconceived ideas by allowing the results of the analysis to fully emerge unforced.

3.4.3 Consent forms

The aims of the study and the interviews were clearly explained to participants before the interviews and a consent form was provided for each participant to sign. Signing the consent form was taken as an informed consent for the data to be used in the study. It was explicitly made clear that participation in the study was entirely voluntary. All responses to the questions will anonymous and participants were informed of this before taking part in the study. Each participant

was also informed that they could withdraw from the study at any point. Samples of the consent forms are in the appendix of this thesis.

3.4.4 Selection of participants

The selection of participants is a key part of any research. Such a process is known as sampling. Gentles et al. (2015) defined sampling in qualitative research in its broadest sense as the selection of specific data sources from which data are collected to address the research objectives. Accordingly, purposeful sampling strategy was used in the selection of participants for this research. Purposeful sampling involves strategically selecting information-rich cases to study, cases that by their nature and substance will illuminate the inquiry question being investigated (Patton, 2015). According to Patton (2015), another name for purposeful sampling is purposive sampling. There are several types of purposeful sampling. Patton (2015) listed 40 forms of purposeful sampling strategies that can be used by researchers and among which was the maximum variation that was chosen for this study. The maximum variation is a sampling technique that is used for the purpose of documenting unique or diverse variations that could emerge in adapting to different conditions, and to identify important common patterns that cut across such variations (Palinkas et al., 2015). A maximum variation sample is constructed by identifying key dimensions of variations and then finding cases that vary from each other as much as possible (Suri, 2011). The use of maximum variation sampling strategy helps researchers to identify essential features and variable features of a phenomenon as experienced by diverse stakeholders among varied contexts to facilitate informed decisions (Suri, 2011). Given that this research was centred on the different users of VLEs in Higher Education, the maximum variation form of purposeful sampling strategy was adopted for the study. The idea was to investigate the experience all the different groups of VLEs users by comparing their experiences with a view to ascertain how best to configure a VLE that enhances **User Experience**. This led to the selection of students, teaching staff, directors of learning, administrative staff and the e-learning team to take part in the study in Aberystwyth and five other universities in Wales.

Upon receiving ethical clearance from Aberystwyth university to conduct the study, letters of recruitment were written and sent out to all the prospective students and staff participants of Aberystwyth university. The recruitment letters were sent via university wide emails using institutes' and departmental emails to ensure that everyone got the email. Interested participants responded with email inquiries and interviews were then scheduled and conducted. With respect to the recruitment of participants from the other five universities, letters of introduction were sent to the Research Ethics of the universities accompanied with the approval letter from the Research Ethics of Aberystwyth University. The letters of approval and letters of recruitment are in the appendix of this thesis. In Cardiff Metropolitan University - the only university outside of Aberystwyth University that approved the study to be carried out in their site, the university volunteered to send the recruitment letters to their staff and students.

3.4.5 Research instruments

The research instruments included five sets of interview questions for the five categories of participants. Each category of participants had different questions. This was to ensure that their unique experiences, perceptions and expectations were adequately captured and the right information elicited from them. The questions were designed based on the recommendations of the pilot study. They were semi-structured and open ended in nature. However, the students' questions had some elements of Likert scale questions. For the students, teaching staff and administrative staff, the questions were designed around their interactions with a virtual learning environment. For the staff of the e-learning team and directors of studies, their questions were structured around student and staff engagement with the VLE, policies and management of the virtual learning environments. The answers from the students, teaching staff, directors of studies, e-learning team and administrative staff with respect to the questions asked formed the data for this study, in addition to the data from students' logs and Blackboard web pages. These five sets of questions are in the appendix of this thesis.

3.5 Data collection

In order to gather data for the study, letters of recruitment were sent out to students and staff of Aberystwyth University introducing the research as well as the researcher while soliciting for their participation in the study. Also, these letters along with the approval from the Research Ethics Committee of Aberystwyth were sent to the five universities namely: Cardiff University, Swansea University, Bangor University, Cardiff Metropolitan University and University of South Wales. While the response from Aberystwyth University was very encouraging, the same could not be said of the other five universities. For instance, only two universities – Cardiff University and Cardiff Metropolitan University responded to the request letters for the research. While the former declined on the basis that they had just carried out a survey on the use of VLE and would not want to bother the students with a fresh survey, the latter approved for their staff and students to be interviewed. However, only one student from Cardiff Metropolitan University took part in the study and no staff member took part in the study. So based on this outcome and in consultation with the PhD supervision team at Aberystwyth University on the challenges associated with the collection of data from these five universities, it was then decided that only the data from Aberystwyth University should be used for the study. It was however agreed that the number of participants in Aberystwyth University should be increased in order to capture enough data for the research work. This was to ensure that the gathered data of the study within Aberystwyth will have some depth that will make up for the lack of breadth of the study across universities in Wales. This no doubt made sense given that PhD research was more of depth and not breadth. So from an initial estimate of 47 participants, the number of participants interviewed was increased to 61. It was also decided that the data from the lone student from Cardiff Metropolitan University be analysed separately to see if it supports the results of the Aberystwyth

University or not. Also worth mentioning here is that at the start of the study, the class of participants targeted did not include the administrative staff of the university. But in the course of the research, the attention of the researcher was drawn by the supervisor to the fact that there were departments within Aberystwyth University where administrative staff make use of the VLE. This led to the study design being revisited and the administrative staff were then included in the study.

3.5.1 Interviews

The data were collected through the means of interviews. Based on the results of the pilot study, the interview questions were designed with the aim to capture the experience, perceptions and expectations of students and staff of Aberystwyth University with respect to their use of Blackboard. The interview questions which were designed to find answers to the research question of the study as stated in section 1.3. Some of the interviews were carried out using face-to-face approach and other were doing through Skype. The face-to-face interviews were done in staff offices, cafes and the Postgraduate Centres at both Penglais and Llanbadarn campuses. The dates, timing and venue were mutually agreed upon for the convenience of the participants. 62 participants took part in the study with 61 in Aberystwyth University and one from Cardiff Metropolitan University. As pointed out in 3.5 a single interview was insufficient to enable the researcher to draw conclusions on the use of VLE in Cardiff Metropolitan University. Hence it was agreed with the supervision team at Aberystwyth University that the data from Cardiff Metropolitan University should not be discarded, but when all the other data has been analysed, it should be transcribed, and any points raised that echo or contradict or depart from the conclusions of the main study should be noted and discussed.

3.5.2 Recording the interviews

The interviews were recorded in audio recording format with the consent of the participants. This was necessary in order not to spend too much time in collecting data through note taking and also to avoid taking too much time of the participants. The data were captured using Olympus digital voice recorder (VN-765). The recordings were later transcribed by the researcher in order to have it in a form that will be suitable for data analysis. The audio recordings and transcribed documents were stored in secure locations. The lengths of the audio recordings ranged from 5 minutes 9 seconds to 1hr 13 minutes 53 seconds.

3.5.3 Transcription of audio recordings

Given the large volume of data gathered, it was necessary to have the recordings in a format that transcription software could be used for it. The challenge however was that Olympus digital voice recorder did not have a means for transference of the files to a computer system hence the need to have the recordings audio recorded

again using a Samsung mobile phone model GT-B7510 in order to have them in transferable files to the computer. Again because the mobile phone recorded them in AMR format, they were finally converted to mp3 files using AMR-mp3 converter. This then made it possible to transcribed using digital transcription software. The transcription of the audio recordings was initially started with a software called InqScribe but the researcher later found EXMARaDA Partitur Editor 1.5.2 to be more suitable for the transcription and was therefore used all through the study. Eight out of the sixty two recordings were found to be of poor quality and were not transcribed. Hence only 54 recordings were transcribed in all.

3.6 An overview of Aberystwyth University participants

Aberystwyth University has 16 departments spread across six institutes. The study was administered across different institutes and departments of the university. This was important in order to have a widespread data for the research work.

3.6.1 Classification of participants

The study was designed to accommodate all the stakeholders in AU as it relates to the use of VLEs. These stakeholders were identified to be students, teaching staff, university administrations represented by directors of studies; the e-learning team which is responsible for the running of the VLE of the university and administrative staff who use the VLE in the course of their work. This was to ensure that the views of all the stakeholders of Aberystwyth University were adequately captured.

3.6.2 Students participants

The students make use of the VLE in their studies. The purpose of interviewing the students of Aberystwyth University was to capture their experiences, perception and needs with respect to their use of Blackboard VLE. In their work, Sharpe et al. (2005) reported that there was a scarcity of studies that could be characterized as expressing a ‘learner voice’, for example, studies in which the learners’ own expressions of their experiences were central to the study. They argued that scarcity was surprising when they actively searched for studies that were methodologically qualitative and especially favoured those which allowed the learners voice to shine through. So the students were chosen in order to listen to the learner’s voice.

3.6.3 Teaching staff participants

The teaching staff make use of the VLE in engaging with students and also in preparing and providing learning resources for the students. Interviewing them helped the researcher to capture the experiences, perception and needs of the teaching staff as it relates to the VLE used by the university.

3.6.4 Directors of studies participants

The directors of studies as university administrators who also double as teaching staff had a lot to contribute to the pool of data collection. Their views were quite important as it provided very useful information for the study.

3.6.4.1 E-learning team staff participant

As the team charged with responsibility of deploying and managing the VLE, it was very important to have their input. Hence interviewing the staff of the e-learning captured the perception of the team with respect to how students and staff engage with AberLearn Blackboard. Specifically, the interview elicited how the requirements of the users are factored into the deployment of VLE and to what extent it was adapted to suit the peculiar needs of the university in general and the various disciplines across the university in particular.

3.6.5 Administrative staff participants

This comprised of administrative staff who make use of the VLE in engaging with students and staff. As mentioned earlier on in section 4.2, this was not initially in the study design but was later included in the course of the research to capture their views on the use of VLE in their routine tasks.

3.6.6 Summary of participants

A total of 61 participants took part in the study at Aberystwyth University made up of 38 students, 17 teaching staff, 3 directors of studies, 1 e-learning team member and 2 administrative staff. The students were made up of both undergraduates and postgraduates. One student participant from Cardiff Metropolitan University took part in the study. This gave a total of 62 participants in all.

3.6.6.1 An overview of the data collection process

The data for this study were gathered from multiple sources namely the interviews, questionnaire, students' log files and Aberystwyth University Blackboard web pages. Each of these is explained below and the overview of the data collection is presented in Figure 3.1.

- (i) Interview: The bulk of the data were gathered through interviews of students, teaching staff, directors of studies, a member of the e-learning team and administrative staff.

- (ii) Questionnaire: A questionnaire was designed to capture some data from students. The Likert Scale data were collected during the interview of students as they were part the interview questions. This was done for logistics reasons as it was unlikely that the same students would turn up another time to take the survey.
- (iii) Students' log files: Data were gathered from the log files of students on BR11710 (Biological Molecules and Methods) for the 2015/2016 academic session. The same academic session that the students were interviewed. The module was selected because it had a large cohort of students. It had 346 students on it. This data gathering captured the features that the students clicked on and provided information on the resources and tools that were popular with the students and the ones that were not.
- (iv) Aberystwyth University Blackboard Interface: Data were also gathered from the Aberystwyth University Blackboard Interface (with the URL <https://blackboard.aber.ac.uk/>). The student home page was inspected to see how the user interface was designed, the navigation structure of the BR11710 module was also inspected to find out the breadth and depth of resources on the VLE.

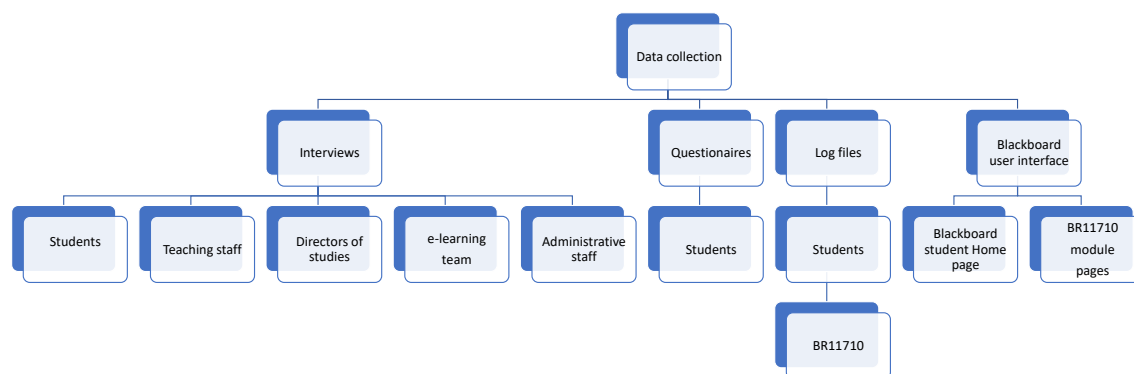


Figure 3.1: The data collection process of the study

3.7 Qualitative research method

Since this was a mixed study methods, it had both qualitative and quantitative data. Qualitative research is a holistic approach that involves discovery (Creswell,

1994). Such a discovery has the capacity to explain what is going on in a given setting. Mason (2002) noted that

Through qualitative research we can explore a wide array of dimensions of the social world, including the texture and weave of everyday life, the understandings, experiences and imaginings of our research participants, the ways that social processes, institutions, discourses or relationships work, and the significance of the meanings that they generate. (p. 1)

Creswell (1994) described Qualitative research as an unfolding model that occurs in a natural setting that enables the researcher to develop a level of detail from high involvement in the actual experiences. Willig (2013), in the same vein argued that a qualitative methodology best describes and possibly explains events and experiences of human behavior. Creswell (2012) argues that Qualitative research is best suited to address a research problem in which the variables are unknown and there is a need to explore. A qualitative research study helps to explore a phenomenon and understand the complexities of the processes involved. Qualitative methods are used to investigate questions about experience, meaning and perspective, most often from the standpoint of the participant (Hammarberg et al., 2016). The purpose of qualitative research is to describe and interpret issues or phenomena systematically from the point of view of the individual or population being studied, and to generate new concepts and theories (Mohajan, 2018). Hence in a qualitative study, the focus of the researcher is on observation, description, interpretation and analysis of the experience, actions and thoughts of people about themselves and the world around them (Bazeley, 2013). Hammarberg et al. (2016) noted that qualitative research techniques include small-group discussions for investigating beliefs, attitudes and concepts of normative behaviour; semi-structured interviews, to seek views on a focused topic or, with key informants, for background information or an institutional perspective; in-depth interviews to understand a condition, experience, or event from a personal perspective; and analysis of texts and documents, such as government reports, media articles, websites or diaries, to learn about distributed or private knowledge (Hammarberg et al., 2016). So in the context of investigating the **User Experience** of VLE in Aberystwyth University, a qualitative study will be very useful in answering the research question.

3.7.1 Choice of a qualitative research methodological approach

There are different types of research methods available for use when it comes to analyzing qualitative data. The choice of what methodological approach to use should be based on what sorts of tasks and information the researcher is interested in. Many methodological approaches are described in terms of the type of analysis they support. Examples are ethnography, grounded theory, interpretative phenomenological analysis, discourse analysis, conversation analysis, content analysis, narrative analysis etc. (Hancock et al., 2007). Other types of qualitative

research methods include thematic analysis (Nowell et al., 2017) and case study (Moriarty, 2011).

3.7.2 Ethnography

Ethnography generally involves researchers directly observing participants in their natural environments over time (Austin and Sutton, 2014). It is a methodology for descriptive studies of cultures and peoples (Hancock et al., 2007). The cultural parameter is that the people under investigation have common traits, which could be geographical, religious, social, shared experience amongst others (Hancock et al., 2007).

3.7.3 Grounded theory

This technique is concerned with the development of new theory through the collection and analysis of data about a phenomenon (Hancock et al., 2007). Grounded theory methodology which was first described by (Glaser and Strauss, 1967) is a framework for qualitative research that implies that theory must derive from data, unlike other forms of research, which suggest that data should be used to test theory (Austin and Sutton, 2014). The emerged theory is grounded in the data hence the name grounded theory (Hancock et al., 2007).

3.7.4 Case study

According to Thomas (2011) “case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods.” A case study could involve studying a single person: if studying patient safety on a hospital ward, a researcher might document one patient’s stay in the ward. More complex is the extended case study which traces events involving several people over a period of time, enabling the analysis to reflect changes and adjustments (Hancock et al., 2007). The case that is the subject of the inquiry will be an instance of a class of phenomena which provides an analytical frame—an object—within which the study is conducted and which the case illuminates and explains (Thomas, 2011).

3.7.5 Interpretative Phenomenological Analysis

This technique involves attempting to understand how participants make sense of their experiences (Hancock et al., 2007). It is about understanding how human beings experience their world and gives the researchers a powerful tool with which to understand subjective experience (Austin and Sutton, 2014). According to Hancock et al. (2007), it looks at subjective states and takes on an insider perspective. It is interpretative in nature and recognises negotiation between the researcher and the researched in order to produce the account of the insider’s perspective. The data are then coded by researchers for emergent themes, and connections established in order to construct higher order themes (Hancock et al., 2007).

3.7.6 Discourse Analysis

This technique focuses on how discourses are organised to be persuasive. They can be used to present a particular ‘world view’. This is done by researchers searching for these patterns in the words that are used (linguistic repertoire) and the way that they are utilised (rhetorical strategies) (Hancock et al., 2007).

3.7.7 Conversation Analysis

Conversation analysis explores how social interactions are structurally organised. This is done by analysing detailed transcripts of tape recordings, examining such things as turn-taking, lengths of pauses, inflections and so on. They are best suited for ‘naturally occurring’ speech and not recommended for analyzing interview data (Hancock et al., 2007).

3.7.8 Content Analysis

This is a qualitative technique that is rooted in quantitative approaches. The emphasis in content analysis is on counting/frequency, where researchers would count occurrences of a word, phrase or theme. They would devise very specialised rules for coding in way that can be processed by the computers. This approach is commonly used when analyzing documents such as newspaper texts, responses to open-ended questions (Hancock et al., 2007).

3.7.9 Narrative Analysis

This focuses on stories of people either about themselves or a set of events. Instead of looking for themes that emerge from an account, it concentrates on the sequential unfolding of someone’s story so there is an emphasis on emplotment and characters. It is time-consuming and usually includes a very small number of cases (Hancock et al., 2007).

3.7.10 Thematic Analysis

Thematic analysis is a method for identifying, analysing, and reporting themes within data (Braun and Clarke, 2006). It has been argued that as a foundational method for qualitative analysis, thematic analysis should be the first qualitative method of analysis that researchers should learn, as it provides core skills that will be useful for conducting many other forms of qualitative studies (Braun and Clarke, 2006).

3.8 Grounded theory

Upon reviewing the various qualitative methodological approaches, grounded theory was chosen because it was best suited for the study as it offered a great mechanism for answering the research question of this study – which is “How should

a VLE be configured in order to enhance the **User Experience** of students and staff within an institution.

3.8.1 What is grounded theory?

Grounded theory (GT) may be defined as “the discovery of theory from data systematically obtained from social research” (Glaser and Strauss, 1967). The grounded theory methodological approach was discovered by Glaser and Strauss (1967) and its sole aim is to generate or discover a theory that is rooted in the data of the study (Glaser and Strauss, 1967). This is what distinguishes grounded theory from other research methods which often test existing theories or verify them (Austin and Sutton, 2014).

Grounded theory methodology uses a combination of techniques that distinguishes it from other qualitative research methods. These techniques include open coding, selective coding theoretical sampling, constant comparison. Through using these techniques, iterative processes are performed on the data to generate a framework or theory that offers explanation for the phenomenon taking place among the researcher participants. According to Isabelle Walsh and Glaser (2015), “the GT research process may be described as investigating an area of interest to the researcher in order to highlight the main concern that emerges from the field through collected data; the purpose of this process is to identify a “core” category that also emerges from the researcher’s data as explaining this main concern.”

In GT, emphasis is on the generation of a new theory from the data. This is made possible by following the basic processes of the grounded theory methodology. This process, which is a product of continuous interplay between data collection and data analysis, ensures that the generated theory is grounded in the data. (Goulding, 2002).

In a true grounded theory research work, the framework or theory that emerges from the analysis of the data is a true reflection of what is going on within the social setting under investigation. Glaser (1998) declared that in a substantive grounded theory, the integrated set of hypotheses account for much of the behaviour that is seen in a substantive area. In the same vein, Strauss and Corbin (1990) argued that a true grounded theory that has been well grounded in its data was bound to be different from a theory that was arrived at by putting together a series of concepts based on speculation. Indeed the diligent and careful application of the techniques of grounded theory yields a true theory that stands scrutiny. This only happens when the theory is allowed to freely emerge as opposed to the researcher forcing a preconceived idea on the analysis.

3.8.2 Reasons for choosing grounded theory as a method of enquiry for this study

Grounded theory was therefore chosen as the method of enquiry for this research work for the following reasons:

- Grounded theory has established guidelines for conducting inductive, theory-generating research. This holds a great promise in uncovering meaningful

information from the gathered data of the research work because it's has an approach that is aimed at developing a theory rather than testing theory.

- Grounded theory is renowned for its application to the study of human behaviour.
- Grounded theory is an established and credible methodology that have been vastly used in sociological and health disciplines (e.g. nursing studies, medicine, psychology), and a burgeoning one in the field of information systems/technology.

The above points made grounded theory a preferred choice as a method of enquiry for this study.

3.8.3 The initial confusion around the use of grounded theory

While pondering on fully understanding the method the researcher discovered it was normal for researchers who were new to grounded theory to be confronted with confusion (Evans, 2013). The researcher only became reassured on the realization that the understanding of GT was in trying it out by doing. As Simmons (2010) points out, "The jargon can be learned through reading but can only be deeply understood through the process of doing." This prompted the researcher to set out in learning classic grounded theory by doing. To that effect, the researcher decided to carry out a sample analysis of a small size of the data. The reason for this was to provide a way of learning by practicing the technique of the analysis. The results of the sample analysis are presented in Chapter 4 of the thesis.

3.8.4 Structure of questions and grounded theory

Given the nature of how the study was designed from the onset with open-ended and semi-structured questions for the interviews, my supervisor raised the issue of how the research question and the semi-structured questions might have influenced the responses of the participants – questioning if the questions were sufficiently open to draw out participants' real concerns? In responding to this point, the researcher was of the view that even though the questions were semi-structured, the way and manner they were phrased gave the participants enough room to express their concerns. The position of the researcher agreed with the submission of Turner (1981) who admitted that the use of semi-structured questions was appropriate for GT. Also other than the four Likert scale questions that were included in the students' ten interview questions, all the other participants' questions were open-ended and semi-structured in nature. Furthermore, based on the pilot study that was conducted previously, the researcher had improved on his interviewing skills and did probe the participants in the course of the interviews when he perceived that they were making an interesting point in the area of investigation. That way, the participants were able to elaborate more on the issues beyond the initial thoughts that they had expressed. So in a way, this helped to ensure that the participants freely expressed themselves during the course of the interviews.

3.8.5 Why classic grounded theory?

After the decision to make use of grounded theory was made, the researcher was faced with the challenge of what strand of grounded theory to go with as it was discovered that there were different types of grounded theory. Fernandez (2012) identified the four major strands of GT to be **classic grounded theory**, **Straussian grounded theory**, **constructivist** and **feminist grounded theory** amongst others. Initially they were all confusing as the researcher was not quite sure of the differences and which one was best suited for the study. Evans (2013) acknowledged that for researchers who were new to GT, learning the different methodologies is a difficult journey as terminologies often sound similar, but was quick to point out that only by exploring the differences can the researcher rationalize their own choice of GT to use. According to Birks and Mills (2015), “methodologically, there are no right or wrong approaches to using grounded theory methods; however, there are differences that need to be taken into account.” It therefore became imperative for the researcher to explore the different strands of GT with a view to selecting the appropriate version for the study. Exploring the differences provided the needed illumination and confidence in the choice of the classic grounded theory. The classic grounded theory was found to offer more flexibility in the analysis and freely allows the theory to emerge (Flick, 2014, Holton, 2008). Holton and Walsh (2017) in their book provided a detailed description of the classic grounded theory which helped to clear the initial confusion on the subject for the researcher.

3.8.6 The abbreviated version of grounded theory

This research work was carried out using the abbreviated form of GT Willig (2013) in place of the full grounded theory methodology. Willig (2013) stated that

The abbreviated version of grounded theory, by contrast, works with the original data only. Here, interview transcripts or other documents are analysed following the principles of grounded theory (i.e. the processes of coding and constant comparative analysis); however, theoretical sensitivity, theoretical saturation and negative case analysis can only be implemented within the texts that are being analysed. The researcher does not have the opportunity to leave the confines of the original data set to broaden and refine the analysis. p 73

So in using the abbreviated grounded theory, the researcher employed the use of line-by-line coding. This was done in line with the views of Willig who reckoned that the depth of analysis generated by line-by-line coding was needed to compensate for the loss of breadth due to the researcher’s reliance on the original data set alone. The techniques of theoretical sensitivity, theoretical saturation and negative case analysis were well utilized within the transcripts of the interviews that were analysed. These techniques are discussed further in Chapter 5 of the thesis. As is the case with the abbreviated version of grounded theory, the data collection and the data analysis stages were distinctly carried out as opposed to

performing both processes concurrently when using the full version of grounded theory (Willig, 2013).

3.8.7 Why the abbreviated version of grounded theory?

The abbreviated version of grounded theory was chosen for this study for a pragmatic reason. Giving the time constraint for this study it was going to be difficult to conduct interviews, transcribe them and analyse them and then start another round of interviews again. The challenges associated with getting more participants to take part in the study was also another one. Furthermore due to the regulations of the Aberystwyth University ethics committee approval which stipulates that every time a research is altered it needed to be approved by the ethics committee and against the background the limited time available to complete PhD research work, the abbreviated version of grounded theory became the preferred choice and the researcher therefore opted to work only with the original data set that were obtained from the interviews already carried out.

No doubt the study would have benefited more from an application of the full grounded theory methodology. This would have given the researcher the opportunity to explore the core category further by asking questions that would directly impact on the emerging issues in the study. This could have offered more robust results but the micro analysing coding of the transcripts which involved line by line coding was used to get a some depth and make up for the lack of breadth due to the use of the abbreviated version of grounded theory.

3.8.8 Basic steps of grounded theory

The grounded theory methodology uses a systematic way in analysing the gathered data. This involves interviews, transcriptions of interviews, open coding, selective coding, theoretical sampling, theoretical saturation, constant composition, theoretical integration and memos. Gasson (2009), Willig (2013) provided some descriptions of these systematic processes. Based on the approach of classic grounded theory, the data gathered were analysed using these analytical processes. A diagram of these analytical steps is provided in section 3.8.9. This started with the coding of the transcripts using in vivo codes and then grouping the generated codes into categories based on the conceptual relationships between the codes. A core category was later discovered and used to sample the rest of the transcripts. The use of constant comparison technique was used all through the data analysis stage leading to the development of theoretical model of the study. The result was the generation of a theory that was grounded in the data of the study. Given that the researcher was new to grounded theory, a sample analysis of the data was carried out on a small size of the data prior to the full analysis of the data because grounded theory is all about doing (Simmons, 2010). This provided the researcher the opportunity to try out the methodological approach in a safe zone while working with a small data set. As a result, the researcher understood the techniques and gained confidence of his analytical skills in the process. This no doubt provided a psychological boost for the researcher as the mistakes made were

corrected and the processes were fine-tuned. The sample analysis and the results are presented in Chapter 4 of this thesis. Upon understanding the analytical steps of the grounded theory, the researcher proceeded to apply it full scale on the whole data. A complete description of these analytical processes that were used in the analysis of the data is presented in Chapter 5 - data analysis of the thesis.

3.8.9 Basic flowchart of grounded theory

Grounded theory aims to discover a theory rather than use an existing theory. There are various activities that make up the grounded theory methodological approach. These activities which were carried out by the researcher are illustrated in Figure 3.2 as shown below:

3.8.10 The repeatability of this study

The repeatability of any study refers to a measure of the variation of between a previous result and a new result when the study is carried out again under the same circumstances. The repeatability of the analysis of the transcripts using the grounded theory approach depends on a number of factors when the same set of transcripts is analysed by a different researcher. Besides the prejudice or theoretical sensitivity of the researcher, a major determining factor is the initial selection of themes or concepts by the researcher which ultimately leads to the identification of the core category. The core category plays a great role on the analysis of the gathered data and the emergence of the generated theory. Whatever issues the researcher decides to focus on and investigate in the initial set of data is what will shape the rest of the analysis. In some instances, it may be very easy to identify a core category because it stands out but in other cases, it may be a combination of issues, or perhaps the way the researcher's attention was caught by it. However after the identification of the core category, repeatability is likely to lead to the same set of results as the core category is what is investigated in subsequent data gathering and analysis. Another factor that may alter the results of the repeatability is the memo writing of the researcher. In the memo, the researcher puts his reflections there and it is later used as an analytical tool during the generation of the framework or theory that emerges from the study.

3.8.11 A comparison of grounded theory methodology and Nielsen & Mack's Usability Inspection methodology

Given that this thesis was investigating an area of Human Computer Interaction in Software Engineering it was important to consider why grounded theory was used in place of standard Software Engineering methods. One of such methods is the Usability inspection methods (Nielsen and Mack, 1994). Usability inspection methods (Nielsen and Mack, 1994, Cheng and Mustafa, 2014) refer to the use of usability evaluation techniques, in which human inspectors are used in detecting

usability problems in a user interface design so that they can be corrected to improve usability (Zhang et al., 1999). These usability problems are found through the expertise of the inspectors using some inspection techniques. According to Nielsen and Mack (1994), these usability inspection methods consists of heuristic evaluation, guideline reviews, pluralistic walkthroughs, consistency inspections, standard inspections, cognitive walkthroughs, formal usability inspection and feature inspection amongst others.

A comparison of grounded theory and Nielsen & Mack's usability inspection methods is presented below and the reasons for choosing GT over usability inspection methods are outlined.

1. Usability inspection methods were primarily developed for evaluating the user interface of a system (Zhang et al., 1999). While user interface design is a major part of the VLE design, it is not the only problem confronting users. Using the usability inspection methodology in this research (Nielsen and Mack, 1994) could have led to the missing of some key issues confronting the users other than the interface issues. Hence, the need to have a holistic and all-embracing methodology made GT the researcher's preference. GT was therefore adopted in order to provide a robust methodology that captures all the possible dimensions involving the users and the broader issues confronting the use of VLEs.
2. In this study the researcher was interested in talking with actual users and analysing their views to draw some conclusions in order to know exactly what was happening in their social space. The grounded theory methodology is centred on the user and the emerging theory is grounded on the data of the participants and was there appropriate for this study. On the other hand, the usability inspection methods are based on experts using a set of techniques such as heuristics evaluation and cognitive walkthrough to evaluate the usability of the system.

Hence, given that the aims of research should guide the researcher towards the choice of a research method (Iqbal, 2007), the researcher preferred GT to Nielsen & Mack's usability inspection methods because GT was best for understanding what was going on with the users of Blackboard at Aberystwyth. GT comes highly recommended when a researcher wants to understand how the users work in their local contexts. This was important given that the environment in which people work influences how they use a software and such influences might unknown to how the developers envisaged the software to be used and how the usability inspection experts evaluate the usability of the system. These experts might therefore not have enough expertise that covers the diverse range of users of the VLE. Getting more experts might not be possible due to cost or scarcity or non-availability of such experts. Although, some of the usability inspection methods may involve a sample of user representatives, the result is not the same as when the actual users are used.

3. As a researcher that was interested in the configuration of a VLE within an

institution for diverse users, it was imperative to involve the end users as opposed to using evaluators in this study. This would help in identifying and proffering solutions based on how the users of the VLE want to use the tool. This research sought to find out how best a VLE should be designed with specific reference to the peculiarities of users and an institution. The grounded theory methodology is great at generating explanations for complex phenomena in social life (Chong and Yeo, 2015) and therefore held more promises at explaining what was happening with the participants than the usability inspection methods in this regard.

4. In usability inspection methods, the evaluators use standard ways that they expect users to use the system. But empirical studies show that users do use systems in unanticipated ways and with unintended consequences (Hearst, 1999, Nworie and Haughton, 2008, Venta-Olkkonen et al., 2016). Lin and Tseng (2010) noted that “a site may be designed for a particular purpose, but be used in unanticipated ways in practice.” It was possible that these unanticipated ways that the users use the VLE might be missed by the usability inspection methods who are restricted to only given guidelines. Against this background, the researcher favoured grounded theory over the usability inspection methods as the usability inspection methods were not considered to be robust enough for identifying these unanticipated ways and understanding the culture VLE users in Aberystwyth University.
5. Nielsen and Mack (1994) alluded to the fact that usability inspection methods are poorly suited for usability engineering very late in the life cycle, when the system has been released to the customers. So for a system like the VLE that has been in use for years, the usability inspection method was adjudged not to be the best methodology to use by the researcher. Nielsen and Mack (1994) noted that field notes, interaction loggings and the analysis of user-support calls were more appropriate than inspections methods.
6. Given that the goal of usability inspection methods is to identify potential problems that users will have with a system (Nielsen and Mack, 1994), the researcher was interested in the actual problems that the users were having with the VLE. This necessitated the use of GT in analysing the interview transcripts as the real barriers and actual problems of the users have would be uncovered through the use of the GT methodology.
7. Usability inspection methods were designed to look out only for problems that the users might have with the system (Nielsen and Mack, 1994). Hence, they are not are not great at pointing out what is good about the design, so that those features can be maintained or even enhanced. The researcher was only not interested in knowing the problems with the VLE but was equally interested in the things that were great in the VLE. This was imperative so that the features that were perceived to be very important to the could be retained in order to enhance the **User Experience** of the VLE users. So, again, GT became the choice of methodology for this study.

8. In the usability inspection methods, there is the risk of false alarms (Jeffries, 1994, Schmettow and Niebuhr, 2007). This is a situation whereby the changes requested on the user interface by the evaluators are misinterpreted by the developers as changes that will have no positive impact on usability of the system and might even run the risk of making the software less usable if implemented (Jeffries, 1994, Schmettow and Niebuhr, 2007). This misunderstanding could make the developers to treat the problems reported as mere opinions and ultimately ignores them and in some cases, the evaluators might indeed have reported false alarms and then implemented by the developers (Jeffries, 1994). This is a disadvantage with the use of usability inspection methods. Hollingsed and Novick (2007), Jeffries (1994) argued that the best way to determine the impact or lack of impact of a potential problem would be to gather field data on the problems experienced by users in real work situations. So, getting the actual data from users and using grounded theory to analyse such data would ensure that false alarms are eliminated from the final recommendations that would be generated at the end of the study. Hence, GT became the chosen methodology as it could sufficiently capture what was actually happening with the users in their local contexts and provide an explanation for it.

9. Usability inspection methods generally involves the use of several experts (Hollingsed and Novick, 2007). The complex nature of the VLE (Zaharias and Poylymenakou, 2009) coupled with its diverse set of users may require more evaluators leading to high cost in implementation which was not feasible in this study. There was no financial provision to recruit and pay evaluators during this study. Neither was the researcher in a position to afford such financial expenses. Also, the researcher could not act as an evaluator for the VLE as that was not advisable.

Some researchers like Jeffries (1994), Jeffries and Desurvire (1992), Nielsen (1994) argued against using an individual as the only evaluator on a project. In fact, Nielsen (1994) demonstrated that in heuristics evaluation problems, different people find different usability problems, noting that some usability problems are so easy to find that they are found by almost everybody, but there are also some problems that are found by very few evaluators. Nielsen (1994) argued that it was not true that the same person will be the best evaluator every time. Some of the hardest to find usability problems are found by evaluators who do not otherwise find many usability problems. Hence the need for multiple evaluators in any heuristic evaluation.

10. Given the domain-specific nature of VLEs, the challenge of getting evaluators whose expertise cover how the diverse users will use the system was another reason why usability inspection method was not feasible in this study. Anybody cannot just act as an evaluator. They will need to know what to look out for and where to find the several VLE features and the challenges that users of such a tool will have. The complex nature of the VLE and its diverse set of users implies that several experts would be recruited in order to use the usability inspection method. Zhang et al. (1999) argued that it

was difficult for inspectors to capture all the different dimensions of usability issues at the same time.

11. Another reason for the choice of GT is that the researcher was interested in how the real users made up of students, teaching staff, admin staff, directors of studies and e-learning team used the system and not how evaluators thought the users will use the system. In this case, the researcher considered GT to be more appropriate when compared with usability inspection methods. Desurvire (1994) argued that there were certain classes of problems which could be found via usability inspection methods other than empirical methods.
12. Another limitation with the use of usability inspection methods is that the overlap between problems found by experts and those reported by users is only of the order of 10% and these methods may not identify the problems that users find most severe (Petrie and Power, 2012). This underscored the need to use a methodology such as GT that was designed to capture the challenges, needs, experiences and behaviour of users of a complex system like the VLE.
13. The unique nature of e-learning makes the Nielsen & Mack's usability inspection methods to be insufficient for use in this research. e-learning systems are quite complex in nature given the diverse users, their background and interactions with the e-learning tools. (Zaharias and Poylymenakou, 2009) The usability inspection methods were primarily designed for system interfaces that are different from e-learning tools like the VLE. As noted by Freire et al. (2012), the difference lies in the fact that the users are expected to use the VLE to learn new knowledge. The challenge however lies in when the users are required to learn to use the system so that they will be able to fulfill that expectation in the first place (Freire et al., 2012).

This fundamental difference implies that the VLE cannot be evaluated the same way as other general systems. As noted by Freire et al. (2012) "The problem is that there is a greater concern with the educational content and system functionalities than with a concern with the interface where such content will be presented." Arguably, it cannot be said that the same problems that Nielsen & Mack usability inspection problems were designed to solve in the 80's and 90's are the same problems faced by VLE users today. In their work, Petrie and Power (2012) argued that "It does not seem appropriate to take the problems that users had with interactive systems in the late 1980s and transfer them to web-based systems in the 2010s." They reckoned that the continued use of heuristics evaluation designed by (Nielsen and Molich, 1990) was particularly problematic when there is no empirical evidence that these problems are actually the ones encountered by users (Petrie and Power, 2012).

14. Nielsen and Molich (1990) acknowledged that one of the disadvantages of the heuristics evaluation method was that it was biased by the mindset of

the evaluators and does not generate breakthroughs in the evaluated design. The GT methodology overcomes this bias by engaging with the actual users of the VLE.

3.8.12 Delayed literature review

Conducting a proper and full literature review is a prerequisite of any research study. This is important for the researcher to be able to appreciate what has been done in the field of research and also to be able to locate the work in the proper context of existing knowledge. So it is usual for a full literature review to be carried out before embarking on solving an identified problem. This will guard against repetition of what others have already done and help the researcher to make substantial contributions towards extending the frontiers of knowledge.

However, the above submission is not the case with studies that make use of the classic grounded theory (CGT) methodology. A major tenet of the classic grounded theory is that the literature investigation should be delayed until the data have been gathered and analysed. This ensures that the researcher is not biased during the data analysis of the study. Also, delaying the literature ensures that the literature does not contaminate, stifle or otherwise impede the researcher's effort to generate categories (Glaser, 1992). Therefore, a full literature review was not conducted before this study was embarked upon by the researcher. But that was not to say that the researcher began the study with a blank mind, because as Dey (1993) argued, the research must not be entered with an empty head but with an open mind.

Prior to starting this study, a pilot study was conducted in the summer of 2015 in area of virtual learning environment. The pilot study which was titled "An Evaluation of the use AberLearn Blackboard in channelling information to the students of Aberystwyth University" is presented in Chapter 2 of the thesis. Conducting the pilot study exposed the researcher to the substantive area of virtual learning environment as he examined the existing literature on VLEs. So, the pilot study provided the researcher with the relevant background knowledge in order to be able to investigate the issues surrounding VLEs. This implied that the study was conducted with sufficient knowledge about the subject area and the researcher was theoretically sensitive to the issues being investigated. So, in keeping with the tenet of classic grounded theory, the researcher waited until the analysis was done with and the theoretical framework had emerging before a full literature review of the study was conducted. The literature review of the study which was based on the emerged concepts is presented in Chapter 7 of the thesis.

3.9 Chapter summary

This chapter has presented the methodological processes that were followed in carrying out this research work. Chapters 4 and 5 provide the description of how these processes were used in the sample analysis and full analysis of the study.

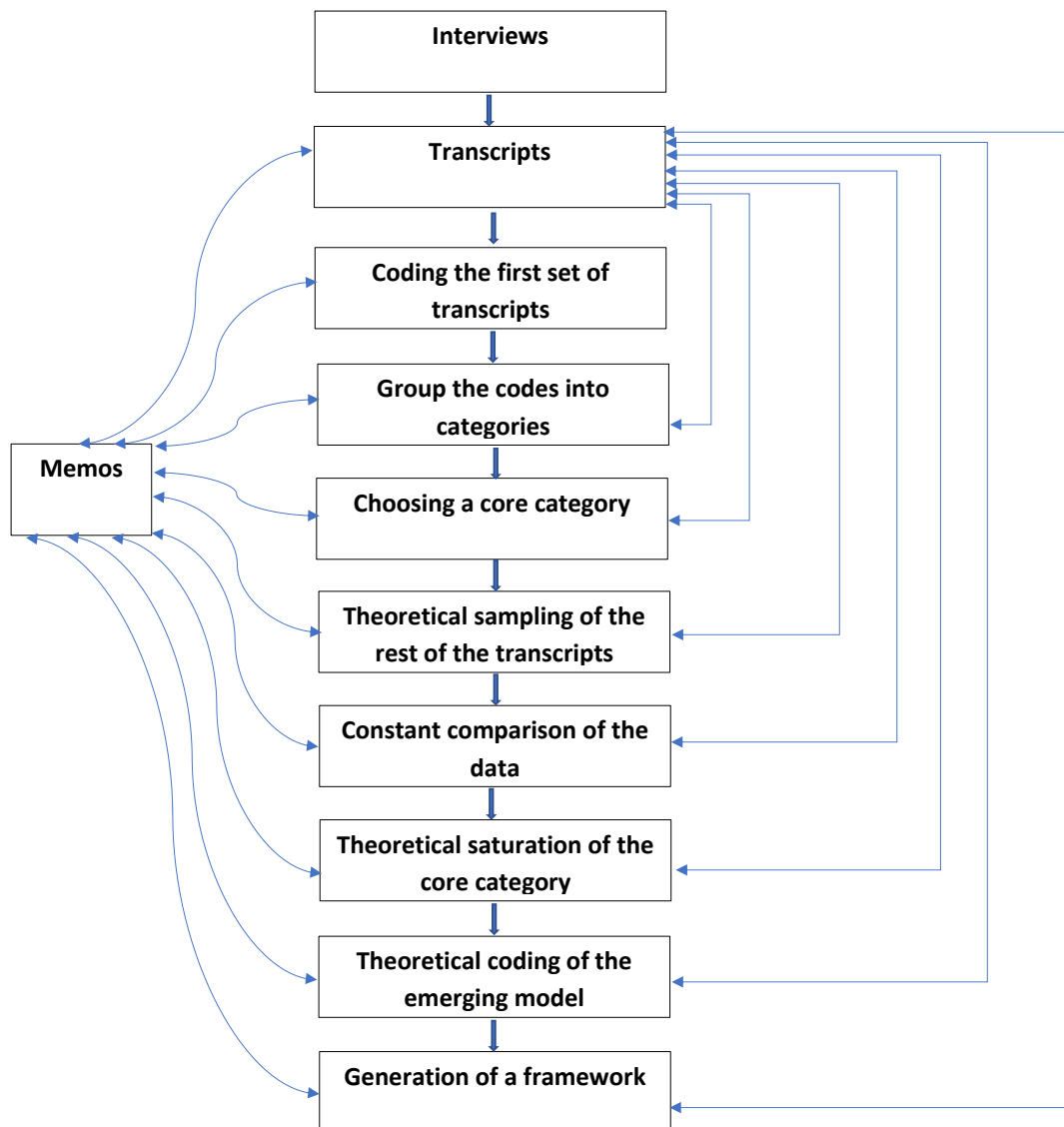


Figure 3.2: The analytical steps of classic grounded theory of the study

Chapter 4

Sample Data Analysis

4.1 Introduction

This chapter discusses the implementation of the analytical approach on a sample set of transcripts and the results that emerged from the implementation. A definition of the analytical processes of Classic Grounded Theory as well as a description of how the processes were carried out using a set of sample transcripts is presented here.

The analytical method for this study was inspired by the Grounded Theory (GT). Before applying the approach to the whole transcripts, it was important to use on a small sample of transcripts in each category i.e. Students, Teaching staff, Directors of studies and e-learning team. This was influenced by the need to have some initial results that would form a basis for judging the appropriateness of the approach or otherwise. The initial results were presented at the Association for Learning Technology (ALT) conference in 2017. It therefore provided a mechanism for making recommendations (if needed) for the purpose of adjusting the approach or doing a total overhaul of it in order to carry out a good piece of work.

Another reason for the idea was that this will help the researcher who was new to grounded theory, to have some hands-on experience as testing with a small set of sample transcripts helped refined the analytical skills of the researcher before commencing the analysis of the full study.

The various stages of the approach are summarized below and this chapter concluded with some reflections at the analysis of the set sample of data.

4.2 Method of data analysis

The Glaserian grounded theory Glaser and Strauss (1967) otherwise referred to as classic grounded theory (CGT) was chosen over both the Straussian (Strauss and Corbin, 1990) and Constructivist (Charmaz, 2006) grounded theories because it offered more flexibility (Holton, 2008, Flick, 2014) in the emergence of conceptualization of the issues and the generation of a theory that explains the patterns underlying a social concept in a substantive area.

4.2.1 Coding in grounded theory

Coding is a fundamental process in grounded theory and it is the starting point for most forms of qualitative data analysis. Coding involves reviewing the interview transcripts and giving identifying labels to chunks of the transcripts that seem to be of potential theoretical significance and/or that appear to be particularly salient within the social worlds of those being studied (Bryman, 2012). According to Charmaz (1983) the use of codes serve as shorthand devices to label, separate, compile, and organize data. It is an important first step in the generation of theory. The data are treated as potential indicators of concepts, which are constantly compared to see which concepts they best fit with.

4.2.2 The coding process methodology

The coding process used for this study is patterned after that of classic grounded theory Holton and Walsh (2017) which follows the approach originally described by Glaser and Strauss (1967) Glaser and Anselm (1967) and the subsequent writings of Glaser - one of the founders of grounded theory (Breckenridge, 2014). The term classic grounded theory (CGT) is therefore used to refer to any work that follow the process of grounded theory as outlined by Glaser. This approach produces a theory that is fully grounded in data. During the process of classic grounded theory, it is expected that everything must “earn” its way into a theory through constant comparison of data rather than being imported from other sources. The outcome is completely influenced by the data rather than by external sources.

4.2.3 Terms used and their definitions

The following are some of the terms used in classic grounded theory and their meanings

- (i) Coding: This refers to the analytic process through which concepts are identified and their properties and dimensions are discovered in data. It is the part of analysis that pertains specifically to the naming and categorizing of phenomena through close examination of the transcripts.
- (ii) Open coding: This is the starting point of the analysis. It involves the breaking down of the transcripts into chunks with descriptive labels called codes. The codes are further grouped into categories based on certain concepts that were identified in the transcripts.
- (iii) Selective coding: This involves choosing one category to be the core category, and relating all other categories to that category. Furthermore, a core category is selected based on an issue that is evident or dominant throughout the analysed transcripts. This core category is then investigated further by asking other participants more questions about it and analyse the data and then go back to the field again. (Gathering and analysing data in a cyclic manner) But in the case of this study, data were not gathered in a cyclic manner. The data gathering ended before the analysis started. This

is acceptable in Grounded Theory and it's referred to as the abbreviated version of the Grounded Theory Willig (2013).

- (iv) **Theoretical sampling:** Theoretical sampling is another technique of grounded theory that is used in analysing data. This technique involves the process of collecting more data to analyse in a definitive and intentional way as opposed to a random manner. Andrews et al. (2012) describes theoretical sampling in grounded theory as a form of non-probability sampling and is considered to be a defining property of grounded theory. Glaser (1998) posited that theoretical sampling is both directed by the emerging theory and further directs its emergence, and 'is the conscious, grounded deductive aspect of the inductive coding, collecting and analysing'. The basic question in theoretical sampling is where to go next in data collection in order to develop the theory. Given the nature of the data collection of this study i.e. data collection was done before the analysis started, theoretical sampling in this case was simply moving on to test the emerging concept (user experience) in the transcripts of teaching staff, directors of studies and the e-learning team. However in the full scale analysis, I am considering analysing the data in the chronological order of gathering i.e. choosing to analyse the first ten transcripts of students and so on and doing the same with the teaching staff. Those of directors of studies will be analysed at once since there are only three participants and the e-learning just has a single participant. This way, the transcripts will be theoretically sampled for emerging ideas and concepts against the background of the transcripts been grouped chronologically for analysis. Also because of the way the interview questions were designed it was possible to probe participants further with the benefits of issues previous participants raised in order to investigate the emerging categories and their properties further.
- (v) **Theoretical saturation:** Within classic grounded theory there is no set sample size, nor are limits set on the number of participants or data sources rather, the researcher is expected to sampling for saturation and completeness based on the core category. This results in an ideational sample as opposed to a representative sample Glaser (1998). The concept of theoretical saturation is therefore used as a criterion to determine when enough data has been collected. A concept is said to be theoretically saturated when new data don't add any new information to the concept that has emerged. In other words, the phenomenon has been fully saturated. So essentially, data collection ends when saturation point is reached. Again with respect to this study, data collection had already ended with the interview of 60 participants. Perhaps it will remain to be seen if the core category of user perception will be saturated before the analysis of the 60 participants. However if saturation is not achieved, the researcher can resort to using literature, published data, case studies, documents, websites and any other data to saturate the study. In the case of this study, some data have been collected from the e-learning team to carry out some form of data analysis.

- (vi) Theoretical coding: Theoretical codes are abstract models for the synthesis and integration of emerging categories (Glaser, 2005). Like everything else in grounded theory, a theoretical code must emerge from the data as opposed to being forced onto the data. Although some theoretical codes were beginning to emerge as possibilities for integrating the theory, theoretical codes will have to be identified. These theoretical codes would create links between the core category and the supporting categories based on their properties and dimensions.
- (vii) Constant comparison: This technique which is also known as constant comparative analysis is very fundamental to the grounded theory approach. When properly applied in data analysis, the constant comparative analysis technique leads to the identification of a continuous pattern emergence in the data and ultimately the emergence of a new theoretical model that offers explanation of the phenomenon under investigation. This technique involves the researcher making comparison using the following: concept to concept, concept to code, concept to data, concept to memo, code to code, category to category, code to category, data to data, data to code, code to memo.
- (viii) Memo: A memo is collection of the personal reflections, ideas, bias, thoughts and views of the researcher during the study as it concerns the interviewees, ideas and concepts raised by them in the course of being interviewed. It also consists of what the researcher makes of the data. Records of these points come handy during the analysis of the data. It's advised that the researcher keeps a trail of these reflections.

4.2.4 The open coding of the study

Using the techniques of opening coding Holton (2010) the transcripts were broken down into discrete chunks, closely examined, and compared for similarities and differences, and questions were asked about the phenomena as reflected in the data. The researcher compared incident to incident with the purpose of establishing the underlying uniformity and its varying conditions as advocated by Glaser (1978). As advised by Glaser (1978), the open coding was guided by the following questions:

- (i) What is this data a study of? This question helps the researcher to reflect on the transcripts while coding in order to ensure that the meaning contained in the transcript is not lost.
- (ii) What category does this incident indicate? The continual asking of this question keeps the analyst from getting lost in the volume of the data by providing a guide for linking the various codes for the purpose of grouping them into a category. This ensures that codes earn its way into the theory by getting them grounded in the data.
- (iii) What is actually happening in the data? This has to do with what is seen to be occurring in the gathered data.

He reckoned that using these three types of questions stated above as a guiding tool would keep the researcher theoretically sensitive and transcending when analysing the data. According to Glaser (1978) these questions would guide the researcher to focus on patterns among incidents, which yield codes, and to rise conceptually above captivating experiences. The need for the researcher to make the generated codes fit the data, rather than forcing the data into codes cannot be overemphasized. As the name of the methodological approach suggests, the theory has got to be grounded in the data and not forced on the data.

In the same vein, Bryman (2012) outlines certain questions the researcher should ask in the course of code generation. Such questions are as follows:

- (i) Of what general category is this item of data an instance?
- (ii) What does this item of data represent?
- (iii) What is this item of data about?
- (iv) Of what topic is this item of data an instance?
- (v) What question about a topic does this item of data suggest?
- (vi) What sort of answer to a question about a topic does this item of data imply?
- (vii) What is happening here?
- (viii) What are people doing?
- (ix) What do people say they are doing?
- (x) What kind of event is going on?

A combination of the rules of Glaser (1978) and Bryman (2012) were used in the coding process of the sample transcripts of this study and the coding labels were in vivo directly from the actual words of the participants. The transcripts were examined line by line to identify salient views of the data. For example ideas, themes, thoughts, feelings, actions, issues or events which were mentioned by the participants were coded. The transcripts were also examined by word by word, paragraph by paragraph and incident to incident in order to have a holistic view of the data and capture the information inherent in the text. In applying the above steps, the transcripts were read several times to find texts that have the same or similar theme.

4.3 The sample transcripts

Some sample transcripts were chosen and analysed using CGT as the analytical approach. The transcripts were made up of 14 transcripts selected randomly as follows: five from the student participants, five from the teaching staff, the three the Directors of studies and the one e-learning team member. This is shown in table 4.1.

	Students	Teaching Staff	Directors of Studies	e-learning Team
1	S4	T1	D1	E1
2	S5	T2	D2	
3	S8	T3	D3	
4	S10	T4		
5	S15	T5		

Table 4.1: The sample transcripts

4.3.1 Concepts

For any given piece of research, there are significant issues or themes that run through it. Reading through the transcripts a list of concepts were found to stand out and they include the following:

1. the benefits that users enjoyed in using the VLE;
2. the features available on the VLE;
3. the drawbacks associated with the use of the VLE;
4. the satisfaction (or otherwise) that users expressed in their use of the VLE;
5. the future expectations of the VLE.

They became the central themes to be explored throughout the coding of the sample set of transcripts.

4.3.2 The coding of sample transcripts

The open coding of the sample transcripts was done using the guidelines of classic grounded theory (Glaser and Strauss, 1967, Holton and Walsh, 2017). The transcripts were examined line by line to identify salient views expressed in the data. For example ideas, themes, thoughts, feelings, incidents, actions, issues or events which were central to the research focus of the study, were coded. In some instances, words, sentences and paragraphs that stood out from the transcripts were also examined in order to have a holistic view of the data and capture the information inherent in the data. These were then coded accordingly. The naming of the code was done using both in vivo codes and descriptive words. In vivo codes emanate from the words of transcripts (Glaser, 1992). These are the direct words of the participants. These code names were generated directly from the data while others were based on issues related to the data. In applying the above steps, the transcripts were read and broken into chunks of data for the purpose of coding. Also each chunk of transcripts was given a label taken from the very words of the participants or based on a concept. Applying this process on the set of sample transcripts led to the generation of a number of codes. These codes are classified and shown below.

4.3.3 Students' codes

The codes that were derived from the student participants were quite interesting as it revealed what was paramount in their minds based on their experience with the VLE. They spoke about the things they liked about the VLE, the advantages as well as the difficulties they encounter in the use of the VLE. A few examples of the codes that emerged from the open coding process of the sample set of students' transcripts include:

- A fairly conservative user of Blackboard
- A more streamlined VLE with incorporated tools
- A single challenge I would say
- Availability of the content
- It has really helped
- Lecturers using different styles
- There are a few things I like about it
- Help the learning of a person
- Lecture slides are great
- Quite good for subject area

Some of the codes and the transcripts from the students' codes are presented below:

- **A fairly conservative user of Blackboard**
I don't think it has done a great thing in developing digital skills because I am a fairly conservative user of Blackboard.
- **A more streamlined VLE with incorporated tools**
Having an incorporation of that where notifications from your email and courses are coming to one place... It would probably be more streamlined and that would also bring in... as well I think the use of... it is easy to catch... It will also transfer the time table to things like that in Outlook. ...apps of Blackboard. It will be great if they can work together.
- **A single challenge I would say**
A single challenge I would say. In the aspect of assignment eh eh last semester with a particular lecturer which is great he... three separate ways for us to hand in our assignments: there was Turnitin, a digital copy if you are working, you hand it in by hand if you are working on paper, the other one I can't remember the name of that particular type but it was on Blackboard where the questions are there and you get to answer. The problem that arose from the numerical answer was that it was only specific to a number of decimal places.

- **Availability of the content**
Eh the availability of the content, especially the video.
- **It has really helped**
It really helps. Although this is a masters course where you are expected to do a lot of self-study but the videos are very self-explanatory such that it would have taken a longer period of time to go into texts and discover for yourself but with the videos, we are able to though... matters and that will be the length of the video for me. ...so it has really helped.
- **Lecturers using different styles**
There is an issue with different lecturers using different ways; different folders to apply things such as you have course documents, where some lecturers put in place lecture slides or what we call course documents. ...to find what you need is always...
- **There are a few things I like about it**
There are a few things I like about it. Is it Panopto? yes, Panopto. That is pretty good. It helps a lot if you miss the lectures and things like that and then basic communication and submitting assignments as well as I suppose...
- **Help the learning of a person**
I don't think you will necessarily get the book ... because there is a book which comes along side and you can work through that book which is also available on Blackboard, the examples are pretty much... it doesn't... the Blackboard they are able to blanch out many different things and views. For example they are able to do to help the learning of a person.
- **Lecture slides are great**
Eh so obviously with Blackboard, it's got to be lecture slides and things like that. That is great but however having said that after the lecture there is the option of recording the lecture but there is still not many lecturers that do that and that can be a limitation.
- **Quite good for subject area**
It is quite good everything we need there. It's quite easy to get hold of it. However, it can be a little bit complicated from time to time to find things, you know there is quite a lot of them to go through.

The full list of the generated codes are contained in the appendix of the thesis.

4.3.4 Teaching staff codes

Very rich and useful codes were developed from the views of the teaching staff. A few examples of the generated codes are:

- Students' engagement

- Students' monitoring
- Impact of VLEs
- Commitment to VLEs
- Drawbacks of VLEs
- Students assessment
- Satisfaction
- Benefits of VLEs
- Staff constraints
- Constraints with use of external tools

Some of the codes and the transcripts from the students' codes are presented below:

- **Students' engagement**
...well on the one hand is the language from which we are teaching and then the content. We have to differentiate the things we put online for students in terms of content. In terms of the language how we engage is just basically is... materials and the writings or a times the exercises the students are supposed to do for the time.
- **Students' monitoring**
So the methodology allows me to check Blackboard how many students have done the exercises prior to entering my class, how many exercises they got right and which one they got wrong. So those exercises will be marked and be revised in class so that they get used to a methodology, the students work prior to the class and I also know what they know and why they have to understand... So I maximise the time I have to teach in my class, not teaching them things they already know and...
- **Impact of VLEs**
I am not sure. I am not sure at all, because in order to analyse the time frame, to what extent the VLE... It is necessary to conduct the research, paying attention to the students results, for a long period of time and that period of time should not be less than 7-10 years. ...I am not very sure scientifically speaking... whether does VLE actually support learning and teaching?
- **Commitment to VLEs**
So I think the teaching staff should and most of them are committed to the success of the VLE as a learning tool and will like to see even more improvement on its performance.
- **Drawbacks of VLEs**
Another aspect of learning platform like Blackboard is that it establish a gap between the student and learner and teacher but then it becomes more anonymous in terms of interactions between the students and the teacher

- **Students assessment**

A lot of the time I would love to use it more. I will love to see more multiple choice tests, again more quizzes and get them to do that a lot of time or get them to do some more of self-directed study again you can kind of use Blackboard to look at that and the discussion forum, I probably can't use it.

- **Satisfaction**

Yea I am very you know within the expectations I have of it I am very satisfied with it. I haven't encountered any problems

- **Benefits of VLEs**

Having said that, I will say that, what again it does for us through the Blackboard is that its enables/assists the teacher to communicate with the students as often as possible during the day without having to meet face to face and also it allows students that opportunity to access materials the lecturers put online or any other yea learning materials in whatever form they are video or audio play or materials, reading materials and so forth. It gives them the opportunity to access it as at when they want to. And that makes learning much more enjoyable and much easier.

- **Staff constraints**

Some times what I want to do is not appropriate with the way of doing things so in terms of alternatives I probably use that. I find out that the alternative method is more direct, in a way more personalised whereas there are some kinds of gaps there using the learning platform and the problem for instance to me is I don't think Blackboard is For instance if I want to remove materials from Blackboard, he told me that ... especially Blackboard, I think it is cumbersome it is not always good at establishing that clear relationship between teachers and students.

- **Constraints with use of external tools**

Well there is a problem with Turnitin specifically in terms of what document types, .. so that kind of refers to Turnitin specifically and not necessarily Blackboard that is part of the VLE that causes us problems students try to submit work assignments Turnitin couldn't handle it. It's only one or two students that happen to, the rest per time. It has been a bit of pain. So that is kind of ... so yea unfortunately I can't really help because I haven't yet tested how well integrated it is.

4.3.5 Directors of studies codes

The directors of studies provided a very a rich set of data that addressed issues surrounding the use of the VLE as it affects both the teaching staff as well as the students. It also touched on central issues like learning, the impact of the VLE on

learning as well as the need to carry the university community along in decision making. The codes generated from the transcripts include:

- Effect of VLE on learning
- What difference is VLE making?
- How lecturers structure the VLE
- Students' attitude to the VLE
- Lecturers' preferences
- BB versus Moodle
- Drawbacks of BB
- Level of customisation
- Default preference for BB
- Elements of learning

Some of the codes and the transcripts from the directors of studies codes are are presented below:

- **Effect of VLE on learning**

I have actually come round to the view that, that doesn't ... offers no evidence... and I can think of a number of cases where good students access materials in advance, international students... and make hard copies so that they have done a bit of the work before the lecture to help support their own language needs and I got used to teaching in a teaching room when I am lecturing with a number of students with the slides in front of them in the laptop in...

- **What difference is VLE making?**

So I have reached the point where I actually brought in that material, accessed that material before the lecture advance hopefully students were on it, spread the reality whether it was before or immediately after it correctly? ...for a lot of students where it does make a difference if they are positive? Eh I tend to be quite active in providing additional information.

- **How lecturers structure the VLE**

I know that change to the way they are viewing as pedagogical studies, think about what colleagues do, colleagues teaching other modules, different approach, different content in the modules use Blackboard to do so many... some certain other things which for them are quite nicely in their subject area.

- **Elements of learning**

...we thought about that and its really nice to have elements of that coming back to the question later. ...ago, of course things... It's interesting in terms of how relevant it's to students. I mean I am aware that my sense of that is certainly incomplete, that

is something where the... come from students rather than from lecturers and I've got clinical evidence, it's interesting. I have got my teaching, second years undergrads. I have got students... and we were talking about in... learning, in lecture learning, learning materials... the fact that most students don't take notes in lectures and are usually challenged about how to engage with the lecture and... learn and imbibe the teaching.

- **Lecturers' preferences**

What we have at the required minimum presence level and the way I want to get engage with students, deliver... information to students, varies potentially

- **BB versus Moodle**

Moodle and that has like a linear kind of description and I much prefer that as an expert in Virtual Learning Environment than Blackboard. Eh Blackboard can, I mean it requires skills in how to use it, different people have to been trained on how to use it.

- **Students' attitude to the VLE**

So is she exceptional... from one student to the others I do not know. I like to know. From comments that were handed out, Panopto recording and... lectures so occasionally you ask some students ... recordings. It's clear that he is not the only student who goes who goes back to go through the recordings sometime after the lecture other than ... it's clear from the, this is the first year I have panoptoed lectures.

- **Drawbacks of BB**

I personally, I am not a fan of Blackboard. I think it's messy, it's is very bigly and it's very difficult sometimes to find what you want on there and I think that is a barrier to colleagues and students who... using it and for students to use it as well.

- **Level of customisation**

You know these things. Yes I mean it allows some customisation, I think it can allow more, it can look a lot better.

- **Default preference for BB**

No but it's kind of, there used to be a saying that when you find a computer hardware, you are stuck with buying IBM because it's IBM, same thing as Blackboard. we need a VLE, we get Blackboard. So I guess we don't need to talk to anybody about what they do.

4.3.6 E-learning team codes

The e-learning team participant touched on a number of issues to help clarify some of the issues previously raised by the other participants. A few examples of the generated code include:

- University policy
- Slow responses interface
- It's fantastic
- The challenge for the e-learning group
- There's always room for improving it
- Works very hard with staff
- Putting things randomly
- An entirely different template
- We made a checklist
- We did focus group

Some of the codes and the transcripts from the directors of studies codes are are presented below:

- **University policy**
Well I think in terms of, I think there is a Required Minimum Presence policy that has been implemented across the university so it has reached the point where there are no staff members who are really able to ignore the VLE. So it should be used at all levels. We have required minimum presence obviously, we have Information working policy, we have lecture capture policy, and we have reading list policy. All of these are approved by the university.
- **Slow responses interface**
That is possible, slow responses interface, so that would be something like that improved.
- **It's fantastic**
Yea; again it depends on what you mean: the VLE, what it's used for or the way the staff use the tool. I think as a tool it's fantastic.
- **How lecturers structure the VLE**
I know that change to the way they are viewing as pedagogical studies, think about what colleagues do, colleagues teaching other modules, different approach, different content in the modules use Blackboard to do so many ... some certain other things which for them are quite nicely in their subject area.
- **The challenge for the e-learning group**
I think the challenge for the e-learning group is with some staff who are keen in using it in other words, staff who are quite busy or resistant sometime to the ... sometime it is just a matter of time. They like to use it more to enrich the experience.
- **There's always room for improving it**
I think the VLE really helps in learning areas. I think there's always room for improving it.

- Works very hard with staff

The learning team works very hard with staff like the session I was in today to make them aware of what they can do and make it as easy as possible for them to do it. To look into what they say, what they want to do and try to find a good solution for them or a good you know some ideas, a good approach to keep the teaching going. So we try to be quite proactive...

- Putting things randomly

Good question. We define that as... when some people don't... some will use, put things randomly, other people would use a really good way of structuring their modules.

- An entirely different template

So we said well we have to make it, so we felt what step we would need and we went through staff and students' needs ... and we went through a core process ... an entirely new different, very template , change it, okay this is what we are doing...

- We made a checklist

There are really nice things staff can do which is we made a checklist that is designed to be used by the teaching members of staff... where am I going to look, what am I looking for in this Blackboard or in that part of Blackboard.

- We did focus group

We did focus group, focus group to get the information before we made that change. We did that with staff and students... TEL and there were discussions as well.

4.3.7 Some reflections on the generated codes

An initial observation with the participants was that while the students were quite brief with their views the other participants namely teaching staff, directors of studies and e-learning team, were quite detailed in their views and were happy to spend more time to explain and convey their views. This could well mean that these participants had more to say based on their interactions with the VLE mainly because they were both users and producers as opposed to the students who were primarily consumers of what has been produced by the teaching staff, directors of learning and e-learning team. This underscores the need to not focus most of the energy and attention on the students as far as the issue of technology enhanced learning is concerned. It's very important to carry every stakeholder along so as to have a holistic view of the issues at hand and not just a limited view of the issues. If changes are effected with respect to the VLE and it takes the teaching staff and directors unawares, there's likely going to be a disconnect at least from the beginning and it would take a while before they fully embrace the changes.

4.3.8 Grouping of codes into categories

A major part of coding is linking the generated codes based on similar patterns Saldana (2009). So after the initial coding of the codes from the students' set of transcripts, the next step was to analyse the generated codes to find similarities and group them into categories based on identified common concepts/themes and properties in the transcripts.

4.3.9 The categories

As a result of the linking of the codes based on similar phenomena within the students' transcripts, a list of categories were created namely Attitude to VLE, Value of VLE, VLE design, Challenges of VLE, learning experience, Features of the VLE and Capacity Building. Subsequent categories were later created after the coding of the rest of the set of sample of transcripts from the teaching staff, directors of learning and e-learning team. These are Localization of the VLE, Listening to users, University Policy, Implications of VLE on Learning and Freedom to use the VLE. A short description of what each category represents is provided below:

1. Attitude to VLE: This category sums up all the codes of the participants that talk about their disposition to the VLE. This category had quite a number of codes in it meaning that the attitude of the users was quite reflected in their views.
2. Value of VLE: This category covers the codes on the benefits that the participants derived from the use of the VLE and how it specifically how it has helped the students to learn and the teaching staff to deliver on their teaching. This category had several codes in it taking about the value they got from the use of the VLE. For the students it meant for them, the value they derived in terms of lecture slides, lecture recordings, videos, reading lists, assignments, quizzes and the availability of the VLE as well as the access to it. They freely spoke about these resources and how it positively impacted their learning.
3. VLE Design: This category encompasses the codes from the participants that capture the way the VLE is designed, the arrangement of the features, interface and tools of the VLE. In this category were the codes that represented the participants' views on their experience with the way the VLE was designed for their use. Most of them spoke about has it has affected their use of it
4. Challenges with the VLE: This category is on the codes derived from the participants on the drawbacks associated with the use of the VLE. This category consists of the codes that captured the frustrations that users were having with making use of the VLE in the course of their work.
5. Learning experience: This category covers the codes that describe the students learning experience based their interactions with the VLE.

6. Features of the VLE: This category was about the various features of the VLE that the participants talked about.
7. Capacity Building: This category is a collection of the codes derived from the participants with respect to acquiring training on how to use the VLE efficiently. This category was based around the training or lack of training of the users. Some of them had one form of training or the other while the rest were happy to explore the VLE themselves and generally progressed from there.
8. Implications of VLE on Learning: This comprised of the codes that revealed how the VLE impacted on learning. In this category are the codes of the participants who shared on the implications of having to use the VLE. There were positive impacts as well as negative impacts.
9. Freedom to use the VLE: This category was based on the freedom of the teaching staff to use the VLE in their preferred ways. It captured the codes that centred around whether the teaching staff were being restricted in all way at all
10. Localization of the VLE: This category was made up of codes that talked about how the VLE was suited for the subject areas and the institution.
11. Listening to users: This category was about the participants' views about the university, e-learning team and VLE developers paying attention to what the users are saying about the VLE.
12. University Policy: This category was about the university policy on the use of VLE.

4.4 Selective coding

After open coding, the next process is selective coding which involves the choice of a core category. So after the initial categories were created, it was important to choose a category to be the core category. The idea behind the choice of a core was to focus on a category that ran through the data and would be well supported by the rest categories. This implies that a core category is selected based on an issue that is evident or dominant throughout the analysed transcripts (Holton, 2010).

4.4.1 Choosing a core category

The route to the choice of a core category for the sample analysis was not a straightforward way. There was a lot of back and forth by the researcher in the process of choosing the core category. For instance, **User Experience** was initially chosen as the core category after examining the students' transcripts and the codes that emerged from the analysis of the transcripts. However, a fresh

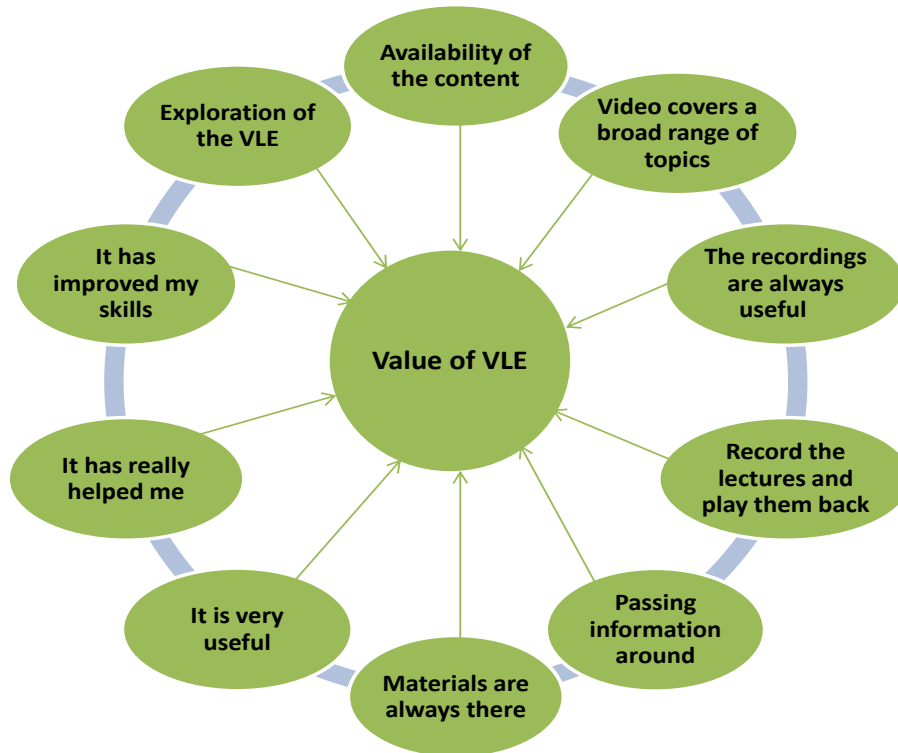


Figure 4.1: Some codes from a student's transcript and the category they belong to

look at the sample transcripts, coding and categories led to a change in the choice of a core category. This was prompted by the fact that *User Experience* was not one of the categories that emerged from the analysis. Another reason was that the choice of *User Experience* as a core category seemed to have emanated from the research question and was more of a summation of five categories from the initial nine categories generated from the coding of the sample transcripts of the students. These five categories were *Attitude to VLE*, *Value of VLE*, *VLE design*, *Challenges of VLE* and *Learning experience*. Based on the above reason and in order for it not to appear as being forced, the researcher revisited the choice of the core category with the intention of allowing the core category to emerge effortlessly from the process of analysis.

After much reflection and review of the analysis, the researcher decided to rename the category *Attitude to VLE* as *User Perception* and made it the core category. This fitted in perfectly with the coding, categories and emerging theoretical model of the study. At this point, it was obvious that the *User Perception* was the core category as the analysis of the sample transcripts showed that the participants' views were shaped by their attitudes to the VLE based on their interactions with the tool. For instance, the analysis of the transcripts revealed that if the participants were advocates of the VLE based on their interactions with it, they were more likely to speak well of the VLE by talking more of its benefits and less of its challenges while on the contrary if they were critics of the VLE, they were more inclined to speak more of its challenges and less of its benefits. All

these justified the choice of **User Perception** as the core category of the sample analysis.

Furthermore, it could be seen that other categories were related to in one form or the other. The relationship between the core category and the other category is a fundamental concept in grounded theory. The core category must be related to the other categories. **User Perception** as the core category and the relationship with the other categories is shown in Figure 4.1.

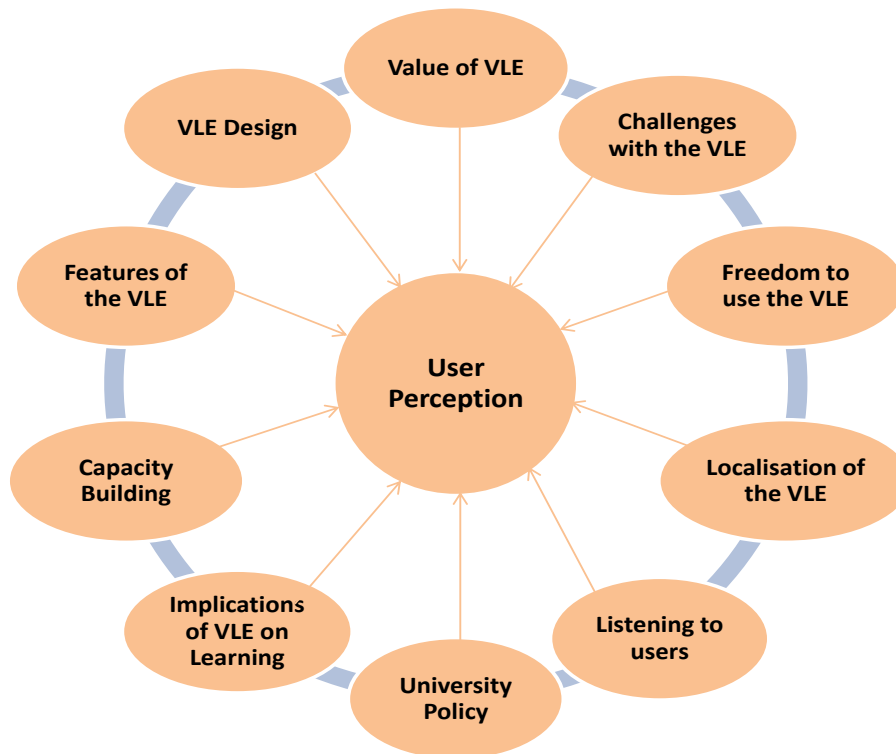


Figure 4.2: The core category and supporting categories of the sample analysis

4.4.2 Using the core category for theoretical sampling

So the after the first set of analysis of the students transcripts that yielded the core category, the transcripts of the teaching staff were analysed using the core category identified to be **User perception** by focusing on only the parts of the transcripts that related to the perception of users. From there on, the directors of studies and e-learning team transcripts were coded using only the core category of **user perception** to x-ray them. Usually in a full grounded theory study, through the process of theoretical sampling, the core category is then investigated further by asking other participants more questions about it and analyse their responses with the intention of going back to the field again by way of gathering more data and analysing them in a cyclic manner. But in the case of this study, the data was not gathered in a cyclic manner. The data gathering ended before the analysis started. This methodology is well accepted in grounded theory and it is referred to as the abbreviated version of the Grounded Theory (Willig, 2013)

4.5 Findings from the sample analysis

The findings of the sample of the analysis are listed and discussed below:

- (i) Configuration of the VLE The configuration of the Blackboard was found to be characterized by the following
 - Features of the VLE e.g. lecture slides, lecture recording etc.
 - User friendly
 - Arrangement of features and organisation of the user interface
 - High learning curve, too many clicks, clunky, old technology,
- (ii) Uniformity across modules
 - Students are happy when the same format is used across all modules and institutes
 - Students experiences differ from module to module owing to differences in the styles, preferences and skill sets of teaching staff
- (iii) How the VLE is structured around the modules
 - There are ways the VLE is used by the lecturer that benefits the students
 - How the teaching staff use the VLE could also affect the students negatively
- (iv) University policy on the VLE
 - There are university policies such as lecture capture and e-submission that benefits students
 - Some teaching staff did not comply with the required minimum presence (RMP) e.g. lecture capture
- (v) Benefits of using the VLE tool
 - Users got several benefits and value from using the VLE. This in no little way contributed to their having a good user experience. Examples include lecture slides, lecture recording, assignment submission
- (vi) Design constraints
 - Too many features on the interface
 - Poor navigation/too many clicks/ multiple log ins
 - Not intuitive
 - Not quite responsiveness
 - Integration with external tools
 - How the teaching staff structure the modules around the VLE

- Students are not happy when the structuring of the module around the VLE does not benefit them
- Some teaching staff don't comply with the RMP e.g. lecture capture

4.6 The common themes from the sample transcriptions

The analysis of the set of sample transcripts across the four categories of the participants made up of students, teaching staff, directors of studies and e-learning team had some common themes which cut across their experiences on the use of VLEs. This yielded a mixed bag of results. For instance participants spoke of things they liked and also of the things they didn't like. It was discovered that for some of these points raised by the participants, there were agreements and disagreements both within each category (except for the e-learning team due to the fact that only one participant was interviewed in that category) and across the categories. Some common themes ran through the views of these participants which are examined below:

4.6.1 Students' engagement

Students find the tool to be very useful in accessing materials and the lecturers believe that it enables them teacher to communicate with the students as often as possible during the day without having to meet face to face. It also allowed students the opportunity to access materials the lecturers put online or any other learning materials in whatever form they are: video or audio play or materials, reading materials and so forth. In the same vein, the lecturers believe that the use of the VLE give students the opportunity to access materials as and when they want to, which goes a long way to make learning much more enjoyable and much easier. The directors of learning and e-learning team also shared these thoughts.

4.6.2 Impact of VLEs

Some students believe that the VLE has had a great impact on their learning though one of them described the impact as average. The lecturers shared the view of a great impact of the VLE on students' learning but not without mentioning that there is room for improvement especially with regards to the amount of time on their part, it takes to prepare materials and in attempt maximise the VLE tool. On the part of the directors of studies, they were quite critical and divergent in their views. For instance, while one of them believed the VLE may be shaping the course rather than supporting it, another believed that there was no clear evidence of VLEs making a difference in students' learning.

4.6.3 Drawbacks of VLEs

All the teaching staff in the set of sample transcripts were unanimous on the issue of drawbacks with the use of the VLE which tallied with some of the views of the directors of studies. Some of the drawbacks included the fact that a VLE like Blackboard includes its cumbersome nature, poor navigation, heavy designs and old-fashioned technology. Other drawbacks were that Blackboard establishes a gap between the learner and teacher because it becomes more anonymous in terms of interactions between the students and the teachers and also creates a barrier to learning. While the e-learning agreed that there were one or two drawbacks, it was emphatic that some of the complaints from students and staff were beyond their control. But on the whole, the e-learning team believed that the VLE was a good system.

4.6.4 Satisfaction

The concept of satisfaction was a common thread all through the transcripts. For instance out of the five students whose transcripts were analyzed, four of the students expressed satisfied and one of them rated the level of satisfaction as average. For the lecturers, while some expressed satisfaction with the present VLE others expressed their reservations. It's interesting to note that amongst those who were satisfied with it, some still complained about it and wished the e-learning team would do something about those things but were also quick to point out the level of performance and improvement of the VLE over the years.

...I am not particularly satisfied. I have my reservations. – Teaching staff T6

Yea I am very, you know within the expectations I have of it I am very satisfied with it. I haven't encountered any problems. It is a bit cumbersome a times, it can a bit, that is so many menus, so many directories, the interface perhaps could be a bit you know streamlined may be. – Teaching staff T13

Yea I am quite satisfied with the performance. I can say a lot has been changed for the better. In the past years, there has been a lot of improvement and the members of staff do offer a lot of support in terms of ways of training and drop in sessions and so on and so forth, so much support for the teaching staff to be able to use the VLE effectively. I think I am quite satisfied. – Teaching staff T10

The directors of learning were more critical of the level of satisfaction of the VLE. All three said they weren't satisfied with the VLE. The reasons they gave range from frustrations and dissatisfaction due to control failure to the poor design of the VLE. While one said he would rate it 5 or 6 out of 10, another said "it provides you with challenges rather than with opportunities." As expected, the e-learning team believed that the VLE was a great tool that is very useful to both staff and students.

On the whole, these four themes above were the common threads that ran through out the set of sample transcripts which were analysed. They formed the basis for shaping the preliminary results of the study.

4.7 The emerging theoretical model

Investigating the results of sampling the core category with more data from teaching staff, directors of studies and e-learning team showed that the experience of the users with the VLE in terms of their perception of the VLE were based on the benefits and challenges they encountered in the course of using the VLE. For example some of the views expressed by participants as shown below reveal how they perceive the VLE:

I think it is the ability to record the lectures and play them back. For example ...I can play them back, pause and hear something I might haven't before ... As a mature student so I might not be able to attend some lectures on time as planned. ... So I can listen to that lecture, then if I am not in class, I can always go back and listen to that lecture. So for revision purposes, it is very useful. You can listen again and hear - Student S10

The first point about Blackboard is that I have never been impressed with the system. I think it is cumbersome and not easy to use from the teacher's point of view. I have found that using Blackboard, it is not easy to navigate always. ... I think it is cumbersome it is not always good at establishing that clear relationship between teachers and students -Teaching staff T6

I wouldn't say that I am constrained. As you can imagine, there are a number of things you can do with a VLE ... Personally, I feel we have a great platform on which we can engage with our students and I feel that the platform here provides that services to our students , so I don't think or feel constrained in anyway in the VLE -Teaching staff T10

I suspect it's not particularly easy to make it seamless when you try it with other things from the point of view of the lecturer... - Teaching staff T17

As these views above and others in the transcripts were analysed in comparison to the common threads in the study, a theoretical framework began to emerged as shown in Figure 4.2.

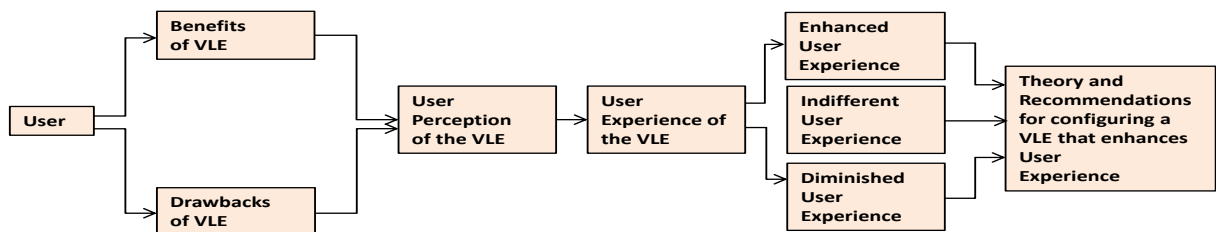


Figure 4.3: An Emerging Framework of how the user perception of a VLE influences the user experience

It remains to be seen if the analysis of the full transcripts will support this emerging framework or otherwise.

4.8 Changes in the approach based on the analysis of the sample transcripts

An overview of the implementation of the analytical approach for this study with a set of sample transcripts has shown how the method works and also provided an opportunity to make some adjustments in its further use. A few things came up during the analysis which are worth mentioning here

- (i) Some of the labels of the codes (especially in the case of the teaching staff) seemed to be more descriptive of the categories and less representative of the chunks of transcripts. This was obvious because when it came to grouping the codes into categories, it was rather confusing, difficult to find other concepts. For instance, some of the initial codes were drawbacks of VLEs, Impacts of VLEs, Satisfaction with the VLE, Students' engagement. Some of these codes were also found to have the same names with some of the common themes that ran through the transcripts. This became an issue that needed to be addressed so as to guard against confusion in the later stage of the analysis. Another reason is that it was clear from the sample analysis that using the exact words of the participants was leading to the generation of tens of codes which might be difficult to manage during the analysis of the full transcripts. On the other hand, using descriptive or conceptual labels that captured the codes not the exact words of the participants seemed like jumping over the first part of open coding to conceptualizing it.
- (ii) Another reason was the need to ensure that the process of analysis was repeatable, extra care was taken to pay attention to every part of the transcripts so that all the ideas of the participants were captured and analysed correctly. This would ensure that a re-analysis of the transcripts led to sufficiently similar results to justify the claim that the key themes have been identified. Hence the approach to coding was revisited and it was decided that the coding of the transcripts should be done using *in vivo* codes and the concept was strictly adhered to.
- (iii) The use of *in vivo* was selected to use in the coding of the whole transcripts of the study.
- (iv) Another change to be implemented during the full analysis is the order of theoretical sampling of the participants. Other than the last interviews of the study, the rest were carried out before the analysis began. So in attempting to follow the tenets of classic grounded theory which dictates that the results of the analysis of the initial transcripts should determine who next to be interviewed. Based on that, it was decided that the transcripts should be sampled chronologically that is in the order that the data was gathered.

4.9 Chapter summary

This chapter has described the processes and results of analysing a set of sample transcripts - the coding of the transcripts, classification of the codes into categories and the choice of a core category for the study. A number of codes were generated from the transcripts as well as a number of categories. The core category of the sample data was discovered to be **User perception**. The results of this sample analysis were presented at the Association for Learning Technology conference in September 2017. The processes described in this chapter will be used in the analysis of the full transcripts in the next chapter subjected to the changes that have been identified in section 4.8 above.

Chapter 5

Data Analysis

5.1 Introduction

This chapter presents the full analysis of the research work. The analytical processes involved in the use of classic grounded theory are shown and explained with respect to how they were implemented. The codes of the transcripts were generated and then grouped into their relevant categories for further analysis. Theoretical sampling and the constant comparative method in conjunction with analytical memos were used in developing a theory that offers explanation on the happenings in the social space of a VLE - Blackboard in Aberystwyth University.

5.2 The analytical process

Following on from Chapter 4, certain changes were made in the analytical processes of the study. These changes are listed below:

- (i) The generated codes of the first set of coding were labelled using the in vivo coding convention while analytical coding was used for the rest of the coding.
- (ii) The interview questions were analysed separately from the Likert scale questions.
- (iii) Theoretical sampling of the transcripts was done chronologically as opposed to the random selection of participants in Chapter 4. The chronological order of sampling the interview transcripts was adopted after the order of a full grounded theory. This implies sampling the transcripts according to the order that the interviews were conducted as is the case of a full grounded theory as opposed to an abbreviated version of grounded theory. This rationale guided the researcher in the theoretical sampling of the transcripts and having the work organized rather than having to postulate in which order to sample the transcripts.
- (iv) Constant comparison was done within and across the different groups of participants.

- (v) Some of the transcripts were revalidated by listening to the audio again. In particular P55 was fully transcribed at this point as only a part of it had been transcribed as at the time it was used for the set of sample analysis.
- (vi) The transcripts of the administrative staff were analysed at this stage. They were only interviewed after the sample analysis of the study had been done.

5.3 The coding methodology

Following on from Chapter 3, the methodological steps of the classic grounded theory were employed in the analysis of the data and the processes of the analysis are shown in Figure 5.1.

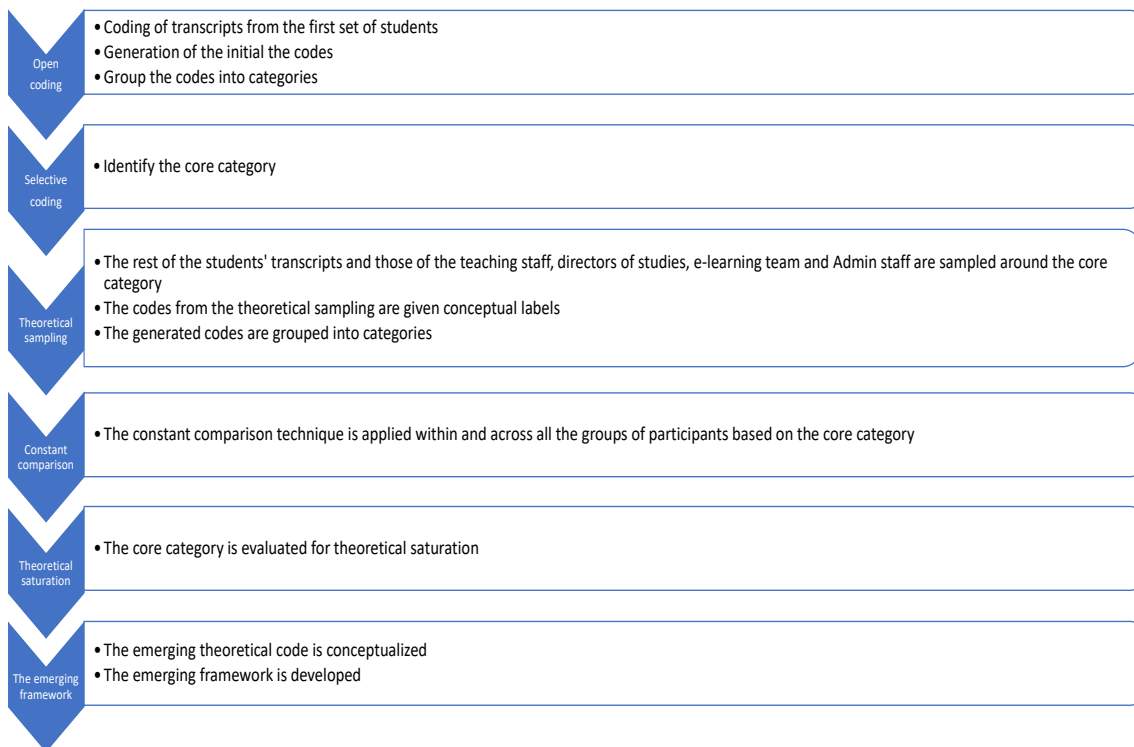


Figure 5.1: The data analytical processes of the study

5.3.1 Open coding

The open coding of the transcripts was done by examining the transcripts line by line to identify the salient views of the data. Glaser (1978) had stated that the researcher should be guided by the following questions:

- (i) What category does this incident indicate?
- (ii) What property of what category does this incident indicate?
- (iii) What is the participant's main concern?

So the themes, thoughts, feelings, actions, issues or events which were central to the research focus of the study, were coded. The line by line examination was very important in order to compensate for the lack of breath of the data given that the abbreviated form of GT was being used for the study. The transcripts were also examined by word by word, paragraph by paragraph and as well as comparing incident to incident in order to have a holistic view of the data and capture the information inherent in the data. The researcher adhered to using in vivo codes all through the open coding process. This implied that the codes were gotten directly from the words of the participants.

5.3.2 Initial coding

The open coding of the full study began with the initial coding of eight out of the first ten participants that took part in the study. The selection of these transcripts was quite different from the way the set of sample transcripts were selected in Chapter 4. These transcripts were sampled in a chronological order as opposed to the random selection of the sample transcripts. Two of the audio recordings of the interviews were of poor quality and were therefore left out as they could not be transcribed. The eight transcripts were then coded and labelled using in vivo coding rule. The in vivo coding stipulates that the words of the participants should be used in giving label names to the codes that have been generated from the transcripts (Charmaz, 2006). These transcripts were closely examined and broken down into separate chunks based on issues they were addressing. This process was carried out by following the guidelines outlined by Glaser (1978), Charmaz (2006), Bryman (2012). In some instances, words, sentences and paragraphs that stood out from the transcripts were coded in order to capture the phenomenon they were addressing. As previously done during the analysis of the set of sample transcripts in Chapter 4 the concepts list below were used in surveying the data while coding:

- (i) The benefits that users enjoyed in using the VLE;
- (ii) The features available on the VLE;
- (iii) The drawbacks associated with the use of the VLE;
- (iv) The satisfaction (or otherwise) that users expressed in their use of the VLE;
- (v) The future expectations of the VLE.

These central themes were only used as a guide to exploring these transcripts as attention was also paid to other pertinent issues raised by the participants in order to ensure that no idea or view was discarded prematurely.

5.3.3 Initial codes

The codes that were derived from the student participants were quite interesting as they revealed what was paramount in the participants' minds based on their experience with the VLE. The participants spoke about the things they liked

about the VLE, the benefits derived from using it as well as the difficulties they encounter in the use of the VLE. A few examples of the codes that emerged from the open coding process of the sample set of students' transcripts include:

- A bit complicated to find things;
- A lot of extra reading;
- A more user-friendly system;
- A single challenge;
- Able to author;

127 in vivo codes were generated from the coding of these transcripts. The complete list of these codes is in the appendix. The 127 codes were generated during the first round of open coding as opposed to the 76 codes that were generated during the first round of the coding of the sample transcripts in Chapter 4. This was due to the fact that eight transcripts were coded in this case as against the five transcripts that were coded during the first round of the set of the sample transcripts.

5.3.4 Categories

The next step was to analyse these codes and group them into categories based on the similarities of the phenomenon associated with the codes and the information contained in their chunks of transcripts. With that frame of mind, the researcher proceeded to group the codes into categories. Also given that there were some similarities in these codes with those generated from chapter five, some of the names of the categories used earlier on in Chapter 4 were equally used here as they were addressing similar concepts. Care was also taken to ensure that the codes earned their entry into such categories. Some of the categories were thereafter modified. For instance **Challenges with the VLE** in Chapter 4 was then changed to **Barriers** as it captured the phenomenon that was being expressed by the users in the transcripts more aptly while others that had no bearing with the core category were discarded and new categories were then created for the emerging concepts based on the selective coding of the transcripts. For example, looking at the chunks of transcripts in both configuration and future expectations categories, it was discovered that they both had something in common based on how the navigation of users was hampered or could be improved. Hence both categories were fused into a single category named **Navigability**. Also, as for **Learning and Value**, it had always been rather tricky in deciding which code should go into either of the categories. So it was then decided that they both be combined and named **Value**. So the category **Value** became made up of the codes that have to do with learning and the values users derive from using the VLE. Based on the similarities of the patterns associated with the codes and the information contained in the data from the interview transcripts, a number of categories were conceptually developed and presented in table 5.1 as shown below:

The categories that emerged after the initial coding as presented in table 5.1 are discussed below:

Categories from the coding
Barriers
Capacity Building
Engagement
Navigability
Online Community
User Perception
Value

Table 5.1: The categories that emerged from the coding

- (i) **Barriers:** This category captures the drawbacks that the users encounter in their interaction with the VLE. It was initially labelled as **Challenges with the VLE** in Chapter 4 but was later changed to **Barriers**. The codes and the transcripts that make up this category are outlined below:

- **Without having to wait for 24 hours**
If I was to redesign it, I would really expect that I could just upload my account and let it check for as often I can without having to wait for 24 hours to get a feedback because the first one, first submission that we did, I instantly got a feedback for the checks but thereafter, if you submit... in the last week of... it takes 24 hours. You can only submit for a particular day.
- **What period it will be maintained**
I will go to put up Blackboard signs to know what period it will be maintained. Sometimes they don't. ...like after the exams it was down and I didn't know about it until after I went on Blackboard.
- **There is a limit for that day**
I instantly got a feedback for the checks but thereafter, if you submit... in the last week of... it takes 24 hours. You can only submit for a particular day. For every account, there is a limit for that day in the submission for that assignment so you cannot use anything else... for that day except at the... and so I was not.
- **System is down**
The feature I find least intimidating at the moment is... the assignment is due and you can't hand them... the system is down or the internet is gone, you can't... This is a pain sometimes.
- **The problem that arose**
The problem that arose from the numerical answer

was that it was only specific to a number of decimal places.

- **Panopto app I cannot access**

Well, I don't think..., the challenge I encountered was as a first time user. I was trying to listen to a lecture on Panopto and learned how to use it. Again, discovered that I cannot even if have the Panopto app, there is a Panopto app, I cannot listen to the lecture on a Panopto app until I log on to Blackboard. I have the Blackboard app on my phone. I can access through the Blackboard app but then there is a Panopto app I cannot access through the Panopto app.

- **It logs you out**

I have encountered a problem with a statistical module and essentially you have to do like an online test and sometimes I think I use my laptop and most time I make use of Blackboard then sometimes when you go to the next question, it logs you out. You can't attempt other questions. You might be unlucky you can't get back on it.

- **I can't access it**

I think so because I thought because it has the Panopto like the one for recording and everything then I realized that... I can't access it.

- **Down for maintenance**

Apart from when it's down for maintenance when you need it...

- **A single challenge**

A single challenge I would say. In the aspect of assignment eh eh last semester with a particular lecturer which is great he had... three separate ways for us to hand in our assignments: there was Turnitin, a digital copy if you are working, you hand it in by hand if you are working on paper, the other one I can't remember the name of that particular type but it was on Blackboard where the questions are there and you get to answer.

- **The correct answer**

You could have the correct answer but you may have put in too much decimal places in or you fill which will then bring back an incorrect answer and you get you know marked down obviously for that even though you have the right answer there.

- **We can't download such videos**

Some of these content even though we will love to

have more of this content available to us. For example the video, the Panopto videos, we can only view when we log in, we can't download such videos because they are computer protected. And students we believe if these contents are made available to us. We have all enjoyed this video and will love to keep it.

Barriers
Without having to wait for 24 hours
What period it will be maintained
There is a limit for that day
System is down
The problem that arose
Panopto app I cannot access
It logs you out
I can't access it
Down for maintenance
A single challenge
The correct answer
We can't download such videos

Table 5.2: The category named Barriers and its codes

(ii) **Capacity Building**: This category consists of codes that represent the views of participants on the training they received or their levels of skills with respect to the use of the VLE. The codes and chunks of transcripts that make up **Capacity Building** category are outlined below:

- **Until I eventually got used to it**
Well not much challenge except that... and as such information was not passed and I was not aware of things until I eventually got used to it and this is due to the fact that I have not been exposed to it but apart from that there hasn't been any much of a challenge.
- **There wasn't any training**
There wasn't any training... through exploration. Nobody actually showed me but through exploration I got used to... the issue is that it was initially difficult but then exploration and trials, I got... by myself.
- **I never had the training**
No. No. I have also thought of that. If I attended the training obviously... I never had the training.
- **I haven't been exposed to it**
Well because I haven't been exposed to it, this is my first time using it. But we need more features which

are more beneficial to us. So I wouldn't know much about it based on my little experience.

- **Information was not passed**

Well not much challenge except that... and as such information was not passed and I was not aware of things until I eventually got used to it and this is due to the fact that I have not been exposed to it but apart from that there hasn't been any much of a challenge.

- **I got used to it**

After I got used to it, I always login to check for updates and to check... so there hasn't been any much challenge.

Capacity Building
Until I eventually got used to it
There wasn't any training
Information was not passed
I never had the training
I haven't been exposed to it
I got used to it

Table 5.3: The category named Capacity Building and its codes

(iii) **Engagement:** This consists of the codes that had to do with the users' interactions with the VLE. The codes and the transcripts that make up the **Engagement** category are presented below:

- **Presentation sent in advance**

But with this, the lecture slides, the presentation in most cases are sent in advance of the lecture. So you get a feel of what the lecturers will present and... will understand. I think it has really helped especially in my presentation.

- **They don't explain much in class**

Yes; in class they would explain with word document most of them on Blackboard. ...they don't explain much in class... reading it in class while the teacher talk about it because last semester, ... we had... and in class he talked about that chapter, so specifically if he talked about the chapter while reading it, that would have made more sense to me.

- **Prejudices a lot of people**

I would say friendly. I won't say very friendly however it is only the fact that the lecturers... which prejudices a lot of people.

- **Multidisciplinary course**

I am doing a multidisciplinary course it involves Inter Pol, IBERS and Geography. But Inter Pol not so much, they don't really have much on Blackboard other than to submit assignment but in IBERS I make use of Blackboard a lot.

- **Lecturers using different ways**

There is an issue with different lecturers using different ways, different folders to... things such as you have course documents where some lecturers put in place lecture slides or what we call course documents things like that. Other lecturers will have new folders. But sometimes it can be a little bit of a hunt to find what you need. But in general it's always useful there, where is it? The feature, I think it's fantastic, I think it's a brilliant way; we need to bring everything all together.

- **Lecturers do include extra materials**

I like the fact that most of the lecturers do include extra materials on it, very easy to access.

- **Lecturers that use the tool brilliantly**

There are organizational tools on there. However, it doesn't use... it tends to quickly. For example you have got so much lecturers that use the tool brilliantly. Every time an assignment is marked they will put the grades up, they will go on to use the tool, en you can view your progress as you are working along... can tell you how you are doing. I don't... of the program itself because the possibilities are there you know some lecturers are doing some things, some lecturers are doing other things.

- **Lecture**

Eh so obviously with Blackboard, it's got to be lecture... and things like that. That is great but however having said that after the lecture there is the option of recording the lecture but there is still not many lecturers that do that and that can be a limitation...

- **It's more face to face**

We don't always do a lot online. It's more face to face...

- **Able to author**

I think he is actually able to author a diverse number of... the answer has to be within this range. That is that. Anything within that will be fine. That worked, however on some occasions, you would want to have the freedom to apply... I think it needs a little bit of

playing around by the lecturers.

- **It needs a little bit of playing around**
I think he is actually able to author a diverse number of... the answer has to be within this range. That is that. Anything within that will be fine. That worked, however on some occasions, you would want to have the freedom to apply... I think it needs a little bit of playing around by the lecturers.
- **Email that have updates**
Em, send the person a mail, create email that have updates rather than having to log on to Blackboard before you know that something has been added...
- **Documents in different folders**
Oh it's a hard question. ...sometimes I couldn't find the document I needed because they put their documents in different folders. ...content and finding it sometimes is a sort of...
- **Copyright issues**
Copyright issues, that will be something they will have to work on...
- **Better than other lecturers**
A lot of the lecturers use the VLE a lot better than the other lecturers.
- **There are no videos or audio recordings**
Well the videos are only for the statistics course. The other courses, there are no videos or audio recordings.

(iv) **Navigability:** This category has to do with how users navigate the VLE in attempt to locate materials, tools and resources. The codes and the transcripts that make up the Navigability category are presented below:

- **The way it's organised**
The organisation tools I don't like that much. The way it's organised is... when it comes to stack up like what we have done when they upload it, ...from next week, that will go on the bottom.
- **Navigate round**
I like the way obviously you have got the, when you have got the modules that are easy to go on and navigate round.
- **It should be in a more prominent place**
...I was taking a course, it was not anywhere near tools, like I said it was under tools, so maybe it should be in a more prominent place under where is it called modules it should have its own features... like assignment...

Engagement
Presentation sent in advance
They don't explain much in class
Prejudices a lot of people
Multidisciplinary course
Lecturers using different ways
Lecturers do include extra materials
Lecturers that use the tool brilliantly
Lecture
It's more face to face
Able to author
It needs a little bit of playing around
Email that have updates
Documents in different folders
Copyright issues
Better than other lecturers
There are no videos or audio recordings

Table 5.4: The category named **Engagement** and its codes

- **Find it hard to browse**
Em, one thing about Blackboard, I find it hard to browse it because there is no guide, guidance to it and sometimes it's down due to maintenance which is a pain and so at the moment I...
- **Quite complicated**
There is not much that I have encountered myself but I am quite technical. Like I said, I think there are issues with the organisation of it and it can be quite complicated.
- **Quite difficult**
It can be quite difficult to... You don't have to look around to find things but whether you can find without... is questionable.
- **Difficult to find things**
It can be quite difficult to find things normally. The way it has been set out is not as easy as it should be.
- **A bit complicated to find things**
It is quite good, everything we need is there. It's quite easy to get hold of it however, it can be a little bit complicated from time to time to find things, you know there is quite a lot of them to go through.
- **A little bit of hunt**
But sometimes it can be a little bit of hunt to find what you need but in general it's always useful there,

where is it? The feature, I think it's fantastic. I think it's a brilliant way. We need to bring everything together. I mean we can probably do everything apart from that through Blackboard. It has that potential. ...why they built it like that... I don't think that's a good idea...

- **Good to navigate**

If I was to redesign it, I will try and make the use of the interface a lot easier, good to navigate.

- **A little bit more of user-friendly**

I will probably be thinking a little bit more of user-friendly better still, there is a list of things to get through which make it harder to find what you are looking for.

- **Smart links to the useful stuff**

So it will be handy if there are, for example for your you are a lot more likely to use you know your reading list than you read and then go to the help section of it. So I think it will be more handy if that was more obvious... on the website. Apart from that only log on there are several things like announcement. It will be good to have smart links to the useful stuff...

- **Search for something**

Good question. If you could search for something like keyword maybe I'm not entirely sure if there is one but I know that sometimes when I'm trying to revise or something and if I'm trying to look up something and I can't remember which lecture it's on ... trying to find one slide and if you could...

- **Search function**

Hmmm maybe like a search function if it's possible for all files in the module along with the module names, it will be easier to search through. The navigation tool I find quite...

- **It needs to be more flexible**

So it needs to be more flexible so that we can get much from it. So that we can do it as much as possible, so that we can put some of our other related work to check for it...

- **Search the index**

What I am studying and perhaps why I'm studying books, you know I can flip through an index and search that... it will be a monumental task for anybody to create any form of database where you can search the index like the back of a book. Perhaps it is not like

when search like when you need it. But for a book you just go back to the index and look at the line. I think it will be financially impossible for them to create that on Blackboard.

- **Search function on every page**

I didn't know there was a search function. ...a search function on every single page of the modules, they can have drop down box for the modules... click the drop down box it... if you click it, it drops down and will give you a list of the modules... I think that will be a lot easier...

- **They use two folders**

I would say friendly. I won't say very friendly however it is only the fact that the lecturers... which prejudices a lot of people. Particularly, they use two folders, where you have the content module there called content and then an additional content in a folder that is called something else. If you click on one of them, you have all the content without necessarily checking the other one.

Navigability
The way it's organised
Navigate round
It should be in a more prominent place
It could be improved
Find it hard to browse
Quite complicated
Quite difficult
Difficult to find things
A bit complicated to find things
A little bit of hunt
Good to navigate
A little bit more of user-friendly
Smart links to the useful stuff
Search for something
Search function
It needs to be more flexible
Be more streamlined
Search the index
Search function on every page
They use two folders

Table 5.5: The category named Navigability and some of its codes

(v) **Online Community:** This category came about as a result of the users talking about their use of discussion forums in their modules. The codes and the transcripts that make up this category are outlined below:

- **Access can be quite brief**
On the forum I feel access can be quite brief and there you can find two people asking very similar questions. I have had cases I have asked someone, I have asked a lecturer question and he will be like it's on the forum, and the thing I'm asking hasn't been... so my question isn't really answered...
- **Easier to message them directly**
I know there is like a chat forum there on the right corner I believe. I don't think I know any one of that should have been used, but I just tend to email the lecturers directly. I have been on one module where there has been a discussion forum, but I feel like sometimes it's more easier to message them directly.
- **We haven't had it**
Eh presently, on my programme we haven't had it.
- **I'm quite confident**
I feel like, I'm quite confident but I don't mind. It is not an issue for me. I feel comfortable asking the lecturer question using the hub but if there is a scenario where I need to ask lots of questions... one person asking all the questions... some people feel a lot less confident asking questions... anonymous.

Online Community
Access can be quite brief
Easier to message them directly
We haven't had it
I'm quite confident

Table 5.6: The category named **Online Community** and its codes

(vi) **Value:** This category was made up of codes that captured the benefits that the users derived from the use of the VLE in their modules. This came out clearly in the transcripts as they expressed their views regarding the benefits the users get and how it aids their learning. The codes and the transcripts that make up this category are outlined below:

- **Everything we need is there**
It's quite good. Everything we need is there.
- **Upload presentation**

With respect to my learning style, I would say it's empowering. I wouldn't say limited. Yea, most of my modules anyway, a few of them for the science based modules, they have to like upload presentation of whatever we are taught in class and it always, I have always been told to go back in there, get access to it...

- **Such content to cover everything**
Obviously, I don't expect, don't expect such content to cover everything but to some extent, it has covered...
- **So that we can keep them**
This apply to some of our lecturers who hand out some of those materials to us but is still good to have them in soft copies so that we can keep them for over a long period of time.
- **Reading more**
I would say a bit because I'm reading more because like I said today on the computer and I'm reading more because of the documents on there and if they weren't there, I would have to go to the library and find out. So it enriches it by giving me the experience to read more on it...
- **Record the lectures and play them back**
I think it's the ability to record the lectures and play them back. For example... I can play them back, pause and hear something I might haven't before.
- **It helps to go back**
With respect to my subject area, I think it just works the same. Yea, in childhood study, you have a range of modules like 6 to 8, I think for the first year, I think it is 8. It helps to go back.
- **Materials are going to be there**
Empowered I suppose, I know the materials are going to be there when I need it. There are lecture slides there for example which the lecturers have placed.
- **Lecture content**
The lecture content on there... Hmmm, hard question. Sometimes not engaging to a point. So for me in the module, I look for the lecture content. ...will change different modules actually inside the module task. We look at a bit of lecture content actually...
- **It hasn't so much helped me**
It hasn't so much helped me necessarily because like I said, I am used to computers but I can see that it might encourage people who also already have various

computer skills to be a little bit more active online.

- **The videos are very self-explanatory**
Although this is a masters course where you are expected to do a lot of self-study but the videos are very self-explanatory such that it would have taken a longer period of time to go into texts and discover for yourself but with the videos, we are able to though... matters and that will be the length of the video for me.
- **We contributed to the wiki page**
For assignment and stuff... used the wiki page... can't remember there were four of us that area in a group work... We contributed to the wiki page in the assignment through a set of questions and I learnt a lot.
- **I made a wiki page**
I'm at par with them on how I use them. I made a wiki page of mine in a module... Not quite interesting.
- **My own notes**
...I refer to the lecture slides, I do have my own notes which I always do but sometimes I have gaps in those notes which I need to fill in and I find that resource available through the various lecture slides that I go through.
- **It helps my learning style**
In terms of my learning style, I don't really take notes during lectures. So it's very useful for me to have a VLE there... It helps my learning style... To my subject area... it makes the lectures easier. Sometimes it empowers me, and makes it more accessible...

Table 5.7 shows some of the codes in the **Value** category.

- (vii) **User Perception:** This category contains the codes that conceptually depict attitude of the VLE users. Users displayed their attitude as they talked about their experiences and expectations of the VLE. Some of them expressed satisfaction while other expressed frustration. There were also cases of where same users expressed satisfaction in one or more area(s) of the VLE and frustrations in one or more area(s). The codes and the transcripts that make up the **User Perception** category are presented below:

- **It's very useful**
So I can listen to that lecture, then if I am not in the class, I can always go back and listen to that lecture.

Value
Everything we need is there
Upload presentation
Such content to cover everything
So that we can keep them
Reading more
Record the lectures and play them back
It helps to go back
Materials are going to be there
Lecture content
It hasn't so much helped me
The videos are very self-explanatory
We contributed to the wiki page
I made a wiki page
My own notes
It helps my learning style

Table 5.7: The category named Value and some of its codes

Also for revision purposes, it's very useful. You can listen again and hear. Just get more information.

- **It's underutilized**
I think it is a pretty good system. It's underutilised.
- **It's always useful**
Sometimes it can be a little... to find what you need but in general it's always useful there... where is it... bring everything together, Blackboard has that potential where there... Well it is problem I guess.
- **It's better than whatever I'm used to**
...it's better than whatever I'm used to. In back home we don't have VLE at all.
- **I don't think it limits me**
I don't think it limits me in anyway.
- **I just don't think about**
There are some features that... there are tools there I think there is calculator, other tools there, a lot of things that I just don't think about.
- **It could be easier**
It's easy to use but it could be easier.
- **It is limiting to me**
It is limiting to me... which is digitally based. Which means that you are in the hands of laptops or phones or tablets.
- **It really helps**
It really helps.

- **It's empowering**
With respect to my learning style, I would say it's empowering. I wouldn't say limited.
- **I feel a lot more comfortable**
I think it has helped me in the fact that I feel a lot more comfortable searching for things online and answering online quizzes. I feel a lot more confidence has improved in the... I also feel like in certain ways obviously you can only type in certain formats like you have to keep an eye to one decimal place and something like brackets...
- **I don't feel limited by anything**
I don't feel limited by anything that I would have thought. I feel... obviously when in there I have quite control. I don't really miss lectures... If my charger goes bad and my laptop goes off, I can't... It is good to know that I can always go on to, you know there are lecture slides and usually there are Panopto recordings are there so I feel like I have to be there to attend and I think that attraction... will be there in the room. If I have missed out on anything there completely not the experience of Blackboard...
- **Things I like about it**
VLE Blackboard. There are a few things I really like about it. Like is it Panopto? yes, Panopto. That is pretty good. It helps a lot, if you miss the lectures and things like that and then basic communication and submitting assignments as well as I suppose...
- **More catchy**
I would say maybe the appearance. It could be more catchy and something. Like the arrangement of subjects, objects and... it could be more, I don't know, more attractive or something, better colours or I don't know like... there is no...
- **More helpful digitally**
...it's actually more helpful digitally.

Table 5.8 shows some of the codes in the User Perception category.

5.4 The main concern and the core category

A critical examination of the transcripts revealed that the main concern of participants was user experience. It was observed that the participants spoke about their engagement with the VLE, benefits, feelings, challenges, perception and expectations of the VLE as it pertained to their experience of using the VLE. This was

User Perception
It's very useful
It's underutilized
It's always useful
It's better than whatever I'm used to
I don't think it limits me
I just don't think about
It could be easier
It is limiting to me
It really helps
It's empowering
I feel a lot more comfortable
I don't feel limited by anything
Few things I like about it
More catchy
More helpful digitally

Table 5.8: The category named **User Perception** and some of its codes

glaring during the sample analysis of the transcripts as described in Chapter 4 of the thesis. With this understanding, the researcher became keen in investigating how the VLE could be improved upon in order to enhance the user experience of Blackboard in Aberystwyth University. It was also seen in the transcripts of their expectations of how a VLE should support learning and teaching rather than obstructing the process. It therefore became necessary for the researcher to identify what processes or ways could be used in resolving the main concern of the participants. The resolution of the main concern through the core category is discussed in section 5.5.1.

5.5 Selective coding

The selective coding stage is where the core category of the study is identified. This is crucial to the study as it is what shapes the emerging theory. The aim of selective coding according to Breckenridge (2014) “is to ‘flesh out’ the core category and delimit the emerging theory around the core category, its properties and any subcategories that are related to it.” At this stage as well as other stages, the researcher must ensure the his preconceived ideas are not imposed on the data but rather the data should guide the discovery of the core category and emerging theory. So in order to guard against bias that could arise from the results of the sample analysis in the previous chapter or any other preconceived ideas, it was necessary for the researcher to embrace the analysis of the whole transcripts with an open mind by taking a fresh look at the transcripts. This led to the writing of new analytical memos as the transcripts were examined afresh.

5.5.1 The choice of a core category

With respect to choosing the core category, the various categories were examined to see what the dominant issues that were inherent in them (Holton, 2010). So coupled with a reflection on the transcripts and the analytical memos, it was discovered that there were issues with users finding their way around Blackboard with a view to locating resources or tools. Although the users also talked about the benefits of the VLE, the challenges with finding their way through the VLE caught my attention and became interesting to me. The notion of users having to find their way through the VLE was easily seen either in the participants expressing how easy or difficult it was to locate items on the VLE. This idea of finding or searching or moving around the VLE becoming the core category started to come together as the researcher examined the transcripts time and again and was convinced that it counted for most of the views of the participants (Holton, 2010). As Breckenridge (2014) puts it, “one core category will emerge as most significant because it appears most frequently in the analysis and accounts for most of what is happening in the data.” Based on these ideas, it therefore became easy to see navigation as a central theme that most of the participants talked about and the researcher then decided to choose **Navigability** as a core category.

Some direct quotes of the participants with respect to finding their way through the VLE are presented below:

Hmmm maybe like a search function if it's possible for all files in the module along with the module names, it will be easier to search through. The navigation tool I find quite. . . – Student S1

Em, one thing about Blackboard, I find it hard to browse it because there is no guide, guidance to it. – Student S2

There is not much that I have encountered myself but I am quite technical. Like I said, I think there are issues with the organisation of it and it can be quite complicated. It can be quite difficult to find things normally. The way it has been set out is not as easy as it should be. I will probably be thinking a little bit more of user-friendly better still, there is a list of things to get through which make it harder to find what you are looking for. – Student S5

It is quite good. Everything we need is there. It's quite easy to get hold of it however, it can be a little bit complicated from time to time to find things, you know there is quite a lot of them to go through. – Student S5

Based on the above quotes from the participants, **Navigability** as a core category appeared to account for most of the views expressed by the participants with respect to how they used the VLE, perceived it, their challenges with it and what sorts of improvements they were looking forward to seeing in the VLE within the transcripts of the initial participants that were sampled.

5.5.2 The relationships between the core category and the other categories

One of the requirements for a core category in grounded theory is that it must be related to the other categories. This condition was met by **Navigability**. The relationships between the core category and the other categories are examined below:

- (i) The relationship between **Navigability** and **Value**: This relationship lies in the fact that good navigation helps the users to access the learning resources and tools on the VLE. Making the process easy or difficult for the users based on the **Navigability** of the VLE will impact on the value of what the users derive from the VLE. The quotes below from some of the student participants supports this relationship.

Hmmm maybe, like a search function if it's possible for all files in the module along with the module names, it will be easier to search through. The navigation tool I find quite... – Student S1

It is quite good. Everything we need is there. It's quite easy to get hold of it. However, it can be a little bit complicated from time to time to find things. You know there is quite a lot of them to go through. – Student S5

The above data demonstrate that **Navigability** as a core category is related to the **Value** category.

- (ii) The relationship between **Navigability** and **Barriers**: The **Navigability** of the VLE can contribute to the challenges experienced by the users or reduce the difficulties that users encounter when engaging with the VLE. These challenges can then become barriers to their user experience.

Em, one thing about Blackboard, I find it hard to browse it because there is no guide, guidance to it and sometimes it's down due to maintenance which is a pain and so at the moment I... – Student S2

It is quite good, everything we need is there. It's quite easy to get hold of it however, it can be a little bit complicated from time to time to find things, you know there is quite a lot of them to go through. – Student S5

- (iii) The relationship between **Navigability** and **Capacity Building**: This relationship lies in the fact that the **Navigability** of the system will determine the level of skills or training that users require in order to be able to use the VLE very well. For example, straight and familiar navigation tools will reduce the need for the users to be trained. A VLE that is user friendly is

likely to have little or no learning curve. The following quotes from an MSc international students support this notion:

There wasn't any training... through exploration. Nobody actually showed me but through exploration I got used to... The issue is that it was initially difficult but then exploration and trials, I got... by myself. – Student S8

Well not much challenge except that... and as such information was not passed and I was not aware of things until I eventually got used to it and this is due to the fact that I have not been exposed to it. But apart from that there hasn't been any much of a challenge.
– Student S8

- (iv) The relationship between **Navigability** and **User Perception**: This relationship is based on the fact that **Navigability** is central to the use of software such that once users start having difficulty with navigating the VLE, it will make them to perceive it negatively. And on the other hand, when they find it easy to use they will perceive the VLE in a positive light. This was easily seen in the transcripts of the students as shown below:

It is easy to use but it could be easier. -Student S1

I think... there is a lot of content and I feel like sometimes, you won't be able to find everything on there. You never find everything on... but usually things like... tell you where to go I don't think that is a problem but I find it quite useful. -Student S3

- (v) The relationship between **Navigability** and **Engagement**: The way the users engage with or are engaged through the VLE can be affected by the navigation process of the VLE. It can make the users to actively or passively engage with the VLE or to simply circumvent it. For instance some of the students had these to say

...sometimes I couldn't find the document I needed because they put their documents in different folders. -Student S2

There is an issue with different lecturers using different ways, different folders like you have course documents things like that. Some other lecturers use new folders. Particularly, they use two folders, where you have the content module there called content and then an additional content in a folder that is called something else. If you click on one of them, you have all the content without necessarily checking the other one. -Student S4

These relationships between the core category, **Navigability** and the other categories were further explored in section 5.6.4 of this chapter, to demonstrate the centrality of **Navigability** as other students and stakeholders were sampled.

Holton (2010) argued that “it takes time and much coding and analysis to verify a core category through saturation, relevance, and workability.” This sampling led to the emergence of new categories in a bid to saturate the core category.

5.6 Theoretical sampling

With the discovery of the core category, it became exciting to discover the experience of other users of Blackboard in Aberystwyth University. Consequently, the next stage of the analysis was to sample more transcripts in order to saturate **Navigability** as the core category of the study. This process is a very critical step during the grounded theory approach as it provides a valuable tool for developing the analysis of the data and keeps the researcher away from becoming stuck in unfocused analyses. The researcher through the process of theoretical sampling is able to construct full and robust categories and as a result becomes well positioned to clarify relationships between categories. (Charmaz, 2006). Expounding further on this process, Charmaz (2006) noted that

Conducting theoretical sampling encourages you to follow up on analytic leads. As a result, you improve your study through:

- *Specifying the relevant properties of your categories*
- *Increasing the precision of your categories*
- *Providing the substance to move your material from description to analysis*
- *Making your analysis more abstract and generalizable*
- *Grounding your conjectures in data*
- *Explicating the analytic links between or among categories*
- *Increasing the parsimony of your theoretical statements.*

(p. 105)

On the same process of theoretical sampling, Holton and Walsh (2017) noted that

The purpose of theoretical sampling is to discover categories, properties, and interrelationships suggestive of a theoretical whole. As such, theoretical sampling is theory-driven sampling, controlled by the emerging theory and not determined in advance based on a preconceived theoretical framework. (p. 100)

Explaining further, Holton and Walsh (2017) influenced by (Glaser and Strauss, 1967) were of the view that

Once a potential core category has emerged, theoretical sampling becomes selective as the analyst focuses on developing central issues related to emerging theory “guided by the logic of the emerging framework” (Glaser & Strauss, 1965a, p289). (p.101)

Holton and Walsh (2017) reckoned that focusing only on the concepts that are related to the core category in sufficiently significant ways will lead to producing a theory with the barest possible level of assumptions. As a result, **Navigability** became the main concept to be looked for in the transcripts and the rally point for further sampling. Coding was therefore delimited to views that were relevant to **Navigability** and its related concepts. Given that this study used the abbreviated grounded theory (Willig, 2013) because the interviews were already conducted before the adoption of Classic Grounded Theory (CGT), the researcher decided to chronologically analyse the transcripts. Also, the theoretical sampling was done both within the set of students and then across the rest of the groups of participants. Bearing in mind that the core category was constructed from the student participants, it was decided to first of all sample the student participants before moving across to the other groups of participants in order to investigate **Navigability** further. The purpose was to find out how the core category was saturated first in the student group and then in the other groups of participants. This was very important as it provided a way to investigate the core category with different slices of data. The result of this process was a framework that is grounded in the data and robust enough to offer explanation in the substantive area under investigation as it relates **Navigability**.

5.6.1 Theoretical sampling of students

The sampling of the students was done by focusing on the rest of the student participants who were 28 in number aside the 10 student participants that were used in the initial coding. These transcripts were sampled by looking for issues and views that were related to **Navigability** - the core category and its related concepts. For the purpose of proper management, the researcher decided to sample the rest of the transcripts in group of 10 students with the last sample covering 8 students.

5.6.2 The theoretical sampling of students S11 to student S20

This group of students were 10 in number but only nine transcripts were produced from the interviews and one discarded due to the poor quality of the recording. The group was made up of both undergraduates and postgraduates as well as full time students and a distance learning student, and spread across different departments within Aberystwyth University. Interestingly, this group had two international postgraduate students who were not familiar with the use of the VLE prior to coming study at Aberystwyth University. They were using Blackboard in Aberystwyth University for the first time were quite excited about the VLE as they shared their views.

The coding of this sampling yielded 9 unique codes out of 26 codes in all. Table 5.9 shows the codes generated. At this stage, the code of the transcripts were labelled using analytical names rather than using the words of the participants as done in the coding of the first set of coding that was done. This was to ensure

that the codes were more conceptual in nature thereby raising the level of analysis. Two new categories namely **Architecture** and **User Interface** emerged from this stage of of theoretically sampling. Some of the codes and their chunks of transcripts from the sampling are outlined below:

- **Consistency among lecturers**

I've had problems where sometimes some teachers put assignments on the calendar where some teachers don't. So you can't really go ahead with the calendar because of the assignment given to you...

- **How lecturers use the VLE**

I think a little easier to access things ahead of time.

- **Guide for users**

Maybe it's not relevant for me but for someone who is new. I don't know if they have this but may be have a kind of tutorial to show or documents... detail to check everything... I am thinking for other people.

- **Interface Design**

As a Computer Science student... the HTML layout. Our Blackboard HTML arrangement... They should use more of CSS and more of JavaScript to make it look better... I think JavaScript is something that can improve the good looking of the layout of Blackboard.

- **Limited IT skills**

When I am not connected to especially the Wi-Fi, it's hard for me to go and obtain the... because I am supposed to log in and I think I should just click and go directly to the page. For me it's really hard. I am not good with computers.

- **Look and feel**

I think I might change the aesthetical approach just to make it look a little bit more modern, a little more inviting to people who often use the system without necessarily.

- **Navigation**

I think what I like the most is that it's very simple to use. It's a very robust system. You get to Blackboard, login and everything is what you think it is.

- **Skills**

Digital skills, not much really. In order to use, you should be quite competent in using it. Like downloading files and navigating... websites...

- **Technology Design**

In terms of what I like the least, the... system can be a little bit chunky and the box a little closed..

Table 5.9 shows the codes generated.

	Codes	Frequency
1	Consistency among lecturers	3
2	How the lecturers use the VLE	1
3	Guide for users	1
4	Interface design	4
5	Limited IT skills	3
6	Look and feel	1
7	Navigation	10
8	Skills	2
9	Technology design	1
	Total	26

Table 5.9: The analytic codes of the theoretical sampling of student S11 to student S20

	Category	Codes
1	Architecture	Technology design
2	Capacity Building	Limited IT skills, Skills, Guide for users
3	Engagement	Consistency among lecturers, How lecturers use the VLE
4	Navigability	Navigation
5	User Interface	Interface design, Look and feel

Table 5.10: Classification of codes from Student S11 to Student S20 into categories

5.6.3 Drawing inferences from the data in each category of the group student S11 to student S20

During the analysis of data, it is a common practice to draw inferences from the data. Miles and Huberman (1994) described the noting of patterns as a way of drawing meaning from a given set of data. The data in each of the categories were examined and the patterns were noted for the purpose of analysis. The meanings drawn from each of the category are outlined below.

- (i) Analysing the category of **Architecture**: This was a new category that emerged during the sampling of this group of students. Although, only one code was generated for this category, it raised a very important point that cannot be ignored. The design of the VLE system has a huge impact on the user experience. For instance, the clunky nature of Blackboard was raised by a student and described it as a little closed box. This clunky nature of Blackboard could impose some limitations on the use of the VLE.

In terms of what I like the least, the... system can be a little bit clunky and the box a little closed. Student S12

- (ii) Analysing the category of **Capacity Building**: The need to build capacity for the users of the VLE came out of the study. It was revealed that students have different level of skills and this reflected in how they interacted with the

VLE. The training of students at the beginning of their studies especially for students who haven't used a VLE before is something that needs to be explored. Some of the students explored the VLE on their own as there was no initial training given to them and eventually got used to it. The ease with which students are able to use the system without initial training is a function of the user friendliness of the VLE. Users with basic skills should not need training to be able to use the tool easily.

Oh you are talking to a man who has absolutely no interest in or whatsoever in Information Technology or in my... some individuals, their wives have to help them to do things digitally because... can't be bold enough on a computer. So I'm not a very good guinea pig in this respect. -Student S13

You know, it's like joint... who have limited IT skills... -Student S13

Digital skills, not much really. In order to use, you should be quite competent in using it. Like downloading files and navigating... websites... -Student S14

When I am not connected to especially the Wi-Fi, it's hard for me to go and obtain the... because I am supposed to log in and I think I should just click and go directly to the page. For me it's really hard. I am not good with computers. -Student S15

Maybe it's not relevant for me but for someone who is new. I don't know if they have this, but maybe have a kind of tutorial to show or documents... detail to check everything... I am thinking for other people. -Student S20

- (iii) Analysing the category of **Engagement**: As expected, how the students engage and are engaged came out of the analysis of this group of students. It revealed that some of the teaching staff have different ways of engaging with the students in terms of the preferences of some of the tools that they use. For instance some of the teaching staff use the calendar tool to engage with the students while others don't. Also some of the teaching staff provide lecture recording while others don't. The notion of teaching staff providing lecture materials ahead of lectures was commendable by a student.

I think a little easier to access things ahead of time. -Student S12

I think some of the lecturers, which, my course comprise of 12 modules in a... These are modules that are run by different lecturers. Some lecturers use Blackboard more than others. In fact in a module, you may have I don't know, 25 percent of the module documents on Blackboard. Other lecturers don't use it at all or may

be a very small percentage. It stands they will be released and that other documents will be part of the internet or they can be able to use Primo. So on the part of the lecturers, about the consistency of the use of Blackboard if more documents support were available on the Blackboard, that will be more helpful and that will probably empower me to get the course... -Student S13

I've had problems where sometimes some teachers put assignments on the calendar where some teachers don't. So you can't really go ahead with the calendar because of the assignment given to you... - Student S14

- (iv) **Analysing the category of Navigability:** This category is centred on the concept of navigation. The users described their experience in moving around the VLE with the intention of locating things. As expected, the students expressed divergent views. While some of the students in this group were positive about the navigation and said they found the VLE easy to navigate, others identified some challenges with navigating for resources on the VLE. Students would like to see improvement on the VLE in order to enhance the navigation on the VLE. The following quotes from the students' transcripts support this analysis:

I think what I like the most is that it's very simple to use. It's a very robust system. You get to Blackboard, login and everything is what you think it is. -Student S12

It's a very convenient way of accessing course documents, course materials, for example you just have to... I think it's just fine when I think about the whole Blackboard thing. -Student S13

I really like that you can get directly into folders and it's always easy to find things like content... I like, it's easy to use. - Student S17

There's a problem. Sometimes it's the document given with the link to the document. The HTTP into the site may not be working anymore then you have to, you try it and you realize, for example the other day, I was searching for this law article and I spent quite a bit of time trying to find it because the... wasn't going to work. -Student S13

- (v) **Analysing the category of User Interface:** This category was about the arrangement of materials on the VLE. The design of the interface had so much impact on how the users interacted with the VLE. This was a new category that emerged from the sampling of this group of students. Some of the students sought for improvement on the **User Interface** of the VLE.

This was against the background that a VLE with a well organised User Interface will no doubt lead to an improved User Experience.

I think I might change the aesthetical approach just to make it look a little bit more modern, a little more inviting to people who often use the system without necessarily... - Student S12

...that might just be a communication platform or more useable. With the original interface for that, so is more inclined for students to use it. Because now it's easier to use things like Facebook... Most people log on to Facebook every day. Most people only log on to Blackboard if they need to. - Student S14

Have less on that page and structure it for what you want directly... less things getting on... Have separate pathways to be able to see everything... If they can have a separate section where like a modules section where you have... -Student S18

I like the organisation and the layout of the VLE. ...provides access to the correct module. -Student S20

5.6.3.1 The theoretical sampling of student S21 to student S30

This was the second cycle of the theoretical sampling of the students. Although this group of students was 10 in number only eight transcripts were produced from the interviews as two of the interview recordings couldn't be transcribed due to the poor quality of the recording. The group was made up of undergraduates and postgraduates across different departments.

The coding of this sampling group yielded 9 unique codes out of 23 codes in all. Table 5.11 shows the codes generated. At this stage of coding, the researcher was keen on using only analytical coding convention. So where a particular chunk of transcript falls into a concept that has already been named analytically, the name of the code was repeated. This was done to minimise the number of codes that the researcher would eventually be working with.

Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Consistency among lecturers**

Like I said before, the content being where it is not meant to be. Like record, when you check it, it is something else... Most of them are scattered and some are not even showing at all.

- **How lecturers use the VLE**

Sometimes we don't get to see the content well. Like it depends on the lecturer maybe they just upload it or something and when you click on it, when you click on it, you will see that no content being displayed but when you go to the document, what is meant to be in the content is in the document segment. So sometimes

you... features that are not supposed to be in there. I actually like the site, because you can get into it from your own comfort zone.

- **Interface design**

It has to have a lot of information about... So you know it's a bit busy front page. If there was somewhere, possibly simple things; I like simple websites. I don't like having to... But you know there is a lot of information on there, there needs to be a lot of stuff on it. It's a little bit busy you have to possibly, could be designed a little bit better.

- **Navigation**

Yea it's actually very friendly because you get to like even though it is digital literate, you get to like know it within... like if you just get to know every point of it, you get to really understand a lot of things. It's constructed in a very simple manner where you can easily learn and make use of it.

- **Self learning**

And some of the things you just have to read for yourself and learn them by yourself.

- **Skills**

...again this isn't just where I learnt website. My digital skills are pretty well developed before I came here. I do know my way around computers, web design, various different components of using, I have been using digital media to recording music for almost since... You know it's another useful tool of... of the complete virtual environment.

- **Training**

I would say very much because before I got here, I didn't know VLE. So I think my first week in Aber, I was asked if I knew what Blackboard was (they had this little survey). I was like no. So we had training. Yes, so had to understand how to do stuff online most of the time.

- **Visible forum**

I will like to incorporate content with full details. More details because I don't use the discussion forum the same [way] as lecturers. So instead of putting them in tools whereby students hardly go to because the most part that students go to is content and assignment. So instead of putting the discussion forum in the tools, I will like to move it from the tools and put it on its own. So that people will know that through this discussion forum, we can... It is not visible because people don't click on tools in Blackboard. But they don't know that inside tools we also have other means whereby you can contact the lecturer. People only believe that you can contact the lecturer through email.

	Codes	Frequency
1	How the lecturers use the VLE	2
2	Consistency among lecturers	1
3	Friendly forum	1
4	Interface design	1
5	Navigation	10
6	Self learning	1
7	Skills	5
8	Training	1
9	Visible forum	1
	Total	23

Table 5.11: The analytic codes of the theoretical sampling of Student21 to Student30

5.6.3.2 Grouping of codes from student S21 to student S30 into Categories

After coding the transcripts of Student21 to Student30, the next step was to group these codes into their relevant categories. Table 5.12 shows the classification of the codes into categories.

	Category	Codes
1	Capacity Building	Self learning, Skills, Training
2	Engagement	How the lecturers engage, Consistency among lecturers
3	Navigability	Navigation
4	Online Community	Friendly forum, Visible forum
5	User Interface	Interface design

Table 5.12: Classification of the codes from Student S21 to Student S30 into categories

5.6.3.3 Drawing inferences from the data in each category of the group Student S21 to Student S30

1. Analysing the category of **Capacity Building**: The analysis of this category revealed that the students came to the university with different levels of skills with respect to the use of the VLE. This reflected in how they engaged with the VLE. Some of the direct quotes of the students are presented below:

I would say very much because before I got here, I didn't know VLE. So I think my first week in Aber, I was asked if I knew what Blackboard was (they had this little survey) if I knew what Blackboard was. I was like no. So we had training. Yes, so had to understand how to do stuff online most of the time. -Student S22

I could already use the computer... I could use the computer and I understood the interface... sort of cleared off... the digital skills maybe I didn't really build on the digital skills because I already was aware of how it works... when I was 10, 11 that was when I began to learn... -Student S25

...again this isn't just where I learnt website. My digital skills are pretty well developed before I came here. I do know my way around computers, web design, various different components of using, I have been using digital media to recording music for almost since... You know it's another useful tool of... of the complete virtual environment. -Student S27

I came here with it [digital skills]. I have used VLE since I was in grade school like from ... I used it for Maths when I was in high school. -Student S28

I'm digitally hopeless. So to be able to access that is quite nice but it's a good thing, I'm satisfied. But I'm still not computer savvy or digitally savvy as I expect myself. -Student S29

Another interesting point that was raised by a student during the theoretical sampling of this group was the level of skills of teaching staff with respect to the use of the VLE.

So I don't know if the rest are doing it wrong but sometimes through my own experience, most lecturers don't know how to use Blackboard itself. -Student S23

This underscores the need for the teaching staff to improve their proficiency on the use of the VLE.

2. Analysing the category of Engagement: The analysis of the transcripts that fell into this was what all about how the teaching staff engaged the students through the provision of lecture slides, lecture recordings, assignments and other learning resources. It also showed how the students engaged with the materials that have been provided on the VLE. The inconsistency of the use of the VLE by the teaching staff was again highlighted here. This inconsistency could affect how they students navigate the VLE to access learning materials or tools.

If at all there was any challenge, it won't be from the VLE. It will be from the data that was inputted into the VLE. One of my modules got mixed up and stuff and I think I had challenges, had to start looking for my module. -Student S22

Sometimes we don't get to see the content well. Like it depends on the lecturer maybe they just upload it or something and when you

click on it, when you click on it, you will see that no content being displayed but when you go to the document, what is meant to be in the content is in the document segment. So sometimes you... features that are not supposed to be in there. -Student S24

Like I said before, the content being where it is not meant to be. Like record, when you check it, it is something else... Most of them are scattered and some are not even showing at all. -Student S24

3. Analysing the category of Navigability: The theoretical sampling of this group of users revealed that the users offered divergent views with respect to the Navigability of the VLE. While some of the students admitted that it was easy to use, others claimed that it was not easy to use. A user who mentioned that the VLE provides easy access to resources, also admitted that it took a while before he was able to master it. This suggests that the need for VLE developers and teaching staff to provide clear and straight signs to where tools and features are can not be overemphasized.

It's constructed in a very simple manner where you can easily learn and make use of it. -Student S24

I feel empowered by it. I feel it gives you a closer connection with your modules and you can find more direction and you can choose, you have a choice... It's direct but it's also broad. Choose your own path within the direction. -Student S25

It took me a while to learn it because my instruction memory is not too good. Yea but once I learnt my way around it; it's a very useful tool to me... -Student S27

...although I was roaming about for a while, I've been trying to find this, I didn't know where it was. -Student S27

...not being able to find things. -Student S28

Like I said easy access to... like assignments, like lecture notes, PowerPoint and all that. That's pretty good. -Student S29

4. Analysing the category of Online Community: This revealed the need to make the discussion forum to be more user friendly and more accessible for students to be able to make the most of it. A student had this to say:

Maybe, make the discussion forum better. Make it concise and more friendly discussion forum. Maybe more easily accessible and quickly straight up there, have the discussion... -Student S25

5. Analysing the category of **User Interface**: This revealed that the **User Interface** has lots of features. The need to provide VLEs with simple **User Interface** is important. This no doubt will improve the **User Experience** of the students. The following quote from one of the students supports this:

So you know it's a bit busy front page. If there was somewhere, possibly simple things; I like simple websites. I don't like having to... But you know there is a lot of information on there, there needs to be a lot of stuff on it. It's a little bit busy you have to possibly, could be designed a little bit better. -Student S27

5.6.3.4 The theoretical sampling of students Student S31 to Student S38

This was the third cycle of the theoretical sampling of the students and eight students were in it altogether but only seven transcripts were produced from the interviews as the eighth one was discarded due to the poor quality of the recording. The group had a mix of undergraduates and postgraduates across different departments.

The coding of this sampling group yielded 8 unique codes out of 28 codes in total. As previously done, analytical coding convention was adopted for labelling the codes. So where a particular chunk of transcript falls into a concept that has already been named analytically, the name of the code was repeated. This was done for the purpose of consistency and to minimise the number of codes that the researcher would eventually be working with. Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Engaging with the students**

But I feel it is a great initiative to you use the Blackboard because from the Blackboard you can, the lecturer can upload, normally they upload the slides, they can record the, record their lectures and save it in Panopto and in case you miss something in the lecture, you can go back to Panopto and listen back to the lecture, look at the specific thing that you are looking for. And in the department of Law and Criminology, all the lectures that I attended, I feel that, I felt that lecturers were very, very efficient, they were very helpful with the Law modules. They are always updating the Blackboard website which... find helpful with information and if they want to let us know that there has been some changes with the schedules or something that we can emulate, they will keep us up to date on Blackboard and also to the webmail. So I do feel that Blackboard and Panopto as virtual learning experience empower my learning style and it improves the subject area that I am learning.

- **Interface design**

Some of the tools... I didn't know about them... Because maybe there should be like a postmark or should be like colour or something so that we can...or it can be more visible for students.

- **Look and feel**

...to incorporate Blackboard with webmail and student records in one place... I feel great if you have everything in one place. ...visible, then I think so... I feel everything is okay...that's the beauty of everything. It's easy to use. It could be more clear for some people like me. ...like more colours or something like that. No; I think everything is fine.

- **Navigation**

On what feature I like the least, I don't know if it is a feature but just the usage in general, in terms of actually finding stuff. So sometimes, it takes a very long time, a lot of clicks to get to where you want to but ideally...

- **Skills**

Ehmmm I think I knew how to, how to use all the, I have like IT skills, so it wasn't a problem for me to use VLE.

- **Training**

And actually...we had training like how to use Blackboard... and all stuff. So it was like for one hour and we were... one of the staff showed us everything, how to use the Blackboard. That was very useful. So we knew everything like... everything before.

- **Tutorials**

So if Blackboard could be more interactive like ... the first time you get the new app...show you the tutorials so if you can have a monthly tutorial that gives you friendly, more friendly if you like, ...more information that broadens your use of the Blackboard.

Table 5.13 shows the codes generated.

	Codes	Frequency
1	Engaging with the students	1
2	Interface design	3
3	Lack of consistency	2
4	Look and feel	1
5	Navigation	14
6	Skills	4
7	Training	2
8	Tutorials	1
	Total	28

Table 5.13: The analytic codes of the theoretical sampling of student S31 to student S38

5.6.3.5 Grouping of codes from student S31 to student S38 into Categories

The above codes were then grouped into categories. No new categories emerged at this stage. Table 5.14 shows the classification of the codes into categories.

	Category	Codes
1	Capacity Building	Tutorials, Skills, Training
2	Engagement	Engaging with the students, Lack of consistency
3	Navigability	Navigation
4	User Interface	Look and feel

Table 5.14: Classification of codes from group S31 to S38 into categories

5.6.3.6 Drawing inferences from the data in each category of the group Student S31 to Student S38

1. Analysing the category of Capacity Building: The analysis of this category revealed that the students came to the:

In the beginning, I didn't know like how it worked. Like in the three years because I have been here now for two years now because I had a year gap and for the three years I found out that I can check everything and I know how it works. Like in the beginning, I didn't know how it worked. So ... it helped me. -Student S32

Like in class before we use the Blackboard; you ought to have attended an induction... -Student S33

Ehmm well building digital skills, that is not much for me because I am used to gadgets and I'm... I've been using computers about and I've been exposed to Internet and how to use the computer, how to troubleshoot probably if you encounter any, any issues with the internet and the computer. So for me, it doesn't give you a lot of opportunity to build digital skills but it's a good, I think for other people, for students who are not exposed, who don't have plenty of digital skills, then they might learn some through using virtual learning experience. -Student S37

I would say not exact really because my digital skills were quite good before I started using it and I would say it didn't help me at all. -Student S36

So if Blackboard could be more interactive like ... the first time you get the new app...show you the tutorials so if you can have a

monthly tutorial that gives you friendly, more friendly if you like, ... more information that broadens your use of the Blackboard.
-Student S33

Ehmmm I think I knew how to use all the, I have like IT skills. So, it wasn't a problem for me to use VLE. ...we knew how to use it before so it wasn't a problem. -Student S38

And actually...we had training like how to use Blackboard... and all stuff. So it was like for one hour and we were, one of the, one of the staff showed us everything, how to use the Blackboard. That was very useful so we knew everything like... everything before.
-Student S38

2. Analysing the category of Engagement: The analysis of the transcripts that fell into this was what all about how the

The features that are not really you know... there is a disadvantage as well of the VLE. ...most of the context is at the instance of the lecturer. But sometimes, the lecturers, some lecturers that forget to update their sites easily and frequently. And so there's a lack of information on those courses, some other courses the information is more relevant. -Student S33

...Blackboard... may be the arrangement. So the way that the lecturer is using say content and assignment, is used so differently. So it's quite hard to find. So personally... content and put in assignment as well. ...many of the lecturers, so they would use it differently. -Student S35

3. Analysing the category of Navigability

The navigation is a nightmare -Student S34

It's really easy to use. -Student S35

On what feature I like the least, I don't know if it is a feature but just the usage in general in terms of actually finding stuff. So sometimes, it takes a very long time, a lot of clicks to get to where you want to but ideally... -Student S34

I really like the fact that it is easy to access all modules and all the information are just there. -Student S36

I would say it's friendly. It is easy to manage. It is easy to go around it. Just maybe lack of some information... but it's friendly. But...the outline, the colours are good; explicit. It is basically quite friendly to experience. You can find the headlines are really helpful. So if you are looking for something... -Student S36

It is quite well designed I would say. The colours are fine and it seems to be really easy to get around the website. -Student S36

Hmmm I would say it's friendly because I'm a student and I find it easy to use the Blackboard and Panopto, it's not all the time. It's easily accessible and you can just use it because you don't need to have much knowledge of Computer Science or anything specific to use the present VLE. -Student S37

4. Analysing the category of **User Interface**:

So if the interface could be changed to because there are some apps that you use Microsoft word and when you go over, hover over a certain item, it gives you a drop down, it gives you a clue of what you are looking for. So if it could be more interactive, in the sense that it gives you, it shows you a path... going for induction. -Student S33

*I used, well like I said I did use it. We used it, I used it. We were asked to find the questions about things the module I put up things anonymously. So I have interacted with it. My only concern is with things like you know when it comes to the **User Interface**; the interface geek is coming out. But little things for instance you click down, you have left your track of, you want to, you have left your track of people replying, you have gone really down, somewhere down and you say oh I still want to respond, it is you that needs to go up backwards to reply but for why do I have to go back all the way up to click reply and then go back down and type my response. That is how it works at least I can remember. There's something you know like I said, you are on other websites, you are bonding and you want to reply, you see reply you just type or click reply down there. You don't have to go back to reply to the user, I mean come back down to type and then go back up to see if they have posted successfully it. Like I said, that might just be the interface geek. -Student S34*

I feel great if you have everything in one place. ...visible then I think So... I feel everything is okay...that's the beauty of everything. It's easy to use. It could be more clear for some people like me...like more colours or something like that. No; I think everything is fine. -Student S38

5.6.3.7 Theoretical sampling of Teaching Staff

The sampling of the teaching staff was done by searching through the transcripts looking for views that were related to the core category **Navigability** and related concepts like **Architecture**, **Engagement**, **U**. Every view that could be linked to

Navigability and its related concepts were noted and coded. As done in the case of students, the teaching staff were sampled in two groups. The first group was made of 10 transcripts while the second group was made up of 7 transcripts.

5.6.3.8 Theoretical sampling of Teaching Staff1 to Teaching staff10

This group was made up of nine transcripts out of the 10 teaching staff that were interviewed. One of the recordings was of poor quality and couldn't be transcribed. The nine transcripts were sampled for views that were related to Navigability. 8 unique codes were generated out of 42 codes. The sampling of this group of teaching staff led to the generation of three new categories namely Time, Usability and User/Domain Specific.

Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Ease of use**

I suppose the first thing is the technical things which will just make life easier. ...they were going to have a test and you didn't want them to... but that's quite a small technical thing. I'm not sure. One thing I would love, I think it's already there just that I don't find it very easy to use, is the materials from lecture, exercises things like... but I have always... to get to know how they work.

- **Fitted for use**

They are not really tailored to any specific needs, that, I think that's the issue. It's very much an off-the-shelf package- we've gotten an extensive version of it but nonetheless it's structured in such a way and the structure of Blackboard I think is quite confusing for the students who are new to it, anybody who is new to it, the user can be students. It can, it's less intuitive.

- **Flexible system**

...I am not sure of how I could do that, greater flexibility, if possible a greater sense of humanity in what is happening. It's very possible technologically. I think flexibility.

- **Interface design**

Blackboard is ugly and complicated. And there are a lot of things on Blackboard that people don't use which could... and it's very difficult.

- **Navigation**

Today, I wanted to set up an assignment... so I went to one module, I went to assignment, I went to tools, I went straight to assignment, so I have to make... in that like me turning in an assignment. So there's the assignment, it's in the menu but it does not do anything... I'm someone who does... For me, I teach, I teach three modules yes, I've got a teaching line, I'm from teaching line. But I certainly need time to ... two or three

times in a year and if you see how, if you do something two or three times a year, you want it to be easy. You don't want to have to look it up every time because you don't remember...

- **Technology design**

So when you are looking at how students progress and rather large so that when you're responding to students queries, you get responsive, the severity of the things they have requested for and you can advise them accordingly. Whereas if you have a larger version of it running something else and come back, it doesn't, it's like ... technology using it in old-fashioned way that's what they are. ...they don't connect. We need an integrated system...

- **Time consuming**

I'm not a strange person to how a module works... or visually impaired.... So I can get them all on time but I can't remember what is going wrong. Anyway lets google it... assignment inbox, check inbox okay. I tried, so could you have guessed that? Because if you did, you could have saved me some time. yeah. I had to google it... This is not easy. It's not simple... it costs me extra 15 minutes of work every time I...

- **Training**

A lot of the time I would love to use it more. I will love to see more multiple choice tests, again more quizzes and get them to do that a lot of time or get them to do some more of self-directed study and again you can kind of use Blackboard to look at that and the discussion forum. I probably can't use it. I have never gone round to using it but I have also been to a couple of the training, training sessions on the enhanced presence and I have looked at what you can with the Blackboard and it's you know, it's great what you can do. It is just having the time to...

Table 5.15 shows the codes generated.

	Codes	Frequency
1	Ease of use	8
2	Fitted for use	11
3	Flexible system	2
4	Interface design	2
5	Navigation	11
6	Technology design	2
7	Time consuming	3
8	Training	3
	Total	42

Table 5.15: The analytic codes of the theoretical sampling of teaching staff T1 to teaching staff T10

5.6.3.9 Grouping of codes from teaching staff T1 to teaching staff T10 into Categories

After coding the first set of transcripts from the teaching staff group made of teaching staff T1 to teaching staff T10, the next step was to group the generated codes into their respective categories. Table 5.16 shows the classification of the codes into categories.

	Category	Codes
1	Architecture	Technology design
2	Capacity Building	Training
3	Navigability	Navigation
4	Time	Time consuming
5	Usability	Ease of use, Flexible system
6	User Interface	Interface design
7	User/Domain Specific	Fitted for use

Table 5.16: Classification of the codes from teaching staff T1 to teaching staff T10 into categories

5.6.3.10 Drawing inferences from the data in each category of the group teaching staff T1 to teaching staff T10

1. Analysing the category of **Architecture**: The data within this category raised issues about the architectural designing limiting users. This point that was raised by one of the teaching staff is quoted below:

...everything is done with a mac-based system which is problematic, for most people are tied up and you're... -Teaching staff T3

2. Analysing the category of **Capacity Building**: The analysis of this category revealed that the some of the teaching staff do go on training to improve their proficiency on the VLE. The other issue is the fact that given the clunky nature of the VLE, training may not solve them problem and the issue of teaching staff having time to attend all the training that they need. Some of the direct quotes of the teaching staff supporting these ideas are presented below:

Yes, it is something I would do at some stage, I haven't got round it yet, I will. I think it will be useful just to have an insight into why the ideas and what's going on. I think of the seminar which was between Aberystwyth and Bangor University and there were doing a lot of basic stuff with the Virtual Learning Environments, assessment, sort of peer-meditated assessment. -Teaching staff T4

A lot of the time I would love to use it more. I will love to see more multiple choice tests, again more quizzes and get them to do that

a lot of time or get them to do some more of self-directed study and again you can kind of use Blackboard to look at that and the discussion forum, I probably can't use it. I have never gone round to using it but I have also been to a couple of the training, training sessions on the enhanced presence and I have looked at what you can with the Blackboard and it's you know, it's great what you can do. It is just having the time to... -Teaching staff T7

Again, the whole... submission system is very complex. This is where you put it, this where you find it, this is how you do it. Need a lot of, people need a lot of training. Even if you're trained, what's the correct version and know where they are going and be able to look into it, really clearly to look at it. I think, I don't like, I don't like the full... there are better ways of doing it ... So because some of the modules are so, I think... the secretary prints some of them out because there are issues. I think it so much has to do with size - how many students do you have in a module. It makes it more cost effective to... obviously makes me... because it's not automatic, because they use it in the exam hall when you're an examiner, you get piles of scripts. -Teaching staff T8

3. Analysing the category of **Navigability**: The theoretical sampling of this group of users revealed that the teaching staff offered divergent views with respect to the Navigability of the VLE. While some of the students admitted that it was easy to use, others claimed that it was not easy to use. A user who mentioned that the VLE provides easy access to resources, also admitted that it took a while before he was able to master it. This suggests that the need for VLE developers and teaching staff to provide clear and straight signs to where tools and features are can not be overemphasized.

It has to be a little bit cumbersome. You know, you are always going deeper and deeper into something-Teaching staff T2

I suspect that there are areas which I find clunky but I so got used to using them that I have forgotten something I would like to see improved. -Teaching staff T2

Today, I wanted to set up an assignment... so I went to one module, I went to assignment, I went to tools, I went straight to assignment, so I have to make... in that like me turning in an assignment. So there's the assignment, it's in the menu but it does not do anything... I'm someone who does... For me, I teach, I teach three modules yes, I've got a teaching line, I'm from teaching line. But I certainly need time to... two or three times in a year and if you see how, if you do something two or three times a year, you want it to be easy. You don't want to have to look it up every time because you don't remember... -Teaching staff T3

I find it quite an easy interface to work with. I think it's... It's down at times but not very often and it's so easy to upload things I want to upload. I find it quite easy to navigate. But there are quite simple ways, it's not so bad for me to do the things I want to do but I think it's fine. -Teaching staff T4

...and it goes that I have had found that using Blackboard, it is not easy to navigate always. -Teaching staff T6

4. Analysing the category of **Time**: The analysis of this category showed that the use of Blackboard is time consuming. This could be a turn off for some of the teaching staff. The following quotes from the teaching staff supports this:

I'm not a strange person to how a module works... or visually impaired.... So I can get them all on time but I can't remember what is going wrong. Anyway lets google it... assignment inbox, check inbox okay. I tried, so could you have guessed that? Because if you did, you could have saved me some time. Yeah. I had to google it... This is not easy. It's not simple... It costs me extra 15 minutes of work every time I... -Teaching staff T3

From the students' point of view, if it is easier to use, I am not sure but for me it is more time consuming. -Teaching staff T6

I have looked at what you can with the Blackboard and it's you know, it's great what you can do. It is just having the time to... -Teaching staff T7

5. Analysing the category of **Usability**: This category covered issues that revealed how easy or difficult it was for users to make use of the VLE in solving tasks. The following quote from one of the students supports this:

...I am not sure of how I could do that, greater flexibility, if possible a greater sense of humanity in what is happening. It's very possible technologically. I think flexibility. -Teaching staff T6

Blackboard is not intuitive and so in that regard, suggestions wow! It needs flexibility ... It's not clear on how to navigate your way through it... -Teaching staff T8

Everybody is... in different ways and you're looking at and trying to navigate your way round it. It's just a nightmare. You need a system that's flexible and you need a system that talks to every system and... your student record so that you keep, you can easily move between the teaching element and the progression element -Teaching staff T8

The argument is I think once Blackboard, the situation with Blackboard becomes a more avoided... I think we should drop it and think about investing in creating Moodle which I think is much better, for allowing more flexible learning delivery and particularly linking things like... It doesn't link very easily into things like the schemes database, degree schemes database, the different ways of the modules and it's very clunky -Teaching staff T8

6. Analysing the category of **User Interface**: This revealed that the **User Interface** has lots of features. The need to provide VLEs with simple **User Interface** is important. This no doubt will improve the **User Experience** of the students. The following quotes from the teaching staff supports this:

I think the Blackboard has an interface that is unworthy. I think the Blackboard design is an obstruction to students and I think the students are already interacting and engaging with each other on other platforms and getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... -Teaching staff T3

Blackboard is ugly and complicated. And there are a lot of things on Blackboard that people don't use which could ... and it's very difficult. -Teaching staff T3

7. Analysing the category of **User/Domain Specific**: There were divergent views on the tailoring of the VLE was to modules. The following quotes in this regard from the teaching staff are presented below:

I think it's not tailored to the way that I want it to. I think that they have got lots of core people that they use computers in advanced ways I think. So for example, I will make my notes likely and then I will have to upload each lecture one at a time. There is no way to say here up is a program for such and such a module, here have in front a set of reading in the topics. You have to add them one by one, click, click, click all the time. -Teaching staff T3

I'm aware it's tailored you know, it's tailored as well to my needs as I'm able to use it. -Teaching staff T5

They are not really tailored to any specific needs, that, I think that's the issue. It's very much an off-the-shelf package. We've gotten an extensive version of it but nonetheless it's structured in such a way and the structure of Blackboard I think is quite confusing for the students who are new to it, anybody who is new to it, the user can be students. It can, it's less intuitive. -Teaching staff T8

I think it is constraining and because it has a sets up, a certain way of doing things and now how it might have been designed... For example do you, I don't think it's all... the same as the point of view of any teacher of the subject. So ... and maybe it is designed from the point of view of students' consumption rather than the teacher's intentions and objectives in career and teaching.
-Teaching staff T6

Again, it is only tailored to the specific needs to a limited extent because I find that I might be teaching a different module in a different place, teaching in different times of the year and again it is not always easy to fix such approaches into what is really a kind of standardised system of providing information to students or relaying materials to students and so the fact inevitably is that it is common use system right across all the disciplines and subjects and I think of the limitation of the suitability for the specific needs of taking the subject and different modules... -Teaching staff T6

5.6.3.11 Theoretical sampling of Teaching Staff T11 to Teaching staff T17

This group was made up of six transcripts out of the seven teaching staff that were interviewed. One of the recordings was of poor quality and couldn't be transcribed. The six transcripts were sampled for views that were related to Navigability. This sampling yielded 7 unique codes out of 38 codes.

Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Ease of use**

I will like to see Blackboard make it easier to link the content. It has already got that functionality but it doesn't make it available in all of the ways you can create the content. So... I'll like a very easy way to do it... adding... information... links to the right and I don't think, sometimes it's easy and sometimes. It's not and I could make it a little bit easier, it would help or... how to do it but I don't think it does everything I want in my way.

- **Fitted for use**

And I will make it easier to tailor to specific modules.

- **Interface design**

Blackboard generally has default class list, Turnitin doesn't always have the full class list... there are things you find out about when it doesn't work... what's frustrating is the level of nesting of things that you get. So you have got scroll bars and scroll bars and scroll bars on the side. I mean it's difficult to... with scroll bars you used to the content. So I think it would have been nice if there were to be a cleaner interface and a clean wrap up around the

content. I can see how they got there... I don't think the students see those barriers as the problems are there. I think it's more of the problem with the people managing the system or using the system to generate content...

- **Navigation**

It's clunky

- **Skills**

No. I don't feel constrained. I have only been here... So I am still learning a lot about the VLE, about everything to do with the job but I don't feel constrained. I think it is fine. Perhaps there is a difference. I don't know whether they do it, messaging service maybe on Blackboard. So if I want to set up a discussion, a real time discussion, then they want a messaging option whenever I can join in real time that could be used but probably does that but I am sure so in answering the question, I don't and that probably has much to do with current my lack of knowledge of the scope of what Blackboard does more than anything.

- **Technology design**

Blackboard is fantastic. I guess I don't need much of Technology in general. Thinking about other software that I have used, I've been happy with, wonder Blackboard could adopt some of those... I don't know. Instant messaging thing could survive from any number of messaging software... they do it well. You know you, just bring out your laptop and lay it out. Twitter for example. From experience I don't really use much software so I can't really picture what I use and like to see on Blackboard.

- **Time consuming**

I don't know how it is going to be but then I will like to see something that is much more easier and much more, much less time consuming in terms of how you can put up materials and it allows you the access to it and for them to be used to access their understanding of what you are doing, what you are teaching them and so on and so forth. I want that to be less time consuming. I don't, I wouldn't want something that I have to spend hours and hours as if I'm doing the summative assessment of students you know because that would, if not going to be, might become impracticable if you want to spend the amount of time to try to do sort of do a normal teaching session in the period of time. So I'll like to see views and resources for summative assessments that will be flexible and less time consuming and be able to give due, real results of students' performance which will be able to adjust your teaching or to feedback your students about their performance in the module and that feedback will enhance...

- **Training**

In the past years, there has been a lot of improvement and the members of staff do offer a lot of support in terms, of ways of training and... and drop in sessions and so on and so forth. So much support for the teaching staff to be able to use the VLE effectively.

Table 5.17 shows the generated codes.

	Codes	Frequency
1	Ease of use	5
2	Fitted for use	3
3	Interface design	11
4	Navigation	12
5	Skills	1
6	Technology design	1
7	Time consuming	2
8	Training	5
	Total	40

Table 5.17: The analytic codes of the theoretical sampling of teaching staff T11 to teaching staff T17

5.6.3.12 Grouping of codes from teaching staff T11 to teaching staff T17 into Categories

After coding this second set of transcripts from the teaching staff group made up of teaching staff T11 to teaching staff T17, the next step was to group the generated codes into their respective categories. Table 5.18 shows the classification of the codes into categories.

	Category	Codes
1	Architecture	Technology design
2	Capacity Building	Skills, Training
3	Navigability	Navigation
4	Time	Time consuming
5	Usability	Ease of use
6	User Interface	Interface design
7	User/Domain Specific	Fitted for use

Table 5.18: Classification of the codes from teaching staff T11 to teaching staff T17 into categories

5.6.3.13 Drawing inferences from the data in each category of the group teaching staff T11 to teaching staff T17

The sampling of the teaching staff further identified issues surrounding the Navigability of the VLE in order to saturate the core category. Some of these views confirmed

what has earlier been expressed by the students and also went ahead to offer new perspectives to it.

1. Analysing the category of **Architecture**: The data within this category raised an issue about Blackboard adopting some techniques from other technologies that he has used. The direct quote of the participant is given below:

Blackboard is fantastic. I guess I don't need much of Technology in general. Thinking about other software that I have used, I've been happy with, wonder Blackboard could adopt some of those... I don't know. Instant messaging thing could survive from any number of messaging software... they do it well. You know you, just bring out your laptop and lay it out. Twitter for example. From experience I don't really use much software so I can't really picture what I use and like to see on Blackboard. -Teaching staff T13

2. Analysing the category of **Capacity Building**: The analysis of this category revealed that the some of the teaching staff. Some of the direct quotes of the teaching staff are presented below:

In the past years, there has been a lot of improvement and the members of staff do offer a lot of support in terms, of ways of training and... and drop in sessions and so on and so forth. So much support for the teaching staff to be able to use the VLE effectively. -Teaching staff T10

Ah it seems to work well with Turnitin at the moment, reasonably well. Ah I don't use it for anything else really. Ah I know that there is something which they are doing which is really perfect because I don't have things, you know I can't work it perfectly. So for example I do a lecture capture and seems to disappear unto towards rather than appearing in the content folder. And I know that you can do that but I don't know how to do it. So, any time there's Panopto and that kind of external thing as well, it seems to work okay. I'm sure I can make it work... I wish I know how to do it. I was on their training and they've given us... they could train us but it's so boring that they can't train you on everything and that's part of the problem I think -Teaching staff T12

No. I don't feel constrained. I have only been here... So I am still learning a lot about the VLE, about everything to do with the job but I don't feel constrained. I think it is fine. Perhaps there is a difference. I don't know whether they do it, messaging service maybe on Blackboard. So if I want to set up a discussion, a real time discussion, then they want a messaging option whenever I can join in real time that could be used but probably does that but I am sure so in answering the question, I don't and that probably

has much to do with current my lack of knowledge of the scope of what Blackboard does more than anything. -Teaching staff T13

3. Analysing the category of **Navigability**: The theoretical sampling of this group of users revealed that the teaching staff talking about the difficulties they encounter while navigating the VLE. Some of the direct quotes of the teaching staff are presented below:

For me it's a clunky system. It's a, for anything you want to do online, there's a lot of process, very slow process by clicking your way through it. So it becomes easily resisted to use other things and you know it's actually... -Teaching staff T11

You know, it's a bit cumbersome at times, it can be a bit, so many menus, so many drifts. -Teaching staff T13

But I have mixed feelings about Blackboard provision. It's a little clunky... see how it works better... There are tools that can help it. The continued challenge is Blackboard is worse, students don't believe in Blackboard; they go there when they want some information. -Teaching staff T14

The links to Blackboard content can be difficult to get hold of. The URL has links to some particular content items, you have to do a few tricks so that it can work well. So yea...VLE, you could make better support for the system than currently. -Teaching staff T14

For every file downloads of assignment, it takes me 25 minutes of clicking buttons and the need to find the place where I can actually download all the assignments as I click through. -Teaching staff T17

4. Analysing the category of **Time**: The analysis of this category revealed that the some of the teaching spend a lot of time in using the VLE to perform certain tasks. This they find to be undesirable. Some of the direct quotes of the teaching staff are presented below:

I don't know how it is going to be but then I will like to see something that is much more easier and much more, much less time consuming in terms of how you can put up materials and it allows you the access to it and for them to be used to access their understanding of what you are doing, what you are teaching them and so on and so forth. I want that to be less time consuming. I don't, I wouldn't want something that I have to spend hours and hours as if I'm doing the summative assessment of students you know because that would, if not going to be, might become impracticable if you want to spend the amount of time to try to do sort of do a

normal teaching session in the period of time. So I'll like to see views and resources for summative assessments that will be flexible and less time consuming and be able to give due, real results of students' performance which will be able to adjust your teaching or to feedback your students about their performance in the module and that feedback will enhance... -Teaching staff T10

It takes so much time just to put any information up there. It's not really very easy to use. -Teaching staff T11

5. Analysing the category of **Usability**: The analysis of this category revealed the user experience of the teaching staff is marred with the clunky nature of the VLE. Their views and expectations are captured in some of the direct quotes of teaching staff as presented below:

The way it is at the moment, you can't use it, you can use it for some formative assessment but then it's quite more, it's more time consuming. -Teaching staff T10

To make it easier to actually incorporate it into a lecture... whether it is forum, discussions, wikis... -Teaching staff T11

I will make it user-friendly for a start. It's quite clunky to use... from the lecturers point of view but I don't think that increase quite matters. Teachers maybe are allowed well even, even, you know, I'm not thinking of posting or teaching, we are going to have this in the future. It's going to be used more and more. Perhaps we have it more user friendly that will make it count maximally. I think that having a more direct ability to put recordings up in it will be good because somehow arrange for that to happen. Lecture capture is pretty good now. —I've got a handle of it but it's still a long throw. I think if we can bring it into our weekly folder in the content list, happens there while you are there right there, that will be good. -Teaching staff T12

I will like to see Blackboard make it easier to link the content. It has already got that functionality but it doesn't make it available in all of the ways you can create the content. So... I'll like a very easy way to do it...adding...information...links to the right and I don't think, sometimes it's easy and sometimes it's not and I could make it a little bit easier, it would help or...how to do it but I don't think it does everything I want in my way. -Teaching staff T14

I guess part of the problem is that in my Blackboard usage basically, I tend to teach quite a lot in one semester and another... And so if I do use Blackboard, I use it for like two or three months and I won't touch it for the rest of the year on the whole because I'm not

teaching all year or haven't recently and then you come back to it after nine or eight months of not using it and you have forgotten where all the little buttons is hidden and which menu you have to do. -Teaching staff T17

6. Analysing the category of **User Interface**: The theoretical sampling of this group of users revealed that the design of the **User Interface** of the VLE plays a huge role in the **User Experience** of the VLE. The views of the teaching staff are expressed below.

The interface perhaps could be a bit you know streamlined may be. When you search for a module, the front page to the module handbook options... It's a bit...you can only do it from the front page. You can put them up just take, you just tailor them to the front page of the module. You need to get rid of it. They don't need it. I can give them a thing they should be on until I turn them off. You can, you can make the module page look nice, there is quite a lot of flexibility... -Teaching staff T13

So you know the front page that you get to on Blackboard is contrast. I don't think it is relevant to the module. It talks about tasks and stuff. I don't see it achieve the module that way so I have replaced that with a different page which is kind of a different point for those who are concerned. So in some ways you work round Blackboard in that way and try to keep it on the website. We keep doing it in some ways and other ways... -Teaching staff T14

I think anyway the problem with Blackboard in particular I think some of the user interface stuff is pretty dire. -Teaching staff T17

7. Analysing the category of **User/Domain Specific**: It was seen from the data that there were challenges with tailoring the VLE to certain modules. The direct quotes of the teaching staff supporting the notion of user/domain specific requirements are presented below:

They are not specifically tailored to any module. -Teaching staff T11

And I will make it easier to tailor to specific modules -Teaching staff T11

A teaching staff pointed out the way students access information was not built into into the VLE.

If it's not naturally reiterated... how they [students] access their materials. -Teaching staff T14

5.6.3.14 Theoretical sampling of the director of studies

The next group of participants to be sampled was the directors of studies. Three directors of studies were interviewed and their transcripts were sampled separately for issues relating to **Navigability**. The codes that were generated from the sampling of the transcripts are presented below.

5.6.3.15 Theoretical sampling of the first directors of studies (D1)

This sampling of this participant based on **Navigability** as a core category yielded 5 unique codes out of 6 codes.

Some of codes and their chunks of transcripts from the sampling are presented below:

- **Interface design**

Em, I'm not aware of series of discussions except if there is a pretty good level of satisfaction probably within the context of not being ... in terms of expectations of it and the probably sources of frustrations and dissatisfaction with it, tends to be associated with control failures, system being down, ...for me the area that comes to my mind is actually more about notation in general about Blackboard interface... something like that, there is a number of frustrations there that none comes to mind.

- **Lack of consistency**

We have got a significant number of students who study across institutes, so we for example have a number of students who study... and we have a significant sort of negative feedback from students disproportionately during that situation that differences, lack of consistency between institutes are actually hindering...the needs of those students.

- **Navigating skills**

En as... first and foremost, engaging with them, how accessing materials, how different needs... getting access to information in accessing content book... negotiating that structure, appreciating, using that structure, using that as a source of information and perhaps we can... estimate the contribution of that become unfamiliar and I see and I presume it may not be valid by the time students move into the second year that is that sort of things they have gotten sufficiently used to, it just require skills...

- **Skills**

There is a lot of skills of accessing information, immediate awareness of, you need information you can do something with.

- **Uniformity**

Well headline level would be opening to the same student what processes that person might want to be straight forward one... unnecessary ambiguity and... to see the need, what sort of basic

need will a module have? ...what is a basic module? what is a document? ...what does a document look like? ...and what is a module handbook? ...within that space... need to submit assignment electronically... The actual content is continually, gradual, actually it doesn't matter. And again, it won't be able to access all similar bases... the lecture materials, content is unrecognizable but the way they get lecture material... for no necessary reason should there be any difference for... And if there are differences there, experience tells us one of the things that contributes is a sense of frustration to the student and why should there be any difference? So what am I really enforcing... of university-wide basic and work module variations and... to see the case of variation at institute level... increasing level of compelling arguments reinforced by experience... from the students not having that.

	Codes	Frequency
1	Interface design	1
2	Lack of consistency	1
3	Navigating skills	2
4	Skills	1
5	Uniformity	1
	Total	6

Table 5.19: The analytic codes of the theoretical sampling of the first director of studies (D1)

5.6.3.16 Grouping of codes from director of studies D1 into Categories

After the first cycle of sampling the transcripts from D1, the generated codes were grouped into their respective categories. Table 5.20 shows the classification of the codes into categories.

	Category	Codes
1	Engagement	Lack of consistency, Uniformity
2	Capacity Building	Skills
3	Navigability	Navigating skills
4	User Interface	Interface design

Table 5.20: Classification of the codes from director of studies D1 into categories

5.6.3.17 Drawing inferences from the data in the different categories of the director of studies D1

The sampling of the transcripts of this participant identified issues surrounding the Navigability of the VLE. Some of these views are presented below:

1. Analysing the category of **Engagement**: The data within this category raised an issue about Blackboard adopting some techniques from other technologies that he has used. The direct quote of the participant is given below:

We have got a significant number of students who study across institutes, so we for example have a number of students who study... and we have a significant sort of negative feedback from students disproportionately during that situation that differences, lack of consistency between institutes are actually hindering...the needs of those students. -Director of studies D1

Well headline level would be opening to the same student what processes that person might want to be straight forward one... unnecessary ambiguity and... to see the need, what sort of basic need will a module have? ...what is a basic module? what is a document? ...what does a document look like? ...and what is a module handbook? ...within that space... need to submit assignment electronically... The actual content is continually, gradual, actually it doesn't matter. And again, it won't be able to access all similar bases... the lecture materials, content is unrecognizable but the way they get lecture material... for no necessary reason should there be any difference for... And if there are differences there, experience tells us one of the things that contributes is a sense of frustration to the student and why should there be any difference? So what am I really enforcing... of university-wide basic and work module variations and... to see the case of variation at institute level... increasing level of compelling arguments reinforced by experience... from the students not having that. -Director of Studies D1

2. Analysing the category of **Capacity Building**: The analysis of this category revealed the need for students to develop the required skills in accessing information. The direct quote of the director of studies D1 is presented below:

There is a lot of skills of accessing information, immediate awareness of, you need information you can do something with. -Director of Studies D1

3. Analysing the category of **Navigability**: The theoretical sampling of this group of users revealed that the teaching staff talking about the difficulties they encounter while navigating the VLE. Some of the direct quotes of the teaching staff are presented below:

En as... first and foremost, engaging with them, how accessing materials, how different needs... getting access to information in accessing content book... negotiating that structure, appreciating, using that structure, using that as a source of information and

perhaps we can... estimate the contribution of that become unfamiliar and I see and I presume it may not be valid by the time students move into the second year that is that sort of things they have gotten sufficiently used to, it just require skills... -Director of Studies D1

4. Analysing the category of **User Interface**: The theoretical sampling of this group of users revealed that the design of the user interface of the VLE plays a huge role in the user experience of the VLE. The views of the teaching staff are expressed below.

Em, I'm not aware of series of discussions except if there is a pretty good level of satisfaction probably within the context of not being ... in terms of expectations of it and the probably sources of frustrations and dissatisfaction with it, tends to be associated with control failures, system being down, ...for me the area that comes to my mind is actually more about notation in general about Blackboard interface... something like that, there is a number of frustrations there that none comes to mind. -Director of studies D1

5.6.3.18 Theoretical sampling of the second director of studies (D2)

The sampling of this participant yielded 7 unique codes out of 8 codes.

Some of codes and their chunks of transcripts from the sampling are presented below:

- **Attitude to the VLE**

I think it looks a little old-fashioned, I think it looks clunky, it is difficult to find when you are looking for. So am I entirely satisfied with it... No, I'm not but I am kind of used to it and I know how to use it I guess. I mean I can give 5 or 6 out of 10.

- **Customisation**

Yes; I mean it allows some customisation, I think it can allow more, it can look a lot better...

- **Discussion with students**

And as it is, we discuss, I mean individual staff discuss with students on how, ...of staff can change different module areas within Blackboard then that is a discussion between, the student and staff can refer to themselves as they are going to change, they are going to do that themselves, and certainly staff can discuss that with the student or something and instruct students on where they can find things and so on. So to a limited level, there is some kind of discussion among students and staff can decide among themselves, between students and staff about how Blackboard is deployed. But on a grander scale, I don't think the students are part of the discussion.

- **Ease of use**

Yea; it's, that is not something that I personally do. I know that some of mine colleagues use Blackboard to perhaps have discussion with, on various academic topics, in fact I know some of mine colleagues, a group of students are given an academic topic to discuss and through Blackboard discussion and there is interaction between the lecturer and the students on the specific academic topics. So there is the opportunity to do that. It's something that I personally explored, certainly my interactions and collaborations with students is through email. So I am a bit old-school I guess. I have seen my colleagues do it through Blackboard and again I thought it looks clunky. I thought it looks a bit cumbersome to use and I have not thought of doing that. It's difficult for students to be able to learn and use it. They could do it but it would be carefully explained and then... It looks like it's quite a lot of hard work.

- **Navigation**

I personally, I am not a fan of Blackboard. I think it's messy, it's is very bigly and it's very difficult sometimes to find what you want on there and I think that is a barrier to colleagues and students who... using it and for students to use it as well.

- **Skills**

Eh Blackboard can, I mean it requires skills in how to use it, different people have to be trained on how to use it.

- **Time consuming**

It requires a lot of skills on the part of the course coordinator, a lot of time on their part as well. Don't forget that you can... It takes an awful lot of time. Can it? Yes; it can. How does it? Through an awful lot of, through experience and time and really people having time to decide. I mean we have, we have one colleague who took sabbatical in order to build a course.... to put that together... It can be done but it's not an easy one.

5.6.3.19 Grouping of codes from director of studies D2 into Categories

After the second cycle of sampling the transcripts from D2, the generated codes were grouped into their respective categories. Table 5.22 shows the classification of the codes into categories.

5.6.3.20 Drawing inferences from the data in the different categories of the director of studies D2

The sampling of the transcripts of this participant identified issues surrounding the Navigability of the VLE. Some of these views are presented below:

	Codes	Frequency
1	Attitude to the VLE	1
2	Customisation	1
3	Discussion with students	1
4	Ease of use	1
5	Navigation	2
6	Skills	1
7	Time consuming	1
	Total	8

Table 5.21: The analytic codes of the theoretical sampling of the second director of studies (D2)

	Category	Codes
1	Capacity Building	Skills
2	Engagement	Discussion with students
3	Navigability	Navigation
4	Time	Time consuming
5	Usability	Ease of use
6	User Perception	Attitude to the VLE
7	User/Domain Specific	Customisation

Table 5.22: Classification of the codes from director of studies D2 into categories

1. Analysing the category of **Engagement**: The raised the issue of teaching staff having a discussion with the students with respect to where to find materials on the VLE especially when there have been changes or before changes are implemented on the VLE by the teaching staff. The direct quote of the participant is presented below:

And as it is, we discuss, I mean individual staff discuss with students on how, ...of staff can change different module areas within Blackboard then that is a discussion between, the student and staff can refer to themselves as they are going to change, they are going to do that themselves, and certainly staff can discuss that with the student or something and instruct students on where they can find things and so on. So to a limited level, there is some kind of discussion among students and staff can decide among themselves, between students and staff about how Blackboard is deployed. But on a grander scale, I don't think the students are part of the discussion. -Director of studies D2

2. Analysing the category of **Capacity Building**: The analysis of this category revealed the need for students to develop the required skills in accessing information. The direct quote of the director of studies D1 is presented below:

Eh Blackboard can, I mean it requires skills in how to use it, different people have to be trained on how to use it. Director of Studies D2

3. Analysing the category of **Navigability**: The theoretical sampling of this group of users . Some of the direct quotes of the teaching staff are presented below:

I personally, I am not a fan of Blackboard. I think it's messy, it's very bigly and it's very difficult sometimes to find what you want on there and I think that is a barrier to colleagues and students who... using it and for students to use it as well. -Director of Studies D2

You can do an awful lot. You can change the number of files. I can imagine before that, I am not a fan of Blackboard because it's can be difficult to find, for staff and students to find what they are looking for and in most of the places where you have to look for, there is a kind of clicking involved and... system which is like I said a minimum, a more linear approach. And you can customise it and I think Blackboard is clunky; it looks old-fashioned if I may say so. You know these things. -Director of Studies D2

4. Analysing the category of **Usability**:

Yea; it's, that is not something that I personally do. I know that some of mine colleagues use Blackboard to perhaps have discussion with, on various academic topics, in fact I know some of mine colleagues, a group of students are given an academic topic to discuss and through Blackboard discussion and there is interaction between the lecturer and the students on the specific academic topics. So there is the opportunity to do that. It's something that I personally explored, certainly my interactions and collaborations with students is through email. So I am a bit old-school I guess. I have seen my colleagues do it through Blackboard and again I thought it looks clunky. I thought it looks a bit cumbersome to use and I have not thought of doing that. It's difficult for students to be able to learn and use it. They could do it but it would be carefully explained and then... It looks like it is quite a lot of hard work. -Director of studies D2

5. Analysing the category of **User Perception**:

I think it looks a little old-fashioned, I think it looks clunky, it is difficult to find when you are looking for. So am I entirely satisfied with it... No, I'm not but I am kind of used to it and I know how to use it I guess. I mean I can give 5 or 6 out of 10. -Director of studies D2

6. Analysing the category of User/Domain Specific:

I think it looks a little old-fashioned, I think it looks clunky, it is difficult to find when you are looking for. So am I entirely satisfied with it... No, I'm not but I am kind of used to it and I know how to use it I guess. I mean I can give 5 or 6 out of 10. -Director of studies D2

5.6.3.21 Theoretical sampling of the third director of studies (D3)

The sampling of this participant based on the **navigability** as a core category yielded 6 unique codes out of 11 codes.

Some of codes and their chunks of transcripts from the sampling are presented below:

- **Challenges**

Yea; I think it provides you with challenges rather than with opportunities.

- **Ease of use**

I think we have not been particularly good at using the forums that are available online in Blackboard and some people... have been much better in encouraging the students to explore answers and share them online with the teachers and so I think some people are much better at that than others. Some of the things you wanted there, some kind of collaboration like the kinds - we have second year students down into group project where they are put into groups each and it is really hard to make sort of groups linking to Blackboard and it would be harder for them to have their own kinds set of discussions. So we set up Facebook instead because that is much more adapted for the type of sharing and cooperation. So it does matter those types of facilities really.

- **Fitted for use**

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work. And it's a kind of problem you could see in other similar systems. So for instance, if you look at Dropbox or... then if you put single files into a place, but when I get a copy of the stuff, they always have a button that says download everything, download into zip and why don't I see that in Blackboard? Why don't I see that in SharePoint? It's those kinds of items, levels of thinking about what, how the user really does stuff, and users mostly want to be able to do stuff offline and not download files every time. And so those kinds of stuff download/upload. So I might have 20 lecture-worth materials, I just want to be able to put them on the side where people could get them. ...that makes it difficult for staff who are more technically-minded to easily get... and the idea of moving around a whole

structure, so if next year I want the same stuff in, I can't say take a copy of everything, I don't think I can because this year is actually better than that one. So you find making a new structure, I could have made it into output... So that kind of efficiency is really hard to... It's efficiency for students as well. So the students go and download the materials of the course while on the train, they just want to download it all and they have got their... lecture... It's not making it lovely, it's just making it workable.

- **Interface design**

...does really nice things with Blackboard and so if... those modules really have nice structure and lots of sensible links... But to do that it's not a lot of work until you look at most people's sites and they don't look like that. Some of what you have done could be automated I think but put in a base front page in HTML which replaces the usual front page and... on HTML to make it work

- **Navigation**

Hmm. So some people within the institute have made quite complex the learning environment via the Blackboard and something we find very difficult to move some of our materials unto Blackboard. It's very rigid in the way it is set up. So you have these links and you put a file... and it doesn't make it easy to... information and you put lots and lots of links when you have got it somewhere else. I think one of the advantages of Moodle for instance, is that you can add... to add modules to it but you choose the way you... with Blackboard.

- **Skills**

It's not a Blackboard problem, it's an awful lot of systems, assume you already know how to use the system to use it well. And with some of the other systems that we have in the university, I have seen some lecturers... not want to use those systems until they learn how they work and somehow you have to... I am going to show you how to do this so that they can then go and I will try it now if I have questions and a few things because the things are just complex. In some ways, it kind of discourages research. You put all the stuff there where they can find it. I don't know how you want to encourage research skills using Blackboard.

5.6.3.22 Grouping of codes from director of studies D3 into Categories

The codes generated from the sampling of the transcripts of the third director of studies D3 were sampled were grouped into their respective categories for further analysis. Table 5.24 shows the classification of the codes into categories.

	Codes	Frequency
1	Challenges	1
2	Ease of use	4
3	Fitted for use	2
4	Interface Design	2
5	Navigation	1
6	Skills	1
	Total	11

Table 5.23: The analytic codes of the theoretical sampling of the third director of studies (D3)

	Category	Codes
1	Barriers	Challenges
2	Capacity Building	Skills
3	Navigability	Navigation
4	Usability	Ease of use
5	User Interface	Interface design
6	User/Domain Specific	Fitted for use

Table 5.24: Classification of the codes from director of studies D3 into categories

5.6.3.23 Drawing inferences from the data in the different categories of the director of studies D3

The sampling of the transcripts of this participant revealed some interesting points on the use of the VLE towards the saturation of **Navigability** as a core category. Some of these views are presented below:

1. Analysing the category of **Barriers**: The analysis of the code that fell into this category alluded to the fact that the VLE posed challenges as opposed to opportunities. The direct quote of the participant is presented below:

I think it provides you with challenges rather than with opportunities. -Director of studies D3

2. Analysing the category of **Capacity Building**: The analysis of this category revealed it's there is an underlying assumption that people know how to use these tools like the VLE. But in reality, people get to figure things out themselves. The direct quote of the director of studies D3 is presented below:

It's not a Blackboard problem, it's an awful lot of systems, assume you already know how to use the system to use it well. And with some of the other systems that we have in the university. I have seen some lecturers... not want to use those systems until they learn how they work and somehow you have to... I am going to show you how to do this so that they can then go and I will try it now if I have questions and a few things because the things are

just complex. In some ways, it kind of discourages research; you put all the stuff there where they can find it. I don't know how you want to encourage research skills using Blackboard. -Director of Studies D3

3. Analysing the category of **Navigability**: The theoretical sampling of the third director of studies D3 revealed that is group of users. This is supported by the direct quotes of the participant as presented below:

Hmm. So some people within the institute have made quite complex the learning environment via the Blackboard and something we find very difficult to move some of our materials unto Blackboard. It's very rigid in the way it is set up. So you have these links and you put a file... and it doesn't make it easy to... information and you put lots and lots of links when you have got it somewhere else. I think one of the advantages of Moodle for instance, is that you can add... to add modules to it but you choose the way you... with Blackboard. -Director of Studies D3

4. Analysing the category of **Usability**:

I think we have not been particularly good at using the forums that are available online in Blackboard and some people... have been much better in encouraging the students to explore answers and share them online with the teachers and so I think some people are much better at that than others. Some of the things you wanted there, some kind of collaboration like the kinds - we have second year students down into group project where they are put into groups each and it is really hard to make sort of groups linking to Blackboard and it would be harder for them to have their own kinds set of discussions. So we set up Facebook instead because that is much more adapted for the type of sharing and cooperation. So it does matter those types of facilities really. -Director of studies D3

5. Analysing the category of **User Interface**:

...does really nice things with Blackboard and so if... those modules really have nice structure and lots of sensible links... But to do that it's not a lot of work until you look at most people's sites and they don't look like that. Some of what you have done could be automated I think but put in a base front page in HTML which replaces the usual front page and... on HTML to make it work -Director of studies D3

So I think it's lack of proper design and lack of making obvious what is available because it needs to be available to staff. It doesn't

need to be available to students. So you could have it at second level priority compared... and make things obvious to students.
-Director of studies D3

6. Analysing the category of User/Domain Specific:

Yes; so it's customizable but like I said the tool is not easily customizable because most people do not customise it quickly, they have content, they have assignments and that is about all they do. Eh you know, another way in which it makes, eh its current difficult really... It will be easy to get things like results from assignments, something you think should be obviously easy to do are... knowledge that the people who know it, know how to do it. The other people have to ask from the people who know it. And I kind of almost have the... knowledge every time I go looking for a set of assignments to come and download I think how did I do this the last time? -Director of studies D3

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work. And it's a kind of problem you could see in other similar systems. So for instance, if you look at Dropbox or... then if you put single files into a place, but when I get a copy of the stuff, they always have a button that says download everything, download into zip and why don't I see that in Blackboard? Why don't I see that in SharePoint? It's those kinds of items, levels of thinking about what, how the user really does stuff, and users mostly want to be able to do stuff offline and not download files every time. And so those kinds of stuff download/upload. So I might have 20 lecture-worth materials, I just want to be able to put them on the side where people could get them. ...that makes it difficult for staff who are more technically-minded to easily get... and the idea of moving around a whole structure, so if next year I want the same stuff in, I can't say take a copy of everything, I don't think I can because this year is actually better than that one. So you find making a new structure, I could have made it into output... So that kind of efficiency is really hard to... It's efficiency for students as well. So the students go and download the materials of the course while on the train, they just want to download it all and they have got their...lecture... It's not making it lovely, it's just making it workable. -Director of studies D3

5.6.3.24 Theoretical sampling of the e-learning team

The e-learning team was also sampled for issues relating to Navigability. The sampling yielded 7 unique codes out of 9 codes.

Some of codes and their chunks of transcripts from the sampling are presented below:

- **Engaging the staff**

So it's not all the last minute. The idea was supposed to be get rid of the out-dated materials and just put in the new stuff in the new folders, the circular we're using in teaching...I think we see all the...people have been doing over the past years with the...every summer. We made appointments with every single department starting from May or June try to turn it...say in May, to say when is a good time for the Blackboard team to come to your department to talk about the changes for next year...and some departments never allowed us to do this but most of them did at some point. Some departments field in all staff from the department, maybe it's a four-member of staff, we don't have control over that but at the end of the session, in the beginning we thought it's generally important that everybody know that why...below the line, the new format or above the line...appear below the main menu... If you want to use the material move it to the right place above the line and once you're happy with that, then you can delete those folders below the line.

- **Good practice**

We can sometimes sample recording of award winners where we have a module available, the course module copies available for people to see. So we just announced the new ones so that people can see how other people, other lecturers have done it. So we can show them the good practice and it seems to come from a lot of patience. We will and we know that it's not something... but we know that they have got all these materials or that we're going to structure other... that is not logical or something either unusual or... and we say you can make it easier for your students to find the materials, you have got to put this here... you have to put it there, you are supposed to put it there. It's a policy, there is a required minimum when you put the assignment information inside the assignment folder, you know basically there are different folders.

- **Interface design**

We try to balance the designs and the needs and express wishes of the various stakeholders in that way because the aim is to help the students to learn and help the lecturers to teach.

- **Navigation**

Sometimes when you are... when you enter the page... sometimes it depends on the resolution of the screen, there might be scroll bars and some toolbars or ... scrolling through the content, you might have several levels of scroll bars and that's not very

adaptable, slow responses interface, so that would be something like that improved. So I think the students may like some final trip down to the notifications area. They like notification area if it could be made better. So like the... of the right hand area... and they use that a lot but there some treats they like to see on that.

- **Technology design**

And then again, I think the real thing here for some proper use of the other side of the issue to the students, so I mean sometimes they think with the software they can control, we don't have control over. Like somebody said to me today "I wish the new item wasn't added at the bottom of the screen, they should be added at the top. New item content in a module, new content item will be added at the bottom of the existing content but the... it added at the top of the existing content because you won't be able to see the latest you just added but we don't have control over that part of the software. That is something that's necessarily common I think. Overall, I think the software, the software basically is fine you know...

- **Training**

We try to incorporate into training our advice on making your presentation accessible more, addressing different needs of, you know a mixed group where presentation...

- **Uniformity**

Good question. We define that as... when some people don't ...some will use, put things randomly, other people would use a really good way of structuring their modules. They can, as part of this, we have a required minimum presence that says the teaching content, the learning content should be in the content folder, the assignment information, submission information and anything assignment-related should be in assignment folder. And the overall module information could be inside you know... detailed list of what the topics are you know, the module handbook, things that apply to the module and the whole should be in the whole module information area... So that helps to keep it consistent which is what we have heard from students they want.

5.6.3.25 Grouping of codes from director of studies D3 into Categories

The codes generated from the sampling of the transcripts of the third director of studies D3 were sampled were grouped into their respective categories for further analysis.

	Codes	Frequency
1	Engaging the staff	1
2	Good practice	1
3	Interface design	1
4	Navigation	1
5	Technology design	1
6	Training	1
7	Uniformity	3
	Total	9

Table 5.25: The analytic codes of the theoretical sampling of the e-learning team

	Category	Codes
1	Architecture	Technology design
2	Capacity Building	Engaging the staff, Good practice, Training
3	Navigability	Navigation
4	User Interface	Interface design
5	User/Domain Specific	Uniformity

Table 5.26: Classification of the codes from the e-learning team E1 into categories

5.6.3.26 Drawing inferences from the data in the different categories of the e-learning team E1

As the transcripts of the e-learning team E1 was sampled around *Navigability* as a core category, some interesting points were identified with respect to the user experience of VLE users. These points are presented under the different categories that were identified in the study.

1. Analysing the category of **Architecture**: The analysis of the code touched on the technology of the VLE. The direct quote of the participant is presented below:

And then again, I think the real thing here for some proper use of the other side of the issue to the students, so I mean sometimes they think with the software they can control, we don't have control over. Like somebody said to me today "I wish the new item wasn't added at the bottom of the screen, they should be added at the top. New item content in a module, new content item will be added at the bottom of the existing content but the... it added at the top of the existing content because you won't be able to see the latest you just added but we don't have control over that part of the software. That is something that's necessarily common I think. Overall, I think the software, the software basically is fine you know... -E-learning team E1

2. Analysing the category of **Capacity Building**: The analysis of this category revealed. The direct quote of the director of studies E1 is presented below:

We try to incorporate into training our advice on making your presentation accessible more, addressing different needs of, you know a mixed group where presentation... -E-learning team E1

So it's not all the last minute. The idea was supposed to be get rid of the out-dated materials and just put in the new stuff in the new folders, the circular we're using in teaching...I think we see all the...people have been doing over the past years with the...every summer. We made appointments with every single department starting from May or June try to turn it...say in May, to say when is a good time for the Blackboard team to come to your department to talk about the changes for next year...and some departments never allowed us to do this but most of them did at some point. Some departments field in all staff from the department, maybe it's a four-member of staff, we don't have control over that but at the end of the session, in the beginning we thought it's generally important that everybody know that why...below the line, the new format or above the line...appear below the main menu... If you want to use the material move it to the right place above the line and once you're happy with that, then you can delete those folders below the line. -E-learning team E1

We can sometimes sample recording of award winners where we have a module available, the course module copies available for people to see. So we just announced the new ones so that people can see how other people, other lecturers have done it. So we can show them the good practice and it seems to come from a lot of patience. We will and we know that it's not something... but we know that they have got all these materials or that we're going to structure other... that is not logical or something either unusual or... and we say you can make it easier for your students to find the materials, you have got to put this here... you have to put it there, you are supposed to put it there. It's a policy, there is a required minimum when you put the assignment information inside the assignment folder, you know basically there are different folders. -E-learning team E1

3. Analysing the category of **Navigability**: The theoretical sampling of the e-learning team participant confirmed the need for improvement in the interaction of users with Blackboard. Below is a direct quote from the only participant from the e-learning team:

Sometimes it depends on the resolution of the screen, there might be... scroll bar, or you might have several levels of scroll bar. That

is possible, slow responses interface, so that would be something like that... improved. -E-learning team E1

4. Analysing the category of **Training**: This category had to do with how the e-learning team supported the teaching staff by way of providing training for them.

We try to incorporate into training our advice on making your presentation accessible more, addressing different needs of, you know a mixed group where presentation... -E-learning team E1

We made appointments with every single department starting from May or June try to turn it...say in May, to say when is a good time for the Blackboard team to come to your department to talk about the changes for next year...and some departments never allowed us to do this but most of them did at some point. -E-learning team E1

5. Analysing the category of **User Interface**: The analysis of this category revealed that the e-learning team strives to balance the requirements and needs of the different users of the VLE in order to provide a good user experience.

We try to balance the designs and the needs and express wishes of the various stakeholders in that way because the aim is to help the students to learn and help the lecturers to teach. -E-learning team E1

6. Analysing the category of **User/Domain Specific**: The lack of consistency in the arrangement of material on the VLE came up in the analysis of the transcripts of the e-learning team.

Good question. We define that as... when some people don't ...some will use, put things randomly, other people would use a really good way of structuring their modules. They can, as part of this, we have a required minimum presence that says the teaching content, the learning content should be in the content folder, the assignment information, submission information and anything assignment-related should be in assignment folder. And the overall module information could be inside you know... detailed list of what the topics are you know, the module handbook, things that apply to the module and the whole should be in the whole module information area... So that helps to keep it consistent which is what we have heard from students they want -E-learning team E1

Yes; we have a really nice thing staff can do which is we made a checklist that is designed to be used by some... and not necessarily a teaching member of staff... where am I going to look, what

*am I looking for in this Blackboard or in that part of Blackboard?
And some of the checklists...to be used... So we have seen some...
implemented that... -E-learning team E1*

5.6.3.27 Theoretical sampling of the administrative staff

The last group to be sampled was the administrative staff users. There were two participants in this group and they were sampled separately as shown below.

5.6.3.28 Theoretical sampling of the first administrative staff

This participant was sampled for issues relating to Navigability. The sampling yielded 6 unique codes out of 14 codes.

Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Access configuration**

...if you ask the students whether they are using any of these stuff, the answer will usually be no. So I suppose, I suppose that would be my main reason for dissatisfaction with a lot of things we don't necessarily use and the module page will be a little bit, could do with a little bit of information. Particularly, I mean this is the only kind of thing that only affects a lot of workload. For a student that's not such a big deal because they would only be registered on only the modules they are studying. So their...I think another thing is if you are added to a module for this year, you are then not automatically added to the modules for the previous years and that can be quite difficult for new members of staff. Quite often, they need to have access to the previous years in order to do, in order to know what they should be doing this year or what has been done before. I don't know if that's so much Blackboard thing really? I suppose it is. Yes; that as well is probably something I should bring up. The business of the previous years, it has been mentioned before.

- **Engaging with the students**

One thing that people bring back from students' feedback is that they are not sure between Blackboard...and so it's still in the interest of the students really. They know if they visit this page they will find the criteria and they can expect the...or if they visit this page, they will find the review of the module, and you can expect to find it there just... So it's very much in the interest of the students to have...have the information in place...

- **Ease of use**

I think it's relatively easy to use, I find it quite user friendly.

- **Interface design**

I think that... while the fact that if you don't know how to use HTML it's quite clunky and the code looks messy if you are not good in HTML and not all members of our staff are fluent in HTML.

- **Navigation**

But I think there are definitely ways of organising that so that it is easier to navigate.

- **Training**

Most of my training came from... Although I have also spoken to the team individually, I have been able to ask them about various things and training on how to use it, is regularly available and it so happened that after my induction, I was so happy with what I was doing and...have with any specific queries, I was able to ask the team anyway.

Table 5.27 shows the generated codes.

	Codes	Frequency
1	Access configuration	1
2	Engaging with the students	1
3	Ease of use	1
4	Interface design	4
5	Navigation	6
6	Training	1
	Total	14

Table 5.27: The analytic codes of the theoretical sampling of the first administrative staff (A1)

5.6.3.29 Grouping of codes from the Administrative Staff A1 into Categories

After coding the first Administrative Staff A1, the generated codes were grouped into their respective categories. Table 5.28 shows the classification of the codes into categories.

	Category	Codes
1	Capacity Building	Training
2	Engagement	Engaging with the students
3	Navigability	Access configuration, Navigation
4	Usability	Ease of use
5	User Interface	Interface design

Table 5.28: Classification of the codes from the Administrative Staff A1 into categories

5.6.3.30 Drawing inferences from the data in each category of the group of Administrative Staff A1

The sampling of the Administrative Staff A1 further identified issues surrounding the Navigability of the VLE in order to saturate the core category. Some of these views confirmed what others have said and also went ahead to offer new perspectives to it.

1. Analysing the category of **Capacity Building**: The analysis of this category revealed how this staff got trained and got the skills for the job. Some of the direct quotes of the teaching staff are presented below:

Most of my training came from... Although I have also spoken to the team individually, I have been able to ask them about various things and training on how to use it, is regularly available and it so happened that after my induction, I was so happy with what I was doing and...have with any specific queries, I was able to ask the team anyway. -Administrative Staff A1

2. Analysing the category of **Navigability**: The theoretical sampling of this group of users revealed that the teaching staff talking about the difficulties they encounter while navigating the VLE. Some of the direct quotes of the teaching staff are presented below:

But I think there are definitely ways of organising that so that it is easier to navigate. -Administrative Staff A1

3. Analysing the category of **Usability**: The analysis of this category revealed the user experience of the teaching staff is marred with the clunky nature of the VLE. Their views and expectations are captured in some of the direct quotes of teaching staff as presented below:

I think it's relatively easy to use, I find it quite user friendly - Administrative Staff A1

4. Analysing the category of **User Interface**: The theoretical sampling of this group of users revealed that the design of the user interface of the VLE plays a huge role in the user experience of the VLE. The views of the teaching staff are expressed below.

I think that... while the fact that if you don't know how to use HTML it's quite clunky and the code looks messy if you are not good in HTML and not all members of our staff are fluent in HTML. -Administrative Staff A1

5.6.3.31 Theoretical sampling of the second administrative staff

The last group to be sampled was the administrative staff users. There were two participants in this group and their transcripts sampled for issues relating to *Navigability*. The sampling yielded 5 unique codes out of 13 codes.

Some of codes and their chunks of transcripts from the sampling are outlined below:

- **Engaging with the students**

So generally like I...in the office is responsible for like the oversight of the control needs and minimum requirements standards over there as well as attached to being, to maintain the different aspects and you know like user experience of the site. So all our modules are designed to work in the same way for every module across the whole department, that...how we make the engagement to ensure they have a consistent user experience like...the programme.

- **Interface design**

And I think another problem is just that there's a lot of inconsistencies of the user interface between departments occasionally there are patterns, patterns...there is no clear, use it for one simple function that's clear...and symbols that will lead you to three different... It's quite frustrating.

- **Navigation**

I think...like the navigation...I think that a lot of the tools that exists in the mainstream of the modules are either lacking or not working at all. A really good example of that is the...ordering of the boxes of content and paint. There are two ways to that. You can actually drag to be able to drop the content of the box and it never works. Do you reorder it at all or do you reload the page is going back to the order you have put it in? So that's one of the biggest frustrations with the Blackboard site

- **Technology design**

Yes; certainly. So there's an awful lot of things...there is a bunch of things that I feel like there should be more... to use. Like take for example...having that kind of thing like design considerations and that sort of thing, to do that, you have got to like copy... from page to page to page to page. There's no provision within that...you want to copy that, you have to manually order it like through the Blackboard...like you have to copy it for every single page, just like one block to every page...countless hours of repetition and when you manually repeat that over and again,... the same thing goes for the assignments...there's is no sort of automation, you do one thing for every module or more like you do one thing for every student. I know that the way we use Blackboard is like a facility for those modules that we have to set up through the students...

- **Training**

I have been on a couple of workgroups and...and I was invited to speak on the workgroup on there and I see that... managed a particular issue... but I have never had any specific training on Blackboard. Mostly by trial and error. Like I said I have the experience of... doing... to the extent of...generally ensure where things are going to be...how to do things... information being passing from Blackboard to Astra... We never had...Blackboard...different students like group work, figuring out how to do the things you need to do...

Table 5.29 shows the generated codes.

	Codes	Frequency
1	Engaging with the students	1
2	Interface design	3
3	Navigation	3
4	Technology design	4
5	Training	4
	Total	13

Table 5.29: The analytic codes of the theoretical sampling of the second administrative staff A2

5.6.3.32 Grouping of codes from the Administrative Staff A2 into Categories

After coding the second Administrative Staff A2, the generated codes were grouped into their respective categories.

Table 5.30 shows the classification of the codes into categories.

	Category	Codes
1	Architecture	Technology Design
2	Capacity Building	Training
3	Engagement	Engaging with the students
4	Navigability	Navigation
5	User Interface	Interface design

Table 5.30: Classification of the codes from the Administrative Staff A2 into categories

5.6.3.33 Drawing inferences from the data in each category of the group of Administrative Staff A2

The sampling of the Administrative Staff A2 revealed some issues around the Navigability of the VLE in order to saturate the core category. Some of the direct quote from the participant are presented below:

1. Analysing the category of **Architecture**: The analysis of this category revealed that there were issues with the way the VLE was structured. Some of the direct quotes of the staff are presented below:

There's no provision within that...you want to copy that, you have to manually order it like through the Blackboard...like you have to copy it for every single page, just like one block to every page...countless hours of repetition and when you manually repeat that over and again,... the same thing goes for the assignments...there's is no sort of automation, you do one thing for every module or more like you do one thing for every student. I know that the way we use Blackboard is like a facility for those modules that we have to set up through the students... -Administrative Staff A2

There's no, like that information is somewhere in the university, like in the timetable or in Astra in some sort of database somewhere and there's no way of pulling out that information into as from Blackboard. You have to do all that manually. You have to like go through and pick the students and push the buttons...find students...how you will feature that is not... I mean we can but not at the moment. Like Blackboard provides no... for that, so what I do is like set up a CSS style sheet which I run in JavaScript for following the page but then we copy the same JavaScript into the module all the other files... -Administrative Staff A2

2. Analysing the category of **Capacity Building**: The analysis of this category revealed how this staff developed his skills through learning to do things through trial and error. Some direct quotes of the administrative staff are presented below:

I have never had any specific training on Blackboard. Mostly by trial and error. -Administrative Staff A2

I have been training and figure out stuff myself, figure out how things work and more recently... -Administrative Staff A2

I have been training and figure out stuff myself, figure out how things work and more recently... -Administrative Staff A2

3. Analysing the category of **Engagement**: The analysis of the theoretical sampling of this participant revealed that the administrative staff strive to provide a consistent user experience for the students. The direct quote of the administrative staff is presented below:

So all our modules are designed to work in the same way for every module across the whole department, that...how we make the engagement to ensure they have a consistent user experience like... the programme. -Administrative Staff A2

4. Analysing the category of **Navigability**: The analysis of the theoretical sampling of this participant revealed that the administrative staff talked about the difficulties associated with navigating the VLE. Some of the direct quotes of the teaching staff are presented below:

Yeah I mean I think it's quite really bad. I don't think it really makes sense. Especially when you login...the useful page is not there. I think now it just shows you your module. It's bad...but on the whole I think, you use Blackboard, so the whole like the administrative panel for Blackboard as a module coordinator or departmental administrative resource technician like dropdown. I mean, if you do not know exactly where it's and where the...is, the only option is to click through every single one or something that looks like it might be what you need.....it's not very good at all.
-Administrative Staff A2

I think... like the navigation... I think that a lot of the tools that exists in the mainstream of the modules are either lacking or not working at all. A really good example of that is the... ordering of the boxes of content and paint. There are two ways to that. You can actually drag to be able to drop the content of the box and it never works. Do you reorder it at all or do you reload the page is going back to the order you have put it in? So that's one of the biggest frustrations with the Blackboard site
-Administrative Staff A2

5. Analysing the category of **User Interface**: The theoretical sampling of this participant revealed that the design of the user interface of the VLE plays a huge role in the user experience of the VLE. The views of the teaching staff are expressed below.

And I think another problem is just that there's a lot of inconsistencies of the user interface between departments occasionally there are patterns, patterns...there is no clear, use it for one simple function that's clear...and symbols that will lead you to three different... It's quite frustrating.
-Administrative Staff A2

Those are the endemic issues with Blackboard, the user experience to provoke the students and staff is really poor and it's not thought through very well. Yeah, so I mean either on the basis of I know and expect what it's going to do; it can't on the basis of what I want to do.
-Administrative Staff A2

I think the user interface needs some improvements in the like, I'm not sure I can describe it.
-Administrative Staff A2

5.6.4 The relationships among the core category and the other related categories

A close examination at the conceptual meaning of the core category and the other categories that emerged from the theoretical sampling and their supporting transcripts shows that there exists some relationships among these categories. These relationships are outlined below.

- (i) The relationship between the **Navigability** and **Architecture**: This is such that the **Navigability** is affected by the **Architecture** of the VLE which is the underlying structure of the system. The architectural design of the VLE may facilitate or hinder how users navigate the VLE. For example, some of the issues raised by the participants with respect to navigation could be traced to the architecture of Blackboard. These were captured in the direct quotes of the participants as presented below:

The... system can be a little bit clunky and the box a little closed.
-Student S12

I am not a fan of Blackboard because it's can be difficult to find, for staff and students to find what they are looking for and in most of the places where you have to look for, there is a kind of clicking involved and... system which is like I said a minimum, a more linear approach. And you can customise it and I think Blackboard is clunky; it looks old-fashion if I may say so. -D2

For me it's clunky system. It's a, for anything you want to do ... there is a lot of process, very slow process by clicking your way through it. So it becomes easily/hugely? resisted to use other things... -Teaching staff T11

It's quite clunky to use. -Teaching staff T12

- (ii) The relationship between the **Navigability** and **Barriers**: This is such that the **Navigability** could pose some challenges to the VLE users. These challenges with then constitute some forms of **Barriers** as to how users use the VLE or circumvent it in some cases. These were captured in the direct quotes of the participants as presented below:

There's a problem sometimes it's the document given with the link to the document, the... into the site may not be working anymore then you have to, you try it and you realize... -Student S13

I think the Blackboard design is an obstruction to students and I think the students are already interacting and engaging with each other on other platforms and getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... - T3

I am not a fan of Blackboard. I think it's messy, it's very bigly and it's very difficult sometimes to find what you want on there and I think that is a barrier to colleagues and students who... using it and for students to use it as well. -Director of studies D2

Yea, I think it provides you with challenges rather than with opportunities. -Director of studies D3

- (iii) The relationship between the **Navigability** and **Capacity Building**: The category of **Capacity Building** is related to the **Navigability** of the system in a number of ways. Straight and familiar navigation tools will reduce the need for the users to be trained. A VLE that is user friendly is likely to have little or no learning curve. The level of skills of the user can determine how well they are able to navigate and use the VLE. It was revealed that some users had challenges using the VLE initially at the beginning but got over it with time. These points were captured in the direct quotes of the participants as presented below:

There wasn't any training... through exploration. Nobody actually showed me but through exploration I got used to [it]... The issue is that it was initially difficult but then exploration and trials, I got... by myself. -Student S8

Digital skills, not much really. In order to use, you should be quite competent in using it. Like downloading files and navigating... websites... -Student S14

A lot of the time I would love to use it more. I will love to see more multiple choice tests, again more quizzes and get them to do that a lot of time or get them to do some more of self-directed study and again you can kind of use Blackboard to look at that and the discussion forum, I probably can't use it. I have never gone round to using it but I have also been to a couple of the training, training sessions on the enhanced presence and I have looked at what you can with the Blackboard and it's you know, it's great what you can do. It is just having the time to... -Teaching staff T7

Ehmmm I think I knew how to, how to use all the... I have like IT skills, so it wasn't a problem for me to use VLE. I knew how to use it before so it wasn't a problem. We actually had training like how to use Blackboard, ... and all that for one hour and we were showed how to use the Blackboard useful so we knew everything before. -Student S38

It requires a lot of skills on the part of the course coordinator... -Director of studies D2

- (iv) The relationship between the **Navigability** and **Engagement**: The way the users engage or are engaged through the VLE can be affected by the navigation process of the VLE. It can lead the users to actively or passively engage with the VLE or simply to circumvent it. Inconsistencies in how some of the teaching staff structure their modules around the VLE and place materials affect the use of the VLE by students because when they get to the usual place or the natural place where they expect to find things they get disappointed because what they are looking for isn't there. These points were captured in the direct quotes of the participants as presented below:

Like I said before, the content being where it is not meant to be. Like record, when you check it, it is something else... Most of them are scattered and some are not even showing at all. -Student S24

...the way the lecturer uses say lecture content, assignment, so it's quite hard to find. -Student S35

I think it will be nice to have instant message like a chat box like Facebook has. So it will be done quicker and you will get your answer much quicker. -Student S37

- (v) The relationship between **Navigability** and **Online Community**: The navigation of the discussion forum can hinder or enhance the user experience of the VLE. These points were captured in the direct quotes of the participants as presented below:

Maybe, make the discussion forum better. Make it concise and more friendly discussion forum, maybe more more easily accessible and quickly straight up there, have the discussion.. -Student S25

It could always be better not in general I don't know but when you use other technology online, they might not even be learning environment but when you use a certain function like a forum online you see how it works, you start to compare and... well it can always be better than that. Well like I said I did use it. We used it, I used it. We were asked to find the questions about things the module I put up things anonymously. So I have interacted with it. My only concern is with things like when it comes to user interface, the interface geek is coming out. But the usual things for instance you click down, you have left your track of people replying, you have gone really down, somewhere down, oh I still want to respond, it is you that needs to go up backwards to reply but for why do I have to go all the way up to click reply and then go back down to type my response. That is how it works until I have known that. You know sometimes like I said, you are on other websites, you are bonding you see something you just type or click reply down there. You don't have to go back to reply to the user,

I mean come back to type and then go back up to see if they have posted it. -Student S34

- (vi) The relationship between the **Navigability** and **Time**: The time it takes to access a resource on the VLE depends on how smooth or complicated the navigation of the VLE is. These points were captured in the direct quotes of the participants as presented below:

And also that it can be easier to message them so in that respect, I think it's a... method which is quick and efficient, easier for me to use and involve less cumbersome and it goes that I have had found that using Blackboard, it is not easy to navigate always. From the students' point of view, if it is easier to use, I am not sure but for me it is more time consuming. -Teaching staff T6

It requires a lot of skills on the part of the course coordinator, a lot of time on their part as well. Don't forget that you can... it takes an awful lot of time. Can it? Yes; it can. How does it? Through an awful lot of, through experience and time and really people having time to decide. I mean we have one colleague who took sabbatical in order to build a course... It can be done but it's not an easy one. -Director of studies D2

The way it is at the moment, you can't use it, you can use it for summative assessment but then it is more time consuming. I don't know how it is going to be but then I will like to see something that is much more easier and much more, much less time consuming in terms of how you can put up materials and allows you access to it and for it to be used to access their understanding of what you are doing, what you are teaching them. I want that to be less time consuming. I don't want something that I have to spend hours and hours say I am doing the summative assessment of teaching that module you know. It is not going to be something that is practicable if you want to spend the amount of time to try to do a normal teaching session in the period of time. So I like to see views and resources for summative assessments that will be flexible and less time consuming and be able to give due real results of the students' performance in the module and the feedback to adjust your teaching or feedback your students about their performance in the module and the feedback will enhance... -Teaching staff T10

It takes so much time to put any information up there. It's not really very easy to use. -Teaching staff T11

- (vii) The relationship between **Navigability** and **Usability**: These points were captured in the direct quotes of the participants as presented below:

I have seen my colleagues do it through Blackboard and again I thought it looks clunky. I thought it looks a bit cumbersome to use and I have not thought of doing that. It's difficult for students to be able to learn and use it. They could do it but it would be carefully explained and then... It looks like it is quite a lot of hard work. -Director of studies D2

Some of the things you wanted there, some kind of collaboration like the kinds we have second year students down into group project where they are put into groups each and it is really hard to make sort of groups linking to Blackboard and it would be harder for them to have their own kinds set of discussions so we set up Facebook instead because that is much more adapted for the type of sharing and cooperation. So it does matter those types of facilities really. -D3

The default is you end up with something that is not very nice but it is easy for the lecturer to make but not easy to use. -D3

- (viii) **The relationship between the Navigability and User Interface:** The design of the User Interface can affect how users navigate the VLE. It can make it easier to access things or more difficult to use it when engaging with the VLE.

These points were captured in the direct quotes of the participants as presented below:

I think the Blackboard has an interface that is unworthy. I think the Blackboard design is an obstruction to students and I think the students are already interacting and engaging with each other on other platforms and getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... -Teaching staff T3

...So you know it's a bit busy front page. If there was somewhere, possibly simple things; I like simple websites. I don't like having to... But you know there is a lot of information on there, there needs to be a lot of stuff on it. It's a little bit busy you have to possibly, could be designed a little bit better -Student S27

The interface perhaps could be a bit you know streamlined may be. When you search for a module, the front page to the module handbook options... It's a bit... you can only do it from the front page. You can put them up just take, you just tailor them to the front page of the module. You need to get rid of it. They don't need it. I can give them a thing they should be on until I turn them off. You can, you can make the module page look nice, there is quite a lot of flexibility... -Teaching staff T13

- (ix) The relationship between the Navigability and User Perception: The design of the User Interface can affect how users navigate the VLE. It can make it easier to access things or more difficult to use it when engaging with the VLE.

These points were captured in the direct quotes of the participants as presented below:

It's easy to use but it could be easier. -Student S1

I think... there is a lot of content and I feel like sometimes, you won't be able to find everything on there. You never find everything on... but usually things like... tell you where to go I don't think that is a problem but I find it quite useful. -Student S3

I think it is a pretty good system. It is underutilised. -Student S4

But sometimes it can be a little bit of a hunt to find what you need. But in general it's always useful there. -Student S4

- (x) The relationship between the Navigability and User/Domain Specific: The design of the User Interface can affect how users navigate the VLE. It can make it easier to access things or more difficult to use it when engaging with the VLE. These points were captured in the direct quotes of the participants as presented below:

Yes I mean it allows some customisation, I think it can allow more, it can look a lot better -Director of studies D2

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work. And it's a kind of problem you could see in other similar systems. -Director of studies D3

- (xi) The relationship between the Navigability and Value: The value that the users derive from the use of the VLE can be affected with how easy or difficult it is to navigate to where the resources/tools are on the VLE. These points were captured in the direct quotes of the participants as presented below:

I like that I get information easier. It's much easier to get contact information. I mean I don't have to carry a backpack with me and now I connect to the library and access information from the computer. Obviously with internet access I can access information -Student S1

I would say a bit because I'm reading more because like I said today on the computer and I'm reading more because of the documents on there and if they weren't there, I would have to go to the library and find out. So it enriches it by giving me the experience to read more on it... -Student S2

You get all in one-stop-shop. -Student S11

These relationships among the categories and core category as explained above are represented below in Figure 5.2. The directions of the arrows implies 'affects' or 'influences'; these effects and influences are supported by the transcripts as shown in the quotes above.

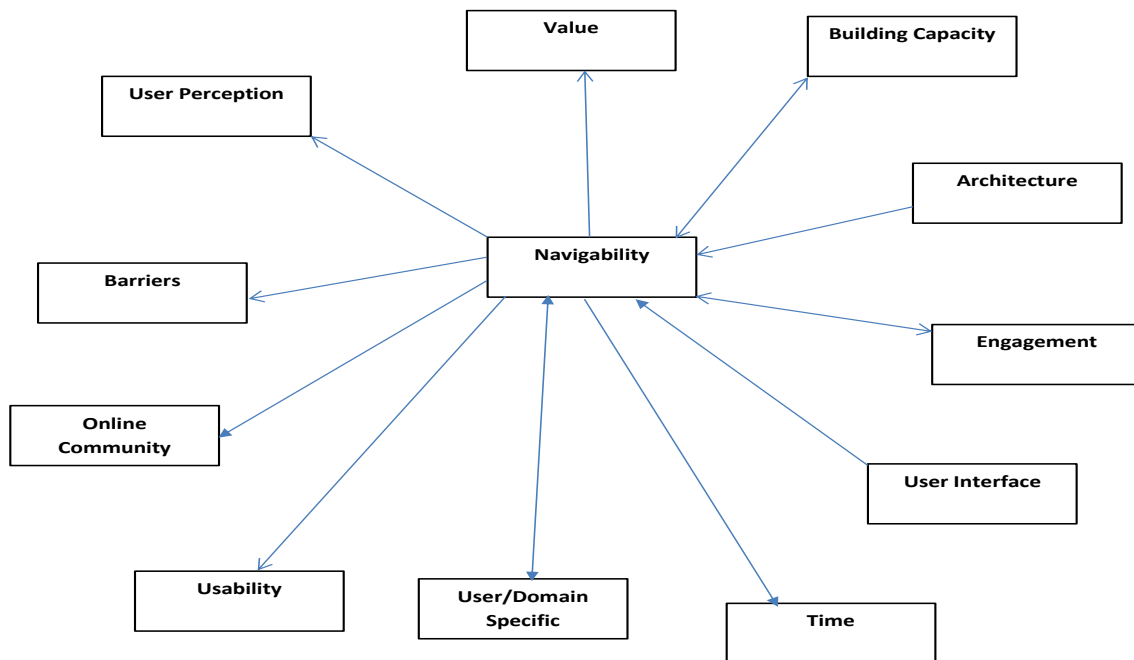


Figure 5.2: The relationships between the core category and other categories

5.6.5 Properties and dimensions of categories

In grounded theory, every category is expected to have its defined properties and dimensions. While Glaser and Strauss (1967) referred to the properties of a category as the conceptual elements of that category, Strauss and Corbin (1990) defined the properties of a category as the attributes or characteristics pertaining to the category. The property of a category in turn has dimensions which Strauss and Corbin (1990) referred to as the location of properties along a continuum.

Glaser and Strauss (1967) noted that

It must be kept in mind that both categories and properties are concepts indicated by the data (and not the data itself); also that both vary

in degree of conceptual abstraction. Once a category or property is conceived, a change in the evidence that indicated it will not necessarily alter, clarify or destroy it. It takes much more evidence - usually from different substantive areas -as well as the creation of a better category to achieve such changes in the original category. In short, conceptual categories and properties have a life apart from the evidence that gave rise to them. p.36

The properties and dimensions of these categories are constructed from the data during the analysis stage as the analysts interrogates the data through the use of the constant comparison of the incidents discovered. This leads the analyst to thinking in terms of the full range of types of the category, its dimensions, the conditions under which it is pronounced or minimised, its major consequences, its relation to other categories, and its other properties. (Glaser and Strauss, 1967).

According to Timonen et al. (2018), the properties of a category refer to the characteristics of the category while the dimensions of a category refer to the possible variation of the category. For example in examining the data that made up the core category **Navigability** it became clear that while some of the navigation challenges experienced by students had to do with the VLE directly, others were as a result of how the teaching staff used the VLE to provide information for the students. So the properties of the core category **Navigability** became **VLE-based** and **Teaching staff-based**. And with respect to the dimensions of the core category **Navigability**, two sets of dimensions were identified after examining the data. The first set was **Easy** and **Difficult**, and the second set of dimensions of the core category **Navigability**, was **Initially**, **Sometimes** and **Always**. It was revealed from the data, that for some people it was easy for them to navigate the VLE and for others it was difficult. It was also discovered that there were those who struggled with navigating the VLE at the beginning and later got over it after getting the right skills. These properties and dimensions are the building blocks for the development of the categories as they ultimately form the basis for establishing the relationship between categories and their subcategories.(Strauss and Corbin, 1990). Therefore having a grasp of the nature of properties and dimensions and their relationship is essential to understanding all the analytic steps for developing a grounded theory. Table 5.31 shows the properties and dimensions of the categories of this study.

5.7 Constant comparison

A major technique employed in grounded theory (GT) is constant comparison. Vasconcelos et al. (2012) advocates that it should be used as a guide for data collection as well as data analysis and be driven by the needs of the developing theory. So in conformity with this advice, the technique was employed by comparing data to data, incident to incident, code to code, categories to categories in the study in order to be able to generate a robust theory. This is what differentiates the approach from that of simple induction. Constant comparison was used to analyse the incidents within each group of participants and across the various

	Category	Properties	Dimensions
1	Architecture	Positive impact Negative impact	{High, Average, Low}
2	Barriers	VLE-induced User-induced	{Strong, Weak}
3	Capacity Building	Students Teaching Staff Admin Staff	{Great, Average, Poor}
4	Engagement	Positive Impact Negative Impact	{Consistent, Not consistent} {Sufficient, Not sufficient}
5	Navigability	VLE-based Teaching staff-based	{Easy, Difficult} {Initially, Sometimes, Always}
6	Online Community	Active Passive Non-existent	{Always, Sometimes, Never}
7	Time	Short Prolong	{Always, Sometimes}
8	Usability	System Easy Difficult	{Always, Sometimes}
9	User Interface	Simple Complicated	{Always, Sometimes}
10	User Perception	System Staff Usage Skills	{Positive, Negative}
11	User/Domain Specific	Fitted, Not fitted	{Always, Sometimes}
12	Value	Sufficient Not sufficient	{High, Average, Low}

Table 5.31: The properties and dimensions of the categories

groups as well by paying attention to similarities, differences and outliers. The following sections show the results of using the technique.

5.7.1 Constant comparison in the student group

Within the student group of participants, it was important to compare incident to incident as they related to **Navigability** by examining their supporting data from the transcripts with a view to arriving at some results. Key incidents were compared using the constant comparison technique and the results are presented below:

1. Breadth of Navigation: The participants complained of too much information on the VLE which made it difficult for them to navigate the web pages.

I will probably be thinking a little bit more of user-friendly better still, there is a list of things to get through which make it harder to find what you are looking for. -Student S5

But I think there is a lot of things that are put into use but never need it. -Student S12

Have less on that page and structure it for what you want directly... less things getting on... Have separate pathways to be able to see everything... If they can have a separate section where like a modules section where you have... -Student S18

It's direct but it's also broad. -Student S25

That's about it. It has to have a lot of information about... So you know it's a bit busy front page. If there was somewhere, possibly simple things; I like simple websites. I don't like having to... But you know there is a lot of information on there, there needs to be a lot of stuff on it. It's a little bit busy you have to possibly, could be designed a little bit better. -Student S27

2. Clunky: The analysis of the transcripts showed that a student described the VLE as clunky.

The... system can be a little bit clunky and the box a little closed. -Student S12

The architectural design of the VLE could impact on the Navigability of the VLE. For instance, a particular student made reference to students' preference for Facebook four times in comparison to Blackboard and how students naturally log on to Facebook but only log on to Blackboard occasionally. The student alluded that there was a competition between Facebook and Blackboard. This underscores the fact that a VLE like Blackboard can improve its design so that students enjoy a user experience similar to what they have when on Facebook.

Just because not many people actually login to Blackboard a lot of time. Most people just use things like Facebook or email. -Student S14

...that might just be a communication platform or more useable. With the original interface for that, so is more inclined for students to use it. Because now it's easier to use things like Facebook... Most people log on to Facebook everyday. Most people only log on to Blackboard if they need to. -Student S14

The only thing I'll, is communication tool... because there is a ...competition between BB and Facebook. Student S14

3. Configuration: Another incident which was identified in the transcripts of the student participants was how Blackboard was configured in Aberystwyth University.

The organisation tools I don't like that much. The way it's organised is... when it comes to stack up like what we have done when they upload it, ...from next week, that will go on the bottom
-Student S2

4. Depth of navigation: Students complained of the depth of navigation and the fact that important features that are hidden deep in the navigation structure are not visible to students. Too many clicks was a turn off.

So instead of putting them in tools whereby students hardly go to because the most part that students go to is content and assignment. So instead of putting the discussion forum in the tools, I will like to move it from the tools and put it on its own. So that people will know that through this discussion forum, we can ... it is not visible because people don't click on tools in Blackboard. But they don't know that inside tools we also have other means whereby you can contact the lecturer. People only believe that you can contact the lecturer through email. -Student S23

What I said earlier about the least feature in terms of actually navigating around the ... page that most people trying to see the same work, same work means having the same name in terms of content, while you are navigating but they go to a completely different page place when they need something else depending on the content or scenario which it tends to require more clicks than I feel like you need to do. I think it should be a bit clearer. That might be because of its general purpose... should be able to... use it for this for that but at least my area of study it doesn't need to be more... to be honest. -Student S34

So I feel that it's a very good initiative to improve the students' learning experience because it keeps, gathers all the information that you need in one place and connects the user to the website, uses a few clicks. -Student S37

5. Ease of use: The importance of the usability of a tool like Blackboard to students can not be over emphasized and so it was interesting to see the student participants offer very useful comments on how easy or difficult they perceived the VLE to be.

It's easy to use but it could be easier -Student S1

So it needs to be more flexible so that we can get much from it.
-Student S8

I think what I like the most is that it's very simple to use. It's a very robust system. You get to Blackboard, log in and everything is what you think it is. -Student S12

It's constructed in a very simple manner where you can easily learn and make use of it. -Student S24

It's easy to browse and all the information is there. -Student S26

Like I said easy access to... like assignments, like lecture notes, PowerPoint and all that. That's pretty good. -Student S29

It's really easy to use.. -Student S35

It is easy to manage; it is easy to go around it. Just maybe lack of some information...but it's friendly. But...the outline, the colours are good; explicit. It is basically quite friendly to experience. You can find the headlines are really helpful. So if you are looking for something... -Student S36

It's easily accessible and you can just use it because you don't need to have much knowledge of Computer Science or anything specific to use the present VLE. -Student S37

...it's very, very clear to use. -Student S38

6. Engagement with the VLE: How the teaching staff in Aberystwyth University use the VLE to present information to students can make it difficult for students to find what they are looking for. It was revealed from the transcripts that there were inconsistencies with how the teaching staff used the VLE and this became an issue for the students.

...sometimes I couldn't find the document I needed because they put their documents in different folders. -Student S2

There is an issue with different lecturers using different ways, different folders like you have course documents things like that. Some other lecturers use new folders. Particularly, they use two folders, where you have the content module there called content and then an additional content in a folder that is called something else. If you click on one of them, you have all the content without necessarily checking the other one. -Student S4

...I was taking a course, it was not anywhere near tools, like I said it was under tools, so maybe it should be in a more prominent place under where is it called modules it should have its own features... -Student S7

I have had problems where sometimes some teachers put assignments on the calendar where some teachers don't. So you can't really go ahead with the calendar because of the assignment given to you... -Student S14

If at all there was any challenge, it won't be from the VLE. It will be from the data that was inputted into the VLE. One of my modules got mixed up and stuff and I think I had challenges, had to start looking for my module. -Student S22

Sometimes we don't get to see the content well. Like it depends on the lecturer may be they just upload it or something and when you click on it, when you click on it, you will see that no content being displayed but when you go to the document, what is meant to be in the content is in the document segment. So sometimes you... features that are not supposed to be in there. -Student S24

I couldn't it find anywhere and I ask... I can't remember where I ended up finding it but it wasn't where I expected it to be. -Student S34

...Blackboard... maybe the arrangement. So the way that the lecturer is using say content and assignment, is used so differently, so it's quite hard to find, ...many of the lecturers, so they would use it differently. -Student S35

They are always updating the Blackboard website which they find helpful with information and if they want to let us know that there has been some changes with the schedules or something that we can emulate, they will keep us up to date on Blackboard and also to the webmail. -Student S37

7. Facebook Integration: Given that students use the social media platforms a lot, it wasn't surprising to see it come up during the interview although only one student raised it.

Because now it's easier to use things like Facebook... Most people log on to Facebook every day. Most people only log on to Blackboard if they need to... because there is a... competition between BB and Facebook. -Student S14

8. Fitted for use: The students agreed that the Blackboard was okay for their subject areas. Only one student talked about how the VLE can be more subject-related in terms of the support it provides.

Like I said on how it is related to... with the link as to how I have been empowered in regards to my area of study. Little things that can help my learning in general you know things like having the

feature of a code. I did mention of that which I called the codility I think. A lot of interviews, technical interviews companies or whatever they would ask the contestants online that means it could be the same website they all use. -Student S34

9. Guide: The provision of a guide for users of VLE came up in the discussions with the students.

one thing about Blackboard, I find it hard to browse it because there is no guide, guidance to it -Student S2

Maybe it's not relevant for me but for someone who is new. I don't know if they have this but may be have a kind of tutorial to show or documents... detail to check everything... I am thinking for other people. I can't really think of anything now. -Student S20

10. Interface: The interface of the VLE plays a major role in the use of the VLE. The student offered divergent views on the Blackboard interface as shown below. It can attract or turn-off users. There are many comments on the interface of Blackboard. Some of the comments of the participants are shown below:

If I was to redesign it, I will try and make the use of the interface a lot easier, good to navigate -Student S2

It would probably be more streamlined... -Student S4

It will be good to have smart links to the useful stuff... -Student S5

I would say may be the appearance, it could be more catchy and something. Like the arrangement of subjects?, objects and... it could be more, I don't know, more attractive or something, better colours or I don't know like... -Student S7

As a Computer Science student... the HTML layout. Our Blackboard HTML arrangement... let say average... they should use more of CSS and more of JavaScript to make it look better... I think JavaScript is something that can improve the good looking of the layout of Blackboard. -Student S11

I think I might change the aesthetical approach, just to make it look a little bit more modern, a little more inviting to people who often use the system without necessarily... -Student S12

I like the organisation and the layout of the VLE. ...provides access to the correct module. -Student S20

So if the interface could be changed to because there are some apps that you use, Microsoft word and when you go over, hoover over a certain item, it gives you a drop down, it gives you a clue of what you are looking for. So if it could be more interactive, in the sense that it gives you, it shows you a path... -Student S33

My only concern is with things like you know when it comes to the user interface; the interface geek is coming out. But little things for instance you click down, you have left your track of, you want to, you have left your track of people replying, you have gone really down, somewhere down and you say oh I still want to respond, it is you that needs to go up backwards to reply but for why do I have to go back all the way up to click reply and then go back down and type my response. That is how it works at least I can remember. There's something you know like I said, you are on other websites, you are bonding and you want to reply, you see reply you just type or click reply down there. You don't have to go back to reply to the user, I mean come back down to type and then go back up to see if they have posted successfully it. -Student S34

Some of the tools...I didn't know about them... them. Because maybe there should be like a post mark or should be like colour so something so that we can... or it can be more visible for students. I feel great if you have everything in one place. ...visible then I think So... I feel everything is okay...that's the beauty of everything. It's easy to use. It could be more clear for some people like me... like more colours or something like that. -Student S38

11. Navigation: There were several comments on navigation by the students. While some agreed that the navigation was fine others disagreed by arguing that it was poor.

Hmm maybe like a search function if it's possible for all files in the module along with the module names, it will be easier to search through. ...a search function on every single page of the modules, they can have drop down box for the modules... click the drop down box it... if you click it, it drops down and will give you a list of the modules... I think that will be a lot easier... -Student S1

One thing about Blackboard, I find it hard to browse it because there is no guide, guidance to it and sometimes it's down due to maintenance which is a pain and so at the moment I... -Student S2

I like the way obviously you have got the, when you have got the modules that are easy to go on and navigate round. I think... there is a lot of content and I feel like sometimes, you won't be

able to find everything on there. You never find everything on... but usually things like... tell you where to go I don't think that is a problem but I find it quite useful -Student S3

But sometimes it can be a little bit of hunt to find what you need but in general it's always useful there... -Student S4

It can be quite difficult to find things normally. The way it has been set out is not as easy as it should be. It is quite good, everything we need is there. It's quite easy to get hold of it. However, it can be a little bit complicated from time to time to find things, you know there is quite a lot of them to go through -Student S5

It's a very convenient way of accessing course documents, course materials, for example you just have to... I think it's just fine when I think about the whole Blackboard thing. There's a problem sometimes it's the document given with the link to the document, the htrr/http into the site may not be working anymore then you have to, you try it and you realize for example the other day, I was searching for this law article and I spent quite a bit of time trying to find it because the... -Student S13

I really like how the way it is... you can ... I like it. I really like that you can get directly into folders and it's always easy to find things like content... I like, it's easy to use. -Student S18

it took me a while to learn it because my instruction memory is not too good. Yea but once I learnt my way around it; it's a very useful tool to me... -Student S27

It's not interactive enough. Because most time if you have not attended the first induction, most of, most of the resources you find them through trial and error. -Student S33

...just the usage in general, in terms of actually finding stuff. So sometimes, it takes a very long time, a lot of clicks to get to where you want to but ideally... -Student S34

12. Skills:

Oh you are talking to a man who has absolutely no interest in or whatsoever in Information Technology... -Student S13

Digital skills, not much really. In order to use, you should be quite competent in using it. Like downloading files and navigating... -Student S14

... I think I should just click and go directly to the page. For me it's really hard, I am not good with computers. -Student S15

13. Training:

There wasn't any training. . . through exploration. Nobody actually showed me but through exploration I got used to... the issue is that it was initially difficult but then exploration and trials, I got... by myself. -Student S8

I would say very much because before I got here, I didn't know VLE. So I think my first week in Aber, I was asked if I knew what Blackboard was (they had this little survey) if I knew what Blackboard was. I was like no. So we had training. Yes; so hard to understand how to do stuff online most of the time. -Student S22

Just learning, learning my way around it first. But I do know that the university clearly has, you know offers advice and help... but I'm a bit taken when it comes to software... I like to learn it myself but that's. . . once I learn my way around it, there is not much wrong with it. I find it useful. ...it took me a little while, I kid you not, but once I have learnt my way around it, it's a useful tool. -Student S27

like in class before we use the Blackboard; you ought to have, attended an induction... So if Blackboard could be more interactive like ... the first time you get the new app... shows you the tutorials so if you can have a monthly tutorial that gives you friendly, more friendly if you like, ... more information that broadens your use of the Blackboard. So that's the problem, that information I don't really know about it tutorials and I attended the induction, tutorials, yea there are some tutorials but you don't really, you are not really aware because some tutorials for example Turnitin you see... for other things like to gain more productivity from the Blackboard at a go sometimes, you are looking for articles, you know all those interactions will be more, it will be more less serious, it should be fluid. -Student S33

And actually... we had training like how to use Blackboard... and all stuff. So it was like for one hour and we were, one of the, one of the staff showed us everything, how to use the Blackboard. That was very useful so we knew everything like... everything before. -Student S35

The use of the constant composition technique within the teaching staff group revealed so many issues surrounding the **Navigability** of Blackboard in Aberystwyth University. These issues enumerated above will be addressed later by proffering solution to them in Chapter 8.

5.7.2 Constant comparison in the teaching staff group

The constant comparison technique was also used in analyzing the various incidents related to Navigability in the teaching staff group. The teaching staff group was made up of two groups and the analysis of both groups were compared. The incidents that were identified in the transcripts and compared for analysis are as follows:

1. Architecture: Within the teaching staff, participants pointed out that there were issues with the architectural design of the VLE as it affected the navigation of the platform. some of the words of the participants supporting this incident are

Everything is done with a mac-based system which is problematic.
-Teaching staff T3

2. Barriers: Two participants were of the view that the VLE was a barrier to learning.

I think the Blackboard design is an obstruction to students. -
Teaching staff T3

To make it feel, to try and remove the barrier to students. ...Blackboard seems to be a barrier to most students... -Teaching staff T14

3. Breadth of Navigation: The participants complained of information overload on the web pages.

A lot of the students would prefer, some students would prefer to have some of the web pages with less content... so you try to work round on how to use Blackboard. It might be easy for students to access materials and how to organise that and the... using a regular web page, I might like different choices to how I would determine? to using a VLE but if I want to use a VLE, I think I am in a better place to use a VLE so I try to work round it. -Teaching staff T14

I will probably actually delete a lot of the features that are in there. I think my ideal piece of software for doing this kind of thing will be if you had a very very simple starting point where you have a very simple screen, very few buttons, clicks and very few menu items which gave you a real simple clear structure for the bare minimum that you needed and then you can then choose to include other more...things . So I think one of the problems I have with Blackboard is that you... it out and you're just presented with a wall of options. There are probably now I login, I have my missing module space. Once I click on a module, I will probably find it viable for every bla and bla you click on the screen which do different things. You know I tend to wish I don't understand because I have never probably...probably what I will do if I was to redesign will

be to massively think of any kind of basic things and then allow people to gradually having a little bit of extra complexity. And I think that would make it easy for students to engage with it. And it would also make it easy for the students to understand what was going on in each module and how each module works. So I would probably simplify it rather than making it more features. Like it said, it has got every feature that I ever need but I'll never use any of them because I don't... -Teaching staff T17

4. Circumvention: There was a trend in the data of some users bypassing the VLE to use other tools.

Some times what I want to do is not appropriate with the way of doing things. So in terms of alternatives I probably use that. I find out that the alternative method is more direct, in a way also more personalised whereas there are some kinds of gaps there using the learning platform. -Teaching staff T6

So it becomes easily resisted to use other things... -Teaching staff T11

5. Clunky

It's very clunky. -Teaching staff T8

For me it's a clunky system. . -Teaching staff T11

It's quite clunky to use. -Teaching staff T12

It's just a bit clunky. -Teaching staff T14

If you...on Facebook, it's just like very very smooth, you know like people who... how easy it is to type something and like somebody's post and the basic features you know are very very smooth and the students appreciate that. Now Blackboard is the opposite of that. It's very hard to post in forums posts. You get this, you know contact form that has all the different patterns and you, it's very very clunky, so one thing I will want to make when I create a new environment will be much more smooth, much more modern than....I think Blackboard looks... -Teaching staff T15

6. Configuration: Another source of challenges with the VLE was the way that Blackboard was configured for use in Aberystwyth University.

Thinking about other software that I have used, I've been happy with, wonder Blackboard could adopt some of those... I don't know. Instant messaging thing could survive from any number of messaging software...they do it well. -Teaching staff T13

what's frustrating is the level of nesting of things that you get. So you have got scrollbars and scrollbars and scrollbars on the side. I mean it's difficult to...with scrollbars... -Teaching staff T14

7. Depth of navigation: The transcripts revealed that users had difficulties with navigating the VLE due to the level of depth of the navigation.

Yes; it's fine. It has to be a little bit cumbersome. You know, you are always going deeper and deeper into something. -Teaching staff T2

There is no way to say here up is a program for such and such a module, here have in front a set of reading in the topics. You have to add them one by one, click, click, click all the time. -Teaching staff T3

For anything you want to do online, there's a lot of process, very slow process by clicking your way through it. ...I will make it easier to use with less, less clicks as you go through -Teaching staff T11

For every file downloads of assignment, it takes me 25 minutes of clicking buttons and the need to find the place where I can actually download all the assignments as I click through. -Teaching staff T17

8. Ease of use:

It has got such a great deal of flexibility you know in the sense that you can email students... talk to them, you know if you look at the tools, they have got a very wide range of tools and they are not using a fraction of it. -Teaching staff T2

I think it is fine. I don't have any problems with Blackboard at all. It's easy to get into, you can see a whole lot of your modules, home page, it's easy to make new folders and put things in the right place. I don't feel constrained. -Teaching staff T4

Okay... right, the first point about Blackboard; I have never been very impressed with it - the system. I think it is cumbersome and not easy to use from the teacher's point of view and I think that there are in fact quicker and more... methods of communication. -Teaching staff T6

At a time... after I tried it, it doesn't quite look the same way because what I wanted them to do was setting up a ...meeting and then report, and then report back to each other and it's structuring that to Blackboard it was a nightmare. It took, we had to devote a whole week of us teaching to showing them how to do, you know

staggering that in a lab based setting, learning how to do it which is a nightmare and then we had to debrief and in the debriefing I wanted them to discuss the pros and cons of working and working across time zones and virtual working and all that. And all they did is complain about Blackboard.... it didn't fulfill you know the pedagogical objective in that regard. That was a nightmare. So my major preference is I would prefer to use Moodle to Blackboard because I don't think Blackboard is particularly flexible. It's, it's fine for posting but it's a very... system, it doesn't really lead itself to the kind of interaction that I was talking about in question one. You need a system that's flexible and you need a system that talks to every system and... your student record so that you keep, you can easily move between the teaching element and the progression element. -Teaching staff T8

So I'll like to see views and resources for summative assessments that will be flexible and less time consuming and be able to give due, real results of students' performance which will be able to adjust your teaching or to feedback your students about their performance in the module and that feedback will enhance... -Teaching staff T10

May be something that is a little bit more flexible and narrowed... And I will make it easier to tailor to specific modules... the look and feel of it, information... to make it easier to actually incorporate it into a lecture... so that... whether it is forum, discussions, wikis...not part of the VLE but is part of the technology that we have in the... -Teaching staff T11

The links to Blackboard content can be difficult to get hold of. The URL has links to some particular content items. You have to do a few tricks so that it can work well. So yea...VLE, you could make better support for the system than currently.

The continued challenge is Blackboard is worse, students don't believe in Blackboard; they go there when they want some information. -Teaching staff T14

9. Engagement with the VLE: The engagement of the teaching staff with the VLE also contribute to the problem of navigation within the VLE. For instance, how some of the teaching staff structure their content might be an issue.

For me, I teach, I teach three modules yes, I've got a teaching line, I'm from teaching line. But I certainly need time to ... two or three times in a year and if you see how, if you do something two or three times a year, you want it to be easy. You don't want to have to look it up every time because you don't remember... -Teaching staff T3

I mean the general thing- quick access to content. I don't actually think that Blackboard necessarily prevents that, I think that's how we structure our content. So but you know things like Coursera feel more like immediate in how you get from login to the course. So that's one specific feature but it's horrible...but the fact that you even have to login in is...information. I never look out but instead I just move directly to the module I'm interested in. I get a very easy way, easy way around it with human readable form in one of my courses. -Teaching staff T14

Another issue related to the engagement with the VLE is that some of the teaching staff that do not teach all year round using the VLE or some of the functionalities. For instance, a teaching staff may teach in one semester and not teach in the other semester. When they then resume to teach in the following academic year, using the VLE to execute certain tasks becomes a challenge. Remembering how to locate some functionalities and use them becomes difficult. This is due to the fact that some of these functionalities on the VLE are structured in such a way that they are not easy to remember. Below is a quote from one of the teaching staff on the challenge of remembering the use of some of the VLE functionalities after not using the Blackboard for some months.

And so if I do use Blackboard, I use it for like two or three months and I won't touch it for the rest of the year on the whole because I'm not teaching all year or haven't recently and then you come back to it after nine or eight months of not using it and you have forgotten where all the little buttons is hidden and which menu you have to do...apart from using..., it's not terrible. I think that if I engage with it ...and I think if you were a teacher and you say "I want more teaching..." but you had two or three modules and you were teaching continuously for seven or eight months of the year and probably they are quite...they will actually be fine. My problem is really is that it's part of... using it sporadically. So I use it for a couple of months and like I said earlier and then not touch it again -Teaching staff T17

10. Facebook Integration: The teaching staff were of the opinion that Facebook should be integrated with the VLE in order to provide maximum learning experience for the students.

I think the students are already interacting and engaging with each other on other platforms. And getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... And it would have anonymous forums which were threaded rather nicely like Facebook may be... I said make it like Facebook. There would be... discussion and some Facebook integration for their verification. -Teaching staff T3

If you...on Facebook, it's just like very very smooth, you know like people who... how easy it is to type something and like somebody's post and the basic features you know are very very smooth and the students appreciate that. Now Blackboard is the opposite of that. It's very hard to post in forums posts. You get this, you know contact form that has all the different patterns and you, it's very very clunky, so one thing I will want to make when I create a new environment will be much more smooth, much more modern than....I think Blackboard looks... May be there is something there, maybe there is something there Facebook integration...to what direction, I don't know but something which makes the content quick and easy for students to get in. -Teaching staff T14

11. Fitted for use: there were divergent views on the suitability of the VLE for learning and teaching. while some of them agreed that it supported learning and teaching, others disagreed and expressed their inability to adequately use the VLE in their teaching.

I think it's not tailored to the way that I want it to. -Teaching staff T3

I'm aware it's tailored you know, it's tailored as well to my needs as I'm able to use it. -Teaching staff T5

...I think it is constraining and because it has a sets up, a certain way of doing things and now how it might have been designed, it's for example do you, I don't think it's all ...the same as the point of view of any teacher of the subject. So ... and maybe it is designed from the point of view of students' consumption rather than the teacher's intentions and objectives in career and teaching. -Teaching staff T6

... Blackboard is kind of very generic for all modules and anonymously, you can tailor it to be specific but I just use the basic that is kind of lecture slides in the content, any announcement in the announcement, I don't tailor tools to the specific module. -Teaching staff T7

They are not specifically tailored to any module. And I will make it easier to tailor to specific modules... the look and feel of it, information... to make it easier to actually incorporate it into a lecture... so that... whether it is forum, discussions, wikis...not part of the VLE but is part of the technology that we have in the... -Teaching staff T11

A lot of the students would prefer, some students would prefer to have some of the web pages with less content... so you try to work

round on how to use Blackboard. It might be easy for students to access materials and how to organise that and the... using a regular web page, I might like different choices to how I would determine? to using a VLE but if I want to use a VLE, I think I am in a better place to use a VLE so I try to work round it. -Teaching staff T14

The divergent views on the tailoring of the VLE to the modules may be due to the fact that different departments have different needs. The present configuration may support learning and teaching in some departments than others. So trying to meet the needs of all the users at the same time seems impossible. Obviously there will be requirements conflicts when the developers try to meet the needs of all the departments and all the categories of users. It would be better to have separate views for different group of users as well as different institutes/departments in Aberystwyth University.

12. Interface: The interface of the VLE plays a major role in the use of the VLE. It can attract or turn-off users. There are loads of comments on the interface of Blackboard. Some of the comments of the participants are shown below:

I think the Blackboard has an interface that is unworthy... Blackboard is ugly and complicated. And there are a lot of things on Blackboard that people don't use which could... and it's very difficult. -Teaching staff T3

I find it quite an easy interface to work with. -Teaching staff T4

And I will make it easier to tailor to specific modules ... the look and feel of it. -Teaching staff T11

You know, it's a bit cumbersome at times, it can be a bit, so many menus, so many drifts, the interface perhaps could be a bit you know streamlined may be... You can, you can make the module page look nice... I don't know, maybe it's just an issue of maybe something that looks a bit dated...I couldn't talk about how to improve the interface maybe while up to it... -Teaching staff T13

So I think it would have been nice if there were to be a cleaner interface and a clean wrap up around the content. -Teaching staff T14

I think anyway the problem with Blackboard in particular I think some of the user interface stuff is pretty dire. -Teaching staff T17

13. Navigation: Given that Navigability was the core category of this study, there were so many comments from the participants on issues surrounding navigation.

There are a lot of issues with the kind of software Blackboard. We cannot move easily..., you cannot... from your best part or from

files on Windows into Blackboard. You cannot load... -Teaching staff T1

It would have the ability to organize things in folders that you can access from a drive. So you will be able to master drive and move folders across and it won't have to cause a great burden in that structure. Because another thing we do is transferring files, yeah and if you have got a file structure that's organized, why would you need to then copy that one at a time across? -Teaching staff T2

Today, I wanted to set up an assignment... so I went to one module, I went to assignment, I went to tools, I went straight to assignment, so I have to make... in that like me turning in an assignment. So there's the assignment, it's in the menu but it does not do anything... But I certainly need time to... two or three times in a year and if you see how, if you do something two or three times a year, you want it to be easy. You don't want to have to look it up every time because you don't remember... -Teaching staff T3

I think it is well organised. It's so easy to upload things I want to upload. It should. I find it quite easy to navigate. But there are quite simple ways, it's not so bad for me to do the things I want to do but I think it's fine. -Teaching staff T4

It is not easy to navigate always. -Teaching staff T6

It's not clear on how to navigate your way through it and I use it... in different ways and you're looking at and trying to navigate your way round it. It's just a nightmare. -Teaching staff T8

The links to Blackboard content can be difficult to get hold of. The URL has links to some particular content items. You have to do a few tricks so that it can work well. So yea... VLE, you could make better support for the system than currently. -Teaching staff T14

As can be seen from the comments of the participants above, there were different views on the efficiency of the navigation of Blackboard in Aberystwyth. These differences were not unlikely as they could be attributed to participant's differences in experience, training, skills, subject area and level of use of the VLE amongst others.

14. Time consuming

This is not easy. It's not simple...it cost me extra 15 minutes of work every time... -Teaching staff T3

From the students' point of view, if it is easier to use, I am not sure but for me it is more time consuming. -Teaching staff T6

It's more time consuming. I don't know how it is going to be but then I will like to see something that is much more easier and much more, much less time consuming in terms of how you can put up materials and it allows you the access to it and for them to be used to access their understanding of what you are doing, what you are teaching them and so on and so forth. I want that to be less time consuming. I don't, I wouldn't want something that I have to spend hours and hours as if I'm doing the summative assessment of students you know because that would, if not going to be, might become impracticable if you want, if you want to spend the amount of time to try to do sort of do a normal teaching session in the period of time. -Teaching staff T10

For anything you want to do online, there's a lot of process, very slow process by clicking your way through it. It takes so much time just to put any information up there. -Teaching staff T11

15. Training:

I have also been to a couple of the training, training sessions on the enhanced presence and I have looked at what you can with the Blackboard and it's you know, it's great what you can do. It is just having the time to... -Teaching staff T7

I would make it rather more like an... make it so that you don't need an extensive training programme and that kind. It works with humans' work, as how we think and we need features responding and interacting with it without extensive training programmes on how it's structured. So I would and I would certainly make sure that it allows, it so takes it easy individual module one, module two, as many group communication based... very often in class, clips of audio or video.. YouTube, from iPlayer and so forth... look at this look at that but you can't do that... and if you have to do, you have to structure it in such a way that the students can... something that's so easy you click and it... -Teaching staff T8

...the members of staff do offer a lot of support in terms, of ways of training and...and drop in sessions and so on and so forth. So much support for the teaching staff to be able to use the VLE effectively. -Teaching staff T10

You know I can't work it perfectly. So for example I do a lecture capture and seems to disappear unto towards rather than appearing in the content folder. And I know that you can do that but I don't know how to do it. So, so any time there's Panopto and that kind of external thing as well, it seems to work okay. I'm sure I can make it work... I wish I know how to do it. I was on their training

and they have given us...they could train us but it's so boring that they can't train you on everything and that's part of the problem I think. ...I can actually all do of this...with a little bit more training I can do a bit more okay but... -Teaching staff T12

And the options are going to be there. So take up to be somewhere so I guess you just get used to it, you work round it. So the point is they are minor issues but once you know where everything is, you can go on training courses, you know they have the academy, it might help you with Blackboard so there's no real excuse apart from time. So it's a clear thing I go to the Academy for, I go on courses maintenance when I can and how much I'm...engage with the Academy, people who are willing to... I'm, so I do feel that I'm kind of committed to its success. I don't know what the alternatives will be so I'm not really worried about what the...are. I'm happy to use it to make it successful and I will continue to develop how I use it as a learning and teaching tool. -Teaching staff T13

16. Differences among the teaching staff: The study revealed that there were differences of opinions among teaching staff with respect to the usability of the VLE. While some of them agreed that it was easy to use, others believed that the VLE was clunky and cumbersome. However in one particular case, a member of the teaching staff mentioned that the chunkiness was in certain aspects after alluding that the VLE was easy to use earlier in the same interview. This was interpreted by the researcher that the VLE was ease to use with respect to certain features and also difficult to use in some other aspects. Another point worth mentioning here is that based on the level of use of teaching staff, their skills, expectations, technical expertise, exposure to other technological platforms, department and training there were bound to be differences in their opinions on the ease of use of the VLE. Some users may have accepted the Navigability issue as part of the VLE so that they are not bothered anymore.

I so got used to using them that I have forgotten something I would like to see improved. -Teaching staff T2

Hear this teaching staff “I so got used to using them that I have forgotten something I would like to see improved.”

The use of the constant composition technique within the teaching staff group revealed so many issues surrounding the Navigability of Blackboard in Aberystwyth University. These issues enumerated above will be addressed later by proffering solutions to them in Chapter 8 of the thesis.

5.7.3 Constant comparison of the director of studies

The transcripts of the directors of studies were analysed by examining and comparing them to see how the data, incidents, codes and categories of the participants

were similar and different in respect of *Navigability*. Based on this comparison, the following points were revealed.

- (i) It was the view of the first director of studies that was interviewed (D1) that differences across institutes with respect to how they present information could hinder how students access information. He was also of the opinion that students can develop skills in the first year and use it in subsequent years as they progress in their studies. “Do students know where to look for information? Have they got searching skills or awareness?” He asked. He also spoke about some of the frustrations experienced by students citing the Blackboard interface as an example. He advocated that the interface should be clear to user by developers using familiar notations.
- (ii) The second director of studies (D2) to be interviewed was of the view that the structure of Blackboard hinders searches. D2 argued that because the arrangement of materials was not user friendly due to the structure and layout of the interface of Blackboard, a lot of users particularly the teaching staff spend an awful lot of time when using it to accomplish tasks. Given that time is of the essence with everyone (especially with the teaching staff), this can become a turn-off, a barrier to using the tool and a source of frustration leading to a poor user experience. This poor experience could ultimately lead to the users circumventing the VLE to use other tools.
- (iii) Another interesting point raised by D2 was the fact that because of the skill sets required to use the VLE, people have to be trained on how to use it. It can be argued that the fact that people need to be trained to know how to effectively use the VLE is an indication to the fact that Blackboard is not user friendly enough. This suggests that the navigation needs to be re-engineered in order to make it possible for users to be able to explore it smoothly and easily. An improvement of the usability of Blackboard especially with specific reference to user interface redesign and provision of user-friendly navigation mechanisms will go a long way to improve the user experience. Based on this, the researcher is convinced that when the Blackboard and other VLEs are redesigned or reconfigured with user-friendly navigation and notations, people with basic computing and web skills will be able to use the tool without training. This would eliminate the difficulty associated with finding things on a complex site like the VLE. People would instantly know where they ought to look and find what they are looking for.
- (iv) On resolving the inconsistencies with the presentation of information, D2 argued that there should be some kind of discussion between staff and students on how to deploy the VLE. And When staff make changes to the presentation of information or arrangement, they should inform the students. This can be done through the module handbook, announcement on the VLE, discussion forum or by email. This notion can be viewed as the need for the VLEs to be user-centric as well. The VLE developers will need to be user-focused when configuring the VLEs.

- (v) According to D3, the VLE should and can be easier to use than it is right now. The structure of Blackboard is so rigid that navigation is a huge challenge. D3 argued that the layout of the VLE needs to be revisited so that users can navigate the tool easily.
- (vi) D3 agreed with D2 that Blackboard is quite difficult to use. According to him “it provides you with challenges rather than opportunities” how can this tread be reversed? As a tool, the VLE should make the task easier and not more difficult as it does now.
- (vii) According to D3 Designers need to understand how users work.

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work.

To be able to successfully design a system that is fitted for use, the developers should focus on how the users perform their tasks in their usual settings. The VLE should be configured around their pattern of use. This would provide a good user experience for them. This resonated with what D2 previously said about the VLE being user-centric.

- (viii) Another point that came out of this group of participants was if VLEs could be developed and structured just like Facebook in order to make it easier to share materials and collaborate with other users. VLEs having the functionalities of social media like Facebook makes it easy for users to use it, share information and interact.

All the three directors of studies interviewed agreed that the navigation mechanisms of Blackboard needed to be improved in order to enhance the experience of users.

5.7.4 Constant Comparison in the e-learning group

Given that only one member of the e-learning team was interviewed, there was no constant comparison within the e-learning team. All the data, incidents, codes and categories within the transcript of the single e-learning participant related to *Navigability* were compared to the other groups made up of students, teaching staff, directors of studies and admin staff in order to get some meaningful information to contribute to the emerging issues.

5.7.5 Constant comparison in the administrative staff group

The administrative staff group was made up of two participants. Their transcripts were compared to see the similarities and differences with respect to issues surrounding *Navigability*. They both agreed that they were committed to providing a consistent experience for the students in their engagement with the VLE.

Both agreed that there were *Navigability* issues with the VLE. However, while one of them agreed that the VLE was easy to use and user friendly in spite

of the Navigability issues, the other participant was of the strong opinion that the VLE was not.

I think it's relatively easy to use, I find it quite user friendly and I think that... while the fact that if you don't know how to use HTML it's quite clunky and the code looks messy if you are not good in HTML and not all members of our staff are fluent in HTML. I think, it has assignments hand-ins so easy although...I don't like...group work or group essays, there's no way of organizing that through Turnitin. I mean, it's an on-going problem and at the moment... so that's a big deal... - Administrative staff A1

I think that a lot of the tools that exists in the mainstream of the modules are either lacking or not working at all. A really good example of that is the...ordering of the boxes of content and paint. There are two ways to that. You can actually drag to be able to drop the content of the box and it never works. Do you reorder it at all or do you reload the page is going back to the order you have put it in. So that's one of the biggest frustrations with the Blackboard site. And I think another problem is just that there's a lot of inconsistencies of the user interface between departments occasionally there are patterns, patterns...there is no clear, use it for one simple function that's clear...and symbols that will lead you to three different... It's quite frustrating. - Administrative staff A2

5.7.6 Constant comparison between students and teaching staff

The students and teaching staff groups were compared during the analysis stage leading to similarities and differences. Both groups agreed that Navigability was an issue with the VLE. Some of the points identified are as follows:

1. The VLE is underutilised. Information overload and too many features on the VLE that are rarely used or never used at all. As a result, only a fraction of the VLE is used.
2. Content providers vs content consumers It was discovered that the teaching staff are primarily content providers on the VLE while the students are primarily content consumers. The implication of this was that as content providers, the teaching staff had more in-depth interaction with the VLE and as a result were more exposed to the challenges of navigability. These challenges were described as “cumbersome”, “clunky” Ranging from uploading lectures slides, moving files around the VLE, uploading lecture recordings, setting up quizzes, downloading assignments, setting up groups etc, the teaching staff had to deal more with navigability than the students. Another consequence of this was that the teaching staff was spending too much time on the VLE at the risk of having less time to do other legitimate

activities in the university. This discouraged some staff from going beyond the basic use of the VLE or in worst cases, a circumvention of the VLE. This was not surprising as people will generally take the path of least resistance.

...you are always going deeper and deeper into something. - Teaching staff T2

So for example, I will make my notes likely and then I will have to upload each lecture one at a time. There is no way to say here up is a program for such and such a module, here have in front a set of reading in the topics. You have to add them one by one, click, click, click all the time. - Teaching staff T3

I think it is cumbersome and not easy to use from the teacher's point of view and I think that there are in fact quicker and more... methods of communication. - Teaching staff T6

For me it's a clunky system. ...for anything you want to do online, there's a lot of process, very slow process by clicking your way through it. - Teaching staff T11

3. Better navigation mechanisms: Both the students and teaching staff agreed that there was a need to provide better navigation mechanism for the VLE in order to enhance the use of the VLE by all users. They would prefer to see a reduction in the number of clicks they have to make in order to get to their desired destination. Time is of the essence to the users and the less time they spend searching or reaching their targets on the VLE, the better for them.
4. The consistency of the teaching staff and expectations of students: The way that the teaching staff structure the VLE could affect how the students navigate the VLE. The students reported a lack of consistency on the part of the teaching staff. Difference in the arrangement of materials on the VLE impacted negatively on how the students accessed their learning materials.

I've had problems where sometimes some teachers put assignments on the calendar where some teachers don't. So you can't really go ahead with the calendar because of the assignment given to you. - Student S14

Sometimes we don't get to see the content well. Like it depends on the lecturer maybe they just upload it or something and when you click on it, you will see that no content being displayed but when you go to the document, what is meant to be in the content is in the document segment. So sometimes you... features that are not supposed to be in there... - Student S24

5.7.7 Constant comparison between students and the directors of studies

One of the revelations of this study was that the problems of navigation was not only as a result of how the VLE developers configured the VLE. The way the teaching staff used the VLE was found to also contribute to the problem of navigation. So it was interesting to hearing D2 talking about some kind of discussions between staff and students on how to deploy the VLE. Undoubtedly, this will go along way in helping to resolve the inconsistencies associated with the presentation of information on the VLE and ultimately improve the navigation of the VLE. Constant comparison between students and the e-learning team The views of the students were also compared with the data that was gathered from interviewing the member of the e-learning team. Some of the Navigability issues that were raised by students also resonated with what the member of the e-learning team said.

Sometimes when you are...when you enter the page... sometimes it depends on the resolution of the screen, there might be scroll bars and some toolbars or ... scrolling through the content, you might have several levels of scroll bars and that's not very adaptable, slow responses interface, so that would be something like that improved. So I think the students may like some final trip down to the notifications area. They like notification area if it could be made better. - e-learning team member E1

5.7.8 Constant comparison between students and the admin staff

The need for a consistent experience with the VLE by students came up in the transcripts of the admin staff interviews. The two participants in the admin group both talked about how they were committed to providing a consistent experience for the students. This was very important to ensure that the students knew what to expect and where to find them. This eliminated the confusion that some students were experiencing with some teaching staff who presented information on the VLE in an haphazard manner.

We have a consistent design that we present to all the modules and that way when you go between... We, we are, we are responsible for making sure that the current event is consistently in the files that we put as information they would provide. - Admin staff A1

So all our modules are designed to work in the same way for every module across the whole department, that...how we make the engagement to ensure they have a consistent user experience... - Admin staff A2

5.7.8.1 The criteria for a core category

For a core category to be fully accepted for a study, it must possess certain criteria within the study under investigation. According to Glaser and Holton (2002) and Holton and Walsh (2017), these criteria are centrality, frequency, relevance, grab and variability. These criteria are discussed below as they relate to **Navigability** which is the core category for this study.

1. Centrality: This criteria implies that the core category should appear central to the main concern. using the technique of constant comparison, navigability was seen to be central to the study. It was a common issue among the students, teaching staff and the directors of studies, e-learning team and admin staff. The centrality of navigability was demonstrated with its presences in the views of all the categories. Therefore it can be said that **Navigability** is central to the user experience of the VLE users.
2. Frequency: The concept of frequency implies that the core category reoccurs frequently in the data and is seen as a regular pattern. The analysis of the transcripts of this study shows that **Navigability** occurred frequently in the data. It was a major issue that dominated the world of the participants as a clear pattern was established all through the data.
3. Relevance: This implies that the core category **Navigability** is relates meaningfully and easily with other categories. **Navigability** was identified to be related to the other categories in one form or the other.
4. Grab: The concept of grab implies that the core category should have some imagery and explanatory power with general implications beyond the substantive area. Clearly, this criteria has been met as **Navigability** goes beyond virtual learning environments (VLEs) because **Navigability** is a major issue in software engineering both in web and stand alone systems.
5. Variability: The concept of variability is that the core category must never lose its meaning i.e. must remain constant even under varying conditions. Again this criteria has been fulfilled by **Navigability** as core category possesses this criteria as its meaning remains constant under varying conditions. The concept of **Navigability** doesn't lose its meaning under any varying situation.

5.8 Theoretical saturation

In the sampling of the data, the researcher gets to a point in which the core category is saturated. This is characterized by having no new information about the core category even though new data is presented. This is achieved by checking the information from the constant comparison of the incidents, data, concepts from previous analysis with the information from the new comparison.

5.8.0.1 Theoretical saturation in the student group

The core category was saturated during the sampling of the student participants. The students were commonly using words clunky, difficult to search, easy to find things. The issue of some teaching staff not being consistent in their presentation of materials on the VLE also cut across the sampled groups. The researcher was convinced of theoretical saturation of the core category as regards the students since no new information or concept emerged after the sampling of the last sample group.

5.8.0.2 Theoretical saturation in the teaching staff group

Comparing data, incidents, codes and categories yielded some new information with regard to *Navigability* as the core category of the study. During the analysis, it was discovered that the teaching staff experienced more navigation challenges than the students due to them being primarily content providers. The issue of skills and training also come up as well as the depth and breadth of search that users have to undertake before getting their search target.

5.8.0.3 Theoretical saturation in the e-learning group

While the core category was observed in the e-learning transcripts, it was not so much talked about by the lone participant. This is understandable because the focus of the interview was not on navigation but about the experiences, perceptions and expectations of the users as it relates to the e-learning team. For instance there were no new concepts with respect to *Navigability* from the e-learning team

5.8.0.4 Theoretical saturation in the administrative staff group

Navigability as the core category of this study was present in the administrative staff group of participants. It reflected in the views of both participants. The only thing that seemed to appear new from the Admin staff category was what they did when they discovered that the way information was presented to students affected their navigation of the VLE. The analysis also showed that the admin staff had the responsibility of managing the modules by way of design, updating and maintenance. This ensured that there was uniformity across all the modules with the department.

5.8.1 Conceptualization of Navigability

The ability to crystallize concepts from a given set of data is what distinguishes grounded theory (GT) from other forms of qualitative analysis techniques. This process is known as conceptualization and it is achieved in GT by using the technique of constant comparison to develop a theoretical model. The theoretical model is what provides an explanation for the happenings in the substantive area under investigation. For a GT to be truly valid the researcher must get beyond the description of what the data represents and move to the conceptual level to

offer some explanations for what is going on with the data. It's at this level that the researcher is able to explain the relationship between concepts and the relationships between them. This helps the researcher to focus and make meaning of the data without getting overwhelmed by the volume of data. According to Glaser (2002), "All that GT is, is the generation of emergent conceptualizations into integrated patterns, which are denoted by categories and their properties. This is accomplished by the many rigorous steps of GT woven together by the constant comparison process, which is designed to generate concepts from all data. Most frequently, qualitative data incidents are used."

The conceptualization of **Navigability** from the given data came about as the research interrogated the data and probing for what was common and dominant with the initial set of data.

5.8.2 Theoretical coding

Theoretical coding is the process of developing a relational model through which all the substantive codes /categories are related to the core category (Hernandez, 2009). The model so developed is called a theoretical code. The theoretical code builds the substantive codes into a substantive theory of the study by integrating them into a cohesive structure that explains what is happening in the substantive area under consideration. This ensures that the theory arrived at is grounded in the data used in the study. In the same vein, Hernandez (2009) posits that the discovery of theoretical codes is pivotal to the development of an integrated and explanatory substantive theory; and makes the distinction that the theoretical code which emerges to integrate the substantive theory is different from the core category of the study. Similarly, Fernandez (1994) argues that "The theoretical code is the conceptual model of the relationship of the core category to its properties and to the other categories and that it is this relational model that integrates the substantive categories into a theory."

5.8.3 Theoretical sorting of memos

The memos of the study were sorted into conceptual headings with a view to providing conceptual ideas to aid the generation of the theory. Over 200 memos were written for the study. The memos captures the views and thoughts of the researcher during the study. Memos are integral part of a grounded theory as they provide the needed pool of ideas for explaining what is happening with the data. These memos were sorted by hand and placed under different conceptual labels for better analysis in order to support the emerging framework of the study. Arranging the memos under the names of the conceptual gave the researcher a better picture of the issues and ideas about the concepts that were emerging from the study. The conceptual labels that were generated are as follows.

- (i) How staff use the VLE: This captured the thoughts of the researcher during the course of the research work. An example is displayed in figure 5.3

- (ii) Usability: The several memos were written on the usability of the VLE as can be seen in figure 5.4
- (iii) User requirements: These memos captured some ideas on tailoring a VLE according to the unique needs of users and domains. An example is displayed in figure 5.5
- (iv) Navigation: A number of memos on the challenges, perception and experience of users with the navigation of the VLE and how it could be improved were written. An example of such is shown in figure 5.6
- (v) Time: There were also memos the time consuming nature of navigating the VLE. An example is displayed in figure 5.7
- (vi) Training: Memos were written on the training of the students and staff to use the VLE. There was a strong indication that a VLE with smooth navigation will not require people to be trained before they can use the VLE. This can be seen in figure 5.9
- (vii) Architecture: Memos were also written on the architecture of the VLE and how it affects navigation within the VLE. An example is seen in figure 5.10
- (viii) User Interface: Memos on having a clean interface fit for use. This is displayed in 5.10

5.8.4 Theoretical model of the study

In a grounded theory study, there is the possibility of having several theoretical codes during the process of coding. This because a theoretical code is simply finding the relationships between two or more concepts. However, it is the duty of the analyst to integrate these several theoretical codes and develop a major theoretical code that best fits the study for the purpose of generating a theory. This position was reiterated by Fernandez (1994) who argued that theoretical coding conceptualises how the substantive codes are interrelated by generating hypotheses that are then integrated into a theory. The grounded integration of concepts is a flexible activity that provides broad pictures and new perspectives. The theoretical flexibility, however must remain grounded on data.

With the above in mind, the researcher came up with some hypotheses as shown below.

In a VLE, the time spent in searching for an item is directly proportional to the complexity of the navigation. This implies that the more complex the navigation of a VLE is, the more time is spent searching for things and the more likely for the user to be less satisfied with the user experience. It can also be inferred that the simpler the navigation of a VLE is, the less time is spent navigating it. In other words, the time of navigation is inversely proportional to the complexity of navigation.

It can also be said that the more complex the navigation of a VLE is, the more training is required for the user for the user to be able the use the VLE efficiently

and effectively and the converse is true. But sadly, skills or training won't guarantee a great user experience if the complexity of the VLE persists. Even those with the skills of effective navigation still desire to have the process easier and simpler. Training is only a make-shift solution because it does not necessarily provide the user with a great experience. The solution to the problem of complex navigation is not more skill or training but an overhaul or revamp or reconfiguration of the VLE. The data suggests that some people with the requisite skills and training still complain about the complexity of the navigation mechanisms of the VLE.

Users should be able to successfully and satisfactorily navigate a VLE with basic skills so much so that they would not need further skills or more training to accomplish tasks. A VLE with well-defined navigation mechanisms will have little or no need for training. The users (students and staff) who by default have computing skills will not need training as it were. They will explore the system and find their way around because the navigation is user friendly and user based. The navigation should be related to the users and their behaviour.

We must remember that the VLE is a tool and not a task. In that sense it should be easy to use the VLE in accomplishing tasks. By implying the logic above, it can also be inferred that the more complex the navigation of the VLE is, the more skills are required by the user in order to be able to use the VLE efficiently and effectively and the converse is also true.

The constant comparison of the data, incidents, codes and categories within and across the different groups of users of VLE in Aberystwyth University as presented in section 5.7 revealed that poor navigation mechanism within Blackboard was as a result of the following barriers:

- (i) Poor usability of the VLE
- (ii) Information overload
- (iii) Clunky system
- (iv) High learning curve
- (v) Lack of memorability
- (vi) How the teaching staff structured their modules around the VLE
- (vii) Usage of VLE is time consuming for teaching staff
- (viii) Lack of advanced search facilities in the VLE
- (ix) Not fit for purpose
- (x) Too many clicks
- (xi) Not meeting users' expectations

These barriers which have led to poor navigation within the VLE, have negatively impacted on the user experience and in some cases, made some users to circumvent the VLE when performing certain tasks.

5.9 The emergent framework of the study

The goal of any grounded theory study is to come up with a framework or theory that offers explanation for the phenomenon uncovered in the data. According to Glaser (1998), the product of a grounded theory research is not the reporting of findings but rather an integrated set of conceptual hypotheses developed from the empirical data of the study.

5.9.1 Framework and theory

According to Rimer and Glanz (2005) “a theory presents a systematic way of understanding events or situations. It is a set of concepts, definitions, and propositions that explain or predict these events or situations by illustrating the relationships between variables.” Jabareen (2009) defined conceptual framework as “a network, or “a plane,” of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena.” Jabareen (2009) argued that the concepts that constitute a conceptual framework support one another, articulate their respective phenomena, and establish a framework-specific philosophy.

Jabareen (2009) argued that conceptual framework analysis offers a procedure of theorization for building conceptual frameworks based on grounded theory method. The advantages of conceptual framework analysis are its flexibility, its capacity for modification, and its emphasis on understanding instead of prediction.

Given the above definitions of theory and framework, this study focused on producing a set of concepts and propositions to explain the behaviour of the VLE users in Aberystwyth University. These sets of concepts and propositions that emerged from the analysis of the study were encapsulated in the framework of *Navigability* that emerged from the study.

It is important that the framework or theory so uncovered is grounded in the data otherwise it is not valid. Hence, the use of constant comparison technique and theoretical coding in ensuring that the emerging framework or theory is grounded in the data. This rule was followed in grounding the emerging framework in the data of the interview transcripts by using the technique of constant comparison in developing a relational model which captured the relationship between the core category and the other categories in the study. Consequently, the following hypotheses were formulated based on the analysis of the study:

- (i) A VLE with a friendly navigation structure supports smooth usability which creates a great user experience. *Navigability* has been rightly referred to as a part of usability. So the navigation of a VLE impacts on the usability of the VLE. This in turn impacts on the user experience of the VLE. Even though navigation is not a feature of VLE, it is major a factor when it comes to accessing the features of the VLE. It can make or mar the user experience. This is represented in Figure 5.11.

There are a lot of issues with the kind of software Blackboard. We cannot move easily, you cannot ... from your best part or from files on Windows into Blackboard. - Teaching Staff T1

Yes; it's fine. It has to be a little bit cumbersome. You know, you are always going deeper and deeper into something - Teaching staff T2

I think the Blackboard has an interface that is unworthy. I think the Blackboard design is an obstruction to students and I think the students are already interacting and engaging with each other on other platforms and getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... I'm concerned but only because the students don't like it. I don't like it myself either. - Teaching staff T3

- (ii) It can be inferred from the transcripts that poor **Navigability** will require people to have advanced skills in order to be able to navigate the VLE successfully. People will have to do more in trying to understand the VLE in order to find their way. A VLE with great **Navigability** will only require basic computing skills which the user already has in all probability. This analogy is represented in Figure 5.12.
- (iii) A VLE with clear and familiar navigation will not require people to be trained before they can use it. From the start, they will be able to find their way around the system to get to their target destination. As Panda et al. (2015) puts it

The roadmap of the Web site should be in such a way that the user can easily interact Web site without any formal training.

Some of the participants thoughts on the ease of using the VLE

I suppose the first thing is the technical things which will just make life easier ...they were going to have a test and you didn't want them to ... but that's quite a small technical thing. I'm not sure. One thing I would love, I think it's already there just that I don't find it very easy to use is the materials from lecture, exercises things like ... but I have always... to get to know how they work. - Teaching staff T5

Okay... right, the first point about Blackboard; I have never been very impressed with it - the system. I think it is cumbersome and not easy to use from the teacher's point of view and I think that there are in fact quicker and more... methods of communication. - Teaching staff T6

- (iv) The architectural design of the VLE can support or hinder the smooth navigation of the VLE. So it's important the VLE developers and design develop architectures that support straightforward navigation within the VLEs. This hypotheses is shown in Figure 5.14.

- (v) The requirements of the users or domain requirements may affect the Navigability of a user within the VLE based on whether the VLE fully supports the unique requirements of the user or the domain in which the user operates. This is depicted in Figure 5.15.
- (vi) How the teaching staff structure their modules around the VLE and use it to present information to students does affect the way that students navigate the VLE. This is shown in Figure 5.16.
- (vii) A VLE without clear and easy navigation will make users to spend more time in finding their way whereas a VLE with simple and clear navigation will make users to spend less time in navigating it. This is shown in Figure 5.17.

5.9.2 The framework of Navigability for virtual learning environments

The product of a grounded theory research is not the reporting of findings but rather an integrated set of conceptual hypotheses developed from the empirical data of the study (Glaser, 1998). The framework or theory developed from the grounded theory methodology should be made up of probability statements about the relationships between concepts (Glaser, 1998). Based on this recommendation by (Glaser, 1998), the end product of the analysis of the data of this study was the generation of the framework of **Navigability** for virtual learning environments. This was arrived at by integrating the various hypotheses listed above in section 5.8.4 with the written memos as presented in section 5.8.3 of this thesis.

Consequently, reflections on the written memos surrounding the integration of the hypotheses, provided clarity and direction on the emergence of a framework for the study. The implication of the hypotheses presented in 5.8.4 is that to have good navigation within the VLE, there is need to look at the **Architecture** and **User Interface** designs of the VLE with a view to configuring it based on the requirements of each user and the domains within the institution. For instance users complained of too many clicks, clunky nature of the VLE, information overload etc. They would rather have direct access to those items on the VLE. Perhaps there is something for VLE developers to learn from Facebook especially in the area of discussion forum where the navigation of Blackboard is quite poor, especially in the posting of replies in the comment sections of the discussion forum. Also, it was evident from the study, that some teaching staff do not like going for training. They would prefer to learn from peers on how to accomplish certain tasks rather than going to sit for a training with the e-learning team. Based on the theoretical code developed in section 5.8.2, a framework of **Navigability** was developed. The framework of **Navigability** is hereby stated as follows:

The navigation mechanisms of the VLE should be configured based on the needs, expectations and social behaviour of users.

The following submissions support the claims of the above framework:

- (i) Given that navigation is critical to user experience, web developers should make use of familiar and localized notations and icons during the design of the **User Interface**.

You know, it's a bit cumbersome at times, it can be a bit, so many menus, so many drifts, the interface perhaps could be a bit you know streamlined may be. When you search for a module, the front page to the module handbook options...it's a bit...you can only do it from the front page. You can put them up just take, you just tailor them to the front page of the module. You need to get rid of it. They don't need it. I can give them a thing they should be on until I turn them off. You can, you can make the module page look nice... - Teaching Staff T13

A lot of the students would prefer, some students would prefer to have some of the web pages with less content... so you try to work round on how to use Blackboard. It might be easy for students to access materials and how to organise that and the... using a regular web page, I might like different choices to how I would determine? to using a VLE but if I want to use a VLE, I think I am in a better place to use a VLE so I try to work round it. So I think it would have been nice if there were to be a cleaner interface and a clean wrap up around the content. - Teaching staff T14

- (ii) For a complex system like the VLE with requirement conflicts, each category of users should have a unique view.
- (iii) The design of the VLE architecture should be user-centric.

And as it is, we discuss, I mean individual staff discuss with students on how, a ... of staff can change different module areas within Blackboard then that is a discussion between, the student and staff can refer to themselves as they are going to change, they are going to do that themselves, and certainly staff can discuss that with the student or something and instruct students on where they can find things and so on. So to a limited level, there is some kind of discussion among students? and staff can decide among themselves between students and staff about how Blackboard is deployed. But on a grander scale I don't think the students are part of the discussion. - Director of studies D2

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work - Director of studies D3

I think it's not tailored to the way that I want it to. - Teaching staff T3

...I think it is constraining and because it has a sets up, a certain way of doing things and now how it might have been designed, it's for example do you, I don't think it's all ...the same as the point of view of any teacher of the subject. So ... and maybe it is designed from the point of view of students' consumption rather than the teacher's intentions and objectives in career and teaching.
- Teaching staff T6

- (iv) Having less features on the interface that are strictly relevant to the users will drastically improved their navigation experience within the VLE. Less is more
- (v) Users are likely to prefer breadth of navigation over depth as long as the materials there are relevant to them.

I will probably actually delete a lot of the features that are in there. I think my ideal piece of software for doing this kind of thing will be if you had a very very simple starting point where you have a very simple screen, very few buttons, clicks and very few menus items which gave you a real simple clear structure for the bare minimum that you needed and then you can then choose to include other more...things. So I would probably simplify it rather than making it more features. Like it said, it has got every feature that I ever need but I'll never use any of them because I don't... - Teaching staff T17

An implementation of this framework in the design and configuration of a VLE will enhance the user experience of students and staff.

Given the above definitions of theory and framework, this study has focused on producing a set of concepts and propositions to explain the behaviour of the VLE users in Aberystwyth University. These set of propositions have been encapsulated in the framework of *Navigability*.

5.9.2.1 Features of the conceptual framework of *Navigability*

The conceptual framework of *Navigability* is made up of the following features:

- (i) The conceptual framework of *Navigability* provides an understanding of the phenomenon under investigation with respect to the user experience of Blackboard in Aberystwyth University and not a description of it. It is a conceptualization of the happenings within the social space.
- (ii) The conceptual framework of *Navigability* is not just an assembly of concepts. Inherent among them is a relationship that defines the roles of those concepts. According to Miles and Huberman (1994) a conceptual framework “lays out the key factors, constructs, or variables, and presumes relationships among them.” The relationship between *Navigability* and the other concepts are presented in figure 5.2.

- (iii) The conceptual framework of **Navigability** provides an understanding of the social interactions among the VLE users in Aberystwyth University with specific reference to how they navigate the VLE to access resources. It also provides a guide for VLE developers, teaching staff and instructional designers on how to embed navigational designs within the VLE and the resources so provided.
- (iv) The conceptual framework of **Navigability** emerged through the process of grounded theory methodology. Thereby ensuring that the framework was grounded in the data that have been analyzed.

The **Navigability** framework that emerged from the study is presented in Figure 5.18.

5.9.3 Comparison of the results of the sample analysis and the full analysis of the study

One of the key qualities of a good research is the repeatability of the study. This provides a way of verifying if the same results can be acquired and if not what explanations can be offered for the variation. So on that basis, this section presents a comparison of the results of the sample analysis in chapter 5 and the results of the full analysis in this chapter 6 of the study. The results of both analysis were different in that the core category of the sample analysis was discovered to be **User perception** while that of the full analysis was found to be **Navigability**. There are a number of explanations for this difference in the results of the analysis. They are outlined below:

- (i) While the data used for the sample analysis were randomly selected, the data used for full analysis were chronologically selected. generated codes of the first set of coding were labelled using the in vivo coding convention while analytical coding was used for the rest of the coding.
- (ii) The set of data used for the first cycle of coding shapes the direction of the analysis because it is from there that the core category is discovered. And since the sets of data were different in both cycles the difference in the results of the analysis was not surprising.
- (iii) It is argued that one of the factors that can affect the emergence of a grounded theory is the level of the skills of the researcher conducting the study. Given that the sample analysis was the researcher's first attempt at doing grounded theory, the skills at work then were quite different from the time the researcher started the full analysis. Mistakes had been corrected, lessons learnt and the analytical skills sharpened. This no doubt contributed to the difference in the outcome of the analysis.

5.10 The analysis of the transcripts of the Cardiff Metropolitan University student

The transcripts of the lone student from Cardiff Metropolitan University was sampled for coding on issues that were related to *Navigability* and its related concepts. Eight codes were generated from the transcripts made up of three unique codes namely ease of use, navigation and user friendly. These codes were then classified into their respective categories. While navigation was classified into the category of *Navigability*, ease of use and user friendly were classified into the *Usability* category.

5.10.1 The comparison of the results

A comparison of the results from Aberystwyth University with that of the only student from Cardiff Metropolitan University revealed that *Navigability* was also an issue with the Moodle VLE in use at Cardiff Metropolitan University. The transcripts showed that the student was also confronted with the same issues faced by students of Aberystwyth University. It confirmed that *Navigability* was critical to the user experience on the VLE. The issues had to do with being able to use the VLE successfully in finding things on the platform. The student complained that the bilingual nature of the VLE was hindering navigation. It was interesting to see that the students at Cardiff Metropolitan University were not given any formal training at all on how to use the VLE. They were simply given the login details and advised to take a tour of the VLE. Students were expected to find their way around the VLE. On the user friendliness of the Moodle VLE in use at Cardiff Metropolitan University, the student was of the view that the VLE was not user friendly enough. The results of the analysis of Cardiff Met supports that of Aberystwyth University even though the VLEs were different. This points to the fact that the *Navigability* issues are not limited to Blackboard.

5.11 Likert scale analysis of the responses of students

In the design of the questions for students, four out of the ten questions were on Likert scale. The students were expected to provide answers to those questions by selecting an option that reflected their experience with the VLE.

The analysis of the data showed that of the 38 students interviewed, only 29 students provided complete answers to these questions. The remaining 9 students were due to the following

- Six of them was due to poor audio.
- Two gave unclear responses.
- A decision by one of the students not to answer one of the questions as he claimed he had no experience with the tool in that area.

5.11.1 The result of the Likert scale analysis

The result of the analysis of the questions on Likert scale revealed that

- For the communication tools on the VLE, 17 students out of 29 were very satisfied or satisfied with the communication tools on the VLE while 12 students viewed the communication tools as average or were dissatisfied with it.
- For the navigational tools on the VLE, 22 students out of 29 were very satisfied or satisfied with the navigational tools on the VLE. 7 students rated the navigational tools as average.
- For the organizational tools on the VLE, 18 students out of 29 students were very satisfied or satisfied with the organizational tools on the VLE. 10 students were of the opinion that the organizational tools were average.

	Very Satisfied	Satisfied	Average	Dissatisfied	Very Dissatisfied
Communication tools	7	10	1	11	0
Navigation tools	5	17	7	0	0
Organization tools	4	14	10	0	1

Table 5.32: The rating of Blackboard tools by the students

The analysis of the data on the stacked bar chart as presented in Figure 5.19 shows that

- 59% of the students were either very satisfied or satisfied with the communication tools of the VLE.
- 76% of the students were either very satisfied or satisfied with the navigational tools of the VLE.
- 62% of the students were either very satisfied or satisfied with the organizational tools of the VLE.

This shows that students were more satisfied with the navigational tools of the VLE than they were with the communication and organizational.

5.11.1.1 User friendliness

The analysis of the user friendliness data on a bar chart shows that 25 students out of 30 students representing about 83 percent rated the VLE as very friendly or friendly. This shows that majority of the students were happy with the VLE as they found it friendly to use. This is shown in Figure 5.20.

5.11.2 Relating this to the result of the interview transcripts

This result agrees with the findings the qualitative aspect where students spoke extensively of their experience. From the interview transcripts, students disagreed on the usability of the VLE. While some agreed that it easy for them to use, others disagreed by saying that it was difficult for them to find things on the VLE. Majority of the students said they found the VLE easy to use though some of them also complained of lots of clicks and information overload. Some of the students interviewed admitted that initially they had issues with the VLE been got over them after a while. It could be argued that they some of them have become used to the process that they are not bothered by it anymore. Also in relating this results to the analysis of the teaching staff, the teaching staff have more to complain about compared to the students. For instance only one student used the word clunky as against four teaching staff using the word clunky.

5.12 Chapter summary

This chapter has presented the analysis of the interview transcripts of this study were using the classic grounded theory. The analysis led to the discovery of *Navigability* as the core category of the study. By using the technique of constant comparison, a theoretical model was developed which formed the basis for the formulation of a theory of *Navigability* for the configuring a VLE. A full discussion of these results, their implications for VLE development in particular and software engineering in general are presented in Chapter 8 of the thesis. The next chapter is on the data analytics of students usage of Blackboard in Aberystwyth University. The results of the analysis of the data analytics will be compared with the results of the analysis of the interview transcripts in order to validate or contradict what the students said.

HOW STAFF USE THE VLE

147. The impact of how teaching staff arrange materials or use the VLE could be positive or negative. 12-Oct-2017

65. How the lecturer structures the module around the VLE 22/12/2016

How the lecturer structures the module around the VLE and uses it affects the way that students perceive and use the VLE. The VLE design affects how the lecturers use it and that in turn affects the learning experience of the students.

160. Different lecturers have different styles of providing or storing learning resources on the VLE. This can be somewhat confusing for students who expect uniformity in the use of the VLE by the lecturers. Although it has been argued that students should be able to find materials on the VLE by themselves and gain some skills during the process, most often than not, they would rather prefer that those things are within their reach and in the expected places across all the modules. 10-Oct-2017

62. How teaching staff provide information to students

When it comes to student satisfaction, it's not just the VLE design but how the users in this case lecturers make use of the VLE to provide information to the students. This is why it is important that the lecturers are happy, comfortable and competent in the use of the VLE. So developers of VLE, need to bear this in mind. If the VLE is a good tool in the hands of the teachers, it will reflect on how the students use it, which will ultimately translate to enhancing students' satisfaction.

Figure 5.3: Some memos on how staff use the VLE

USABILITY

63. Usability

There is a need to develop VLEs to be responsive, intuitive and in comparison to what students are used to. E.g. Facebook.

4. Navigation Minimum user memory load 10/04/18

Some teaching staff don't use some aspects of the VLE all year round and this does cause a problem for them because each time they are then using it for certain things, they would have forgotten how to find their way around the VLE to find what they are looking for. So if the developer can use a minimum user memory load when designing the VLE or the user interfaces that would help.

177. The organization of materials in the VLE is a major cause of the complication with respect to finding materials. 10-Oct-2017

187. Make some tools or features to be more accessible or obvious. 12-Oct-2017

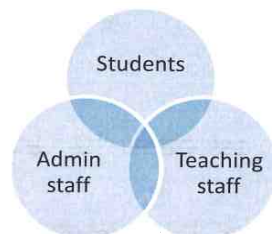
This is an issue the users seem to have when interacting with the VLE - being able to recall where a feature is. The home page of a VLE should be user-friendly enough to point users in the direction that they like to go and also in the fastest time possible. When developers make use of well-defined routes with familiar steps that require minimum user memory load in the design, configuration and arrangement of features, they provide the users with an excellent experience.

Figure 5.4: Some memos on the usability of the VLE

USER REQUIREMENTS

48. Fitted for use 13/03/2018

The users have different needs. For instance, the needs of the students are different from those of the teaching staff as well as the administrators. The core needs of each user should be provided for/met. The developers can then harmonise and resolve requirements conflicts in the areas that there are tensions. Each user should be able to use the VLE to meet their core needs easily, so their views, interface and tools should be designed from their point of view, how they like to use the system, etc without necessarily being constrained by other users. For instance what are the basic needs of the students, teaching staff, admin staff? Their basic needs should be met without constraints from other users.



A diagram showing the relationship among the requirements of different users of the VLE

This can be looked into by considering

- Configuration of general areas
- Configuration of user-specific areas
- Conflicts and tensions can then be resolved in cases where requirements are overlapping.
- Experts' opinions can then be sought to resolve it.

Figure 5.5: Some memos on user requirements

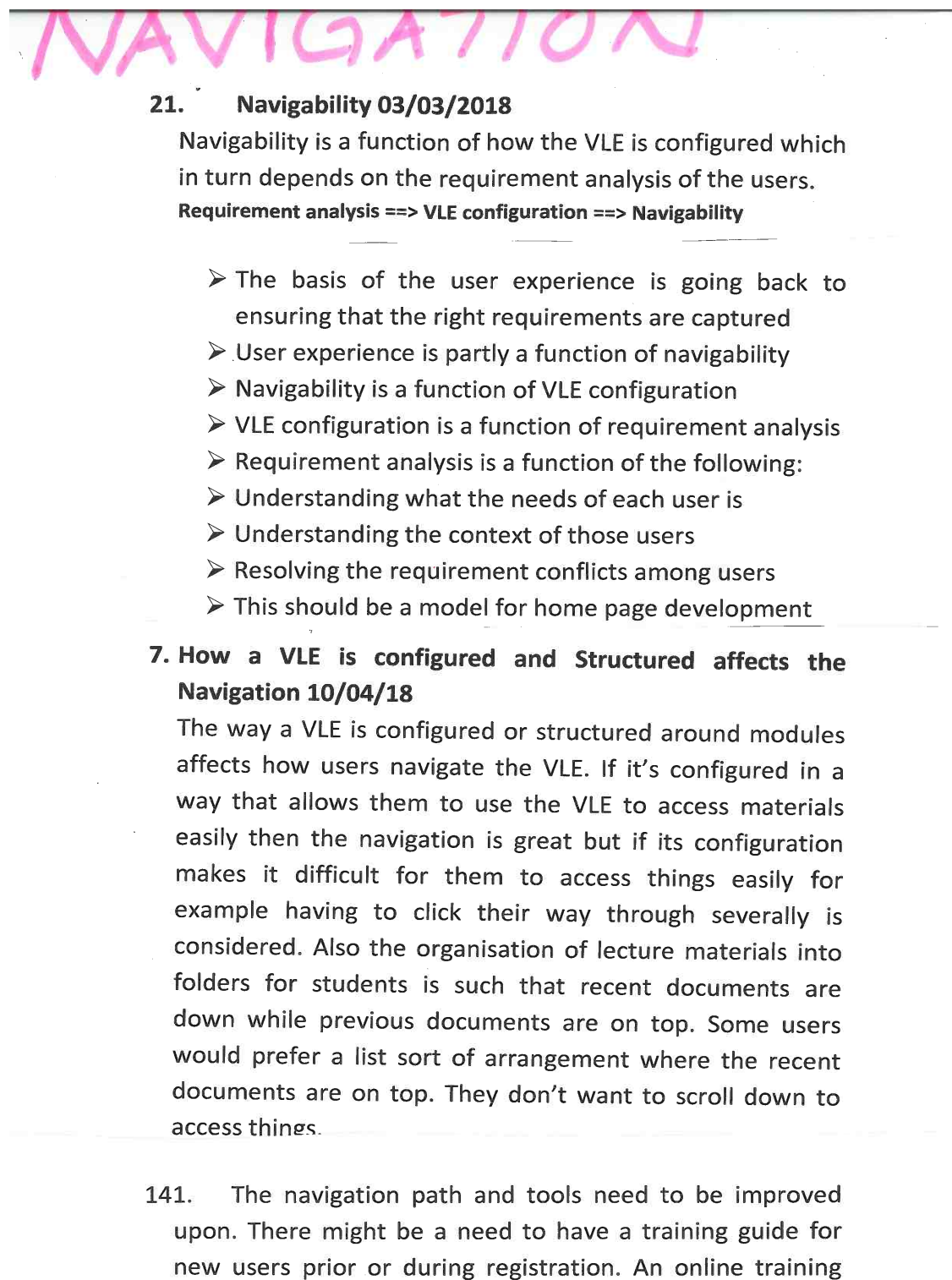


Figure 5.6: Some memos on navigation of the VLE

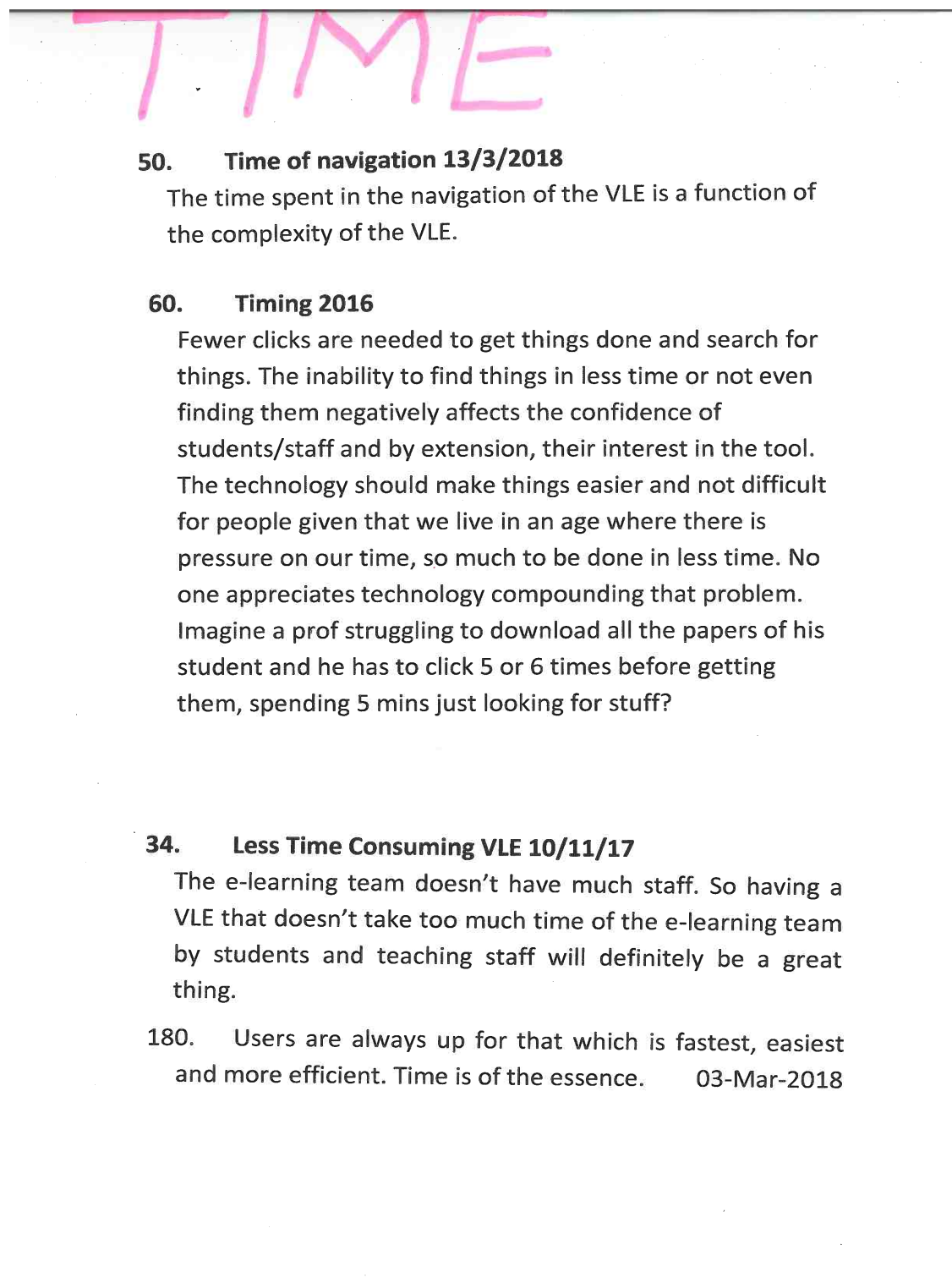


Figure 5.7: Some memos on time with respect to using the VLE

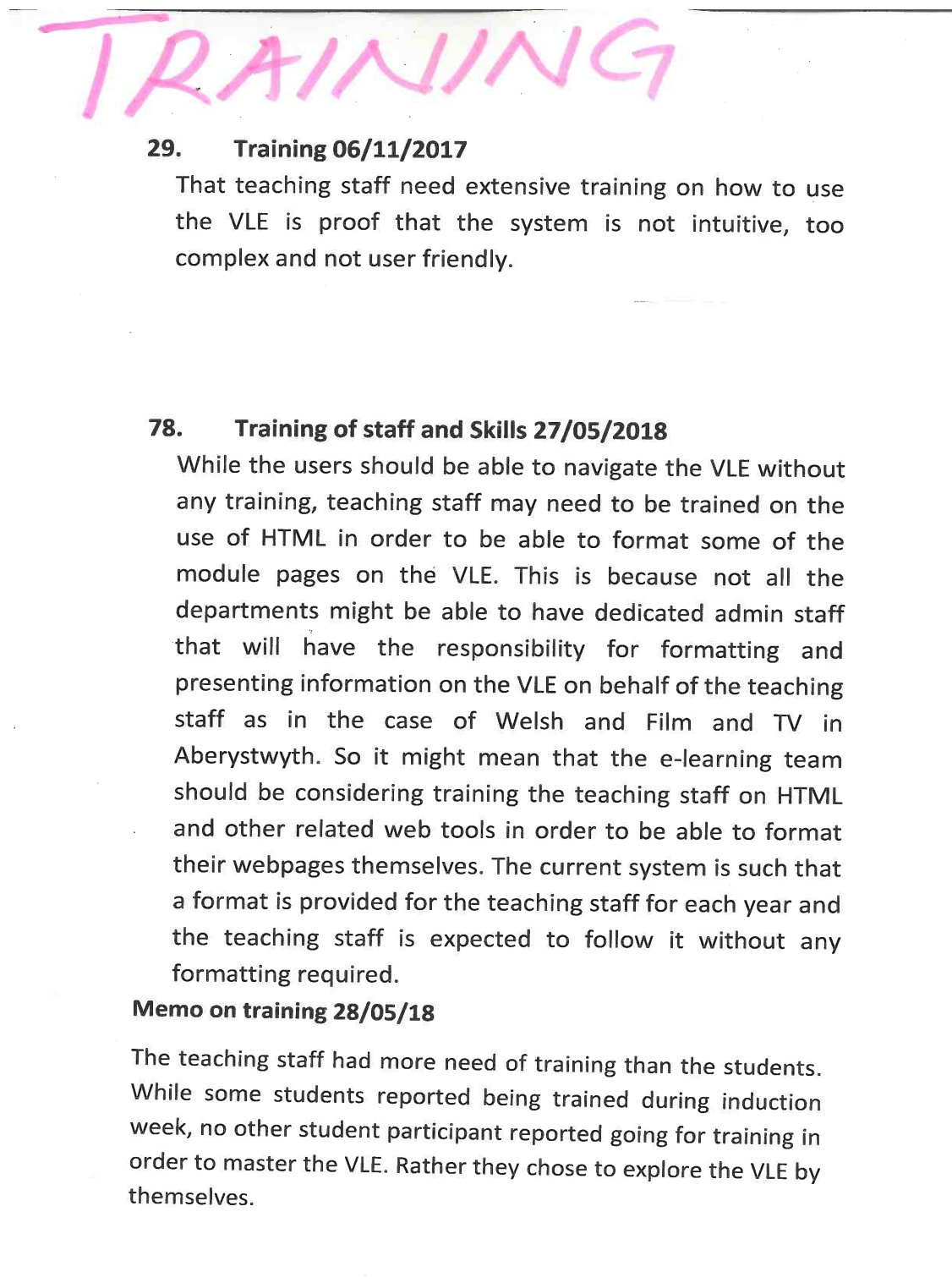


Figure 5.8: Some memos on training to use the VLE

ARCHITECTURE

66. The influence of a VLE design

The design of the VLE affects the usability and learning experience of the students as well as the teaching of users.

28. Forgetting the steps 4/11/2017

If a particular process is not carried out very often, users tend to forget how it's done. The learning curve is not user friendly and not intuitive. If you're not using the VLE regularly, it's not very user friendly.

116. Competition between BB and FB. 26/03/2018

How can the developers of VLEs win this competition? Will it be by making VLE look like Facebook?

24. Architecture of learning platforms Designing for present day and future users 18/10/2017 wrt P30 Q4

Designers should bear in mind how users like to search for information or use the VLE to accomplish tasks. Pay attention to user analytics to redesign, reconfigure VLEs for optimum efficiency. They can learn from how social media developers like Facebook are doing it.

26. Design of VLEs 30/10/2017

Should VLEs be designed from the point of view of teaching staff or lecturers? Each user should have a design that fits their behaviour.

104. As far as this user is concerned, the VLE is easy to use but quick to mention that it's a bit clunky. While it's useable, the fact that the technology behind the VLE is old-fashion comes across in the attitude of users. 26/03/2018.

Figure 5.9: Some memos on the architecture of the VLE

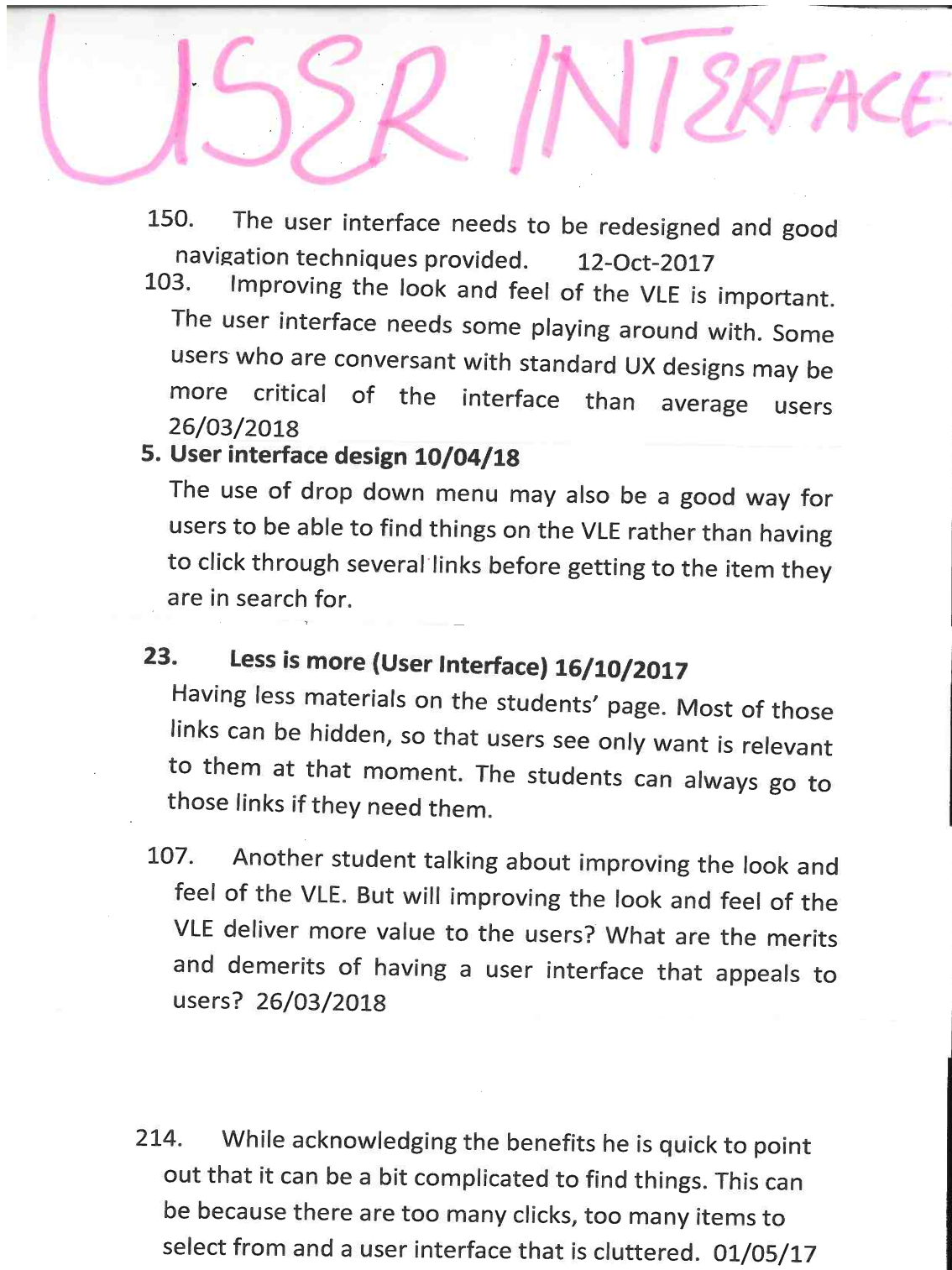


Figure 5.10: Some memos on the user interface of the VLE

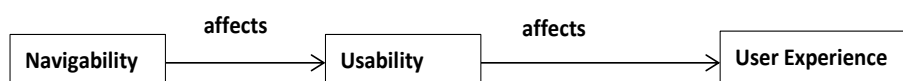


Figure 5.11: The relationship between navigability, usability and user experience

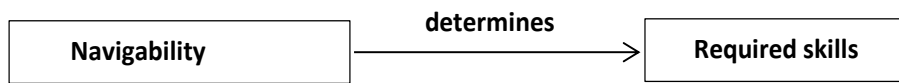


Figure 5.12: The relationship between Navigability and skills

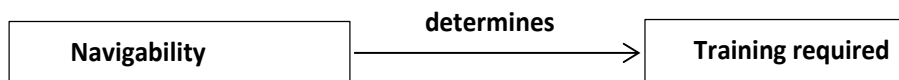


Figure 5.13: The relationships between Navigability and training required to use the VLE

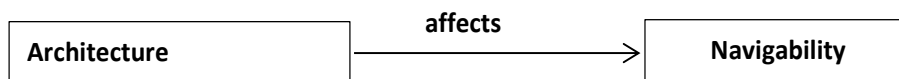


Figure 5.14: The relationships Architecture and Navigability

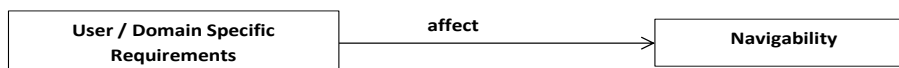


Figure 5.15: The user or domain requirements may affect Navigability

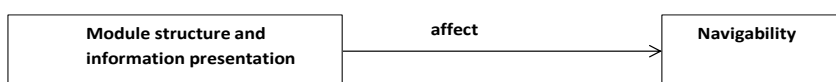


Figure 5.16: How the module is structured and information is presented affect navigability

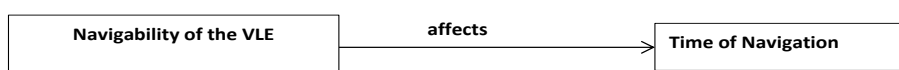


Figure 5.17: Navigability affects the time of navigation

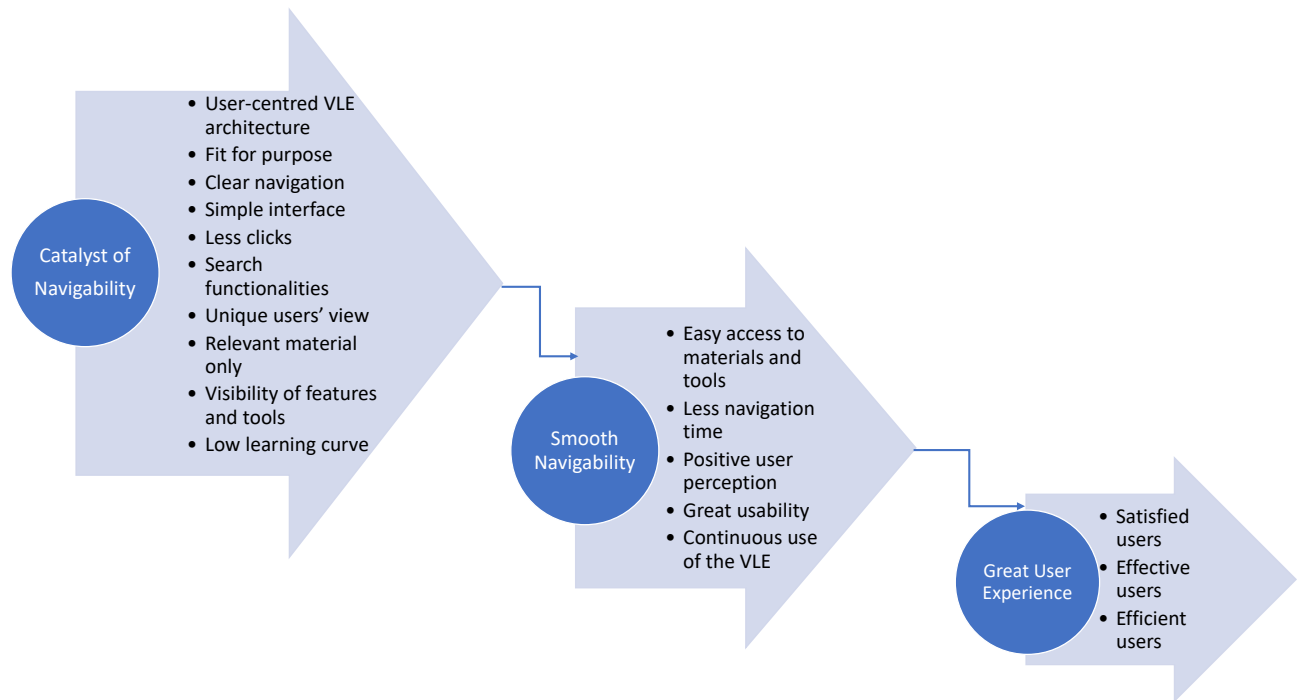


Figure 5.18: The Navigability framework for virtual learning environments

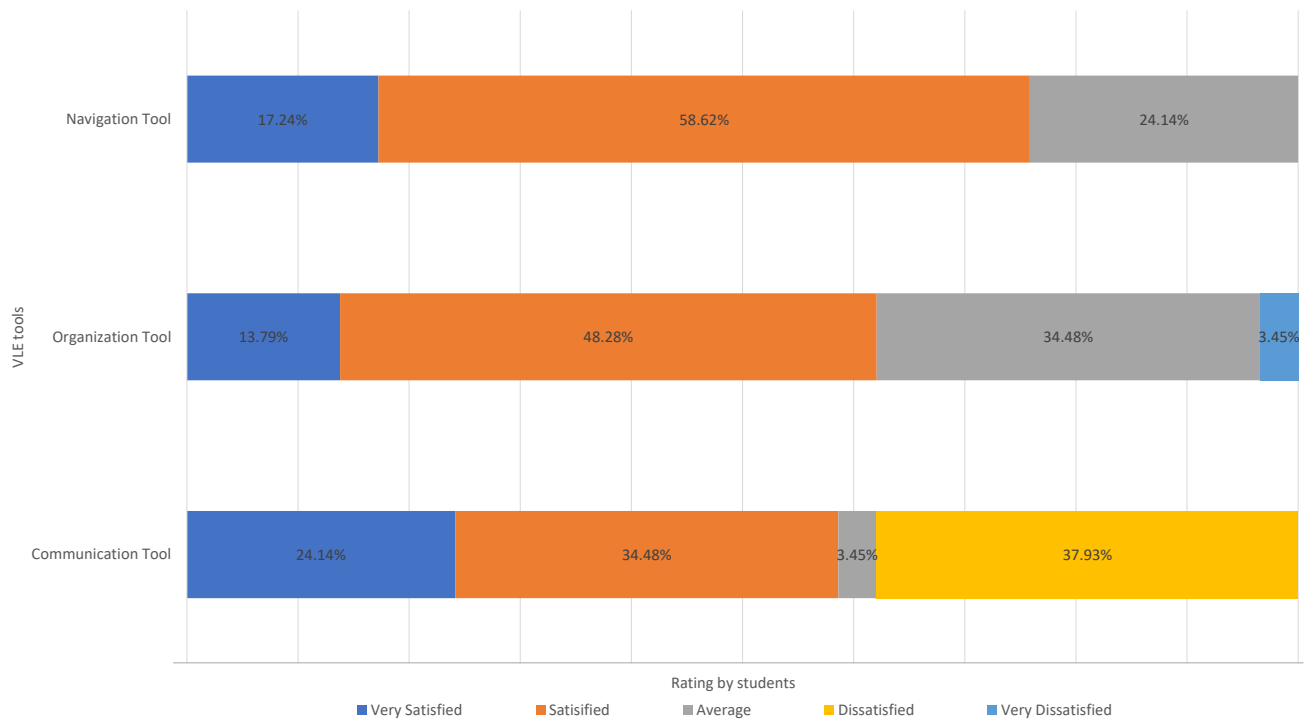


Figure 5.19: Satisfaction rating of Blackboard by students

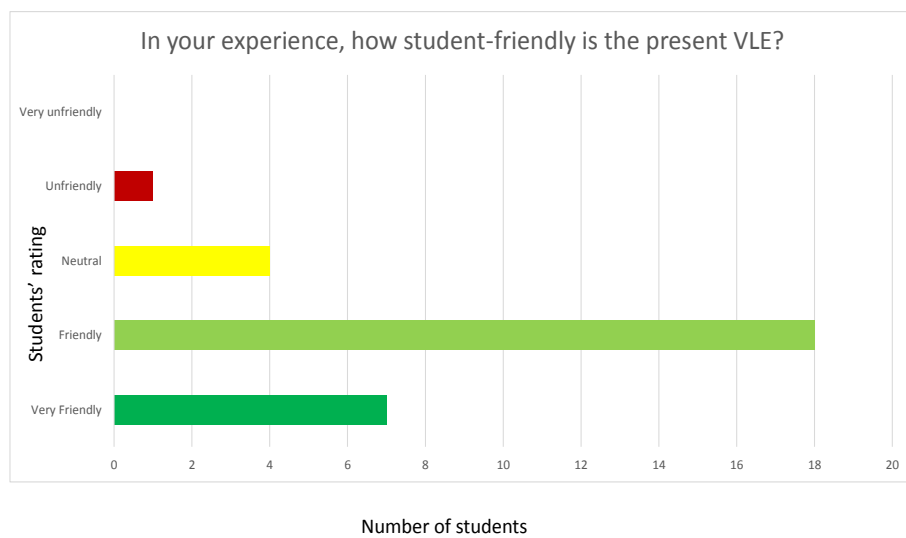


Figure 5.20: How students perceived the user friendliness of Blackboard

Chapter 6

Data Analytics

6.1 Introduction

This chapter presents the results of investigating the log activities of students on Blackboard in Aberystwyth University using a particular module during the 2015/2016 academic session. The data were analysed and meaningful information extracted from them. Details of how the data analytics were obtained and the relevant data extracted for analysis are outlined in the subsequent sections of this chapter. The results of the data analytics provided a basis for comparison with the the results of the interview transcripts that were presented in Chapter 5.

6.2 Background of chapter

Hidden in the log files of the users of the VLE are information that could be mined to improve the experience of the users. Agudo-Peregrina et al. (2014) defined learning analytics as “the analysis of electronic learning data which allows teachers, course designers and administrators of virtual learning environments to search for unobserved patterns and underlying information in learning processes.” Agudo-Peregrina et al. (2014) argued that the main goal of learning analytics is to improve learning outcomes and the overall learning process in virtual environments. So against the background that this thesis was about the use of a VLE in Aberystwyth University, it was therefore thought worthwhile to have some actual data of the students’ usage of the VLE. Consequently, the e-learning team was approached by the researcher for the students’ logs after receiving approval from the Research Ethics Committee of Aberystwyth University. The consent of the module coordinator of module BR11710 (Biological Molecules and Methods) was also obtained. The log files of the activities of the students on Blackboard were thereafter obtained by the researcher from the e-learning team of Aberystwyth University for the 2015/2016 academic session. The period covered by the data was from 22/09/2015 to 11/12/2015. This period is also known as Term 1 on the calendar of Aberystwyth University. A screenshot of the log file of the students is shown in Figure 6.1.

	A	B	C	D	E	F	G
1	timestamp	lower_course_id	user_pk1	event_type	data	title	
2	22/09/2015 00:21	NULL	34675	SESSION_TIMEOUT	_9760726_1	NULL	
3	22/09/2015 00:21	NULL	36004	SESSION_TIMEOUT	_9760785_1	NULL	
4	22/09/2015 01:30	NULL	34874	LOGIN_ATTEMPT	Login succeeded.	NULL	
5	22/09/2015 01:30	NULL	34874	TAB_ACCESS	_11_1	Student.label	
6	22/09/2015 01:30	NULL	34874	PAGE_ACCESS	Announcements	NULL	
7	22/09/2015 01:31	NULL	34874	TAB_ACCESS	_11_1	Student.label	
8	22/09/2015 01:31	NULL	34874	PAGE_ACCESS	/webapps/calendar/viewPersonal	NULL	
9	22/09/2015 01:31	NULL	34874	PAGE_ACCESS	Personal information	NULL	
10	22/09/2015 01:32	NULL	34874	TAB_ACCESS	_11_1	Student.label	
11	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
12	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
13	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
14	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
15	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
16	22/09/2015 01:33	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
17	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
18	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
19	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
20	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
21	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
22	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
23	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
24	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
25	22/09/2015 01:34	NULL	34874	PAGE_ACCESS	/webapps/blackboard/webapis/ui/404.jsp	NULL	
26	22/09/2015 01:36	NULL	34874	LOGOUT	Login succeeded.	NULL	
27	22/09/2015 01:51	NULL	34874	LOGIN_ATTEMPT	Login succeeded.	NULL	
28	22/09/2015 01:51	NULL	34874	TAB_ACCESS	_11_1	Student.label	
29	22/09/2015 01:51	NULL	34874	LOGOUT	Logout succeeded.	NULL	
30	22/09/2015 02:21	NULL	34640	SESSION_TIMEOUT	_9761021_1	NULL	
31	22/09/2015 02:21	NULL	36270	SESSION_TIMEOUT	_9761080_1	NULL	
32	22/09/2015 09:09	NULL	36613	LOGIN_ATTEMPT	Login succeeded.	NULL	
33	22/09/2015 09:09	NULL	36613	TAB_ACCESS	_11_1	Student.label	
34	22/09/2015 09:09	NULL	36613	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
35	22/09/2015 09:09	NULL	36613	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	
36	22/09/2015 09:09	NULL	36613	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybbOverview	NULL	
37	22/09/2015 09:13	NULL	36613	LOGOUT	Logout succeeded.	NULL	
38	22/09/2015 09:53	NULL	34594	LOGIN_ATTEMPT	Login succeeded.	NULL	
39	22/09/2015 09:53	NULL	34594	TAB_ACCESS	_11_1	Student.label	
40	22/09/2015 09:56	NULL	34594	PAGE_ACCESS	/webapps/bb-social-learning-BBLEARN/execute/mybb	NULL	
41	22/09/2015 09:56	NULL	34594	PAGE_ACCESS	/webapps/streamViewer/streamViewer	NULL	

Figure 6.1: A screenshot of the log file of students' use of Blackboard

6.3 Interview transcripts and data analytics

In order to have a meaningful result of the analytics that would be comparable to the results of the interview transcripts, it was important for the researcher to identify the kinds of issues to be investigated from the students' click data. These issues had to be based on the results that emerged from the analysis of the transcripts in Chapter 5 of the thesis. Therefore the researcher was interested in the following investigations.

- (i) Ascertain the features of Blackboard that were most popular with students and the ones that were least popular with them.
- (ii) Investigate the depth of the navigation of the BR11710 module materials.
- (iii) Investigate the breadth of the navigation of the BR11710 module materials.
- (iv) Investigate how the presentation of materials by the teaching staff affected students' navigation within the VLE.

The investigation of each point listed above is described below.

6.4 Investigation one: Features of Blackboard

In this section, the use of the features of Blackboard in Aberystwyth University were explored using the log files of the students.

6.4.1 Aim

The aim of this investigation was to ascertain the features of Blackboard that were most popular with students and the ones that were least popular with them.

6.4.2 Method

The researcher studied the file to understand what kind of data was contained in it. The examination of the file showed that the file contained data under the headers: `timestamp`, `lower_course_id`, `user_pk1`, `event_type`, `data` and `title`. The meaning of these headers are given below:

1. **Timestamp:** This referred to the time that the student performed a particular activity on Blackboard.
2. **Lower course id:** This referred to the course identification field for BR11710 module.
3. **User pk1:** This was the primary key (unique identifier) of each user (student) that accessed the BR11710 module on Blackboard.
4. **Event type:** This was a description of what the student activities was about.
5. **Data:** This captured the data on the activities of the student with the BR11710 on Blackboard. It provided meaningful information of what the student actually clicked on and provided some form of URL of the links to the material that was accessed by the student. The data didn't cover the period leading up to the exams where there might have been more activities on the module page.
6. **Title:** This was the title of the page that the students clicked on.

6.4.3 Clicks of unique items

On Blackboard, there are many features that students click on. And given that one of the things that the researcher was investigating was the features on Blackboard that were most popular and least popular with students, an extraction of the unique items and a scan of them was made in order appreciate the distribution of the frequency of clicks with respect to the different features that the students clicked on.

Consequently, seven features were chosen to show their distribution with respect to the number of clicks. The file containing the logs of students for Term one during the 2015/2016 academic session was used in extracting the weekly logs of the students. The extraction of weekly logs was done using Linux commands on a terminal. The decision to analyse the data on weekly basis as opposed to monthly basis was based on the fact that only October and November were full months during Term 1 as both September and December had only 9 days and 11 days respectively during the period under investigation. Hence representing the frequency of clicks of the features on a monthly basis would have been unbalanced. The weekly representation therefore was more appropriate for the investigation. There were 346 students on the module, although only 323 attempted at least one form of assessment. However, the log file revealed that there were 262 unique students identifiers that use the VLE for the module during the period from 22/09/2015 to 11/12/2015.

6.4.4 Extraction of weekly logs

The click data of students were then extracted in Linux by issuing the following command on a terminal

```
$ grep "2[2-6]/09/2015" BR11710\_AB0\_2015-16.csv > week1.csv
```

The above command was used in extracting the data for the 12 weeks that made up term 1 in the period under investigation.

6.4.5 Extracting the data on clicks

An examination of the file containing the students' logs as shown in Figure 6.1 revealed that the 5th column contained the data of what the students clicked on. So the 5th column of the file for each week was therefore extracted using the Linux command below in a terminal:

```
$ cut -d , -f 5 week1.csv > wk1_row5.csv
```

The above command was used in extracting the fifth column of the file containing the data that the researcher was interested in for the 12 weeks of the module in term 1 during the 2015/2016 academic session. The next step was to extract the frequency of items in each week and this was done using the following command:

```
$ grep -c 'content' wk1_row5.csv  
44
```

The command above was used to query the number of clicks that students made on the following features

- (i) Address Book.
- (ii) Announcement.
- (iii) Assignment.
- (iv) Calendar.
- (v) Content.
- (vi) Discussion Boards.

The above features were the features that were selected by the researcher to show how students clicked on the features.

6.4.6 Data Analysis

The results of the queries were used to construct a frequency table for the 12 weeks as shown in Figure 6.2.

Using the frequency table, a stacked bar chart was created using Microsoft Excel package to provide a pictorial distribution of the clicks as shown in Figure 6.3.

	Address Book	Announcement	Assignment	Calendar	Content	Discussion Boards
week 1	3	35	45	35	44	0
Week 2	3	396	874	107	1388	1
Week 3	3	294	679	95	1497	0
Week 4	0	96	850	71	1443	0
Week 5	2	32	618	40	1071	0
Week 6	1	23	154	42	570	0
Week 7	2	82	801	23	1654	1
Week 8	0	128	336	30	824	0
Week 9	0	107	427	19	685	0
Week 10	4	22	533	20	771	0
Week 11	1	32	772	10	979	0
Week 12	1	17	60	11	354	0

Figure 6.2: The frequency table of students' clicks on some Blackboard features in module BR11710

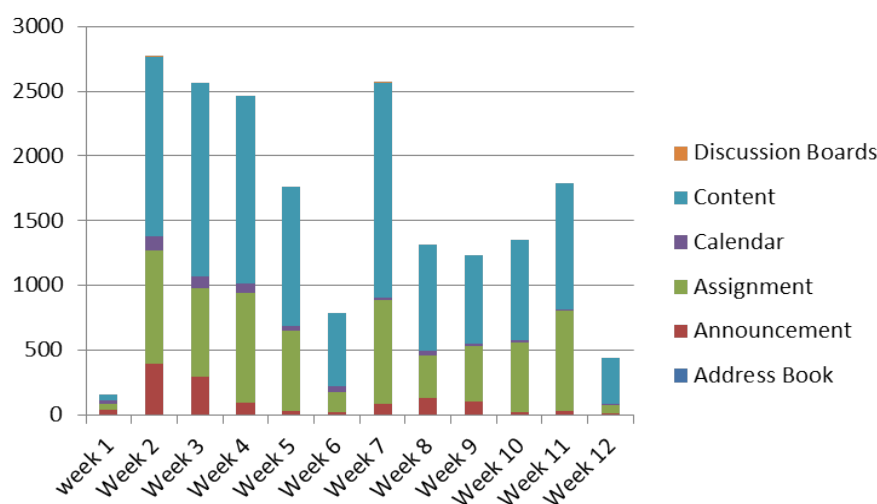


Figure 6.3: The weekly distribution of students' clicks on some features in module BR11710

6.4.7 Results

The analysis of the data showed that Content was most popular with the students as it had the highest clicks in all the 12 weeks followed by Assignment and Announcement. The table showed that Discussion Board was not popular with the students at all as there was only a single click in 2 of the weeks and none in the other ten weeks all through term 1.

6.5 Investigation two

Having analysed the students' clicks on the features of Blackboard on the module BR11710, the next aspect of investigation was to examine the structure of the module on Blackboard with the aim of extracting some useful information. Hence the researcher was added on the BR11710 module for the 2015/2016 academic session on Blackboard as a "student" by the module coordinator.

6.5.1 Method of the investigation

The navigation pattern of the module within Blackboard was understudied with a view to establishing the navigation hierarchy within Blackboard. This helped the researcher to be able to investigate the breadth and depth of navigation that the students experienced in the course of their use of Blackboard in BR11710 module.

6.5.2 Result

The result was an outline of the navigation tree that the students went through before getting to their desired target on the VLE. The following steps were captured by the researcher:

- (i) Students browse to Blackboard home page.
- (ii) Students supply login details. Student is taken to My modules page containing all the modules that the student is registered on.
- (iii) Students click the module of interest and gets taken to the content page of the module.
- (iv) Students click on the item of interest.

These steps are shown in Figure 6.4.

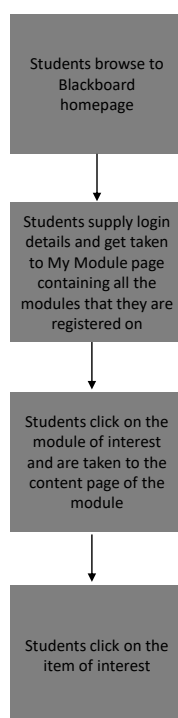


Figure 6.4: A flowchart of students' navigation on Blackboard in Aberystwyth University.

6.5.3 Discussion

Figure 6.4 revealed that there were four levels of navigation which the students had to click through. In other words, it took four clicks for the student to navigate to their desired destination on BR117110 module. However this gets reduced to two clicks once the student is within the BR11710 module while the breadth of navigation was found to be three. The result of this disagrees with the results of the interview transcripts in most of the items except for the discussion forum which is hidden away under tools. On the other hand and as pointed out in Chapter 5, most of the complaints with respect to the depth of navigation were from the teaching staff. However a student complained of the depth of the navigation in respect of the Discussion Board. In the student's opinion, the discussion board was hidden away given that it was placed under Tools - a place where most students are not likely to think it would be. The VLE can benefit from a better arrangement of a feature like the discussion board and other materials. This will no doubt improve the user experience. A diagrammatic representation of the navigation pathway of students of BR11710 on Blackboard is represented in Figure 6.5.

6.5.4 Results

As shown in Figure 6.6, it takes three clicks from the Blackboard homepage to get to the level of lecture materials navigation. The pages have been configured in

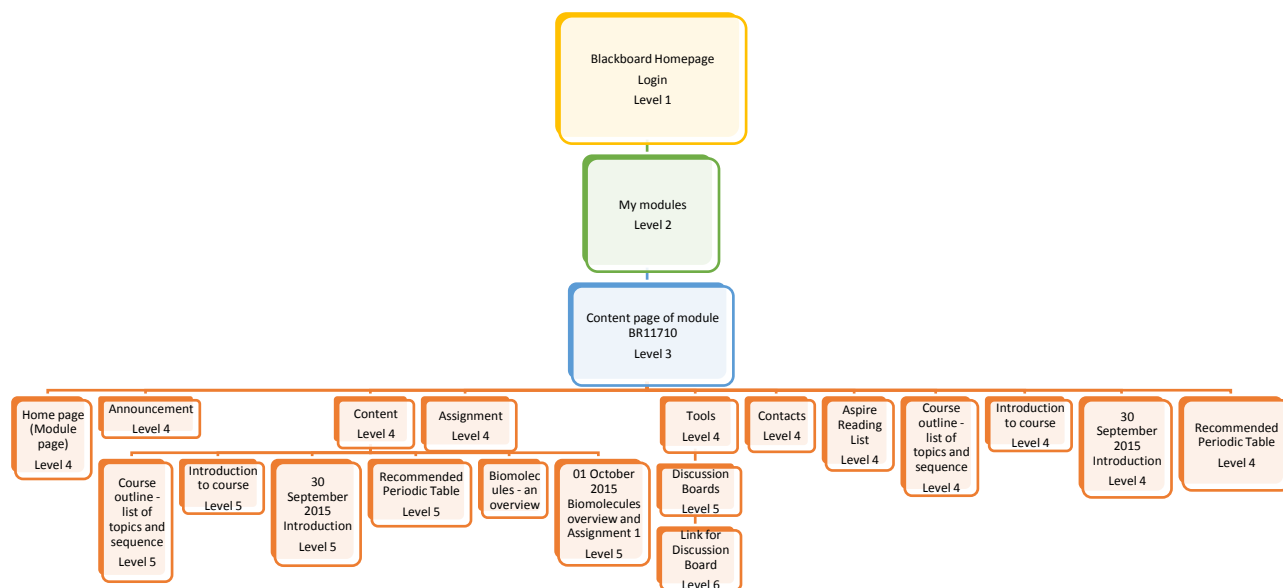


Figure 6.5: The depth of the navigation pathway of students of BR11710 on Blackboard

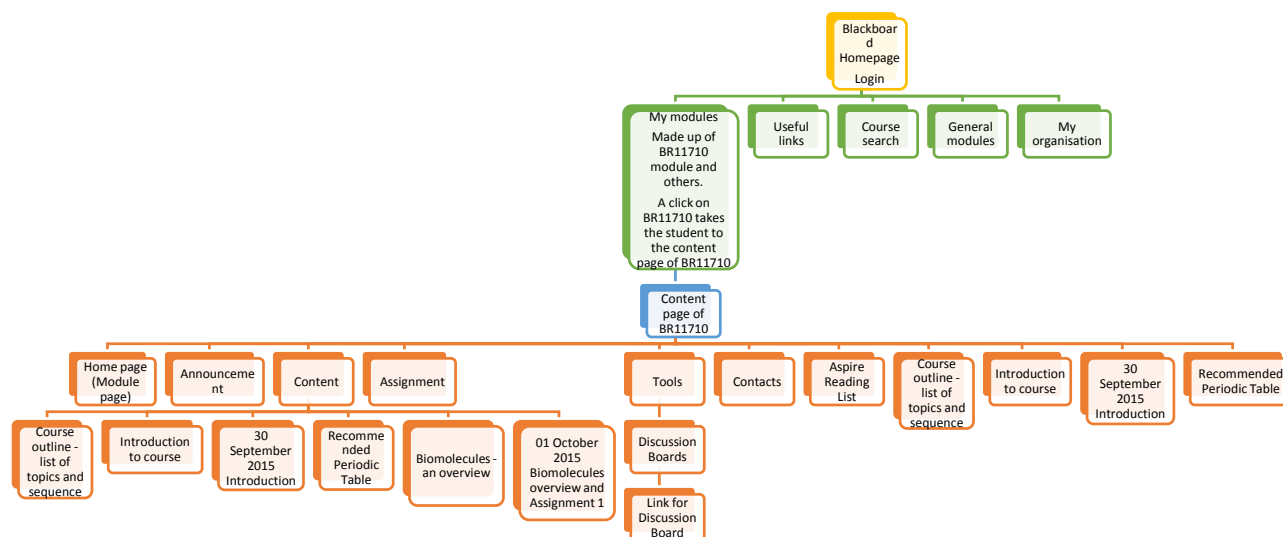


Figure 6.6: How broad the navigation of the BR11710 module materials was

such a way that the students are taken directly to the content page of the module and a vertical menu consisting of links to Home page, Announcement, Module Information, Content, Assignment, Contacts and Aspire Reading List. This is an improvement over the layout during the pilot study, which was conducted in 2015. The e-learning of Aberystwyth University has restructured the arrangement of materials on Blackboard such that students have now been provided with direct access to the lecture materials on the content page which is of utmost importance and interest to them. It is believed that this is partly due to the presentations made by the researcher to the e-learning team of Aberystwyth University at various times including a presentation of the results of the pilot study in January

2016, a presentation during the Aberystwyth University Learning and Teaching Conference in July 2016 and a presentation of the initial findings of the main study during the Aber/Bangor Academy Showcase Webinar in 28 June 2017.

6.6 Investigation three

This involved looking at the content page of the BR11710 to see how broad the navigation of the page was within the VLE.

6.6.1 Aim

To investigate the breadth of the navigation of BR11710

6.6.2 Method

The researcher took a critical look at how the module materials have been laid out and then constructed a diagrammatic representation with respect to the navigation within the module on Blackboard. This is shown in Figure 6.6. Also, the content page of module BR11710 was also inspected for the breadth of navigation since that was where most of the lecture materials were placed. A screenshot of the content page is provided in Figure 6.7

6.6.3 Results

There were quite a lot of items that were on this page for the students to navigate and select from. As a result, students were required to scroll down to be able to see everything on the page and make their selection. Perhaps the materials on this page could have been better arranged using weekly folders. That way, students can easily see all the folders at a glance and click on the weekly folder of their choice. Although it can be argued that some students may not remember the particular weekly folder that contains what they are looking for and therefore do not mind having all the materials by their names on a single page and scrolling down to find them. For the students who prefer the weekly folder arrangement, they are likely to view scrolling down as a turn-off. This agrees with the interview transcripts which pointed out that the way the teaching staff use the VLE could affect how students navigate the module on the VLE.

6.7 A comparison of the data analytics and the transcripts

This section presents a comparison of the results of the data analytics and the results of the data analysis of the interview transcripts.

6.7.1 Supporting the transcripts

The results of the data analytics supported the interview in the following ways.

- (i) It affirmed the fact that there were features that were popular with the students and the ones that were not popular with the students.
- (ii) The navigation of the content page of module BR11710 was quite broad. This involved scrolling down of the page.
- (iii) It also revealed how the arrangement and presentation of materials on the VLE by the teaching staff could negatively affect the way that students access such materials.
- (iv) The depth of the discussion board agreed with the findings of the interview that some of the features were too deep with respect to navigation. Also, the poor use of the discussion board that was observed in the logs was in harmony with the interview transcripts.
- (v) Demonstrated the need to improve the *Navigability* of Blackboard in order to enhance the user experience of students.

6.7.2 Contradicting the transcripts

Apart from the discussion boards, the results of the data analytics did not support the notion that the features within module BR11710 were too deep.

6.7.3 Implications of the results

The overall results show that there is a need to improve the navigability of the VLE by focusing on providing only the materials that are relevant to the students. There is a need for some features to be reconfigured within the VLE. For instance, if the students are going to use the discussion boards the way they use the assignment, announcement and content features, perhaps a consideration should be given to making the discussion board visible and the teaching staff should also consider being active with it in their engagement with the students. Another point worth mentioning here is that how the teaching staff arrangement materials on the VLE affects the navigation of students. The teaching staff strive to present information to students in such a way that is not too broad or deep for the students.

Another way that the navigability of the VLE can be improved is to consider improving the search functionalities of the VLE. The transcripts showed that some students would prefer to search for items than click from the search result to what they want rather than finding their way through a hierarchy.

Hmmm may be like a search function if it's possible for all files in the module along with the module names, it will be easier to search through.

-Student S1

If you could search for something like keyword maybe I'm not entirely sure if there is one but I know that sometimes when I'm trying to revise or something and if I'm trying to look up something and I can't remember which lecture it's on ... trying to find one slide and if you could... -Student S3

6.8 Chapter summary

In this chapter, the data analytics on the students' use of Blackboard in Aberystwyth University has been analysed and the results compared with the results of the analysis of the interview transcripts. The results of the analytics as well as the analysis of the Blackboard web pages supports the results of the interview transcripts. This implies that there is a need to improve the Navigability of Blackboard in Aberystwyth University. This will involve focusing on providing only the materials that are relevant to the students and ensure that the depth of navigation for materials and tools is not an issue for the users. For instance, the depth of the discussion boards needs to be reduced to not more than three clicks if the students are going to use the discussion boards the way they use the assignment, announcement and content features.

The screenshot displays the Blackboard interface for the course 'Biological Molecules and Methods (2015-16) BR11710'. The left sidebar contains navigation options such as Home Page, Announcements, Module Information, Content, Assignments, Tools, and Contacts. The main content area, titled 'Content', lists the following items:

- Course outline - list of topics and sequence (Attached File: 161110775a04a4d412.03 KB)
- Introduction to the course (Attached File: 161110775a04a4d412.03 KB)
- 20 September 2015 Introduction
- Recommended Periodic Table
- Biomolecules - an overview (Attached File: 161110775a04a4d412.03 KB)
- 01 October 2015 Biomolecules overview and Assignment 1
- Cholesterol animation
- Nucleic Acids
- Week 6 Chemistry tutorials (Attached File: 161110775a04a4d412.03 KB)
- Recommended directed study resources (These resources are recommended for any areas of the course you are struggling with and for revision)
- Lipids (2 lectures) (Attached File: 161110775a04a4d412.03 KB)
- 21 October 2015 Lipids lecture 1
- 22 October 2015 Lipids 2
- Ted Talk on TAGs and Cis / Trans fats
- 28 October 2015 Proteins 1
- 29 October 2015 Proteins 2
- Amino Acids and Proteins (Attached File: 161110775a04a4d412.03 KB)
- Proteins - Ebola Case study (Attached File: 161110775a04a4d412.03 KB)
- 04 November 2015 Ebola proteins
- Workshop booklets
- Analysis and Applications (Dr Anjan Edwards: lectures on qualitative and quantitative analysis)
- pH, acids and bases (Attached File: 161110775a04a4d412.03 KB)
- 12 November 2015 pH
- Water and redox (Attached File: 161110775a04a4d412.03 KB)
- 18 November 2015 water
- Carbohydrates (Attached File: 161110775a04a4d412.03 KB)
- 02 December 2015 carbohydrates 1
- 03 December 2015 Carbohydrates 2

Figure 6.7: A long list of items for students to scroll through within the content page of BR11710 module

Chapter 7

Literature Review

7.1 Introduction

This chapter presents the literature review of this study. According to the tenets of classic grounded theory (CGT), a full literature review of the study should be delayed until after the analysis of the transcripts of the research work.

Although a literature review was conducted during the pilot study, it was in the general area of virtual learning environment while the one conducted during the main study and presented in this chapter was specifically on Navigability of the web and VLE. It is instructive to mention here that the literature review conducted during the pilot study was meant to provide the researcher with the basic background knowledge to be able to conduct a proper study in the substantive area. While the literature of the pilot study shaped the research question and the interview questions of the main study, the analysis of the data of the main study was not influenced by the literature review of the pilot study. The researcher adopted an inductive rather than a deductive approach in analyzing the data gathered. This ensured that the emerging results of the analysis were a product of diligently following the principles and techniques of the classic grounded theory methodology. For example, the constant comparative approach was used to validate or otherwise the suitability of the core category in the substantive area under study. This guarded against an imposition of preconceived ideas on the data and consequently, the data analysis was not biased or stifled due to preconceived ideas from the existing literature or any other area. As the analytical processes presented in Chapter 5 reveal, the results are fully supported by the exemplification of data from the interview transcripts and the emergence of the framework of *Navigability* for virtual learning environment is well grounded in the data of the research.

Consequently, a full literature review of this main study was then undertaken after the key issues of the study had been identified through the analysis of the transcripts as presented in Chapter 5. So based on the result of the analysis, a number of issues were investigated in the existing literature in order to provide a basis for integrating the emerging theory with the existing literature. The key issues that were investigated include the web, web information search, issues of web information arrangement, technology enhanced learning, virtual learning environ-

ments (VLEs) and navigation in VLEs. The review provided a theoretical basis for investigating the key issues that were identified in the study. Based on the fact that the framework of **Navigability** with respect to VLEs was the result of the analysis, **Navigability** became the core thread of investigation in order to find out what the existing literature had to say about the concept of **Navigability** with respect to virtual learning environments.

7.2 The web

The Web has been defined by Easley and Kleinberg (2010) as an application developed to let people share information over the Internet. It is made up of virtual pages that are linked together globally. According to Easley and Kleinberg (2010) the original framework of the web involved two central features. The first one was to make documents available to internet users in the form of Web pages that could be created and stored on a publicly accessible part of a computer. The second feature was to provide a means for others to easily access such Web pages. The access was provided through the use of a browser with the capability to connect to the public spaces on computers across the Internet and retrieve the Web pages stored there. Hence the web has over the years become a repository for information and that information growing at an exponential rate. Consequently, web pages have become significantly more complex (Butkiewicz et al., 2011). The web is now a complex framework made up of billions of web pages (Thielsch et al., 2014). As at Monday, 10 June, 2019, the size of the World Wide Web stood at about 60 billion pages (based on the estimated size of Google's index from <http://www.worldwidewebsite.com>). From a web that was initially made up of text and images, webpages now include several content types, ranging from videos to scripts executed on the client's device to "rich" media (Butkiewicz et al., 2011). Furthermore, Butkiewicz et al. (2011) noted that the present day website fetches content not only from servers hosted by its providers but also from a range of third party services such as advertising agencies, content distribution networks (CDNs), and analytics services. The implication of this is that displaying a single web page today involves fetching several objects with varying characteristics from multiple servers under different administrative domains (Butkiewicz et al., 2011). The explosion of the internet as a result of e-commerce in the last decade is another reason for the large and complex data on the web (Bhosale and Shingate, 2016). This is not surprising when viewed against the background that this age has been described as the information age (Alberts and Papp, 1997) where information is key and essential. So this has made it very important to have access to the available information on the web in order to provide the users with leverage in achieving their objectives.

The above points underscores the need for information on the web to be well structured and placed in a way that facilitates navigation and not hinder it. This is important because a website that is easy to navigate will allow the user to access desired information without getting lost or having to backtrack (Sachan and Singh, 2015).

7.3 Searching for information on the Web

Given that the primary aim of people using the website is to get information (Gasson and Waters, 2013), it follows that there has to be some form of navigation from one page of the website to another as all the information needed by users cannot possibly be on a single page. According to Fu and Pirolli (2007), “Web navigation, or browsing, typically involves some mix of scanning and reading Web pages, using search engines, assessing and selecting links on Web pages to go to other Web pages, and using various backtracking mechanisms (e.g., history lists or Back buttons on a browser” and Pandey et al. (2019) defines navigation as the ease with which users traverses through a website while searching for information. Perkowski and Eizioni (2000) opined that websites as of 2000 were intricate but not intelligent and argued that while Web navigation was dynamic and idiosyncratic, all too often websites are fossils cast in HTML (Perkowski and Eizioni, 2000). Hence, facilitating the browsing of a complex website is increasingly important in modern web management (Lin and Tseng, 2010). The users of a website have a greater chance of finding information when the navigation of the site is smooth (Pandey et al., 2019), which demonstrates why navigation is considered as an important parameter that contributes to the usability of the website. van Oostendorp and Aggarwal (2015), while noting that navigation within a website is an important factor for the success of a website, argued that faster and easy web-navigation leads to better usability and reduces cognitive load on the users.

However, the literature reveals that accessing information on the web can sometime be a challenge especially in a website that has complex structure and enormous information (Carmel et al., 1992, Dhyanani et al., 2002). It has been reported by van Oostendorp and Aggarwal (2015) that the amount of information on the internet is so abundant that users are known to often face what is called infobesity or information overload. The implication of this is that as websites grow larger and more complex, users are likely to face more challenges that can be linked to navigation. According to Yen et al. (2017), one of the implications of the abundance of web pages of information is that it increases the navigation time for users due to the excessive amount of irrelevant information, and thereby reducing web usability. It has been shown that some websites are so complicated that it is easier to use Google to find the direct link rather than navigate the website itself (Morville and Sullenger, 2010).

In their study involving 111 participants, Lazar et al. (2003) reported that web browsing was cited as the task that most frequently caused frustration. Their study revealed that web browsing was the largest source of frustration. It accounted for 122 frustrating experiences with Web browsing out of a total of 373 frustrating experiences reported by the participants. One of the most surprising findings of their work, was the time lost due to frustrating situations caused by web navigation. In the same vein, Nizam et al. (2012) opined that navigation within a website is one of the major causes of user frustration on the web. According to the 2007 Harris Interactive Survey of Online Customer Behaviour, navigation difficulty was one of the top issues that led to the abandonment of websites after users experienced them only one time (Tealeaf, 2007). Navigation was identified

by Fernandez et al. (2011) in their study as one of the main dimensions that define web applications with the others being content and presentation.

Perkowitz and Eizioni (2000) argued that reducing the number of clicks that visitors have to make on a website and reducing the complexity of pages they must navigate will benefit them.

In their study, Chiou et al. (2010) focused on improving website evaluation through the analysis of 83 articles by classifying them into information systems (IS), marketing, and combined-approaches. They found out that IS-approach studies adopted technical factors, such as ease of use, security/privacy, visual appearance, and information quality, as the major evaluation criterion for websites evaluation. Furthermore, Chiou et al. (2010) reported that “nearly every IS study (97%) included ease of use as a factor; the most frequently used criteria were navigation, logical structure, user-friendly interface, loading speed, well linkage, searching mechanism, ease of access, and ease in finding targeted information.” This shows how important navigation is in websites.

The arrangement of information on the web is a key task that web designers and developers are expected to pay attention to when building websites as it is not just about providing content on the website. The way that the content is structured and laid out on the web is critical to the experience of the end users. In a study conducted by Lamprecht et al. (2017) titled “How the structure of Wikipedia articles influences user navigation”, their result suggested that enhanced organization of information can help make information networks more navigable. It goes without saying that the arrangement of the materials could either positively or negatively affect the users’ ability to access the provided information.

7.4 Key issues of information arrangement on the Web

Given complex and growing data available to people on the Web every day, it is increasingly becoming difficult to build information systems that can be navigated in an efficient way Dimitrov et al. (2015).

According to Perkowitz and Eizioni (2000), designing a complex website so that it readily yields its information is tricky. A number of reasons were given for this.

- (i) Different visitors have distinct goals.
- (ii) The same visitor may seek different information at different times.
- (iii) Many sites outgrow their original design, accumulating links and pages in unlikely places.
- (iv) A site may be designed for a particular use, but may be used in unanticipated ways in practice; the designer’s a priori expectations may be violated.

In the same vein, Wang and Yen (2007) alluded to the fact that the task of improving navigation was not a trivial one due to the scale and complexity of

websites. Moreover, such a task can be further complicated by the diversity and multiplicity of web pages of interest (Yen et al., 2017).

According to Min and Ryu (2013) designing well-structured websites to facilitate effective user navigation has long been a challenge. They stated that a major reason is that the web developers' understanding of how a website should be structured can be considerably different from that of the users. This implies that websites should be structured in such a way that the disparity between its structure and users' expectations is kept at a minimum (Min and Ryu, 2013).

Therefore, it is imperative for web designers and developers to do more in the arrangement of information on the web. Over the years, issues resulting from the arrangement of information on the web, have been shown to shape the perceptions of users and how they make use of the web. And ultimately it has affected how they rate the usefulness of the websites that they visit. The challenges that come from a poor or complex arrangement of information on the web could lead to navigational complexity as the users interact with the websites. Navigational complexity is a function of the structural complexity of the website. The more the web pages are interlinked together, the greater the structural complexity of the website and the more the difficulty in navigating the website (Pandey et al., 2019). According Pandey et al. (2019), other factors that could contribute to the navigational complexity of a website include website defects (e.g. broken links and orphan pages), maximum depth and path density.

Tullis (2005) described 10 of the most common mistakes in the presentation of information on the web. These mistakes are listed below:

- (i) Burying information too deep in a website
- (ii) Overloading pages with too much material
- (iii) Providing awkward or confusing navigation
- (iv) Putting information in unexpected places on the page
- (v) Not making links obvious and clear
- (vi) Presenting information in bad tables
- (vii) Making text so small that many users cannot read it
- (viii) Using color combinations for text that many users cannot read
- (ix) Using bad forms
- (x) Hiding (or not providing) features that could help users

Tullis (2005) provided examples for each of these mistakes above as well as arguing why the usability evidences show that they are indeed mistakes and then offering ways that they could be avoided. Some of these issues highlighted by Tullis (2005) and others identified in the existing literature are discussed in the next section with a view to situate the issues of **Navigability** in its proper theoretical context.

7.4.1 Burying information too deep in a website

The use of hierarchical structures in a website, helps the novice user who lacks sufficient memory capacity to learn and recall all of the commands necessary to execute the desired actions (Zaphiris, 2001). However, its use has some drawbacks. Ruzza et al. (2017) stated that hierarchies often hinder user access to the site's deepest content, where the most detailed and relevant information may be found. According to Whitenon (2013), websites with deep hierarchies are more difficult to use. With respect to burying information too deep in a website, Tullis (2005) found out the deeper a piece of information resides in a website; the less likely users will find it. He argued that the more clicks it takes from the homepage to get to the information, the harder it is to find. In the same vein, Whitenon (2013) argued that in deep hierarchies, when there are only a few categories on each level, they tend to be more generic and more confusing for the users. Therefore, the challenge for web developers/designers is negotiating between presenting information in a deep level and a broad level, and the extent of that depth or breadth as the case may be. This challenge which has been described as the concept of "depth vs breadth trade-offs" (Zaphiris et al., 2002, Tullis, 2005) has been a subject of previous investigations by researchers in human computer interactions over the years.

In an experiment conducted at the University of Maryland (Zaphiris et al., 2002), expandable indexes providing full menu context were compared with sequential menus providing only partial context. The menu depth was varied using hierarchies of 2, 3, and 4 levels deep in an asymmetric structure of 457 root level items. Twenty one participants were asked to find specific targets within the menus, which they accessed via a web browser. The results of the study indicated that reducing the depth of hierarchies improved performance in terms of speed and search efficiency. The researchers unexpectedly found out that the expandable indexes resulted in poorer performance with deeper hierarchies than did sequential menus and therefore pointed out that menu hierarchies should be designed with a minimum depth and maximum breadth if at all possible. The researchers further argued that expandable index menus are acceptable only for shallow menu hierarchies or depths 2 and 3, and should be avoided for deeper hierarchies.

This however contradicts the views of the participants in my study. The transcripts show that they complained about clutter and information overload while some others users also said they don't like too many clicks, which indicates that they don't like deep hierarchies either. But again Tullis (2005) was quick to add that when menus with expandable indexes are used, they should be redesigned in such a way as to make relevant, hierarchical, context information clear and available to the user. This point underscores the need to strategically manage the user interface effectively. The participants of my study complained of irrelevant information of the user interface. This no doubt affect how they perceived the VLE. Another point worth noting according to (Zaphiris et al., 2002) is that developing design web pages that are devoid of unfriendly indentation schemes and long lists that require excessive scrolling of the list in a browser window. But the transcripts of this study revealed that users were not happy with having to scroll

up and down.

In a related study, Larson and Czerwinski (1998) conducted an experiment aimed at the discovery of principles for the design of multiple hyperlinks on a web page for information retrieval tasks. This study was carried out with 19 persons who were all experienced computer and web users. They concluded that one implication for design based on their set of results was that web designers needed to balance the number of categorical decisions made for their information structure against the number of items needing to be visually searched on the web page. They argued that for designers to appreciate the concept of the “depth vs breadth trade-off”, it was imperative for the web designers to consider the layout as well as the semantics and labelling of web content. This recommendation was also collaborated by Zaphiris (2000) who pointed out that web designers should be guided by the fact that access time is proportional to depth in menu selection during the construction of homepages, arguing that low depth designs of a taste of variety seemed to be preferred by users.

7.4.2 Information overload on web pages

When information on the web is broadly displayed, it makes it easier for web users to find what they are looking for. Content is more discoverable when it’s not buried under multiple intervening layers (Whitenton, 2013). This way, users are able to see at a glance, the options available to them without having to dig deep into the website and they make less mistakes. According to Bernard (2003) “people make fewer mistakes and find information more quickly if the menu structure of the site is broader rather than deeper” According to Whitenton (2013) “a flatter hierarchy with more categories at each level usually has more-specific labels that are easier to understand; but in broad hierarchies with a very large number of items, there is often some conceptual overlap between at least a few of the categories. Users can also become overwhelmed with long, cluttered menus.” According to Galletta et al. (2006), a broad site requires only a few clicks to reach the target, also minimizing the delays that accompany the required traversal from top to bottom. However, this can become a challenge if not well structured. A major issue with the way information is presented on the web is the amount of information that is placed on a web page for the user to interact with. While arguing in favour of breadth style in the “depth vs breadth trade-offs”, Tullis (2005) stated that “there is a limit to how much material should be placed on the web page”. This ensures that the pages are not overloaded with too much materials as this affects the loading time of the web pages.

In an earlier but related study, Selvidge (1999) conducted an experiment on the average page load time using 3 levels: 1, 30 and 60 seconds. Given the same tasks, she reported that not only did users complete fewer tasks at the 30- and 60-seconds levels, it was also observed that they were frustrated and experienced more difficulty at those levels in comparison to the 1-second level.

Trimmel et al. (2003) in a study to measure the physiological response of users to websites with page load times of 2, 10 or 22 seconds, evidence was found of physiological stress as shown by higher heart beat rates and increased electroder-

mal activity, with load times of 10 and 22 seconds. The import of the studies examined above with respect to the amount of information placed on a web page suggests that degree of frustration experienced by users is directly proportional to the load time of the web page. Tullis (2005) pointed out that there is some evidence that in a wide variety of situations users expect web pages to load in less than 10 seconds arguing that beyond that point, there seems to be a significant increase in user frustration, perception of poor site and/ or product quality, and may simply move away from the site.

7.4.2.1 Making the trade off in real life situations

Even though the literature Morville and Rosenfeld (2007) advocates the adoption of a broad and shallow architecture in the design of the information architecture of a website, Ruzza et al. (2017) argued that large organizations that have complex and heterogeneous materials may nonetheless be forced to maintain a certain level of depth in the hierarchical organization of their content. This no doubt calls for some trade-offs when designing a website. For example, given that the quality of website structure is based on its navigability, average number of clicks and structural complexity Sreedhar et al. (2010), designers are faced with having to make choices in website design, by considering the trade-offs between cluttering a screen with many links per page in a “broad” site, or providing a “clean” look and forcing users to drill down very deep (Galletta et al., 2006).

With respect to the “depth vs breadth trade off” Tullis (2005) argued that it was better to aim for breadth over depth in most of the real-world situations that are encountered on websites. According to Tullis (2005) this strategy would translate to putting more choices on each page and having fewer levels of pages. He was however quick to point out that such organization must also be consistent with the natural organization of the information that the users are used to. Tullis (2005) reckoned that having more selections (links) on a page makes it easier for users to make comparisons between the options when on the crossroad of deciding which path to choose. Another advantage that Tullis (2005) pointed out is that with users having more selections on the web page is that each item will tend to be more specific in order to distinguish it from the other selections, which ultimately helps the navigation of the users. The position of Tullis (2005) was corroborated by Galletta et al. (2006) who alluded to the fact that website designs with many links per page and few levels have been found to be preferable to deep websites with fewer links per page. The implication of this according to Galletta et al. (2006) is that the web designers will have to choose between taking up space and explaining technical terminology or providing a less cluttered interface that assumes some level of user knowledge. From the above it can be inferred that for better user experience, designers of web pages should adopt the broad design technique as opposed to the deep design technique when arranging information on the web as long as such links are relevant to users. This will ensure that users encounter little or no difficulty in the search for information on the web and frustration is eliminated. This agrees with the position of Burrell and Sodan (2006) who argued that Web designer should ensure that sites are structured in such a

way that information lookup is easy and that the site be intuitively navigable.

7.4.3 Typography

Another issue that affects the presentation of information on the web is typography. Typography has been described by Turgut (2017) as one of the most effective and indispensable components of visual communication whose primary function is making texts readable. The way the tool of typography is used in presenting information on the web goes a long way in conveying information or otherwise to web users. Tullis (2005) identified “making text so small that many users cannot read it” as one of the ten most common mistakes in the presentation of information on the web. He argued that the challenge with many websites is that they were being designed by people in their 20’s and 30’s who don’t struggle with reading from computer monitors as in the case with older people. Tullis (2005) reported that the studies surveyed seem to suggest that a website targeted for a general audience should probably use a default font size of 10 or 12 points and recommended that a default font size of 12 or 14 points should be used for website that are specifically targeted for older users. Nielsen (2002) criticized the practice of web designers whereby they specify the exact size of text down to the pixel. He noted that such a practice led to reduced readability of an increasing number of websites. Nielsen (2002) recommended that web designers should use font size 10 as their default size and use bigger font sizes (at least 12 point) for websites that target senior citizens. In a related study based on comparing objective and subjective readability and comprehension of articles for font sizes ranging from 10 to 26 points, and line spacings ranging from 0.8 to 1.8 using Arial font, Rello et al. (2016) on the basis of their findings, recommended the use of 18 points font size and default line spacing for the purpose of optimizing readability and comprehension of web text content.

Websites with smaller font sizes can also create accessibility issues for web users especially for users with learning disabilities such as dyslexia. McCarthy and Swierenga (2010) argued that small font size is a major problem experienced by people with dyslexia. They reported that people read and comprehend texts better with increasing font sizes. Al-Wabil et al. (2007) recommended font size 14 for people with dyslexia. There is evidence that some readers with dyslexia prefer larger font sizes as in the case of Rello et al. (2013) where 22 dyslexia participants were tested with four sizes for arial: 14, 18, 22 and 26. Their findings revealed that 14 out of the 22 participants preferred the biggest option of font size 26 and the rest of the 8 participants preferred the second biggest font size of option of 22. The general consensus is that increasing accessibility of Websites for people with dyslexia can also improve access for non-dyslexic users (Boldyreff et al., 2001, Rello et al., 2013, McCarthy and Swierenga, 2010).

7.4.4 Lack of clarity in navigation

Another mistake on the part of web designers which is responsible for poor navigation in websites is what Tullis (2005) refers to as “Not making links obvious

and clear”. Tullis (2005) argued that users have challenges with differentiating between links and non-links in a situation where the links are not clear and made obvious to them. In the same vein, Miller and Remington (2004) who conducted a study on menus and web search tasks through the use of a computational model of information navigation, reported that by varying the quality of the link labels in their simulations, they found out that the optimal structure of a website depends on the quality of the labels of the links. And as Nielsen (2000) puts it “recognizing something is easier than remembering it. Minimize the user’s memory load by making all important navigation options permanently visible. The most important navigation options should be available at all times, not just when we anticipate that the user will need them.” Belanche et al. (2012) advocated the need for management to focus on building websites with designs and structures that are simple and easy for the users to understand.

7.4.5 Poor navigation mechanism

Another issue that affects the search for information on web pages as pointed out by Tullis (2005) is the hiding of information behind navigation mechanisms that users perceive difficult to understand or use. He argued that this mistake with web designs often shows up when information is organized in a way that does not make sense to the users including using terminologies in the navigation that users were not used to. Tullis (2005) mentioned that another way that this mistake could occur is when information is presented in a manner that does not flow with the the expectation of the users.

7.4.6 The three-click rule

One of the implications of living in this fast paced age is that people want to get information in a fast and quick manner. They are always anxious to get information from the web within a very short time frame. But the reality on ground is that most users spend a lot of time searching for information on complex websites and at times with no success. The challenges of spending so much time in searching for information has led to the emergence of the concept of the “three-click-rule”. The “three click rule” states that users should ideally be able to reach their intended destination within three mouse clicks (Zeldman, 2001). This implies that from the homepage of a website, a user should be able to get to any other page on the site within three clicks of the mouse (Zhang et al., 2004). But this is far from being the experience of most users as they often have great difficulty in navigating complicated websites (Carmel et al., 1992). The frustrations they experience in the course of navigating these websites are due to the fact that most websites designers ignore “the three-click rule”. According to Zeldman (2001), the “three click rule” can help web designers to build good sites with intuitive and logical hierarchical structures but again keeping up with the “three-click rule” is not a thing that is cast in stone. Zeldman (2001) noted that

With the average site offering hundreds if not thousands of items and options, the “three-click rule” sounds preposterous. But it is actually

fairly easy to achieve if you start by constructing user scenarios before you begin to design the site. What will people who use this site want to do? Where will they want to go? Based on those scenarios, the site is structured into main areas of content. These are then organized into no more than five main areas. (See the next section, “The So-Called Rule of Five”) Submenus in each of the five main areas get the user close enough that he or she is at least reassured by the third click, even if it takes a fourth click to get to the final, desired page. p. 98

As should be expected, there is a different school of thought on the “three-click rule”. In a study conducted by Porter (2003) it was discovered that there was no correlation between the number of times users clicked and their success in finding the content they sought. The analysis of their results showed that there was not any more likelihood of a user quitting after three clicks than after 12 clicks. They found no difference in the distribution of tasks lengths on comparing the successful tasks with the unsuccessful ones, arguing that hardly anybody gave up after three clicks. They found no evidence for the “three-click rule” in their study. They posited that the frustrations of users was about failing to find what they were looking for, and insisted that users who found what they wanted did not complain about the number of clicks. They concluded by saying that the “three click rule” does not focus on the real problem. The number of clicks isn’t what is important to users, but whether or not they’re successful at finding what they’re seeking.”

In agreeing with Zeldman (2001), Porter (2003) stated that the “three-click rule” can help web designers focus on the needs of the users and thereby help create better web sites in the process and in the same vein, Cucciniello et al. (2012) argued that the “three-click rule” was considered a good practice for web designers and a rule of thumb by users, who expect to find the information they are looking for in no more than three clicks.

While Glassey and Glassey (2004) agreed that the “three-click rule” can be a useful factor in evaluating user experience based on the fact that many web designers and users have embraced it as good practice, they argued that the “three-click-rule was not a sufficient indicator to measure the accessibility or usability of a website. On their part, Hathorn and Hathorn (2010) declared that there was no evidence that users do abandon websites after three clicks. In disagreeing with the concept of “three-click rule”, Krug (2014) insists that the number of clicks is not important as long as each link is clear to the user.

7.5 Virtual learning environments

The concept of technology enhanced learning has led to the use of virtual learning environment across Higher Education in the UK and globally. Virtual learning environment has been defined as a system for delivering learning materials to students via the web (Oxford University Press, 2016)¹. This involves some forms of online interactions whereby learning materials are provided for the students by the

¹<http://global.oup.com/uk/orc/learnvle/>

teaching staff and the students are in turn able to submit their assignments online for grading and feedback. VLEs are now an integral part of Higher Education as both students and staff make use of them in searching for information that will help their learning and provision of provision of learning materials.

7.5.1 Navigability in virtual learning environments

The use of VLEs in Higher Education has seen both students and staff making use of the VLE in searching for information that have been provided via it. The ability to navigate within the VLE has a lot of impact on how both staff and students use it. It can either support or hinder their use of the VLE. Zaharias (2005) identified navigation as one of the several design attributes that has an impact on learners' motivation to learn. Navigation assists the way the learners browse through the instruction and how the instruction is designed to facilitate understanding of organization and structure of content (Zaharias, 2005).

Navigability has been defined as “the sequencing of pages, well organized layout, and consistency of navigation protocols” (Palmer, 2002). Navigational mechanisms are provided to help users easily navigate the web pages seamlessly in order to find what they are looking for because according to Liu et al. (2009) “a system which is easier to navigate provides more flexibility in user's preference to locate the information and tools needed.” Talking about the importance of navigation, Krug (2014) stated that

Navigation isn't just a feature of a Web site; it is the Web site, in the same way that the building, the shelves, and the cash registers are Sears. Without it, there's no there there” p 59.

7.5.2 The challenges of navigation in VLEs based on existing Literature

The complex nature of Virtual Learning Environments (VLEs) can make the accessing of resources a daunting task. This is because merely providing navigation on a website does not solve the problem of navigation. The way the navigation mechanisms of the web pages are structured can enhance or complicate the navigation of the VLE. Given that a VLE is web-based, the challenges of web navigability earlier identified in this chapter are very must present in VLEs. A critical look at the existing literature on navigation in VLEs reveal that navigation is still a major issue in the use of VLEs in Higher Education.

7.5.3 Gaps in the literature

With specific reference to the navigation of VLEs, there is a need to conduct more studies that focus on improving the Navigability of VLEs. Although some studies have been carried out with respect to navigation in VLEs (Alelaiwi and Hossain, 2015, Brown and Bullock, 2014, Kear, 2007, Power and Kannara, 2016, Kate Pittsley, 2012, Sadoux et al., 2016), more work is still required to tackle

the problem of navigation. This research fills this gap by undertaking an in-depth study of the issues of **Navigability** and the development of a framework **Navigability** for virtual learning environments.

Carter (2013) identified technical glitches with accessing and navigating the VLE as barriers to students' satisfaction with online learning.

Power and Kannara (2016) in their study identified difficulty in navigation as a perceived barrier in the use of a VLE. Their study was based on a purposive sample of academic staff as participants across two academic schools within the Creative Arts at one Post-92 Higher Education institution in the United Kingdom. After conducting a comprehensive VLE content analysis in their study, four main barriers were found to affect the use of the VLE within Creative Arts. Lack of flexibility in relation to navigation and interface was one of the barriers identified. The result of their study was a VLE best-practice model that focused directly on improving aesthetics and navigation. The implementation of the model in re-designing of the VLE generated positive feedback from both students and teaching staff. (Power and Kannara, 2016).

Kate Pittsley (2012) reported in their study how the students of a graduate online course did not notice the tab navigation of the module in the course of using the online module platform. The implication of not recognizing navigational elements on web-based research guides, was that students were not always accessing secondary pages of the guides. Consequently, in their study, two types of navigation improvements were applied to separate sets of online guides and the logs of students on both guides were analyzed. Their analysis of the usage patterns from before and after two types of navigation improvements were applied to the separate sets of online guides revealed that the challenge experienced by the students was due to the navigation mechanism inherent on the e-learning platform. Both sets of experimental guides showed an increase in use of secondary guide pages after the changes were applied whereas a comparison group with no navigation changes showed no significant change in usage patterns. In their case, both duplicate menu links and improvements to tab design appeared to enhanced independent student navigation of complex research sites (Kate Pittsley, 2012).

In a study which spanned four different universities and four VLEs but only involved lecturers, Kear (2007) noted that "it is important that VLEs have straightforward navigation, use clear terminology, and are based on structures and processes that make sense to students". Based on the study presented here, one can now say that not just students but all users including the teaching and administrative staff face **Navigability** challenges.

In their study titled "Evaluating and Testing User Interfaces for E-Learning System: Blackboard Usability Testing" involving students of a university, Alelaiwi and Hossain (2015) reported that participants identified navigation difficulties in the user interface of Blackboard.

The work of Sadoux et al. (2016) involved the recruitment of students to design a new navigational architecture for the Moodle pages of the Language Centre at the University of Nottingham Ningbo China. This became necessary after a number of issues were identified with the VLE of the university. Their goal was to work in partnership with students in order to create a new navigational

architecture that would be clear and inviting to the student. Furthermore, the new information architecture was to be used as a framework for a master plan to develop the pedagogy of the Language Centre using the VLE. They argued that though previous studies have shown that navigational design was of primary importance to users, it was hardly the focus of any training on how to use the VLE or even rarely the focus of any e-learning training at the University of Nottingham Ningbo China. Sadoux et al. (2016) were convinced that navigational design as the central pillar of the project could stimulate a positive engagement with Moodle along multiple pathways that students could make use of in their learning.

Sadoux et al. (2016) agreed with Kear (2007) arguing that without a clear navigational design, the ability of the learners to engage with the VLE may be hindered. They posited that it was important to focus on navigation and ensure that it was user-friendly. Sadoux et al. (2016) admitted that planning the navigation of the VLE would require a proper understanding of the needs of the learners while noting that

Planning the navigation though, requires a clear notion of the elements that learners will need to navigate to and from as well as decisions about the linearity or otherwise multiplicity of pathways that need to be available to learners.

The decision of Sadoux et al. (2016) to use students to design the framework was based on the following.

- (i) Students were chosen to design the navigational framework of the VLE based on the conviction that working with students provided them a way to challenge their own assumptions and beliefs and in that sense they were able to explore what the students could bring to the project as change agents.
- (ii) They involved the students in order to have a holistic view of the proposed framework as they were concerned that their own perceptions of the architecture of the Moodle page might be partial and based on their own ability to read the web.
- (iii) The desire to explore the adaptability of the linear navigation pathway which Moodle and others offered as a default by standard VLE designs.

The result of the study was a framework that had a horizontal structure rather than a vertical design structure. The horizontal design made it possible to have a full view of all items in the first page. They then chose a hybrid model of content including both linear pathways and non-linear exploration of the web pages. This ensured that there was clear navigation through the use of drop-down menus. One of the designs was eventually chosen by the Language Centre team upon review of all the designs made by the students. At the end of the project, most of the Language teaching staff were happy to see the VLE reconfigured through the prism of students and also appreciated the fact that their willingness to listen to the ideas of students was having a ripple effect on the students by way of boosting learner engagement.

The challenge of navigation on VLEs was also corroborated by Brown and Bullock (2014) Abuhlfaia and de Quincey (2018). In their study, Abuhlfaia and de Quincey (2018) identified navigation as a common usability problem that affects the **User Experience (UX)** of e-learning platforms. On their part, Brown and Bullock (2014) advocated the need to “address the access and navigation issues identified by users that currently act as barriers to use”

All these studies revealed that users of VLEs still grapple with the problems caused by poor navigation.

7.5.3.1 The challenges of navigation in VLEs based on the interview transcripts

As pointed out in section 5.8.4, the transcripts of this PhD thesis revealed that users had navigation challenges due to the following:

- (i) Poor usability of the VLE
- (ii) Information overload
- (iii) Clunky system
- (iv) High learning curve
- (v) Lack of memorability
- (vi) How the teaching staff structured their modules around the VLE
- (vii) Usage of VLE is time consuming for teaching staff
- (viii) Lack of advanced search facilities in the VLE
- (ix) Not fit for purpose
- (x) Too many clicks
- (xi) Not meeting users' expectations

These challenges could be traced to the navigation structure of the VLE. This therefore suggests that attention should be paid to how the navigation of the web pages are developed at the design stage of the websites because as Palmer (2002) puts it the success of a website is significantly associated with its navigation mechanisms. Sadoux et al. (2016) stated that studies on web usability all point to navigational design as a critical factor for users but were quick to admit that it was rarely addressed. While there have been some studies on navigation such as (Kear, 2007, Alelaiwi and Hossain, 2015, Sadoux et al., 2016), they involved either only students or teaching staff or other university staff, and not all the different users of VLEs in the Higher Education.

They argued that it was of vital importance to pay attention to navigation and to ensure that it was user-friendly. Designing an effective web page therefore implies that the web interfaces should be properly designed with clear Navigation in mind. Khan (2005) underscores this point when he alluded to the fact

that “Interface design refers to the overall look and feel of e-Learning programs. Interface design categories encompass page and site design, content design, navigation, accessibility and usability testing.” This assertion was further supported by Sadoux et al. (2016) in stating that planning the navigation requires a clear notion of the elements that “learners will need to navigate to and from as well as decisions about the linearity or otherwise multiplicity of pathways that need to be available to learners.”

Although the issue of typography did not come up in the interview transcripts, the implications of fonts used in virtual learning environments is reported in existing literature. AlKhuder and AlAliv 2017 argued that the font of wording of e-learning materials should be comfortable for the average reader, not too tiny, neither too large forcing the user to do more navigation than actually reading.

7.6 User-centred design

The use of grounded theory in this PhD work implies that the emerging framework of Navigability which has been developed for configuring VLEs is centred on the needs and expectations of the users. This concept of software development in which the design of a system is significantly influenced by the users is referred to as user-centred design (UCD).

According to Abras et al. (2004) “user-centred design is a general term for a philosophy and methods which focus on designing for and involving users in the design of computerized systems.” Through this process, the end-users influence how a design takes shape (Abras et al., 2004). Lowdermilk (2013) defined user-centred design as “a methodology used by developers and designers to ensure they’re creating products that meet users’ needs” According to Ritter et al. (2014), “user-centered design involves focusing on the user’s needs, carrying out an activity/task analysis as well as a general requirements analysis, carrying out early testing and evaluation, and designing iteratively.”

According to Garcia et al. (2017) “user-centred design is the practice of focusing on the users” and dos Santos and Souto (2018) refer to user-centred design as a method that is used to design digital products in which users are involved in all stages of product development.

All five definitions of UCD above point to the fact that the focus of the design methodology is on the users and not necessarily on the system being developed or the developers. As Stone et al. (2017) puts it “the purpose of user-centered design is to create products, tools, software, and systems that are attuned to the needs, goals, and limitations of the intended users.” This implies that a greater emphasis is placed on the users and less focus on formal methods for requirements gathering and specification, and a move from linear, rigid design processes to a more flexible iterative design methodology (Ritter et al., 2014). Stone et al. (2017) noted user-centered design emphasizes the importance of end-user input at all stages of development. According to Reich-Stiebert et al. (2019), “user-centered design fosters mutual exchange in order to create usable products, tools, systems, interfaces, or software programs, for instance, that meet the needs of end users.

This ensures that developers focus on the right things such as meeting users' needs with the proper technological solutions. And this leads to the system providing a great user experience for the users (Lowdermilk, 2013). Furthermore, Lowdermilk (2013) noted that placing users at the centre of software development process removes ambiguity and allows the developer to get to the heart of what the users really need. They asserted that when UCD is rightly done, the system becomes an outcome of actively engaging users. They argued that any design decisions that were made by observing and listening to the users will not be based on the whims or personal preferences of the developers (Lowdermilk, 2013). Hence, user-centered design systems are easier to learn, faster in performance, reduce users errors substantially, and encourage users to explore features of the system beyond the minimum required to get by. (Shneiderman et al., 2018).

There exists various methods for carrying out user-centred designs. In their work, Vredenburg et al. (2002) presented 13 methods for engaging in user-centered designs. These are:

- (i) Field studies
- (ii) User requirements analysis
- (iii) Iterative design
- (iv) Usability evaluation
- (v) Task analysis
- (vi) Focus groups
- (vii) Formal heuristic evaluation
- (viii) User interviews
- (ix) Prototype without user testing
- (x) Surveys
- (xi) Informal expert review
- (xii) Card sorting
- (xiii) Participatory design

Based on the work of Preece et al. (2002), Abras et al. (2004) outlined seven ways to involve users in the design and development of a system. These strategies are:

- (i) Background Interviews and questionnaires
- (ii) Sequence of work interviews and questionnaires
- (iii) Focus groups

- (iv) On-site observation
- (v) Role Playing, walk-throughs and simulations
- (vi) Usability testing
- (vii) Interviews and questionnaires

In their study, Stone et al. (2017) highlighted participatory design, iterative design, and usability considerations as methods that could be used in user-centred designs to drive research and discussions of educational technologies.

Abras et al. (2004) noted that these methods should be used at different stages of the software development process from the start to finish. Rather than spending more time on deciding what framework to use for developing a system, it's important to spend time with the users so that we can effectively plan to provide great value for them. Engaging with the users at all the stages of the software development is very important because users have rich contextual knowledge of the software they use which the designers and other experts lack (Klapwijk and Doorn, 2015).

The key objective of UCD is to produce a software that is based on the real needs of the users. So using the framework generated from grounded theory meets the objective of UCD methodology. This ensures that using the Navigability framework in the overall development of VLEs keeps the focus of the development process cycle on meeting the needs of the users. Engaging with the users at all the stages Users have rich contextual knowledge of the software they use which the designers and other experts lack.

7.6.1 Similarities between grounded theory and user-centred design methods

There are similarities between grounded theory and user-centred design methods in software development. These similarities are discussed below.

- (i) Both GT and UCD place emphasis on users all through the methodological processes. Both methods make the user the focus. Hence, the users are involved in the design of the product throughout all the stages of the development.
- (ii) The use of both GT and UCD in software development stipulates that the development processes are based on the requirements of the users and not on the assumptions or whims of the developers.

7.6.2 Linking categories in GT study to UCD concepts

Some of the categories that emerged through the GT analysis of the data can be related to UCD concepts. These concepts are examined with a view to comparing how these categories/concepts were presented in both methods.

- (i) Usability: In the grounded theory research presented here, usability was identified as one of the categories. The usability category had to do with the

ease of use of the VLE, revealing how easy or difficult it was for users to make use of the Blackboard in carrying out their tasks. Based on the results of the analysis, recommendations were made on how the usability issues of the VLE should be addressed in order to provide greater usability for both students and staff. In the same vein, the field of UCD is all about ensuring that the software product provides great usability for the end users. Through using UCD, developers place users at the centre of software development process, thereby removing ambiguity and can get to the heart of what the users need (Lowdermilk, 2013). According to ISO (2018), **Usability** refers to the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

As noted by Stone et al. (2017), the goal of the usability of educational technology is to get the users (i.e., learners or teachers) to concentrate on learning and teaching the content rather than navigating the software. Therefore, by involving users such as students and teaching staff throughout the life cycle of the development, UCD guards against distraction or frustration stemming from poor usability (Danbjorg et al., 2016, Stone et al., 2017). Both methods enhance the usability of the software because the product is based on the actual requirements of the users and their voices have been heard. The use of both GT and UCD in software development ensures that the software product has great usability. This is so because the system has been designed and developed based on the needs and culture of the users.

- (ii) **User Experience:** According to ISO (2018), **User Experience** refers to the “user’s perceptions and responses that result from the use and/ or anticipated use of a system, product or service.” The overall purpose of the GT study presented in this thesis was to improve the **User Experience** of VLE users in Aberystwyth University. Equally, **User Experience** is a major goal of UCD. The use of UCD in software development helps to provide a great **User Experience** for the users. UCD does this by ensuring that developers focus on the vital things such as meeting users’ needs with the proper technological solutions (Lowdermilk, 2013). Both methods are guaranteed to provide great user experience because the processes are committed to the users’ needs and requirements. For instance, the end result of a GT is rooted in the data gathered and in the case of UCD, the end product is a function of the iterative engagement between the software developers and the users of the software product during the software development life cycle.
- (iii) **Navigability:** The use of GT in the extraction of the framework of Navigability provided a very robust method of configuring the the navigational mechanisms of virtual learning environments such that the users can enjoy a great user experience. This is hinged on the fact that the framework of **Navigability** was grounded in the analysis of the data used for the study. This is similar to what would have been obtained had UCD method been used. Therefore the resulting framework can be said to be user-centred in its design.

- (iv) **User Interface:** The recommendations made for the design of the **User Interface** in this study for the Blackboard users of Aberystwyth University was based on the analysis of the data gathered using grounded. This implies that the recommendations for the **User Interface** followed the principles of UCD. For instance, the VLE users did not want to click too many times to access resources on the VLE and at the same time, they did not want a crowded interface. They preferred a simple interface with a shallow depth of navigation to the resources and tools. Therefore the **User Interface** is said to be user-centred.
- (v) **User / Domain Specific:** A thorough understanding of the end-user community is a key preliminary factor in order to be able to define a correct set of end-user requirements (Doroftei et al., 2017). So, given that both GT and UCD methods focus on the users during the software life cycle, developers can capture and implement the real requirements of the users in the system. This ensures that the software developed at the end of the day is fit for purpose both for the user and the domain of the user. The major thing that makes UCD stand out from other design philosophies is that user-centered design tries to optimize the product around how users prefer to use the product, as opposed to trying to force users to change their behaviour to adapt to the way the product has been designed (Doroftei et al., 2017). UCD equally shares this outstanding difference with GT since the emerging framework or theory from the GT is grounded on the data of the study. By so doing, the usability of the software is enhanced because the product is based on the actual requirements of the users and their voices have been heard.

7.6.3 Differences between grounded theory and user-centred design

A major difference between the grounded theory study presented here and the UCD method is that the iterative processes carried out during the software life cycle of the system in UCD is more robust. The use of UCD in software development involves usability testing which was not done in the study presented here. In carrying out usability testing, the prospective users are given the opportunity to try out the prototypes of the new system. While using the system, the users are observed by the system developers to see how they interact with the system. Such observations are recorded alongside with the comments of the users on the usability of the system that are gathered through any other survey evaluations. The results of these evaluations are fed back into the design of the system and used to modify the system. The use of user-centered design principles ensures that designers analyze and foresee how users are likely to use a product and that they should also test the validity of the initial assumptions with regard to how the user behaves in real-world. This is achieved by carrying out operational tests with actual users at each stage of the design process (Doroftei et al., 2017). For instance, in the ICARUS project which had to do with the development of unmanned SAR technologies for detecting, locating and rescuing humans (Cubber et al., 2013),

It was reported by Doroftei et al. (2017) that expressing requirements could often be a daunting task without evaluating the practical operational repercussions of captured requirements by doing field tests with the tools to be designed. Against this background, the ICARUS consortium decided to organize multiple operational field trials at the very early stages of the project. This was done in close collaboration with end users. During these events, the capabilities of early developments and prototypes were showcased. This was necessary in order to get valuable feedback from the end users, provide an opportunity for the end users to re-iterate their requirements and allow the designers to improve the systems. Furthermore, Doroftei et al. (2017) noted that in the first phase of the development, initial proof-of-concept prototypes were presented to potential end users in non-operational conditions. This was done to give the end users a grasp of the effects and repercussions of the requirements they expressed on the different systems. They also performed several early design iterations during the first European unmanned search and rescue end users' conference which was purposely organized and dedicated to the study (Doroftei et al., 2017).

Bias et al. (2007) presented a user-centered design case study that used the hybrid user-requirements and interface evaluation (HURIE) method - a combination of requirement gathering and user interface evaluation in a software project. The method was necessitated by the insufficient interface design of the prototype of the Digital Warrior. Despite the earlier literature review, interviews, and observation of live training conducted by the developer, there was a lot of uncertainties as they were not sure if the prototype had all the expected functionalities to support game-based distance learning of battle command skills. In addition to being faced with this lack of clarity about the system functionality, they were also constrained by time for the evaluation of the system using representative users. Faced with this dilemma, the team of developers adopted the HURIE method. The method involved the usability team carrying out the evaluation of the existing prototype in combination with a requirements-gathering task. The usability team used this prototype in a pluralistic usability walk-through (WT) with participants from the software's users, while at the same time gathering new product requirements. The results of these tests were designed to inform the next iteration of the design cycle by either validating existing requirements or introducing new ones that the software designers might have missed.

The HURIE exercises were considered a success by all the stakeholders in the project, including the test participants. By using the HURIE method, the usability team collected satisfaction data and performance data and in addition, they captured several new requirements that were considered important to the project's success which would have been difficult to implement if they had not been discovered in early stage of the project. Consequently, the use of the HURIE method, resulted in the Digital Warrior becoming a system that was fit for purpose and domain specific. It became more reflective of the actual battle command situation, afforded the users a chance to take actions before seeing what the correct actions were, and accommodated various skill levels Bias et al. (2007).

In UCD, usability evaluation of this nature are done in order to ensure that the final product is fit for purpose and a great User Experience is provided for the

users. Another difference between GT and UCD is that one aspect of the software gets emphasized more than other aspects of the system in GT whereas in the case of UCD, all aspects get equal attention based on the requirement data gathered. For instance, when the data of the first set of students in this study were analyzed, there were other issues as well as Navigability. But because **Navigability** was chosen as the core category, the study became centred on Navigability. Other aspects of the VLE could only be related to Navigability at best. It does suggest that GT solves an aspect of the VLE per time while the UCD tends to focus on all the aspects of the system all the time. This is understandable because GT was used for an existing system in this study as opposed to building a brand new system as is the case most times with UCD.

In their work, Vesin et al. (2018) presented a user-centered design case study that involved the optimization of the programming tutoring system (ProTuS). ProTuS is a learning system that provides smart and interactive content, personalization options, adaptive features, and learning analytics as a support for users engaged in learning complex cognitive skills (Vesin et al., 2018).

The study was designed to apply user-centered design approach to further develop ProTuS with additional components such as interactive visualized learning analytics that will support users to utilizing smart content. The additional learning analytic (LA) component developed by Vesin et al. (2018) for ProTuS was quite unique in that it does not only provide visualizations of students' activities, but also collects student feedback and adapt the learning context based on the preferences and needs of students. The LA component also collects information about learning outcomes, goals, and reports that students show particular interest in, and thereby incorporate the data as an input for further personalization.

The LA component was developed using design-based research methodology, which was based on rapid prototyping, deployment of artefacts, and observations in iterative cycles (Vesin et al., 2018). The product development life cycle was made up of the following stages:

- (i) Development of learning analytics component prototype;
- (ii) Integration of additional data sources from different applications;
- (iii) Evaluation and further development.

The data collection of the study conducted by Vesin et al. (2018) was carried out with two groups of participants made up of teaching assistants (TAs) and students. Focus group was used as their means of data collection from the TAs. Ten (TAs) from the Web Technology course took part in the focus group where the authors collected data on exemplary practices from the TA with respect to working with students in the course. A usability questionnaire was thereafter administered to the TAs to collect more data.

The students' data collection was carried out during the Web Technologies class, where students were asked to interact with ProTuS and take the assigned tests. In addition to the tests, usability questionnaire was administered to the students. A total of 66 first year bachelor students participated in the usability

testing of ProTuS while 55 students completed the usability questionnaire that was administered to them afterwards. Using the affinity diagram technique, Vesin et al. (2018) transformed the gathered practical applications into design considerations for further development of visualizations based on user-centered analytics. In analyzing the data, Vesin et al. (2018) used an inductive approach to build common themes out of the individual ideas generated from the focus group. This was however based on existing formulated and theoretically driven key categories. These categories were **Affordances**, **Content**, **Assessment functionalities**, **Visualizations**, **Outcomes** and **Analytics**. So, during the focus group the participants were guided with six questions and the discourse centred around these categories.

During the focus group session with the TAs, 53 practical applications were generated and grouped into these six categories. Using the affinity diagram technique, Vesin et al. (2018), classified majority of the generated ideas from the session with the TAs before the use of ProTuS into three sub-categories: interface, gamification, and examination. In the same vein, the generated ideas after the use of ProTuS, were grouped to two subcategories: settings and means. These subcategories generated by Vesin et al. (2018) in their work are summarized below:

1. **Interface:** The Interface subcategory covered anticipated uses, learner's needs, and application of the system and its components. For example, the focus group revealed that users like intuitive interfaces that would not require additional time to be allocated in order to learn how to use the system and its components. They wanted the content in the system to be interactive so that the users can feel engaged while using it.
2. **Gamification:** This sub category covered the application of elements of game playing such as badges/points scoring and competition with others to maximize enjoyment and engagement based on learners' interest and to motivate users to continue learning. For example, if interaction with the system can simulate playing a game, they reckoned that users will be more motivated to using the system. They noted that users would like to see gamified elements inside the system which will allow them to collaborate with other peers and create competitive environment where they can compare and measure achievements among individuals or among groups.
3. **Examination:** The third subcategory that was generated by Vesin et al. (2018) was centred around the methods and materials that were used to test current knowledge in order to automatically prepare the right instructional scaffoldings for students for the purpose of improving their progression. For example, ProTuS should be able to allow users to prepare for exams based on their progress so far. Users should be provided with an overview of their progress and learning path and have the option of choosing what gaps to cover or get system regulated interventions.
4. **Settings:** This subcategory covered the preconditions and attitudes that help users to successfully interact with the ProTuS system and its components.

For example, in a situation whereby the users' feedback on their learning curve and recommendations for improvement were not fed back into the system, the users will not find the system useful.

5. Means: This subcategory was centred around the methods and materials in preparing and motivating users for the purpose of enhancing their readiness to interact with ProTuS. For example, the system should provide tailored feedback and reports to users based their tasks, resources used, scores achieved, and support them to learn more effectively and efficiently.

Based on the findings from the initial data gathering, Vesin et al. (2018) simplified the user interface of ProTuS before the usability test with the students. Based on the redesign, the second usability study recorded a significant improvement from the students' perspective regarding the complexity of ProTuS.

The categories of this thesis that were generated by the use of grounded theory as listed above in section 7.6.2 can be compared with the categories and subcategories that were generated by Vesin et al. (2018) in their work. The difference lies in the fact that Vesin et al. (2018) generated the categories of their study before the focus group with the teaching assistant and used those categories in steering discussions during the focus group. Whereas in the thesis presented here, the categories emerged from the analysis of interview transcripts through the use of the classic grounded theory.

7.6.4 Chapter summary

In this chapter, the existing literature on web and web navigation with specific reference to virtual learning environments has been examined. The literature confirms the navigation is still a major issue with website and indeed VLEs (Kear, 2007, Power and Kannara, 2016). This issue of **Navigability** has therefore created a gap on how to effectively design the information architecture of VLEs such that users can be provided with better VLEs that have excellent navigation mechanisms. The literature on user-centered design was also reviewed and a comparison made with the grounded theory study. The identified gap of poor navigation in the configuration of VLEs set the stage for the research work in situating it within the existing literature. The solutions to the identified challenges associated with navigation in VLEs are presented in Chapter 8 of this research work.

Chapter 8

Discussion

8.1 Introduction

This chapter presents the discussion of the findings of this study. **Navigability** was found to be the main challenge confronting the users of Blackboard in Aberystwyth University. This concept was discovered based on the results of the analysis of the interview transcripts using the technique of classic grounded theory (CGT) methodology as demonstrated in Chapter 5 of the thesis, where navigability was identified to be the core category. This led to the development of the framework of **Navigability** which explained the phenomenon of how the users of Blackboard in Aberystwyth University navigate the VLE. In this chapter, the subject of navigation is discussed with respect to how it affects the **User Experience** of the VLE. The improvement of the VLE navigation mechanisms and the implications of the findings of this study on research and software engineering are also discussed. A summary of the discussion is provided at the end of the chapter highlighting the major findings of this research work as well as how the challenges of VLE navigation have been addressed by this researcher.

8.2 Navigation

Navigation is a major element of the Interface design of a virtual learning environment (VLE). According to Khan (2005)

Interface design refers to the overall look and feel of e-learning programs. Interface design categories encompass page and site design, content design, navigation, accessibility and usability testing.

And as pointed out by Sadoux et al. (2016) the navigation design of the VLE should take into consideration the elements that learners will need to navigate the VLE. This implies that getting the navigation of the VLE right is very important since without a well thought out and articulated navigation mechanism, the interface design of the VLE or the web page will be a nightmare for the end users. So it follows that if we are looking at improving the **User Experience** of students and staff with VLE in Aberystwyth University, the need to improve the

navigation mechanism of Blackboard cannot be overemphasized. In the words of Krug (2014) “Navigation isn’t just a feature of a Web site; it is the Web site” The navigation mechanism of a web page can make or mar the user experience. So it’s very important that the navigation of a website (in this case a VLE) is good. As Krug (2014) puts it, “Web navigation had better be good.” Given that the navigation of a VLE is very critical to the user experience, it follows that good navigation will enhance the **User Experience** while bad navigation will hinder the **User Experience** in one form or the other. Laurillard (2002) puts it like this:

The navigation features affect usability of the environment. Good design practice will ensure that students can always return to the homepage from any point, that this has a well-structured hierarchical index to the whole website and that there is a keyword search facility. The institution has to decide whether the course homepage or the student homepage is the default option for when a student logs in – or may offer the student the option. P. 211

The above underscores the need to have a navigation that supports the way that students learn as well as the way that the teaching staff use the VLE to engage with the students. Hence the need to embed the learning and teaching styles of students and staff within the navigational design of the VLE. Sadoux et al. (2016) described the navigational design of their VLE project as the central pillar that could enable a positive engagement. With all the above points in mind it can be said that depending on the design of the VLE, its **Navigability** can either be a catalyst or a barrier to using it. One of the obvious ways that the navigation of Blackboard can be improved is by de-cluttering the user interface as this was one of the issues that the participants complained about in the transcripts.

8.2.1 Dimensions of navigation

Apart from identifying navigation to be the core category of the study, it was also revealed from the transcripts that the problem of navigation in VLEs had two dimensions.

- (i) The first dimension of navigation has to do with how the designers of the VLE structured the interface of the VLE. The findings from the analysis of the transcripts revealed that the way the VLE was designed and configured affected how the users used the VLE. For instance, participants used words like clunky and messy to describe the VLE.

For me it’s a clunky system. ...for anything you want to do online, there’s a lot of process, very slow process by clicking your way through it. Teaching staff T11

*I personally, I am not a fan of Blackboard. I think it’s messy, it’s very bigly and it’s very difficult sometimes to find what you want on there and I think that is a barrier to colleagues and students...
- Director of studies D2*

In terms of what I like the least, the... system can be a little bit clunky and the box a little closed. - Student S12

- (ii) The second dimension of navigation identified in this study has to do with how the teaching staff used the VLE to present information to students. It was discovered that some teaching staff were not consistent in how they presented information to the students. For instance, some student were quoted as saying:

There is an issue with different lecturers using different ways; different folders like you have course documents things like that. Some other lecturers use new folders. I won't say very friendly however it is only the fact that the lecturers' ... which prejudices a lot of people. Particularly, they use two folders, where you have the content module there called content and then an additional content in a folder that is called something else. If you click on one of them, you have all the content without necessarily checking the other one. - Student S4

Sometimes I couldn't find the document I needed because they put their documents in different folders. ...content and finding it sometimes is a sort of... - Student S2

8.3 The three-click rule

The number of clicks a user should make on the website in order to retrieve an information has been a subject discussion among researchers over the years as earlier mentioned in section 7.4.6. With respect to the application of the three-click rule to e-learning platforms such as VLEs, Hathorn and Hathorn (2010) argued that the three-click rule may not be appropriate for an educational website. They reckoned that provided the navigation is clear, there is no evidence that students will give up in frustration if they have to click more than three times to get to the required pages. According to Hathorn and Hathorn (2010), the instructor may even design the platform to maximize incidental learning as students navigate through the site. They noted that the three-click rule was an area of future research

Having considered the position of Hathorn and Hathorn (2010) and those of Porter (2003), Zeldman (2001), Zhang et al. (2004), this researcher will like to state that the argument that people are will not leave the website, in spite of the fact that the participants that took part in those studies used used more three clicks to complete given tasks does not hold water in the case of VLEs. This researcher would like to point out that those activities were carried out in controlled environments and the participants were using the systems for the first time ever. Consequently, it is the view of this researcher that for the participants in those experiments, the fun and thrill of getting the tasks done may have provided some form of adrenaline for them to accomplish the tasks. They might not have

been bothered by the number of clicks rather they were urged on by the thrill of accomplishing such tasks.

Also the participants in those experiments were experienced in the use of the web and were most likely proving their skills to show how good they were or were competing with others to see how far they could go with others. But in the normal day use of the VLEs, users particularly the teaching staff have other things competing for their time. The teaching staff use these tools and features regularly and it becomes a turn off when they always have to click several times to do the same thing on a regular basis. They would rather such processes were simplified for them to use.

For one, I will make it easier to use with less, less clicks as you go through in uploading things - Teaching staff T11

I think it's not tailored to the way that I want it to. I think that they have got lots of core people that they use computers in advanced ways I think. So for example, I will make my notes likely and then I will have to upload each lecture one at a time. There is no way to say here up is a program for such and such a module, here have in front a set of reading in the topics. You have to add them one by one, click, click, click all the time. -Teaching staff T3

On what feature I like the least, I don't know if it is a feature but just the usage in general, in terms of actually finding stuff. So sometimes, it takes a very long time, a lot of clicks to get to where you want to but ideally... -Student S34

It is therefore imperative that where possible, the process of accessing resources and tools on the VLE should be simplified. The number of clicks that users have to make should be reduced to three in order to enhance the **User Experience**.

8.3.1 The usability of VLEs

The usability of a virtual learning environment can make or mar the **User Experience**. (Wong et al., 2003) argued that an e-learning system with poor usability hinders e-learning efforts as the learners would spend more time learning how to use the system instead of learning the contents. Poor usability can be a drawback for the VLE users given that the primary purpose of the VLE is for learning. As such the design of the VLE should facilitate learning and not hinder it as learners navigate from one web page to the other. It is therefore important that VLEs have great usability in order for the **User Experience** to be smooth because as noted by Wong et al. (2003), "usability plays a vital role in the success of an e-learning program."

Given that the ease of use of VLEs cannot be separated from their navigation structures, it suggests that attention should be paid to how the navigation of the web pages are developed at the design stage of the VLEs in to provide an efficient usability for the users. As Palmer (2002) pointed out, the success of a website

is significantly associated with its navigation mechanisms. While several studies abound on navigation on the web, not much studies have focused on resolving the challenges of navigation in virtual learning environments. Hathorn and Hathorn (2010) alluded to the fact that much of the studies on website evaluation are based on commercial websites which may or may not be relevant to educational websites. They argued that browsing and studying require the use of different cognitive strategies, and creating a website to sell a product and creating a website to encourage learning have different presentation requirements (Hathorn and Hathorn, 2010).

In the same vein, Sadoux et al. (2016) argued that “studies on web usability all point to navigational design as being of primary importance for users and yet, this is something which is rarely the focus of in any training on how to use a VLE or even rarely the focus of any eLearning training, as can be evidenced by glancing at University eLearning training resources.” They emphasized the importance of paying attention to navigation on VLEs and to ensure that they were user-friendly. This is evidenced in e-learning as Sungand and Mayer (2012) in an earlier study argued that e-learning systems are not easy to navigate. In a previous study, Granic and Cukusic (2011) reported that usability studies in the area of e-learning are not very frequent despite the important role that usability plays in the success of e-learning systems. They noted that there was a need to pay attention to interaction mechanisms on the e-learning systems in order to efficiently communicate the contents and improve the learning experience (Granic and Cukusic, 2011). This would ensure that learners maximize their time in using the system for learning rather than being forced to spend so much time in understanding the software functionality (Costabile et al., 2005).

Arshad et al. (2016) in their study noted that there was a lack of framework for evaluating the effectiveness of the navigation structure of VLEs just as Cole (2013) had earlier reported a lack of intuitive *Navigability* in VLEs.

It is significant to point out that, while there have been studies on navigation involving only students (Alelaiwi and Hossain, 2015, Sadoux et al., 2016) or involving only teaching staff (Kear, 2007, Power and Kannara, 2016), there are no studies on navigation focusing on all the different users of the VLE in a single study. This is the gap that this thesis fills. This research has focused on navigation of VLEs with participants drawn from students, teaching staff, directors of studies, e-learning team and administrative staff.

Designing effective web pages for e-learning requires that the user interfaces of VLEs are well structured and constructed with clear navigation mechanisms for the diverse users of a VLE. However, as pointed out in the existing literature presented in Chapter 7, accessing information on the web can sometime be a challenge especially in a website that has complex structure and enormous information (Palmer, 2002) like that of a VLE. Tidwell in her book “Designing interfaces” talks about the cost of navigation. She argues that web designers should bear in mind that there is a cost associated with users jumping from page to page and make effort to keep the number of those jumps down. Tidwell (2011) points out when a common task requires many page jumps, it should be reduced to one or two, arguing that a web designer should not compel users to go into multiple levels of

sub-pages, dialogs, and so forth every time they need to accomplish simple and everyday tasks. Tidwell (2011) throws a challenge

Can you design your application so that the most common 80% of use cases can be done in one page, without any context switches? (Or perhaps only one?)

This is hard to do with some kinds of applications. Is a certain tool too big to put on your main page? Try shrinking it: eliminate controls, shorten labels, turn words into pictures, or use specialized form controls that save space. Is it too distracting when combined with everything else on the main page? Again, try shrinking it, isolating it with whitespace, or putting it in an out-of-the-way spot. Can you use progressive disclosure to gradually show more content on the same page? Can you use Module Tabs or an Accordion to hide some content by default?

Sometimes it's appropriate to bury functionality inside pages that take more than one jump to get to, such as that extra 20% of tasks left over from the 80% you made easily available. It could also be that on your application, simplicity of presentation is more important than saving one or two jumps. You could put little-used functionality behind an extra "door" (also using the 80/20 rule). As always, experiment with different designs, and usability test them if you have any doubts. pp. 79-80

With respect to the intuitive nature of a VLE, Cole (2013) noted that

The ideal VLE from a usability point of view would be so intuitive to use and learn that users would not need instruction on how to use the environment and would be able to navigate themselves through the environment with total control, as the software would tailor itself to the needs of the individual user. Clearly, such technology is not currently available and all VLEs have strengths and weaknesses. However, given the restrictions of current technology we recommend that educators should take up the challenge of becoming involved in usability testing while developing their curriculum for online technologies. It is within the educators' power to require VLE providers to make improvements and confront real problems that become real barriers to learning enhancement for many students. p44.

Still on the issue of providing intuitive VLEs, Costabile et al. (2005) argued that since the purpose of educational software is to support learning, the software should intentionally take into account the way students learn and also provide good usability so that student's interactions with the software can be as natural and intuitive as possible.

These views by Costabile et al. (2005), Tidwell (2011) and Cole (2013) resonated with those of Kear (2007), Sadoux et al. (2016) and also resonated with some of the views expressed in the transcripts of this thesis. It was earlier mentioned in section 5.8.4, that poor navigation within the VLE was responsible for

making some users to circumvent the VLE when performing certain tasks. For this trend to be reversed, this study suggests that excellent navigation mechanism should be embedded in the VLE using the following baselines:

- (i) Quick and direct access to materials
- (ii) Ease of use
- (iii) Provision of relevant features and tools.
- (iv) Clear and familiar **User Interface**
- (v) User-centric architecture design
- (vi) Low learning curve.

8.4 Proffering solutions to the challenges of Navigability in VLEs

8.4.1 Less is more

The homepage of a web platform is very important and critical to its usability. Having a VLE that is well designed makes the navigation a walk in the park for the users. The present homepage of Blackboard in Aberystwyth University needs to be improved in order to enhance the user experience of both students and staff. There is a lot of materials on the homepage that need to give way. Chang et al. (2019) noted that when the user interface is crowded and high in complexity, individual elements start competing for the attention of the user. Another implication of the information overload is that it imposes a cognitive load on the users (Jalani and Sern, 2015). Stiller and Bachmaier (2018) argued that a bad presentation design could lead to high extraneous cognitive load, which in turn can hinder learning. This implies that both the VLE developers and teaching staff the need to present information in a way that will align with the student's learning as opposed to presenting materials in ways that will disorient the learner.

The concept of “Less is more” should be followed in designing the homepage of the VLE. As shown in Figure 8.2, the present homepage of Blackboard in Aberystwyth University needs to be streamlined to the materials that are relevant to the users. There are too many features on it and in some cases duplication of materials as well. For instance “BB-AU-00008: International Students Information” comes under My Modules 2017-18, General Modules and also My organisation. Apart from overcrowding the homepage, it can be also confusing for the students. BB-AU-00008: International Students Information is not a taught or research module but an organisation that all international students are enlisted in. So it should not appear under “My Modules” nor should it appear under “General Modules”. The figure also revealed that there are cases where certain modules that the student is not registered on, appear under My Modules and General Modules.

Below is a quote from a students that complained of the redundant modules on the homepage of Blackboard in Aberystwyth University:

Like the challenges that I still have those modules which I don't do because I changed my [course]. In my first year I was in Business School/Law but in my first week I changed them but then I did have that my modules which I don't use anymore. I think that was the only challenge which. I wouldn't expect them to be there because I don't need them. - *Student S36*

The homepage for users should be configured to display to the users only relevant materials. For instance, only the teaching or research modules should be listed there while other materials or information that are not directly related to their academic tasks can be hidden under a link which could be referred to as "Useful links". This way, the users will only see the relevant modules or materials given that the number one reason for the users coming to the VLE is for academic purpose.

It is the submission of this researcher that the homepage of Blackboard in Aberystwyth University needs to be simplified such that only relevant features be provided for users on the user interface. For example, the module pages of students on the VLE right now are too crowded. This needs to be streamlined into relevant features for the students. For instance there are loads of courses that are showing up in the module pages that do not need to be there. Some of these things needed to be totally removed. A student should only see registered modules and not all sorts of modules. One of the student participants picked on this and complained about still seeing the modules of a course that she took transfer from in her first year. She could not comprehend why she should still be seeing such modules on her module pages. An implementation of the concept of "less is more" would be more feasible when the VLE developers commit to providing only relevant materials to the users on the interface of the VLE. Rather than trying to provide materials to everyone with an overcrowded interface, materials should be segmented and provided for the users based on their unique needs and domains. So for instance, the VLE should be built in such a way that only relevant modules are should be on the students' pages. Other materials or features that the VLE developers or e-learning feel will be needed by the students or staff can be kept in a general link. That way, a clean interface would be maintained for the students and staff.

We had a meeting about this a few months ago that there were lots of features just weren't being used and this is for the most part of ...we don't use it. - Admin staff A1

And I think it should be updated regularly because for example from my first year, I changed my modules and they are still there although I have nothing to do with law anymore because first year I was involved with law, and those modules are still there although I don't need them anymore and they haven't been cancelled yet. -Student S36

Again, from the front page somewhere I would get a link that said a, you are able... that would then lead to your timetable which would then

lead to... of a student or something. And you know when people are deciding or deciding not to get because if it's on the front page, it would help me although I was roaming about for a while I've been trying to find this, I didn't know where it was. That's about it. It has to have a lot of information about... So you know it's a bit busy front page. If there was somewhere, possibly simple things; I like simple websites. I don't like having to... But you know there is a lot of information on there, there needs to be a lot of stuff on it. It's a little bit busy you have to possibly, could be designed a little bit better. -Student S27

I will probably actually delete a lot of the features that are in there. I think my ideal piece of software for doing this kind of things will be if you had a very very simple starting point where you have a very simple screen, very few buttons, clicks and very few menus items which gave you a real simple clear structure for the bare minimum that you needed and then you can then choose to include other more...things. So I think one of the problems I have with Blackboard is that you... it out and you're just presented with a wall of options. ...probably what I will do if I was to redesign will be to massively think of any kind of basic things and then allow people to gradually having a little bit of extra complexity. And I think that would make it easy for students to engage with it. And it would also make it easy for the students to understand what was going on in each module and how each module works. So I would probably simplify it rather than making it more features. Like it said, it has got every feature that I ever need but I'll never use any of them because I don't... Teaching staff T17

8.4.2 Improving the search functionality of Blackboard

There is evidence both in the literature and transcripts that web users and indeed VLE users expect that they should be able to search then click from the search result to what they want rather than finding their way through a hierarchy. VLE users expect that they should be able to search directly for items through the search box and get immediate or straightforward results. The way people navigate the web and indeed the VLE has changed since some of the studies presented Chapter 7. Navigation is not a static concept because apart from clicking on the links on websites, users also use search functionalities on the homepage. According to Nielsen and Tahir (2002) "Search is one of the most important elements of homepage, and it's essential that users be able to find easily and use it effortlessly." This notion was also supported by the words of some of the participants from the interviews.

If you could search for something like keyword maybe I'm not entirely sure if there is one but I know that sometimes when I'm trying to revise or something and if I'm trying to look up something and I can't remember which lecture it's on ... trying to find one slide and if you could... - Student S3

When you search for a module, the front page to the module handbook options...it's a bit...you can only do it from the front page. - Teaching staff T13

8.4.2.1 The search functionality of Blackboard in Aberystwyth University

Presently, the experience of Blackboard in Aberystwyth University is different from what has been identified in section 8.4.2 above. The search functionality in the current Blackboard is limited in so many ways. For instance, it does not allow the search of lecture slides using topics and keywords. Only the modules pages can be searched for using module name, module ID, module description and module instructor. Also when the module ID is used, it does not provide an immediate result rather it takes the user to the “Browse Course Catalogue” page to refine the query in order to get the desired results. This can be described as a configuration problem. Blackboard needs to be configured in a way that the search box can accept any search query and deliver immediate results.

Another problem with the current search function is that it is not likely to be used by the users who are registered on the module as they already have such modules right before them except for modules in previous sessions. But again there is a link before them to access the modules in previous sessions. So in essence it does not really meet their needs.

Hence there is a need to improve the present search functionality so that users will be able to search everything on the VLE from the homepage without the limitations of using only the module name or ID. They should be able to search for everything such as topics, assignments, features, tools etc without limitations. Students and staff should be able to search the same way that users are able to search for things on Google. They want to be able to search for everything on Blackboard. Therefore having a search functionality on the VLE is highly desirable as it will greatly assist those who prefer to search the VLE rather than looking around for links or without having to perform several clicks to get to their desired item.

The Aberystwyth University experience in the use of Blackboard is such that only courses can be searched and in order to be able to search for the list of modules on the VLE, the user has to supply the name of the module of interest. Once the user queries the VLE using the correct name of the module, the correct modules are returned to the user. However on the other hand if a user queries it using the module identifier which can't be ruled out, the user is taken to a page to select another field called ID in order to notify the system that the query is being done using the module ID and not the name of the module that the VLE defaults to. It prompts users to tell the system that they are searching by ID by selecting ID from a drop-down menu. This can be improved to allow users to be able to search using both names of modules and module ID to get direct results.

Some direct quotes from the participants on search functionality are given below.

Hmmm maybe like a search function if it's possible for all files in the module along with the module names, it will be easier to search through.
- Student S1

If you could search for something like keyword maybe I'm not entirely sure if there is one but I know that sometimes when I'm trying to revise or something and if I'm trying to look up something and I can't remember which lecture it's on ... trying to find one slide and if you could..." -Student S3

Well what I am studying and why perhaps and some books, you know I can flip through an index and search that...I mean it will be a monumental task for anybody to create any form of database where you can search...the index on the back of a book. And you know you just don't know...flip them I don't know like the properties of lines. Em, it's not the case where you search the back of the search thing and then have that found when you need it whereas for the book you just go back to the index, so you look at the line... If you can do that, I think it will be highly improbable enough but financially impossible for them to create that on Blackboard. To the specific pages when you search but it would be impossible. -Student S4

Users would like to be able to search directly for items through the search box and get immediate results or straight forward results without referring users to the "Browse Course Catalogue" page to refine the query in order to get their desired results. This is more of a configuration problem. Blackboard needs to be configured in a way that the search box can accept any search query and deliver immediate results. Also at the moment materials cannot be searched for on the VLE. Only the course catalogue can be searched for. Embedding a search mechanism within the VLE will assist the users in navigating the VLE. In this way, users are likely to employ the search mechanism should they not remember how to locate a particular item on Blackboard. Screenshots of Aberystwyth University Blackboard are provided in Figures 8.2, 8.3 and 8.4

8.4.3 User-specific VLEs

Towards developing a VLE that meets the needs of the users, it is important that requirements which are specific to the user and domain are met. It is important that the VLE developers understand the needs of the users and how they prefer for those needs to be met. Poor requirements capture can lead to the development of a system that is not fully usable by the users. This can only be achieved when the developers talk to the end users and engage them before and during the development of the VLE. A VLE that is institution, user and subject specific will assist in the provision of relevant of the features of the VLE. For instance designing a view specifically for students and providing them with only the basic features that they need will go a long way to improve the navigation of all the students. When the peculiar needs of the Aberystwyth University, the departments, staff

and students, users will be able to navigate the VLE easily and will not have to contend with irrelevant features that are inherent in the present VLE.

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work. -Director of Studies D3

8.4.4 Architecture

The architecture of the VLE greatly affects its **Navigability**. The transcripts also revealed that some of the issues confronting users were traceable to the architecture of Blackboard. In other words the architecture of the VLE affected the **Navigability** within the VLE.

Everything is done with a mac-based system which is problematic- for most people are tied up and you're ... So when you are looking at how students progress and rather large so that when you're responding to students queries, you get responsive, the severity of the things they have requested for and you can advise them accordingly. Whereas if you have a larger version of it running something else and come back, it doesn't, it's like ... technology using it in old-fashioned way that is what they are. ...they don't connect. We need an integrated system... -Teaching staff T3

It could always be better not just in general I don't know but when you use other technology online, they might not even be learning environment but when you use a certain function like a forum online you see how it works, you start to compare and ...well it can always be better than that. -Student S34

“Technology is a tool and like all tools it should fit your hand when you pick it up, you shouldn't have to bio-re-engineer your hand to fit the tool- David Snowden” (Jones, 2009)

The peculiarity of **Navigability** in e-learning is that VLEs are not just in place to provide information but to provide information in a way that enhances learning and teaching (Jones, 2009). The clunky nature of Blackboard makes it difficult for both students and staff to use for learning and teaching respectively. It needs to be revamped and re-engineered for greater relevance as was demonstrated in the works of Power and Kannara (2016), Sadoux et al. (2016)

8.4.5 Providing the relevant requirements of the VLE

Virtual learning environments exist to support learning and teaching with educational institutions. So it is imperative that the VLE developers focus on providing a tool that will support the learning needs of students and not work against it. From the transcripts, it was evident that students benefited a lot from the use of Lecture slides, Lecture recordings and Online submissions among others. These

features were highly commended by students and should be retained on the VLE. In addition to that, it will be great to see a VLE that has the following characteristics.

- (i) The VLE should be responsive and easy to use.
- (ii) It should not be time consuming for teaching staff to use the VLE to deliver an enhanced learning experience for students. This will also prevent some of the staff from circumventing the VLE for other tools or forms of engagement.
- (iii) The VLE should have a discussion forum (mainly for distance learning students) that is responsive. The forum also needs to be regularly moderated / updated by the teaching staff with respect to answering students' questions.
- (iv) The VLE should be configured to wholly support subject specific needs. The users expect that the VLE should be able to support their specific learning and teaching skills. For instance, Blackboard does not support web development teaching/demonstration involving animation and JavaScript.
- (v) The VLE should be customized in such a way that it provides opportunity to design for lasting impression, reflection, engagement, transformation and personalization as the requirements of users change over time.

8.4.6 Implications of the framework of Navigability for software engineering

The framework of *Navigability* that emerged from the analysis of the interview transcripts through the use of the classic grounded theory approach will be very useful in the configuration of a VLE that enhances both the teaching experience of the lecturers and learning experience of the students. The limitations and challenges associated with building a VLE that is not tailored to the specific needs of the users are well known (Costabile et al., 2005, Kear, 2007, Beckton, 2009, Tidwell, 2011, Cole, 2013) and such challenges have also been highlighted by the results of the pilot and the main study of this thesis. The implications of adopting the use of the framework of *Navigability* in the configuration of VLEs by software developers are examined below.

- (i) This approach underscores the need for a user-centric design whereby the developers fully understand the users of the VLE and how such users will prefer to use the VLE in their day to day activities with respect to their navigation patterns. The framework of *Navigability* will assist VLE developers in building systems that are user-centered and provide great usability. This will ensure that smooth interactions exist between the VLE and users of the VLE.
- (ii) Another implication is that a complex system like the VLE is bound to generate some tension as a result of the conflict of requirements which is due to uniqueness of each class of users. So we propose a situation whereby each

class of users have unique views such as student view, teaching staff view and administrative staff view. This will reduce the information overload of features on the VLE. It will allow for the user interface of each class of users to be properly configured to fit their needs in a very simple manner. In this way, only relevant information can be provided while other materials are hidden away.

- (iii) One of the key principles of design as expounded by Norman (2002) in his book titled “The design of everyday things” is visibility. The need for designers have to make features visible to users cannot be overemphasized. Users of VLEs should not have to look too far to find the features or be wandering all over the VLE. In short the VLE should not a maze but a simple to use tool. The VLE should be designed like a recreational park where there are signposts to direct fun seekers that are new to it and also to refresh the memories of those who have been away from it for a while. The visibility of the features of the VLE and how to navigate to them is indispensable in the quest for improving the navigability experience of the users. No user ever appreciates being stranded when browsing the web or VLE for that matter.

It goes without saying that the more visible functions are, the more likely the user will know what to do next. If functions are “out of sight”, then it’s difficult to know. (Norman, 2002)

- (iv) Capacity Building is related to the **Navigability** of the system. Straight and familiar navigation tools will eliminate the need for formal training on how to user the tool (Benbunan-Fich, 2001) or at least reduce the need for the users to be trained. This was discussed in 5.7.3 A VLE that is user friendly is likely to have little or no learning curve.
- (v) **Navigability** accounts for the perception of the user. Navigability is so central to the use of software that once users have difficulty with navigating the VLE, it affects how they perceive the VLE.
- (vi) The way the users engage with or are engaged through the VLE can be affected by the navigation process of the VLE. It can make the users to actively or passively engage with the VLE or to simply circumvent it.

8.4.7 The Framework of Navigability and the components of Usability

According to Nielsen (2012), there are five components of **Usability**. Four out of the five components identified by Nielsen (2012) are discussed below in relation to how the framework of **Navigability** can be used to improve the usability of virtual learning environments. These are learnability, efficiency, memorability and satisfaction. The last component of usability- error is left out in the discussion here because it did not come up in the transcript. The only error that was reported in the transcripts had to do with the submission of dissertation through Turnitin on Blackboard.

8.4.7.1 Learnability

Learnability is a key component of usability that Nielsen (2012) talked about with respect to the use of a software. It refers to how easy it is for users to accomplish basic tasks when they encounter the system for the first time (Nielsen, 2012). Learnability has to do with how steep the learning curve of the web platform is (Garrett et al., 2016). The issue of learnability was identified to be a challenge for participants in some aspects of the VLE. For the students, some of them noted that learnability was an issue for them. The transcripts revealed that it took a while before they mastered their way around the VLE without undergoing any training. Some of them initially struggled with using the VLE at the initial stage of their studies but got over the struggles once they became used to the VLE. From that point on, they became conversant with it. However, this experience of students was different from that of the teaching and admin staff. For instance, some of the teaching staff complained of how steep the learning curve of Blackboard was. This view was in relation to the teaching staff using the tool to accomplish certain tasks. This was apparent in the creation of content by the teaching and more evident in tasks that were performed occasionally. Most of the staff interviewed have had some training in order to be able to use the VLE to perform certain tasks. The fact that teaching staff have to be trained on how to use the VLE to perform certain tasks suggests that the learnability of Blackboard needs to be improved upon. The use of the framework of **Navigability** in the design and configuration of a VLE will ensure that the learning curve will be less steep in comparison to what obtains presently. As pointed out in section 5.7.4 when the Blackboard and other VLEs are redesigned or reconfigured with user-friendly navigation and notations, people with basic computing and web skills will be able to use the tool without undergoing training. This would eliminate the difficulty associated with finding things on a complex site like the VLE. Teaching staff and indeed all users should be able to instantly know where to look and locate whatever they may be looking for.

8.4.7.2 Memorability

Memorability is another quality components outlined by Nielsen (2012) with respect to the design of software. Nielsen on memorability queries

When users return to the design after a period of not using it, how easily can they reestablish proficiency?

Alonso-Rios et al. (2009) defined memorability as “the property of the system that enables the user to remember the elements and the functionality of the system” while according to Holzinger (2005) memorability can be defined as “allowing the casual user to return to the system after a period of non-use without having to re-learn everything.” How well users of the VLE are able to navigate the system after being away from the VLE is indicative of the degree of the memorability the VLE. One of the issues that came out of the interview with respect to **Navigability** was that some teaching staff have difficulty with remembering how to locate or use certain features after being away from the VLE. For instance a teaching staff may

teach in one semester and not teach in the second semester and on returning to the VLE the following academic session, such a teaching staff is met with a rude shock due to the inability to remember where some of the features of the VLE are located or how to use them. This poses a serious challenge for the teaching staff as the processing has to be relearned again and the cycle continues year in year out. Another instance where the issue memorability comes up in Aberystwyth University Blackboard is the downloading assignments and examinations which are not done on daily or weekly basis. I recall that during the interview session with one of the teaching staff, the participant offered to demonstrate this difficulty on the spot by trying to search on how to download assignments within Blackboard to which there was no such help like FAQ and how to go to Google to search for the basic steps to downloading assignments. It took about fifteen minutes to be able to navigate the VLE to download the assignment for the module that was being used for the demo.

This researcher argues that an implementation of the framework of Navigability in the reconfiguration of Blackboard in Aberystwyth University will eliminate the challenge that users, particularly the teaching staff face when returning to an aspect of the Aberystwyth University Blackboard after some time. Designers of VLEs can achieve this positive experience by incorporating the quality memorability in the design of the user interface and navigation such that users of a complex system like the VLE should be able to easily remember the process of performing some tasks after being away from the VLE. Designers should also strive to use only simple and consistent designs that are devoid of ambiguity on the user interface and on the design of the software functionalities and tools. This way, users of a VLE would have positive memorability in their use of the tool and thereby improve their **User Experience**.

8.4.7.3 Efficiency

Efficiency as an attribute of usability has to do with how quickly users can perform tasks once they have learned the design (Nielsen, 2012). The interview transcripts revealed that users particularly the teaching staff spend a long time in using the VLE to perform tasks. This was due to the several clicks that they had to make into to access the required resources or tools on the VLE. It was clunky and time consuming for the teaching staff. An implementation of the framework of Navigability will help to reduce the navigation time of the VLE. By so doing, users will be able to access resources on the VLE easily.

8.4.7.4 Satisfaction

Satisfaction as an attribute of usability has to do with how pleasant is it to use the design of the system (Nielsen, 2012). According to Kurt (2019), “user satisfaction is a measure of the successful interaction between an information system and its users.” This underscores the importance of paying attention to user satisfaction in the design of a VLE. Furthermore, Kurt (2019) argued that the features of a system such as its continuous accessibility, interactive and user-friendly interface increase system usage and lead to higher user satisfaction. Cui et al. (2015) in

their study, found out that when users have higher perceived **Navigability**, they are more satisfied with the website. This suggests that users derive great satisfaction from the VLE when they enjoy smooth navigation and have a great **User Experience**. As long as users struggle to access the resources on the VLE, satisfaction will continue to elude them. The use of the framework of **Navigability** in the configuration of a VLE will provide users with smooth navigation on the VLE which will in turn lead to an improved **User Experience**.

The need to ensure that software have the above attributes of usability (Nielsen, 2012) have been further reinforced given the results that emerged from the analysis of the interview transcripts, click data and the user interface of Blackboard in Aberystwyth University of this study. These results show that for users to be fully satisfied, the VLE needs to be user-centred. The developers should study the behaviour and vocabulary of the users and use such knowledge to design the VLE. This will lead to the emergence of intuitive VLEs with enhanced **User Experience**.

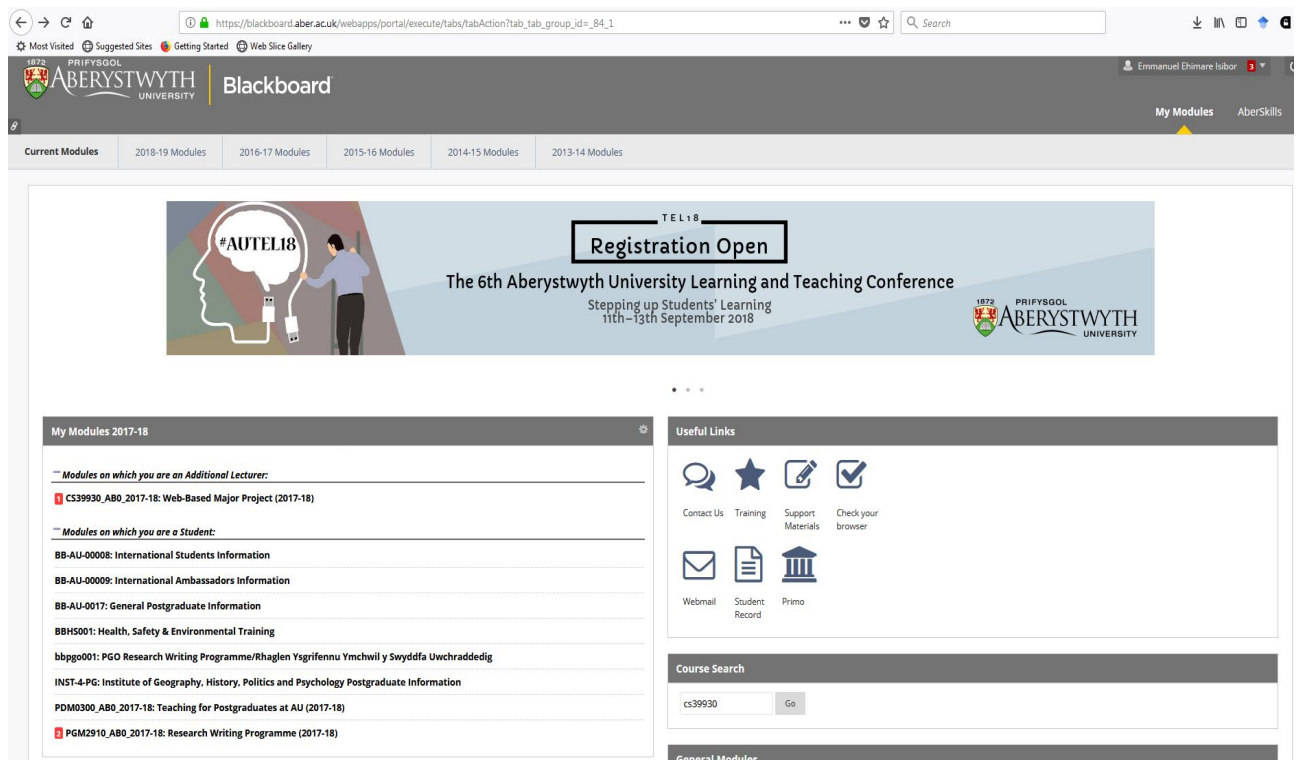
8.5 Chapter summary

This chapter has presented a discussion of the issues identified during the analysis of the transcripts from the large set of participants. The researcher has stressed the need to have straight forward navigation within the VLE, less cluttered user interface, less clunky VLE designs, provision of immediate access to relevant materials and freedom by users to use the VLE in their preferred ways and settings. Factoring these suggestions into the design and configuration of the VLE will provide enhanced **User Experience** for the users of the VLE as this will lead to the development of better suited VLEs. This will ensure that users with basic computing skills will be able to navigate the VLE smoothly with little or no training because the VLE is friendly enough for them to navigate seamlessly. The next chapter presents the conclusion of the study after taking into consideration all that have been discussed so far.

The screenshot displays the Blackboard interface for Aberystwyth University. At the top, the university's name and logo are visible alongside the Blackboard logo. A user profile for Emmanuel Ehimare Isobor is shown in the top right corner. Below the header, a navigation bar includes 'My Modules' and 'AberSkills'. A main banner for the '6th Aberystwyth University Learning and Teaching Conference' (September 11th-13th, 2018) features a 'Registration Open' button and the hashtag #AUTEL18. The main content area is divided into several sections:

- My Modules 2017-18:** Lists modules for lecturers (e.g., CS39930_ABO_2017-18) and students (e.g., BB-AU-0008: International Students Information).
- Useful Links:** Provides quick access to Contact Us, Training, Support Materials, and Check your browser.
- Course Search:** Includes a search input field and a 'Go' button.
- General Modules:** Lists various postgraduate information pages across different departments.
- My Organisations:** Lists organizations where the user is a participant, including the Institute of Geography, History, Politics and Psychology Postgraduate Information.

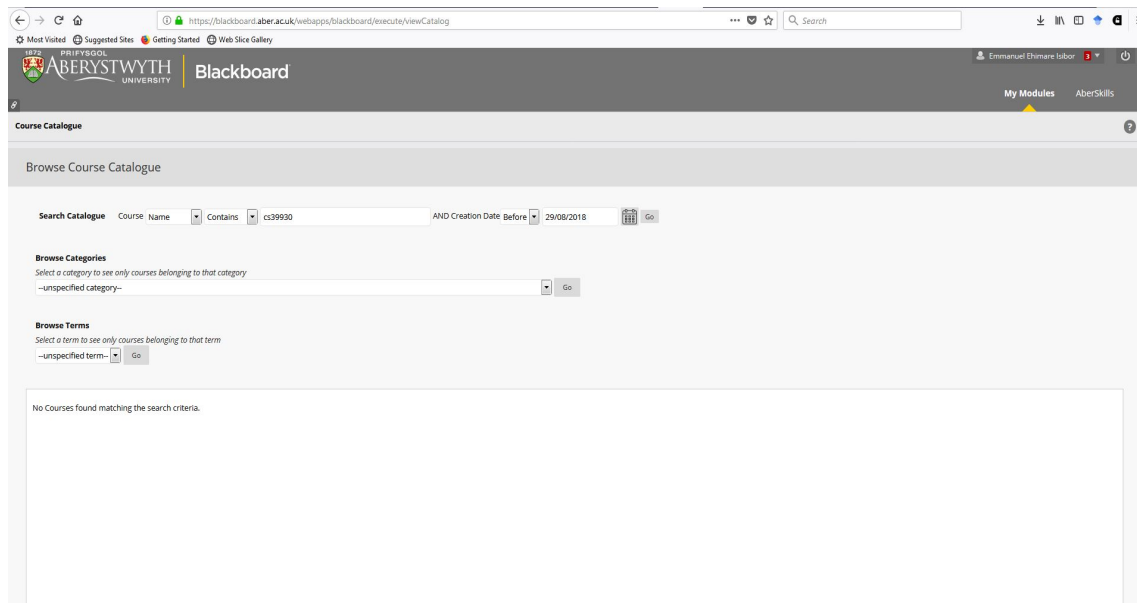
Figure 8.1: A screenshot of the homepage of Blackboard in Aberystwyth University



The screenshot shows the Blackboard interface for Aberystwyth University. At the top, there is a navigation bar with the university logo and the text "Blackboard". Below this, there is a banner for the "6th Aberystwyth University Learning and Teaching Conference" with the hashtag #AUTEL18 and the dates 11th-13th September 2018. The main content area is divided into several sections:

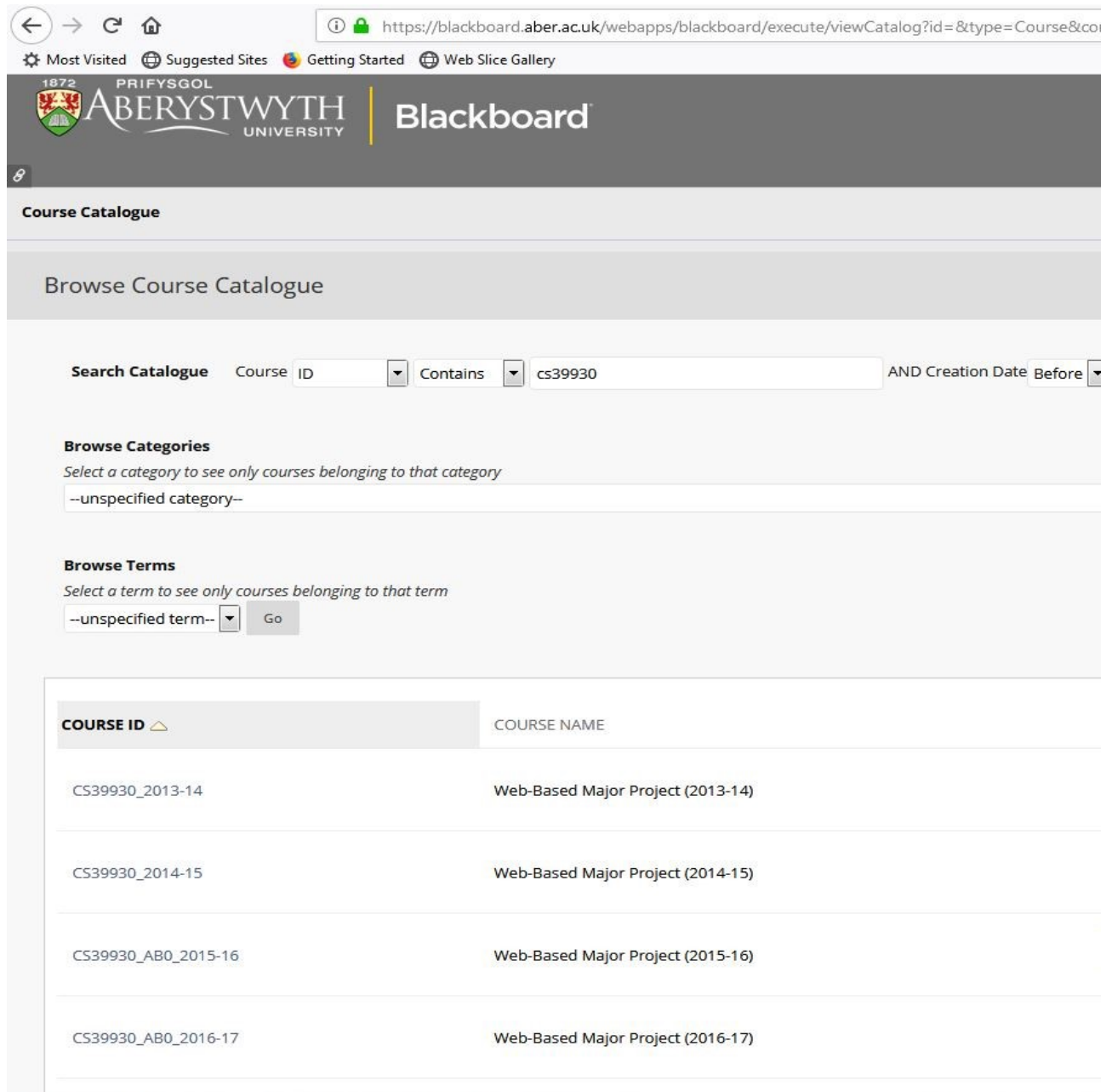
- My Modules 2017-18:** A list of modules categorized by role:
 - Additional Lecturer:** CS39930_ABO_2017-18: Web-Based Major Project (2017-18)
 - Student:**
 - BB-AU-0008: International Students Information
 - BB-AU-0009: International Ambassadors Information
 - BB-AU-0017: General Postgraduate Information
 - BBHS001: Health, Safety & Environmental Training
 - bbpgo001: PGO Research Writing Programme/Rhaglen Ysgrifennu Ymchwil y Swyddfa Uwchraddedig
 - INST-4-PG: Institute of Geography, History, Politics and Psychology Postgraduate Information
 - PDM0300_ABO_2017-18: Teaching for Postgraduates at AU (2017-18)
 - PGM2910_ABO_2017-18: Research Writing Programme (2017-18)
- Useful Links:** A grid of icons for Contact Us, Training, Support Materials, Check your browser, Webmail, Student Record, and Primo.
- Course Search:** A search bar with the course ID "cs39930" entered and a "Go" button.
- General Modules:** A section for general module information.

Figure 8.2: A screenshot of the search functionality of Blackboard in Aberystwyth University



The screenshot shows the Blackboard Course Catalogue search results page. The search criteria are: Course Name contains cs39930 AND Creation Date Before 29/08/2018. The search results are empty, displaying the message "No Courses found matching the search criteria." The page also includes sections for "Browse Categories" and "Browse Terms", both with dropdown menus and "Go" buttons.

Figure 8.3: A screenshot of the query result of searching the Blackboard of Aberystwyth University using a course ID



The screenshot shows a web browser window displaying the Blackboard Course Catalogue for Aberystwyth University. The browser's address bar shows the URL: `https://blackboard.aber.ac.uk/webapps/blackboard/execute/viewCatalog?id=&type=Course&co`. The page header includes the Aberystwyth University logo (1872 PRIFYSGOL ABERYSTWYTH UNIVERSITY) and the Blackboard logo.

The main content area is titled "Course Catalogue" and "Browse Course Catalogue". It features a search bar with the following criteria: "Search Catalogue", "Course ID" (dropdown), "Contains" (dropdown), "cs39930" (text input), and "AND Creation Date Before" (dropdown).

Below the search bar, there are two sections for browsing:

- Browse Categories:** "Select a category to see only courses belonging to that category". The dropdown menu shows "--unspecified category--".
- Browse Terms:** "Select a term to see only courses belonging to that term". The dropdown menu shows "--unspecified term--" and a "Go" button.

The search results are displayed in a table with two columns: "COURSE ID" and "COURSE NAME".

COURSE ID	COURSE NAME
CS39930_2013-14	Web-Based Major Project (2013-14)
CS39930_2014-15	Web-Based Major Project (2014-15)
CS39930_AB0_2015-16	Web-Based Major Project (2015-16)
CS39930_AB0_2016-17	Web-Based Major Project (2016-17)

Figure 8.4: A screenshot of second level the query result of searching the Blackboard of Aberystwyth University using a course ID

Chapter 9

Conclusion

9.1 Introduction

This study was designed based on the results and recommendations of the pilot study as presented in Chapter 2 of the thesis. As such, it was driven by a research question that emerged from the pilot study after it was discovered that there were challenges with students and staff navigating Blackboard in Aberystwyth University.

Consequently, the aims of this PhD study were firstly to explore individual experiences, perceptions and expectations of the use of virtual learning environments in Aberystwyth University; secondly to investigate the phenomenon of how people use the VLE within Aberystwyth University; and thirdly to identify subject- and institution- specific requirements on a VLE as perceived by different users. These aims were achieved by investigating a large set of diverse users of Blackboard in Aberystwyth University and, following the systematic analytical process of classic grounded theory methodology, it was revealed that being able to find things within the VLE is critical to the **User Experience**. Based on the results of the analysis that emerged through the use of the classic grounded theory methodology, a framework of **Navigability** for virtual learning environments was developed to explain the phenomenon taking place in the use of Blackboard in Aberystwyth University and to improve the **User Experience** with specific reference to how users navigate the VLE. The results of the analysis were also used to investigate the students' logs in a module and the **User Interface** structure of the module in Blackboard at Aberystwyth University. The analysis of the click data from the student logs revealed that features like lecture slides, lecture capture, assignments were popular with the students while a feature like the discussion forum was not popular with the full time students of Aberystwyth University.

This final chapter presents the conclusion of the study. It outlines the major findings of the research work and how they impact on the **User Experience** of VLE with specific reference to the **Navigability** of VLEs as well as how it informs the design and configuration of future VLEs. The recommendations offered by this researcher with a view to configuring VLEs for an enriched **User Experience** and the major contributions of this research work to the body of knowledge with respect to virtual learning environment have also been presented in this chapter.

In addition, the limitations of the study as well as possible future work are also presented in this chapter.

9.2 The framework of Navigability for virtual learning environments

The importance of a great navigation system within the VLE cannot be over emphasized because navigation plays a major in shaping the **User Experience** on the web (Kalbach, 2007). A well-structured navigation system will provide users with intuition and flexibility when accessing resources and tools on the VLE. It becomes so easy for users to find what they need and that in turn provides them with a great **User Experience**.

Towards enhancing the **User Experience** of Blackboard in Aberystwyth University, the framework of **Navigability** was developed from the study presented here. A major strength of this framework is that it was grounded in the views of the participants as contained in the transcripts of the interviews. This was achieved by using the classic grounded theory methodology in analyzing the gathered data. The framework of **Navigability** articulates the approach to improving the experience of users as they navigate the VLE and ensure that the users find what they are looking for with ease. For this to be achieved, all those involved in development of the VLE and design of the materials such as the VLE developers, the e-learning team, teaching staff, instructional designers and learning technologists, students, administrative staff, university administrators and all other stakeholders within the university environment need to be on the same page through active engagement and consultation with respect to the functional and non-functional requirements of the VLE as it affect each user-group. This is very important as the task of designing software that supports user-friendly navigation is not a job that can be done by the web developer alone.

The expertise of software developers and in this case VLE developers is not sufficient to produce software that will meet the needs of students and staff with respect to how they navigate the VLE. This is because the development of software systems that are efficient and offer a good **User Experience** is only made possible by understanding the users and how they prefer to engage with the system. In other words, an appreciable knowledge of their needs, experiences, environments, preferences and expectations are vital to the development of the right software products that fit. This guarantees that the needs of the users are met. For this reason, software engineering practitioners appreciate the importance of paying attention to eliciting and understanding the experience of users; and ensure they rightly interpret those experiences in the reality of the domain in which the software development is taking place. Hence capturing the right requirements and analyzing them correctly are both vital to the success of the software product. Therefore, the need for users - in this case students and staff to be involved in the software development life cycle of VLEs cannot be overemphasized. This ensures that the developers take into consideration what each user really needs in their specific settings as opposed to configuring the VLE according to the assumed

perceptions of the developers.

All the stakeholders in the e-learning community need to make input into the design and configuration of the VLE. This will ensure that the VLE deployed for their use is configured based on how they work. Another point is that the web developers need the advice of experts in the user domain in order to be able to capture how best the navigation will benefit the users. And given that the VLE is a complex system which is expected to support multidisciplinary subject areas, the expertise of the web developers when considering all the subject areas may be limited. So an expert advice in each of these areas will come handy and these consultations can be provided by the university that the VLE is being designed for. It advocates the need for VLE developers to focus on providing user-centred VLEs.

The framework of *Navigability* has also highlighted the need for VLE developers to focus on providing user-centred VLEs, pay attention to the navigation mechanisms within the VLE and ensure that it receives the priority it deserves in the design of the VLE. This can be achieved by taking into account how the end users use the tool in their local settings and not how the developers expect the users to use the VLE. According to Campos (2012) the navigation should be designed before starting the developing. He argued that navigation is an element of design that is unique to e-learning. How can this be possible when the developer has not interacted with the diverse users? The navigation is so important that it cannot be assumed or based on assumptions. The navigational mechanisms should be user-centred and ultimately be influenced by the end-users. Based on the above point, improving the navigation of the VLE implies that the architecture and configuration of the VLE have to be revisited in line with a proper capture of the users' requirements. This will ensure that the architecture and configuration of the VLE are user-centred. The implication of the user-centred design is that the developer will need to understand the users and how they use the VLE in their natural settings and engage them as co-designers of the VLE.

It is not uncommon to have requirements conflicts in a complex system like the VLE. The complexity of the system is bound to generate some tension due to conflicts of requirement arising from the differences of each class of users. So in order to solve this problem, we propose that the VLE be configured in a way where each class of users has a unique view. This way, the user interface is not cluttered but rather each class of user is provided with streamlined views based on their requirements. This will reduce the information overload of features on the VLE. It will also allow for the user interface of each class of users to be properly configured to fit their needs in a very simple manner. By so doing, only relevant and streamlined information will be displayed to each class of users while other materials can be hidden away under a different label that is known to the users.

9.2.1 The components of the framework of *Navigability*

The framework of *Navigability* for virtual learning environment that emerged from this study as presented in Figure 5.18 has three components. These components are discussed here:

- (i) **Catalysts of Navigability:** The catalysts of Navigability refer to the actionable steps that are required to enhance the Navigability of the VLE. They are the good practice and recommendations that should be implemented by VLE developers, e-learning team, teaching staff, instructional designers and other stakeholders who are involved in the design of the VLE and learning materials. These catalysts of Navigability will remove the real and apparent barriers caused by the poor navigation inherent in VLEs. Implementing the catalysts of Navigability will increase the usability of the VLE.
- (ii) **Smooth Navigability:** Having a smooth Navigability on the VLE is the result of implementing the catalysts of Navigability in the design and configuration of VLEs. This will ensure that users can easily access and use the VLE in accomplishing their tasks. Factoring the catalysts of Navigability into the design and configuration of the VLE will provide easy navigation for the users of the VLE. Moreover, users with basic computing skills will be able to navigate the VLE smoothly with little or no training required because the VLE is friendly enough for them. Also a VLE with smooth navigation will make it possible for users to spend less time in using the VLE to perform tasks.
- (iii) **Great User Experience:** The provision of a smooth navigation within the VLE will no doubt enhance the user experience and which in turn, contributes to the satisfaction of the user. According to Lowdermilk (2013), **User Experience** is one of the many focuses of user-centered design and it includes the user's entire experience with the product, including physical and emotional reactions. Developing a system with consideration for **User Experience** will in the long run, lead to a continuous use of the VLE and users' engagement with the VLE. However, providing a great **User Experience** is not something that happens by chance. It will require a deliberate effort, explicit intention, and strategy on the part of the developers. So, the **User Experience** aspect of the system needs to be taken seriously during the design of the software. On the importance of **User Experience** during software development, Garrett (2003) noted that

The biggest reason user experience should matter to you is that it matters to your users. If you don't provide them with a positive experience, they won't use your site. And without users, all you've got is a dusty Web server somewhere, idly waiting to fulfil a request that will never come. For the users who do come, you must set out to provide them with an experience that is coherent, intuitive, and maybe even pleasurable – an experience in which everything works the way it should. No matter how the rest of their day has gone. (p. 19)

So creating a great user experience will involve knowing the users, how they work, their needs, requirements and expectations.

9.3 The framework of Navigability and the core issues that emerged

The framework of *Navigability* emerged from the analysis of the interview transcripts in order to address the issues that came out of the study and provide answers to the research question. This section examines the framework of *Navigability* in the light of these issues.

9.3.1 Architecture

There is a need to have an architecture that reflects the features and characteristics of the new technologies that students and staff are used to. The new architecture should not be carved in stones but dynamic enough to the ever changing needs and requirements of users. It is expected that developing such an architecture will reduce the numbers of clicks that users perform in order to get to their target item on the VLE. For the framework of *Navigability* to be implemented in the present VLE, it is very important that the architecture of Blackboard is revisited with a view to developing a new architecture that captures the expectations of students and staff and supports the behaviour of users in their settings. For instance, the transcripts revealed that Blackboard is old-fashioned and clunky.

I think the Blackboard has an interface that is unworthy. I think the Blackboard design is an obstruction to students and I think the students are already interacting and engaging with each other on other platforms and getting them to adopt a platform which looks old-fashioned and which does not have the directions or features that they expect for example from Facebook and Twitter and this is what... -Teaching staff T3

...in terms of what I like the least, the... system can be a little bit clunky and the box a little closed. -Student S12

I suspect that there are areas which I find clunky but I so got used to using them that I have forgotten something I would like to see improved. -Teaching staff T2

...I think Blackboard is clunky; it looks old-fashion if I may say so. . I have seen my colleagues do it through Blackboard and again I thought it looks clunky. I thought it looks a bit cumbersome to use and I have not thought of doing that. It's difficult for students to be able to learn and use it. -Director of studies D2

To make it feel, to try and remove the barrier to students. It's just a bit clunky. I mean I can understand why the structure it is and why you have to click through by content links to get all of there but Blackboard seems to be a barrier to most students who use that as an...but the really...learning is a different matter... -Teaching staff T14

For me it's a clunky system. It's a, for anything you want to do online, there's a lot of process, very slow process by clicking your way through it. So it becomes easily resisted to use other things and you know it's actually... but the VLE is not, it takes so much time just to put any information up there. -Teaching staff T11

it's quite clunky and the code looks messy if you are not good in HTML and not all members of our staff are fluent in HTML. -Administrative staff A1

The VLE users will like to see automated processes of work flows and basic tasks. This could be achieved by embedding drag and drop features on the VLE. This will reduce the number of steps involved in performing basic tasks and save the time of the users especially the teaching staff who have expressed their frustrations with the time consuming nature of Blackboard. Students and staff that are used to modern software expect the VLE to be intuitive, fast and responsive with smooth navigation to the materials and features on the VLE. Consequently, the researcher suggests an architecture that is built around the behaviour of users in Higher Education and not just according to the imaginations of the VLE developers.

9.3.2 User Interface

In the light of the framework of **Navigability**, the interface of Blackboard needs to be reconfigured to meet the needs and preferences of users. It should be appealing to users and very friendly as well. It should be less cluttered by providing only relevant materials to the users.

I think the Blackboard has an interface that is unworthy. -Teaching staff T3

Yea I am very you know within the expectations I have of it I am very satisfied with it. I haven't encountered any problems. You know, it's a bit cumbersome at times, it can be a bit, so many menus, so many drifts, the interface perhaps could be a bit you know streamlined may be. When you search for a module, the front page to the module handbook options... It's a bit...you can only do it from the front page. You can put them up just take, you just tailor them to the front page of the module. You need to get rid of it. They don't need it. -Teaching staff T13

9.3.3 Search functionalities

The framework of **Navigability** has highlighted the need to provide the navigation mechanisms based on how users prefer to engage with the VLE. One of such ways, is the provision of advanced features as the transcripts revealed that some users will prefer to search rather than clicking their way to what they are looking

for. This trend is supported by existing literature (Laurillard, 2002). This can be achieved by ensuring that advanced search functionalities are embedded within the VLE so that users can search for content, keywords, features and other things that may be of interest to them within the VLE.

9.4 Recommendations for the design of VLEs

This research work has applied social science methods to analyse different users' requirements in order to identify how best to configure a VLE within an institution with a view to optimizing the **User Experience** of students and staff. This is a promising approach for configuring complex software systems in order to meet the real requirements of different user groups.

The analysis has resulted in the generation of a framework of **Navigability** that explains the **User Experience** of VLE users with specific reference to Aberystwyth University. As a result of this research work, the researcher is making the following recommendations in the identification and analysis of the core requirements of the VLE in Aberystwyth University.

- (i) To continuously provide for the learning needs of students, by retaining the provision of lecture slides, lecture recordings and online submissions. These were highly commended by students.
- (ii) To provide an easy to use, responsive and less time consuming tool for the teaching staff in order to be able to deliver enhanced learning experience for students. This will also prevent some of the staff from circumventing the VLE for other tools or forms of engagement.
- (iii) The structural complexity of the VLE should be enhanced for ease of navigation. In particular, the depth of navigation of the resources on the VLE should be reduced to the barest minimum. The use of the "three-click rule" is hereby recommended.
- (iv) To provide users with only relevant and streamlined features on the **User Interface** of the VLE in a simple and concise manner in order to guard against information overload.
- (v) To revamp the architecture of Blackboard by developing a new architecture that support the behaviour of users by providing easy and fast navigation to materials on the VLE. Such a VLE should be continuously improved upon to meet the dynamic requirements of users.
- (vi) To provide a discussion forum (primarily for distance learning students) that is responsive. The forum also needs to be regularly moderated / updated by the teaching staff with respect to answering students' questions. The discussion forum needs to be within three clicks in order to reduce the depth of navigation for the users.

- (vii) The developers of VLEs should consider enlisting users as co-designers of the VLE in order to develop user-centred VLEs. This will help the developers to appreciate how the users of VLEs work and then use such knowledge to build VLEs that provide tailored services. The use of user-centered designs will go long way in helping VLE developers to provide VLEs that are fit for purpose.

I think the only trouble with Blackboard is people haven't thought about how lecturers work or how students work. -Director of studies D3

- (viii) With respect to the provision of customized VLEs that are subject-specific, the VLE developers will be designing for a lasting impression building a VLE that supports reflection, engagement, transformation and personalization of the requirements of users. For instance, it is expected that the VLE should be able to support web development teaching / demonstration tools / features such as animation and JavaScript.
- (ix) Another recommendation from this study is that VLE developers should consider embedding advanced search features within the VLE platform. This will assist users to search directly for materials and tools rather than getting frustrated with how to navigate to such resources on a digital maze like the VLE.
- (x) There should be consistency in the design of the elements of VLE across the different sections of the tool as well as consistency in the way that the teaching staff use the VLE to present information to students.
- (xi) Recommends the application of the framework of **Navigability** which is capable of assisting VLE developers in configuring a VLE that fits the needs of diverse kind of users within an institution. This will improve the **Navigability** of the virtual learning environment and as a result enrich the experience of users.
- (xii) The researcher recommends that a method like the classic grounded theory should be used for analysing VLE requirements of diverse kind of users and in resolving requirements conflicts that is inherent in a complex system like the VLE.

9.5 Grounded theory in software engineering

Based on its vast application to human behavior, grounded theory can be regarded as an established and credible methodology for investigating topics that are social in nature. Given that most of the issues which software developers have to deal with are socio-technical in nature (Fernández and Lehmann, 2005), GT has since found application in Software Engineering. In their work on the use of grounded theory in Software Engineering, Stol et al. (2016) carefully and systematically

surveyed 98 articles that were found to have mentions of GT, of which 52 explicitly claim to use GT, with the other 46 only using GT techniques.

9.5.1 The strengths of grounded theory in Software Engineering

Grounded Theory offers many benefits to research in software engineering as it is suitable for the investigation of complex multifaceted phenomena and explore socially related. Despite existing criticism, it is a rigorous and methodical research approach capable of broadening the perceptions of those in the research community. Grounded theory offers a rigorous method for investigation of software processes. It is common knowledge that software engineering is labour-intensive and software process relies heavily on human compliance for its deployment in order to have a product that is both efficient and effective. The use of GT provides robust tools for capturing how software users view the system thereby providing software developers a prism through which to construct meaning out of the experiences of those users in the domain under investigation. GT makes it possible to learn the ways that people understand and respond to what is happening to them over time (Schreiber and Stern, 2001).

A number of researchers have used grounded theory to look at a diverse range of socio-cultural activities in software engineering.

Coleman and O'Connor (2007) used grounded theory as a methodology to investigate software process improvement for the purpose of understanding how the software process is used within an organisation. They believed that such investigation would drive the implementation of changes to that process in order to achieve specific goals such as increasing development speed, achieving higher product quality and reducing costs (Coleman and O'Connor, 2007). They argued that from a software process perspective, the role of individual actors, and their environmental surroundings and conditions have huge impact on how the process is carried out. Consequently, Coleman and O'Connor (2007) noted that facilitating the gathering and analysis of those human experiences and the associated inter-relationships with other human actors, coupled with situational and contextual factors, are particular strengths of the GT methodology. In another study by the same authors, Coleman and O'Connor (2008) used a grounded theory approach to characterize the experiences of small software organizations in developing processes to support their software development activity. Their work underscored the point that grounded theory offers explanatory powers for investigating the phenomenon surrounding the experience of users within the software development life cycle Coleman and O'Connor (2008).

Another example where GT has been successfully used in Software Engineering is in the work of Adolph et al. (2011). They used grounded theory to study the experience of software development- how people manage the process of software development. Adolph et al. (2011) found GT to be an effective tool for software engineering research in investigating how people manage the software development process. They argued that the real gold of Grounded Theory is the ability to view a problem from the participants' perspective and to tell the story of that problem

as a set of conceptual hypotheses.

Badreddin (2013) noted that the user of GT in Software Engineering is particularly attractive because applications and systems are growing increasingly more complex and involve ever increasing numbers of users and stakeholders (Badreddin, 2013). According to Badreddin (2013) for adopting the use of GT in Software Engineering is that Grounded theory can help discover patterns from a stakeholders' perspective of the system under development that may increase our knowledge of the users' needs and how those stakeholders may perceive aspects related to the new system, like the organization impact of the new system and changes in business tasks and activities (Badreddin, 2013).

In their study, Stol et al. (2016) investigated the use of grounded theory in Software Engineering Research and provided a critical review and some guidelines for would-be users of GT in software engineering. They argued that that grounded theory offers a highly suitable methodology to address social, cultural and human aspects in software engineering, noting that several GT studies in SE have contributed novel and rich insights. Stol et al. (2016) argued that though software engineering presents non-trivial challenges for grounded theory research, grounded theory no doubt remains one of the most rigorous methods to generate new theories. They asserted that this was a significant issue as the establishment of a strong theory base has been identified as an important challenge for the software engineering discipline. (Stol et al., 2016) concluded that well conducted GT studies can make significant contributions to the field of software engineering and help to develop rich theories which will in turn shape future empirical studies in software engineering (Stol et al., 2016).

The above instances of how GT has been used in software engineering, provided a strong support for the use of GT in this research work. As outlined in works of Adolph et al. (2011), Coleman and O'Connor (2007, 2008), Stol et al. (2016), grounded theory methodology has rich application in software engineering research works where the social aspect is critical. Grounded theory as a method more commonly associated with the social science perspective has the capacity to solve social-related problems that are context-based interpretive in nature such as this PhD work.

9.5.2 What the classic grounded theory brings to the findings of the study

The use of the classic grounded theory brought the following findings to this study:

- (i) As a robust research methodological approach, the classic grounded theory (CGT) provided a rigorous way of analyzing the experience VLE users in Aberystwyth university. This methodological approach GT provided very useful insights that led to the discovery of emerging concepts that were inherent in the data under study given its interpretive nature as a research methodology.
- (ii) The use of grounded theory in this study also assisted in the discovery of useful findings and relevant contributions to the field of Human Computer

Interaction and specifically, the configuration of virtual learning environments.

- (iii) The findings of this study can be trusted as the results were a product of an academically sound research that has very useful application for software development.
- (iv) A major strength of the CGT method is that the findings are grounded in the data analyzed. Consequently, we can be sure that, the framework of *Navigability* that resulted from the study is sufficient in explaining the user experience of the Blackboard users in Aberystwyth University with specific reference to how the users find things on the VLE.

9.6 Contributions of the study

The contributions of this study to the body of knowledge are as follows:

- (i) The main contribution of this study is that a robust articulation of the barriers of *Navigability* in a VLE has been presented in a greater depth compared to what has been previously done by other researchers. The processes that led to the articulation of the barriers of *Navigability* are presented in Chapter 5 of the thesis. Also the significance of the study reiterates this contribution as presented in 9.7.
- (ii) The researcher developed a framework of *Navigability* which provides an explanation of the phenomenon that exists among the users of Blackboard in Aberystwyth University. The framework of is capable of assisting developers to configure a VLE that best fits the needs of diverse kind of users within an institution. Through this contribution, the first and second aims of this research work as outlined in section 1.4 were achieved.
- (iii) The framework of *Navigability* for virtual learning environments that emerged from this study provides ways of optimizing the structural complexity of VLEs in order to facilitate ease of navigation within the VLE as presented in Figure 5.18 and section 9.2.1 of the thesis.
- (iv) The researcher has analysed a large set of diverse participants in order to extract a framework using a social science methodology called classic grounded theory. The analysis of the data of the study and the processes leading to the extraction of the framework of *Navigability* were presented in Chapter 5 of the thesis. This application of the classic grounded theory has been used to analyse different users' requirements in order to identify how best to configure a VLE within an institution. This is a promising approach for configuring complex software systems that will help to meet the real requirements of different user groups as opposed to using hypothetical requirements. By so doing, the second and third aims of this study as specified in section 1.4 were realized.

- (v) The researcher has also analysed the logs of students activities on the VLE in Aberystwyth University and the results were compared with those of the interview transcripts in order to ascertain if they supported or contradicted the transcripts. The results of the data analytics were presented in Chapter 6.
- (vi) Justified the need for developers to be well acquainted with the users of the VLE as opposed using an imaginary set of users when building a VLE.
- (vii) This study has provided some recommendations for improving both tailored and off-the shelf VLEs.
- (viii) Devised a method for analysing VLE requirements of diverse kind of users while resolving requirements conflicts.

9.7 Significance of Study

The significance of this study is that this research applies social science methods to analyse different users' requirements in order to identify how best to configure a VLE within an institution. Previous studies on VLE navigation have either focused on only students (Alelaiwi and Hossain, 2015, Sadoux et al., 2016) or only teaching staff (Kear, 2007) or both students and teaching staff (Power and Kanara, 2016). Although Brown and Bullock (2014) focused on students, educators and organizational representatives, their study was based on a postgraduate online learning programme in a college of medicine. The work presented in this thesis is comprised of participants that are varied and diverse; made up of students, teaching staff, directors of studies, e-learning team and administrative staff. The student participants group of the study cuts across different academic departments, made up of undergraduates and postgraduates, full time and distance learning students. Furthermore, data were also gathered from the students' logs and the Blackboard user interface structure. These diverse elements of the participants and multiple data sources provided robust data for the study.

Using classic grounded theory to analyze the data collected led to the identification of **Navigability** as a critical factor in the User Experience of VLE users in Aberystwyth University. This led to the development of a framework of **Navigability** that offers a holistic view to understanding the different needs inherent in a complex system like the VLE and explanations of how users navigate virtual learning environments with specific reference to Aberystwyth University. This is a promising approach for configuring complex software systems in order to meet the real requirements of different user groups on a VLE.

9.8 How the use of GT differs from the use of Usability inspection methods

The result of use of classic grounded theory differs from Nielsen and Mack's Usability Inspection Methods in many respects. In the use of grounded theory for

this study, real users were interviewed on their experience, perceptions and expectations with respect to their use of Blackboard in Aberystwyth University. This provided the researcher with real data from actual users of the VLE. Another major difference is that the use of CGT in the analysis of the data gathered in this study has made up for the misses and failures that often arise from using usability inspection methods. Furthermore, the use of the classic grounded theory makes the result of the study to be user-centred as opposed to it being centred around the experts.

9.9 Limitations of the study

The researcher does not believe that it is possible to have a VLE that every user will be satisfied with. However, it is the view of the researcher that the navigation barriers inherent in a VLE like Blackboard can be reduced to the barest minimum such that majority of users will be happy to use. A good way to begin that process is for VLE developers to pay attention to the end users in areas of needs, culture, feedback, environment, concerns and preferences. The GT process comes handy at this stage in ensuring that the requirements of the users are adequately captured and provided for. The use of an abbreviated version of grounded theory in the analysis of the study could have imposed some form of limitations on the results of the study. The issue of *Navigability* investigated could have benefited more from the use of the full version of the grounded theory approach.

9.10 Possible future work

As pointed out in 9.9, the study might have been limited by the use of the abbreviated version of GT. It would be interesting to explore the concept of *Navigability* further using the full version of grounded theory in Aberystwyth University and other universities in Wales and the rest of the United Kingdom. This is likely to lead to not just a substantive theory but a formal theory that could be generalized for all universities within the United Kingdom with respect to how best a VLE should be configured in order to retain and build on the best aspect of the learning experience offered by an institution.

9.11 Chapter summary

This chapter has presented the conclusion of this PhD work which generated the framework of *Navigability* for an improved *User Experience* in a VLE in Aberystwyth University. It highlighted the contributions and recommendations made by the researcher towards improving the *User Experience* of Blackboard users in Aberystwyth University. This chapter also pointed out the limitations and possible future work with respect to the thesis.

Bibliography

- C. Abras, D. Maloney-Krichmar, and J. Preece. User-centered design. In W. Bainbridge, editor, *Encyclopedia of Human-Computer Interaction (in press)*. Thousand Oaks: Sage Publications, 2004.
- K. Abuhlfaia and E. de Quincey. The usability of e-learning platforms in higher education: A systematic mapping study. In *Proceedings of the 32nd International BCS Human Computer Interaction Conference (HCI 2018) Belfast, UK*, pages 249–256. BCS Learning and Development Ltd, July 2018. doi:10.14236/ewic/HCI2018.7.
- S. Adolph, W. Hall, and P. Kruchten. Using grounded theory to study the experience of software development. *Empirical Software Engineering*, 16:487–513, 2011. doi:10.1007/s10664-010-9152-6.
- D. E. Agosto, A. J. Copeland, and L. Zach. Testing the benefits of blended education: Using social technology to foster collaboration and knowledge sharing in face-to-face LIS courses. *Journal of Education for Library and Information Science*, 54(2):94–107, 2013.
- A. F. Agudo-Peregrina, S. Iglesias-Pradas, M. A. Conde-Gonzalez, and A. Hernandez-Garcia. Can we predict success from log data in VLEs? Classification of interactions for learning analytics and their relation with performance in VLE-supported F2F and online learning. *Computers in Human Behavior*, 31: 542–550, 2014.
- A. Al-Wabil, P. Zaphiris, and S. Wilson. Web navigation for individuals with dyslexia: An exploratory study. In C. Stephanidis, editor, *Universal Access in Human Computer Interaction. Coping with Diversity. UAHCI 2007. Lecture Notes in Computer Science*, volume 4554, page 593–602. Springer, Berlin, Heidelberg, 2007. doi:10.1007/978-3-540-73279-2_66.
- D. S. Alberts and D. S. Papp. The information age: an anthology on its impact and consequences. Technical report, Office of the Assistant Secretary of Defense, Command and Control Research Program (CCRP), 1997. Washington DC.
- A. Alelaiwi and M. S. Hossain. Evaluating and Testing User Interfaces for E-Learning System: Blackboard Usability Testing. *Journal of Information Engineering and Applications*, 5(1):23–30, 2015.

- A. A. Alhogail and A. A. Mirza. Implementing a virtual learning environment (VLE) in a Higher Education institution: A change management approach. *Journal of Theoretical and Applied Information Technology*, 31(1):42–52, 2011.
- D. Alonso-Rios, A. Vazquez-Garcia, E. Mosqueira-Rey, and V. Moret-Bonillo. Usability: A Critical Analysis and a Taxonomy. *International Journal of Human-Computer Interaction*, 26(1):53–74, 2009. doi:10.1080/10447310903025552.
- L. Andrews, A. Higgins, M. W. Andrews, and J. G. Lalor. Classic Grounded Theory to Analyse Secondary Data: Reality and reflections. *Grounded Theory Review*, 11(1):12–26, 2012.
- R. Arshad, A. Majeed, H. Afzal, M. Muzammal, and A. ur Rahman. Evaluation of Navigational Aspects of Moodle. *International Journal of Advanced Computer Science and Applications*, 7(3):289–298, 2016.
- Z. Austin and J. Sutton. Qualitative research: getting started. *Can J Hosp Pharm*, 67(6):436–440, 2014.
- B. Aydin, M. M. Darwish, and E. Selvi. State-of-the-art-matrix analysis for usability of learning management systems. In *ASEE's 123rd Annual Conference and Exposition, New Orleans, LA*, pages 48–60. American Society for Engineering Education, June 26-29 2016. Paper 14949.
- O. Badreddin. Thematic Review and Analysis of Grounded Theory Application in Software Engineering. *Advances in Software Engineering*, 2013. doi:10.1155/2013/468021.
- J. Barker and P. Gossman. The Learning Impact of a Virtual Learning Environment: Students' views. *Teacher Education Network Journal*, 5(2):19–38, 2013. URL <http://insight.cumbria.ac.uk/1455/1/146-574-1-PB.pdf>. Accessed: 02.09.2019.
- P. Bazeley. *Qualitative data analysis: Practical strategies*. SAGE Publications Inc, London, 2013.
- J. Beckton. Lumping and Splitting. Rolling out a new VLE at the University of Lincoln. In *e-Learning: A Reality Check - Do We Practice What We Preach? Durham University, 8th - 9th January 2009*, 2009. URL <http://eprints.lincoln.ac.uk/1756/>. Accessed: 23.08.2015.
- D. Belanche, L. V.Casalo, and M. Guinaliu. Website usability, consumer satisfaction and the intention to use a website: The moderating effect of perceived risk. *Journal of Retailing and Consumer Services*, 19:124–132, 2012. doi:10.1016/j.jretconser.2011.11.001.
- R. Benbunan-Fich. Using Protocol Analysis to evaluate the usability of a Commercial Website. *Information and Management*, 39:151–163, 2001.

- S. Bennett. Learning Management Systems: A Review. Auckland: AUT University, 2011. URL https://eclass.teicrete.gr/modules/document/file.php/TP271/Reading%20material/3_LMSreview%28AUT%20Univ.-2011%29.pdf. Accessed: 04.05.2019.
- S. J. Bennett, K. Maton, and L. Kervin. The 'Digital Natives' Debate: A Critical Review of the Evidence. *British Journal of Educational Technology*, 39(5):775–786, 2008.
- O. Bentahar and R. Cameron. Design and Implementation of a Mixed Method Research Study in Project Management. *Electronic Journal of Business Research Methods*, 13(1):151–163, 2015.
- M. Bernard. Criteria for optimal web design – designing for usability, 2003. Wichita State University Department of Psychology: Software Usability Research Lab.
- S. A. Bhosale and P. A. Shingate. Buying Behavior of Online Buyers With Respect to Flipkart Website. *ETHOS*, 9(1):56–66, 2016.
- R. G. Bias, S. Lucas, and T. L. Latham. The hurie method: A case study combining requirements gathering and user interface evaluation. In C. Righi and J. James, editors, *User-Centered Design Stories: Real-World UCD Case Studies*, page 163–183. Elsevier, San Francisco, CA, 2007.
- M. Birks and J. Mills. *Grounded Theory: A practical guide, second edition*. SAGE Publications Ltd, London, 2015.
- C. Boldyreff, E. Burd, J. Donkin, and S. Marshall. The case for the use of plain english to increase web accessibility. In *Proceedings of the 3rd International Workshop on Web Site Evolution. WSE 2001, Florence, Italy*, pages 42–48. American Society for Engineering Education, 2001. doi:10.1109/WSE.2001.988784.
- P. Bradford, M. Porciello, N. Balkon, and D. Backus. The Blackboard learning system: The be all and end all in educational instruction? *Educational Technologies Systems*, 35(3):301–314, 2007.
- V. Braun and V. Clarke. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3:77–101, 2006. doi:10.1191/1478088706qp063oa.
- J. Breckenridge. Doing classic grounded theory: The data analysis process. In C. Gorla, O. Speicher, and S. Stollhans, editors, *SAGE Research Methods Cases*. SAGE Publications, London, 2014. doi:10.4135/978144627305014527673.
- D. Bremer and R. Bryant. Comparison of two learning management systems: Moodle vs blackboard. In *Proceedings of the 18th Annual Conference of the National Advisory Committee on Computing Qualifications*, pages 135–139, 2005.
- J. S. Brown and R. P. Adler. Minds on fire: open education, the long tail, and learning 2.0. *EDUCAUSE Review*, 43(1):16–32, 2008.

- M. Brown and A. Bullock. Evaluating PLATO: postgraduate teaching and learning online. *The Clinical Teacher*, 11:10–14, 2014.
- T. Browne, M. Jenkins, and R. Walker. A Longitudinal Perspective Regarding the Use of VLEs by Higher Education Institutions in the United Kingdom. *Interactive Learning Environments*, 14(2):177–192, 2006.
- A. Bryman. *Social Science Methods 4th Edition*. Oxford University Press Inc, New York, 2012.
- A. Burrell and A. C. Sodan. Web interface navigation design: Which style of navigation-link menus do users prefer? In *Proceedings of the 22nd International Conference on Data Engineering Workshops (ICDEW'06)*. Computer Society, IEEE, 2006.
- L. Busetto, K. Luijckx, S. Calciolari, L. G. González-Ortiz, and H. J. Vrijhoef. The Development, Description and Appraisal of an Emergent Multimethod Research Design to Study Workforce Changes in Integrated Care Interventions. *International Journal of Integrated Care*, 17(1):1–11, 2017. doi:10.5334/ijic.2510.
- M. Butkiewicz, H. V. Madhyastha, and V. Sekar. Understanding website complexity: measurements, metrics, and implications. In *Proceedings of the 2011 ACM SIGCOMM conference on Internet measurement conference, Berlin, Germany*, pages 313–328. ACM, Nov. 2011. doi:10.1145/2068816.2068846.
- R. Cader and M. McGovern. Introducing Blackboard: an electronic learning platform. *Nursing Times*, 99(32):24–25, 2003. doi:10.1016/j.sbspro.2013.06.604.
- J. Campos. Peeling back the layers: an interview with kevin thorn, 2012. URL <https://elearnmag.acm.org/archive.cfm?aid=2170471>. Accessed: 21.08.2018.
- E. Carmel, S. Crawford, and H. Chen. Browsing in Hypertext: A Cognitive Study. *IEEE Transactions on Systems, Man and Cybernetics*, 22(5):865–884, 1992. doi:10.1109/21.179829.
- M. Carter. A Study of Students' Perceptions of the Online Component of a Hybrid Postgraduate Course. *Procedia – Social and Behavioural Sciences*, 84:558–568, 2013. doi:10.1016/j.sbspro.2013.06.604.
- S. Cassidy. Virtual Learning Environments as Mediating Factors in Student Satisfaction with Teaching and Learning in Higher Education. *Journal of Curriculum and Teaching*, 5(1):113–123, 2016.
- R. Chang, D. F. Bliss, , and A. R. Altemus. Usability Guidelines for an Online Image Database. *Journal of Biocommunication*, 43(1):14–233, 2019.
- K. Charmaz. Loss of self: A fundamental form of suffering in the chronically ill. *Sociology of Health & Illness*, 5(2):168–195, 1983.

- K. Charmaz. *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE Publications, London, 2006.
- L. C. Cheng and M. Mustafa. A reference to usability inspection methods. In *International Colloquium of Art and Design Education Research (i-CADER 2014)*, page 407–419. Springer, 2014.
- W.-C. Chiou, C.-C. Lin, and C. Perng. A Strategic Framework for Website Evaluation based on a Review of the Literature from 1995–2006. *Information & Management*, 47:282–290, 2010.
- C.-H. Chong and K.-J. Yeo. An overview of grounded theory design in educational research. *Asian Social Science*, 11(12):258–268, 2015. doi:10.5539/ass.v11n12p258.
- S. Chowdhry, K. Sieler, and L. Alwis. A Study of the Impact of Technology-Enhanced Learning on Student Academic Performance. *Journal of Perspectives in Applied Academic Practice*, 2(3):3–15, 2014.
- S. Cohen. *Folk Devils and Moral Panics*. Routledge, London, 2011.
- I. J. Cole. Usability of online virtual learning environments: Key issues for instructors and learners. In C. Gonzalez, editor, *Student Usability in Educational Software and Games: Improving Experiences*, chapter Two, page 41–58. IGI Global, Hershey, PA, USA, 2013.
- G. Coleman and R. O’Connor. Using grounded theory to understand software process improvement: A study of Irish software product companies. *Information and Software Technology*, 49:654–667, 2007.
- G. Coleman and R. O’Connor. Investigating Software Process in Practice: A Grounded Theory Perspective. *Journal of Systems and Software*, 81(5):772–784, 2008.
- C. Costa, H. Alvelos, and L. Teixeira. The Use of Moodle e-learning Platform: A Study in a Portuguese University. *Procedia Technology*, 5:334–343, 2012.
- M. F. Costabile, M. D. Marsico, R. Lanzilotti, V. L. Plantamura, and T. Roselli. On the usability evaluation of e-learning applications. In *Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS’05), Big Island, HI, USA, January 03-06*, pages 6b–6b. IEEE, 2005. doi:10.1109/HICSS.2005.468.
- E. Costello. Opening Up to Open Source: Looking at How Moodle was Adopted in Higher Education. *Open Learning: The Journal of Open, Distance and e-Learning*, 28(3):187–200, 2013.
- T. B. Creighton. Digital Natives, Digital Immigrants, Digital Learners: An International Empirical Integrative Review of the Literature. *ICPEL Education Leadership Review*, 19(1):132–140, 2018.

- J. Creswell. *Research design: Qualitative and quantitative approaches*. SAGE Publications, California, USA, 1994.
- J. Creswell. *Educational research: planning, conducting, and evaluating quantitative and qualitative research. 4th edition*. Pearson Education, California, USA, 2012.
- J. Creswell and V. L. Plano Clark. *Choosing a Mixed Methods Design. Designing and Conducting Mixed Methods Research*. SAGE Publications Inc, London, 2018.
- J. W. Creswell. *Research design: Qualitative, Quantitative, and Mixed methods approaches Fourth Edition*. SAGE Publications Ltd, London, United Kingdom, 2014.
- G. D. Cubber, D. Doroftei, D. Serrano, K. Chintamani, R. Sabino, and S. Ourevitch. The eu-icarus project: Developing assistive robotic tools for search and rescue operations. In *2013 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR), Linkoping, Sweden*, pages 1–4. IEEE, October 21-26 2013. doi:10.1109/SSRR.2013.6719323.
- M. Cucciniello, G. Nasi, and G. Valotti. Assessing transparency in government: Rhetoric, reality and desire. In *HICSS '12 Proceedings of the 2012 45th Hawaii International Conference on System Sciences. Washington, DC*, pages 2451–2461. IEEE Computer Society, 2012.
- T. Cui, X. Wang, and H. Teo. Building a culturally-competent web site: A cross-cultural analysis of web site structure. *Journal of Global Information Management*, 23(4):1–25, 2015. doi:10.4018/JGIM.2015100101.
- D. B. Danbjorg, J. Clemensen, and M. J. Rothmann. Participatory design methods in Telemedicine. *International Journal of Integrated Care*, 16(5):S11, 2016. doi:10.5334/ijic.2559.
- D. DeNeui and T. Dodge. Asynchronous Learning Networks and Student Outcomes: The Utility of Online Learning Components in Hybrid Courses. *Journal of Instructional Psychology*, 33(4):256–259, 2006.
- L. DeSantis and D. N. Ugarriza. The Concept of Theme as Used in Qualitative Nursing Research. *Western Journal of Nursing Research*, 22(3):351–372, 2000. doi:10.1177/019394590002200308.
- H. W. Desurvire. Faster, cheaper!! are usability inspection methods as effective as empirical testing? In J. J. Nielsen and R. Mack, editors, *Usability Inspection Methods*, chapter 7, pages 173–202. John Wiley & Sons, Inc., New York, 1994.
- I. Dey. *Grounding Grounded Theory: Guidelines for Qualitative Inquiry*. Routledge, London, 1993.
- D. Dhyani, W. Keong, and S. Bhowmick. A Survey of Web Metrics. *ACM Computing Surveys*, 34(4):469–503, 2002. doi:10.1145/592642.592645.

- D. Dimitrov, P. Singer, D. Helic, and M. Strohmaier. The Role of Structural Information for Designing Navigational User Interfaces. In *Proceedings of the 26th ACM Conference on Hypertext & Social Media, September 01-04, 2015, Guzelyurt, Northern Cyprus*, 2015. doi:10.1145/2700171.2791025.
- D. Doroftei, G. D. Cubber, R. Wagemans, A. Matos, E. Silva, V. Lobo, G. Cardoso, K. Chintamani, S. Govindaraj, J. Gancet, and D. Serrano. User-centered design. In G. D. Cubber, D. Doroftei, K. Rudin, K. Berns, D. Serrano, J. Sanchez, S. Govindaraj, J. Bedkowski, and R. Roda, editors, *Search and Rescue Robotics. From Theory to Practice.*, chapter 2, page 19–36. IntechOpen, London, 2017. doi:10.5772/intechopen.69483.
- F. A. dos Santos and V. T. Souto. Graphic design and user-centred design: designing learning tools for primary school. *International Journal of Technology and Design Education*, 2018. doi:10.1007/s10798-018-9480-1.
- M. Dougiamas. Moodle version 1.9. 7. *The Electronic Journal for English as a Second Language*, 13(2), 2010.
- D. Easley and J. Kleinberg. *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*. Cambridge University Press, New York, USA, 2010.
- R. A. Ellis, P. Ginns, and L. Piggott. E-learning in Higher Education: Some Key Aspects and Their Relationship to Approaches to Study. *Higher Education Research & Development*, 28(3):303–318, 2009. doi:10.1080/07294360902839909.
- G. L. Evans. A Novice Researcher ’s First Walk Through the Maze of Grounded Theory: Rationalization for Classical Grounded Theory. *The Grounded Theory Review*, 12(1):37–55, 2013.
- R. Everett. MLEs and VLEs Explained. Briefing paper No. 1. Joint Information Systems Committee, 2002. URL http://www.webarchive.org.uk/wayback/archive/20080625160610/http://jisc.ac.uk/uploaded_documents/bp1.pdf. Accessed: 18.08.2015.
- A. Fernandez, E. Insfran, and S. Abrahao. Usability Evaluation Methods for the web: A Systematic Mapping Study. *Information and Software Technology*, 53: 789–817, 2011.
- C. Fernandez. Guest Editorial, Themed Section. *The Grounded Theory Review*, 11(1):27–28, 2012.
- W. D. Fernandez. Metateams in major Information Technology Projects. A Grounded Theory on Conflict, Trust, Communication, and Trust. *Unpublished Doctor of Philosophy, Queensland University of Technology*, 1994.
- W. D. Fernández and H. Lehmann. Achieving rigour and relevance in information systems studies: Using grounded theory to investigate organizational cases. *The Grounded Theory Review*, 5(1):136–158, 2005.

- M. Finnegan and C. Ginty. Moodle and social Constructivism: Is Moodle Being used as a Constructed? A case study analysis of Moodle use in Teaching and Learning in an Irish Higher Educational Institute. *All Ireland Journal of Teaching and Learning in Higher Education (AISHE-J)*, 11(1), 2019.
- U. Flick. *An introduction to qualitative research*. SAGE Publications, Inc, London, 2014.
- L. L. Freire, P. M. Arezes, and J. C. Campos. A literature review about usability evaluation methods for e-learning platforms. *Work*, 41:1038–1044, 2012.
- W. Fu and P. Pirolli. SNIF-ACT: A Cognitive Model of User Navigation on the World Wide Web. *Human-Computer Interaction*, 22:355–412, 2007.
- E. E. Gallardo-Echenique, L. Marqués-Molíás, M. Bullen, and J.-W. Strijbos. Let’s Talk about Digital Learners in the Digital Era. *International Review of Research in Open and Distributed Learning*, 16(3):157–187, 2015.
- D. F. Galletta, R. Henry, S. McCoy, and P. Polak. When the Wait Isn’t So Bad: The Interacting Effects of Website Delay, Familiarity, and Breadth. *Information Systems Research*, 17(1):20–37, 2006. doi:10.1287/isre.1050.0073.
- A. Garcia, T. S. da Silva, and M. S. Silveira. Proceedings of the hawaii international conference on system sciences (hicss-50), waikoloa village, hawaii. In *ED-MEDIA 2007*, pages 5859–5868, 4–7 January 2017.
- J. J. Garrett. *The Elements of User Experience: User-Centered Design for the Web*. New Riders, Indianapolis, 2003.
- R. Garrett, J. Chiu, L. Zhang, and S. D. Young. A Literature Review: Website Design and User Engagement. . *Online Journal of Communication and Media Technologies*, 6(3):1–14, 2016.
- S. Gasson. Employing a grounded theory approach for mis research. In W. M. S. S. DWIVEDI YK, LAL B and W. M, editors, *Handbook of Research on Contemporary Theoretical Models in Information Systems*, chapter Three, page 34–56. IGI Global, Hershey, PA, USA, 2009.
- S. Gasson and J. Waters. Using a Grounded Theory Approach to Study Online Collaboration Behaviors. *European Journal of Information Systems*, 22(1):95–118, 2013. doi:10.1057/ejis.2011.24.
- S. J. Gentles, C. Charles, J. Ploeg, and K. McKibbin. Sampling in Qualitative Research: Insights from an Overview of the Methods Literature. *The Qualitative Report*, 20(11):1772–1789, 2015.
- B. Glaser. *Theoretical sensitivity*. Sociology Press, Mill Valley, CA, 1978.
- B. Glaser. *Emergence vs. Forcing: Basics of Grounded Theory*. Sociology Press, Mill Valley, CA, 1992.

- B. Glaser. *Doing Grounded Theory: Issues and discussions*. Sociology Press, Mill Valley, CA, 1998.
- B. Glaser. Conceptualization: On theory and theorizing using grounded theory. *International Journal of Qualitative Methods*, 1(2), 2002.
- B. Glaser and J. Holton. Remodeling Grounded Theory. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 5(2), 2002.
- B. Glaser and A. Strauss. *The discovery of grounded theory: strategies for qualitative research*. Aldine de Gruyter, New York, USA, 1967.
- O. Glassey and O. F. Glassey. A Proximity Indicator for e-Government: The Smallest Number of Clicks. *Journal of E-Government*, 1(4), 2004.
- C. Goulding. *Grounded Theory: A Practical Guide for Management, Business and Market Researchers*. SAGE Publications Inc, London, 2002.
- A. Granic and M. Cukusic. Usability Testing and Expert Inspections Complemented by Educational Evaluation: A Case Study of an e-Learning Platform. *Educational Technology & Society*, 14(2):107–123, 2011.
- K. Hammarberg, M. Kirkman, and S. de Lacey. Qualitative research methods: when to use them and how to judge them. *Human Reproduction*, 31(3):498–501, 2016. doi:10.1093/humrep/dev334.
- B. Hancock, E. Ockleford, and K. Windridge. An Introduction to Qualitative Research. *The NIHR RDS EM / YH*, 2007.
- L. Hathorn and J. Hathorn. Evaluation of online course websites: Is teaching online a tug-of-war? *Journal of Educational Computing Research*, 42(2):197–217, 2010. doi:10.2190/EC.42.2.d.
- M. Hearst. The changing relationship between information technology and society. *IEEE Intelligent Systems*, page 8–17, 1999.
- A. Heirdsfield, J. Davis, S. Lennox, S. Walker, and W. Zhang. Online Learning Environments: What Early Childhood Teacher Education Students Say. *Journal of Early Childhood Teacher Education*, 28(2):115–126, 2007. doi:10.1080/10901020701366699.
- A. M. Heirdsfield, S. Walker, M. M. Tambyah, and D. A. Beutel. Blackboard as an Online Learning Environment: What Do Teacher Education Students and Staff Think? *Australian Journal of Teacher Education*, 36(7):1–16, 2011.
- E. J. Helsper and R. Eynon. Digital natives: where is the evidence? *British Educational Research Journal*, 36(3):503 — 520, 2010. doi:10.1080/01411920902989227.
- C. A. Hernandez. Theoretical coding in grounded theory methodology. *Grounded Theory Review*, 8(3), 2009.

- A. Herrington and A. Bunker. Quality teaching online: putting pedagogy first. In A. Goody, J. Herrington and M. Northcote (Eds.), *Research and Development in Higher Education: Quality Conversations*, page 305–312, Perth, Australia, July 2002. Higher Education Research and Development Society of Australia, Inc.(HERDSA).
- T. Hollingsed and D. Novick. Usability inspection methods after 15 years of research and practice. In *Proceedings of the 25th Annual ACM International Conference on Design of Communication (SIGDOC'07)*, pages 249–255. ACM Press, 2007.
- J. A. Holton. Grounded theory as a general research methodology. *The Grounded Theory Review*, 7(2):67–89, 2008.
- J. A. Holton. The Coding Process and Its Challenges. *The Grounded Theory Review*, 9(1):21–38, 2010.
- J. A. Holton and I. Walsh. *Classic grounded theory: applications with qualitative and quantitative data*. SAGE Publications, Inc, California, USA, 2017.
- A. Holzinger. Usability Engineering Methods for Software Developers. *Communications of the ACM*, 48(1):71–74, 2005.
- J. Iqbal. Learning from a doctoral research project: Structure and content of a research proposal. *The Electronic Journal of Business Research Methods*, 5(1): 11 – 20, 2007.
- L. B. W. F. N. L. Isabelle Walsh, Judith A. Holton and B. Glaser. What grounded theory is...A critically reflective conversation among scholars. *Organizational Research Methods*, 18(4):581 – 599, 2015. doi:10.1177/1094428114565028.
- ISO. ISO 9241-11:2018(en): Ergonomics of Human-system interaction- Part 11: Usability: Definitions and concepts. <https://www.iso.org/obp/ui/#iso:std:iso:9241:-11:ed-2:v1:en>, 2018. Accessed: 13.09.2019.
- Y. Jabareen. Building a Conceptual Framework: Philosophy, Definitions, and Procedure. *International Journal of Qualitative Methods*, 8(4):49–62, 2009.
- S. Jackson and C. Fearon. Exploring the Role and Influence of Expectations in Achieving VLE Benefit Success. *British Journal of Educational Technology*, 45 (2):245–259, 2014. doi:10.1111/bjet.12029.
- N. H. Jalani and L. C. Sern. The Example-Problem-Based Learning Model: Applying Cognitive Load Theory. *Procedia - Social and Behavioral Sciences*, 195: 872–880, 2015. doi:10.1016/j.sbspro.2015.06.366.
- R. Jeffries. Usability problem reports: Helping evaluators communicate effectively with developers. In J. J. Nielsen and R. Mack, editors, *Usability Inspection Methods*, chapter 11, page 273–294. John Wiley & Sons, Inc., New York, 1994.

- R. Jeffries and H. Desurvire. Usability testing vs. Heuristics Evaluation: Was there a contest? *Special Interest Group on Computer & Human Interaction*, 24 (4):39–41, 1992.
- JISC. In Their Own Words. Exploring the learner’s perspective on e-learning. Available from <http://www.webarchive.org.uk/wayback/archive/20140615220212/> <http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/iournal.pdf>, 2007.
- JISC/Ipsos Mori. Great expectations of ict: How higher education institutions are measuring up, (jisc-ipsos mori full report) london, 2008. URL <http://www.jisc.ac.uk/publications/research/2008/greatexpectations.aspx>. Accessed: 04.05.2019.
- L. Johnson, S. Adams Becker, V. Estrada, and A. Freeman. Nmc horizon report: 2015 higher education edition. Technical report, The New Media Consortium, 2015. Austin, Texas.
- R. B. Johnson and A. J. Onwuegbuzie. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educate*, 33(7):14–26, 2004.
- C. Jones and R. Ramanau. The Net Generation Enters University: What are the Implications for Technology Enhanced Learning? In *M-2009: Proceedings of the 23rd ICDE World Conference on Open Learning and Distance Education including the 2009 EADTU Annual Conference, 7–10 June 2009, Maastricht NL*, 2009.
- C. Jones and B. Shao. The net generation and digital natives: implications for Higher Education. *Higher Education Academy*, 2011. York.
- D. Jones. Quotes from snowden and the mismatch between what university e-learning does and what it needs. <https://djon.es/blog/2009/04/06/quotes-from-snowden-and-the-mismatch-between-what-univeristy-e-learning-does-and-what-it-needs/>, 2009. Accessed: 04.09.2018.
- J. Kalbach. *Designing Web Navigation*. O’Reilly Media, Inc, Sebastopol, California, 2007.
- S. M. Kate Pittsley. Improving Independent Student Navigation of Complex Educational Web Sites: An Analysis of Two Navigation Design Changes in LibGuides. *Information Technology and Libraries*, 84:52–64, 2012. doi:10.6017/ital.v31i3.1880.
- D. Katsifli. The impact of Blackboard software on education globally over the past 10years. *Blackboard Inc.*, 2010.
- K. Kear. Communication aspects of virtual learning environments: Perspectives of early adopters. In *ED-MEDIA 2007*, June 2007.

- D. J. Kennedy. Virtual Learning Environments (VLEs): here to stay, or on the brink of demise? *The Plymouth Student Educator*, 1(1):58–66, 2009.
- B. H. Khan. Learning features in an open, flexible, and distributed environment. *AACE Journal*, 13(2):137–153, 2005.
- G. Kirkup and A. Kirkwood. Information and communications technologies (ICT) in Higher Education teaching – a tale of gradualism rather than revolution. *Learning, Media and Technology*, 30(2):185–199, 2005.
- A. Kirkwood and L. Price. Technology-enhanced learning and teaching in higher education: what is ‘enhanced’ and how do we know? A critical literature review. *Learning, Media and Technology*, 39(1):6–36, 2014. doi:10.1080/17439884.2013.770404.
- R. Klapwijk and F. V. Doorn. Contextmapping in Primary Design and Technology Education: A Fruitful Method to Develop Empathy for and insight in User Needs. *International Journal of Technology and Design Education*, 25(2): 151–167, 2015. doi:10.1007/s1079 8-014-9279-7.
- S. Krug. *Don’t make me think (Revisited): A commonsense approach to Web (and Mobile) Usability*. New Riders, San Francisco, USA, 2014.
- S. Kumar, A. K. Gankotiya, and K. Dutta. A comparative study of moodle with other e-learning systems. In *Electronics Computer Technology (ICECT), 3rd International Conference on*, volume 5, page 414–418. IEEE, April 2011. doi:10.1109/ICECTECH.2011.5942032.
- O. E. Kurt. Examining an e-learning system through the lens of the information systems success model: Empirical evidence from Italy. *Education and Information Technologies*, 24:1173–1184, 2019. doi:10.1007/s10639-018-9821-4.
- R. B. Kvavik, J. B. Caruso, and G. Morgan. *ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control*. EDUCAUSE Center for Analysis and Research, Boulder, Colorado, 2004. URL <https://www.educause.edu/ir/library/pdf/ers0405/rs/ers0405w.pdf>. Accessed: 06.05.2019.
- P. Lameris, P. Levy, I. Paraskakis, and S. Webber. Blended University Teaching Using Virtual Learning Environments: Conceptions and Approaches. *Instructional Science*, 40(1):141–157, 2012.
- D. Lamprecht, K. Lerman, D. Helic, and M. Strohmaier. How the structure of Wikipedia articles influences user navigation. *New Review of Hypermedia and Multimedia*, 23(1):29–50, 2017. doi:10.1080/13614568.2016.1179798.
- K. Larson and M. Czerwinski. Web page design: Implications of memory, structure and scent for information retrieval. In *Proceedings of CHI’98 Conference on Human Factors in Computing Systems*, pages 25–32. ACM, Sept 1998.

- D. Laurillard. *Rethinking University Teaching*. Routledge, London, 2002.
- J. Lazar, K. Bessiere, I. Ceaparu, J. Robinson, and B. Shneiderman. Help! I'm Lost: User Frustration in Web Navigation. *IT & Society*, 1(3):18–26, 2003.
- B. A. D. Leng, D. H. J. M. Dolmans, A. M. M. Muijtjens, and C. P. M. V. D. Vleuten. Student Perceptions of a Virtual Learning Environment for a Problem-Based Learning Undergraduate Medical Curriculum. *Medical Education*, 40(6): 568–575, 2006. doi:10.1111/j.1365-2929.2006.02484.x.
- C. Lin and L. Tseng. Website Reorganization Using an ant Colony System. *Expert Systems with Applications*, 37(12):7598–7605, 2010.
- N. Liu, Y. Zhong, and J. Lim. An empirical investigation on the effectiveness of virtual learning environment in supporting collaborative learning: A system design perspective. In G. Salvendy and M. Smith, editors, *Human Interface and the Management of Information, Information and Interaction, Part 2*, page 650–659. Springer, Oxford, 2009.
- T. Logan and T. Neumann. Comparison of Blackboard 9.1 and Moodle 2.0. United Kingdom. *Institute of Education, University of London*, 2010. Accessed: 28.08.2015.
- T. Lowdermilk. *User-centered design: A developer's guide to building user-friendly applications*. O'Reilly Media, Sebastopol, California, 2013.
- M. Machado and E. Tao. Blackboard vs. moodle: Comparing user experience of learning management systems. In *Proceedings of 37th ASEE/IEEE Frontiers in Education Conference*, volume 5, pages 7–12. IEEE, October 2007. doi:10.1109/ICECTECH.2011.5942032.
- S. Marshall and G. Mitchell. An e-learning maturity model? In *19th ASCILITE Conference, Auckland, New Zealand*, 2002.
- A. J. Martin. Self-reflection on emergent research design. *Graduate Journal of Social Science*, 5(1):49–70, 2008.
- J. Mason. *Qualitative Researching. Second Edition*. SAGE Publications Inc, London, 2002.
- J. E. McCarthy and S. J. Swierenga. What we Know About Dyslexia and Web Accessibility: A Research Review. *Universal Access in the Information Society*, 9:147–152, 2010. doi:1007/s10209-009-0160-5.
- M. B. Miles and A. M. Huberman. *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE Publications, California, 1994.
- C. Miller and R. Remington. Modeling Information Navigation: Implications for Information Architecture, Human-Computer Interaction. *Human Factors*, 19(3):225–271, 2004. doi:10.1207/s15327051hci1903_2.

- M. C. Min and Y. U. Ryu. Facilitating Effective User Navigation through Website Structure Improvement. *IEEE Transactions on Knowledge and Data Engineering*, 25(3):571–588, 2013.
- H. Mohajan. Qualitative Research Methodology in Social Sciences and Related Subjects. *Journal of Economic Development, Environment and People*, 7(1): 23–48, 2018.
- D. L. Morgan. Emergent design. In L. M. Given, editor, *The Sage Encyclopedia of Qualitative Research Methods. Volumes 1 & 2*, pages 245–248. Sage Publications Inc, London, 2008.
- J. Moriarty. Qualitative Methods Overview. *SSCR Methods Review*, 2011. NIHR School for Social Care Research, London.
- P. Morville and L. Rosenfeld. *Information Architecture for the World Wide Web, Third Edition*. O’Reilly Media, Inc., Sebastopol, California, 2007.
- P. Morville and P. Sullenger. Ambient Findability: Libraries, Serials, and the Internet of Things. *The Serials Librarian*, 58(1-4):33–38, 2010. doi:10.1080/03615261003622999.
- L. H. Mosquera. Impact of implementing a Virtual Learning Environment (VLE) in the EFL Classroom. *Íkala, Revista de Lenguaje y Cultura*, 22(3):479–498, 2017. doi:10.17533/udea.ikala.v22n03a07.
- J. Nielsen. Heuristic evaluation. In J. J. Nielsen and R. Mack, editors, *Usability Inspection Methods*, chapter 2, page 25–62. John Wiley & Sons, Inc., New York, 1994.
- J. Nielsen. *Designing Web Usability: The Practice of Simplicity*. New Riders Publishing, Indianapolis, Indiana, USA, 2000.
- J. Nielsen. Let users control font size. <https://www.nngroup.com/articles/let-users-control-font-size/>, 2002. Accessed: 22.08.2019.
- J. Nielsen. Usability 101: Introduction to usability. <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>, 2012. Accessed: 15.07.2018.
- J. Nielsen and Mack. *Usability Inspection Methods*. John Wiley & Sons, Inc., New York, 1994.
- J. Nielsen and R. Molich. Heuristic evaluation of user interfaces. In *Proceedings of the ACM Conference on Computer Human Interaction (CHI) 1990, Seattle, Washington*, pages 249–256. ACM, April 1990.
- J. Nielsen and M. Tahir. *Homepage usability: 50 Websites deconstructed*. New Riders Publishing, Indianapolis, Indiana, USA, 2002.

- N. Nizam, C. Watters, and A. Gruzd. Website navigation: An exploratory study of three navigation tools for simple web tasks. In *Proceedings of the 8th International Conference on Web Information Systems and Technologies*, April 2012.
- D. A. Norman. *The Design of Everyday Things*. Basic Books, New York, 2002.
- L. S. Nowell, J. M. Norris, D. E. White, and N. J. Moules. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16:1–13, 2017. doi:10.1177/1609406917733847.
- J. Nworie and N. Haughton. Good intentions and unanticipated effects: The unintended consequences of the application of technology in teaching and learning environments. *TechTrends*, 52:52–57, 2008.
- D. G. Oblinger and J. L. Oblinger. Is it age or it: First steps toward understanding the net generation. In D. G. Oblinger and J. L. Oblinger, editors, *Educating the Net Generation*, chapter 2, pages 85–91. EDUCAUSE, Washington DC, 2005. Accessed: 04.05.2019.
- M. A. Ocak. Why are faculty members not teaching blended courses? Insights from faculty members. *Computers & Education*, 56(3):689–699, 2011. doi:10.1016/j.compedu.2010.10.011.
- Office for Standards in Education. Virtual learning environments: An evaluation of their development in a sample of educational settings, 2009. URL <http://dera.ioe.ac.uk/325/1/VLE%20an%20evaluation%20of%20their%20development.pdf>.
- Oxford University Press. Learn about virtual learning environment/course management system content. <http://global.oup.com/uk/orc/learnvle/>, 2016. Accessed: 21.04.2018.
- R. O’Leary and A. Ramsden. Virtual learning environments. In P. Davies, editor, *The Handbook for Economics Lecturers*, volume 2889. University of Bristol, Bristol, 2002. Accessed: 01.09.2019.
- B. C. Pailthorpe. Emergent design. In J. Matthes, C. S. Davis, and R. F. Potter, editors, *The International Encyclopedia of Communication Research Methods*, pages 245–248. John Wiley & Sons, Inc., London, 2017.
- L. A. Palinkas, S. M. Horwitz, C. A. Green, J. P. Wisdom, N. Duan, and K. Hoagwood. Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Adm Policy Ment Health*, 42(5): 533–544, 2015. doi:10.1007/s10488-013-0528-y.
- J. Palmer. Web Site Usability, Design, and Performance Metrics. *Information Systems Research*, 13(2):151–167, 2002. doi:10.1287/isre.13.2.151.88.

- S. Panda, S. Swain, and R. Mall. Measuring web site usability quality complexity metrics for navigability. In L. Jain, S. Patnaik, and N. Ichalkaranje, editors, *Universal Access Theoretical Perspectives, Practice, and Experience*, pages 393–401, Springer, New Delhi, 2015. Advances in Intelligent Systems and Computing. doi:10.1007/978-81-322-2012-1_41.
- D. Pandey, R. Nagpal, and D. Mehrotra. Navigational complexity metrics of a website. In M. Hoda, N. Chauhan, S. Quadri, and P. Srivastavas, editors, *Software Engineering*, volume 731. Springer, Singapore, 2019. doi:10.1007/978-981-10-8848-3_41.
- B. Parkinson. Blackboard teaching and learning conference 2014. <https://elearningyork.wordpress.com/2014/05/14/blackboard-teaching-learning-conference-2014/>, 2014. Accessed: 12.04.2019.
- M. Q. Patton. *Qualitative Research & Evaluation Methods 3rd Edition*. SAGE Publications Inc, London, 2002.
- M. Q. Patton. *Qualitative Research & Evaluation Methods 4th Edition*. SAGE Publications Inc, London, 2015.
- M. Perkowski and O. Eizioni. Toward adaptive Web sites: Conceptual framework and case study. *Artificial Intelligence*, 118:245–275, 2000.
- H. Petrie and C. Power. What do users really care about?: A comparison of usability problems found by users and experts on highly interactive websites. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, pages 2107–2116. ACM, 2012.
- J. Porter. Testing the three-click rule, 2003. URL http://www.uie.com/articles/three_click_rule. Accessed: 25.04.2018.
- J. Power and V. Kannara. Best-practice model for technology enhanced learning in the creative arts. *Research in Learning Technology*, 24, 2016. doi:10.3402/rlt.v24.30231.
- J. Preece, Y. Rogers, and P. Sharp. *Interaction design: Beyond human-computer interaction*. John Wiley & Sons, Inc., New York, 2002.
- M. Prensky. Digital Natives, Digital Immigrants part 1. *On the Horizon*, 9(5): 1–6, 2001. doi:10.1108/10748120110424816.
- D. Raftery and A. Risquez. Engaging students through the VLE: comparing like with like using the #VLEIreland student survey. *Irish Journal of Technology Enhanced Learning*, 3(2):24–34, 2018. doi:10.22554/ijtel.v3i2.42.
- N. Reich-Stiebert, F. Eyssel, and C. Hohnemann. Exploring University Students’ Preferences for Educational Robot Design by Means of a User-Centered Design Approach. *International Journal of Social Robotics*, page 1–11, 2019. doi:10.1007/s12369-019-00554-7.

- L. Rello, M. Pielot, M.-C. Marcos, and R. Carlini. Size matters (spacing not): 18 points for a dyslexic-friendly wikipedia. In *10th International Cross-Disciplinary Conference on Web Accessibility (W4A '13)*. New York, USA. ACM, 2013. doi:10.1145/2461121.2461125.
- L. Rello, M. Pielot, and M.-C. Marcos. Make it big!: The effect of font size and line spacing on online readability. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems, San Jose, California, USA*, pages 3637–3648. ACM, May 07 - 12 2016. doi:10.1145/2858036.2858204.
- M. L. Renau Renau. Effective Learner-Lecturer Interaction Working with a Virtual Learning Environment. *Sino-US English Teaching*, 9(7):1300–1305, 2012.
- B. Rimer and K. Glanz. Theory at a glance: A guide for health promotion practice second edition. Technical report, Bethesda, MD: US Department of Health and Human Services, National Institutes of Health. NIH Publication No. 05-3896, 2005.
- F. E. Ritter, G. D. Baxter, and E. F. Churchill. User-centered systems design: A brief history. In F. E. Ritter, G. D. Baxter, and E. F. Churchill, editors, *Foundations for Designing User-Centered Systems*, chapter Two, pages 33–54. Springer, London, 2014. doi:10.1007/978-1-4471-5134-0_2.
- M. Ruzza, B. T. C. Mantovani, F. D’Este, and L. Ravarotto. Designing the information architecture of a complex website: A strategy based on news content and faceted classification. *International Journal of Information Management*, 37:166–176, 2017. doi:10.1016/j.ijinfomgt.2017.02.001.
- K. Sachan and R. Singh. A survey and comparative analysis of e-learning platform (MOODLE AND BLACKBOARD). *International Journal of Recent Research in Mathematics Computer Science and Information Technology*, 2(1):293–299, 2015.
- M. Sadoux, D. Rzycka, M. Jones, and J. Lopez. Overcoming navigational design in a vle: students as agents of change. In C. Gorla, O. Speicher, and S. Stollhans, editors, *Innovative Language Teaching and Learning at University: Enhancing Participation and Collaboration*, chapter Eleven, pages 85–91. Research Publishing, Dublin, 2016. doi:10.14705/rpnet.2016.000409.
- J. Saldana. *The Coding Manual for Qualitative Researchers*. SAGE Publications, London, 2009.
- M. Schmettow and S. Niebuhr. A pattern-based usability inspection method: First empirical performance measures and future issues. In *Proceedings of the 21st BCS HCI Group Conference HCI 2007, Lancaster University*, volume 2. British Computer Society, September 2007.
- R. S. Schreiber and P. Stern. *Using Grounded Theory in Nursing*. Springer Publishing Company, New York, 2001.

- P. Selvidge. How Long is Too Long to Wait for a Website to Load? *Usability News*, 2(2), 1999.
- R. J. Sharpe, G. Benfield, E. Lessner, and E. DeCicco. Final Report: Scoping study for the pedagogy strand of the JISC e-learning programme. https://www.researchgate.net/publication/295400695_Scoping_study_for_the_pedagogy_strand_of_the_Jisc_eLearning_programme, 2005. Accessed: 30.07.2018.
- B. Shneiderman, C. Plaisant, M. Cohen, S. Jacobs, N. Elmqvist, and N. Diakopoulos. *Designing the User Interface: Strategies for Effective Human-Computer Interaction, 6th Edition*. Pearson Education Limited, England, 2018.
- O. Simmons. Is That a Real Theory or Did You Just Make It Up? Teaching Classic Grounded Theory. *The Grounded Theory Review*, 9(2):15–35, 2010.
- M. Spring, M. Stevenson, and K. Selviaridis. Emergent research design strategies in collaborative research: A tale of two studies. In *POMS 18th Annual Conference Dallas, Texas, U.S.A.*, May 2007.
- G. Sreedhar, A. Chari, and V. Ramana. A Qualitative and Quantitative Framework for Effective Website Design. *International Journal of Computer Applications*, 2(1):71–79, 2010.
- M. Stiles. Death of the VLE?: a challenge to a new orthodoxy. *The Journal for the Serials Community*, 20(1):31–36, 2007. Accessed: 21.04.2018.
- K. D. Stiller and R. Bachmaier. Cognitive Loads in a Distance Training for Trainee Teachers. *Frontiers in Education*, 3(4), 2018. doi:10.3389/educ.2018.00044.
- K.-J. Stol, P. Ralph, and B. Fitzgerald. Grounded Theory in Software Engineering Research: A Critical Review and Guidelines. *Interaction Design and Architecture*, 29:120–131, 2016.
- M. L. Stone, K. M. Kent, R. D. Roscoe, K. M. Corley, L. K. Allen, and D. S. McNamara. The design implementation framework: Iterative design from the lab to the classroom. In R. D. Roscoe, S. D. Craig, and I. Douglas, editors, *End-User Considerations in Educational Technology Design*, pages 76–98. IGI Global, Hershey, Pennsylvania, 2017.
- A. L. Strauss and J. M. Corbin. *Basics of Qualitative Research : Techniques and Procedures for Developing Grounded Theory*. SAGE Publications Inc, London, 1990.
- P. Subramanian, N. Zainuddin, S. Alatawi, T. Javabdeh, and A. R. C. Hussin. A study of comparison between Moodle and Blackboard based on case studies for Better LMS. *JOURNAL OF INFORMATION SYSTEMS RESEARCH AND INNOVATION*, 6:26–33, 2014.

- E. Suess. Painting over the Blackboard – Customisation of a Proprietary VLE. <https://www.heacademy.ac.uk/knowledge-hub/painting-over-blackboard-customisation-proprietary-vle>, 2010. Accessed: 08.05.2019.
- E. Sungand and R. E. Mayer. Affective Impact of Navigational and Signaling Aids to e-learning. *Computers in Human Behavior*, 28:473–483, 2012.
- H. Suri. Purposeful Sampling in Qualitative Research Synthesis. *Qualitative Research Journal*, 11(2):63–75, 2011. doi:10.3316/QRJ1102063.
- D. Tapscott and A. Williams. Innovating the 21st Century University: It’s Time. *Educause Review*, 45(1):17–29, 2010.
- Tealeaf. The Two Waves of Online Abandonment: The 2007 Harris Interactive Survey of Online Customer Behavior. http://multichannelmerchant.com/wp-content/uploads/whitepaper/The_Two_Waves_of_Online_Abandonment.pdf, 2007. Accessed: 12.06.2019.
- M. T. Thielsch, I. Blotenberg, and R. Jaron. User Evaluation of Websites: From First Impression to Recommendation. *Interacting with Computers*, 26(1):89–102, 2014. doi:10.1093/iwc/iwt033.
- G. Thomas. A typology for the case study in social science following a review of definition, discourse and structure. *Qualitative Inquiry*, 17(6):511–521, 2011.
- J. I. Thomas and A. L. Harden. Methods for the Thematic Synthesis of Qualitative Research in Systematic Reviews. *BMC Medical Research Methodology*, 8(45), 2008. doi:10.1186/1471-2288-8-45.
- J. Tidwell. *Designing Interfaces 2nd. edition*. O’Reilly Media Inc, Sebastopol, Canada, 2011.
- Y. C. Tie, M. Birks, and K. Francis. Grounded theory research: A design framework for novice researchers. *SAGE Open Medicine*, 7:1–8, 2019. doi:10.1177/2050312118822927.
- V. Timonen, G. Foley, and C. Conlon. Challenges When Using Grounded Theory: A Pragmatic Introduction to Doing GT Research. *International Journal of Qualitative Methods*, 17:1–10, 2018. doi:10.1177/1609406918758086.
- M. Trimmel, M. Meixner-Pendleton, and S. Haring. Stress Response Caused by System Response Time When Searching for Information on the Internet. *Human Factors*, 45(4):615–621, 2003.
- T. S. Tullis. Web-based presentation of information:the top ten mistakes and why they are mistakes. In *HCI International 2005 Conference*. ACM, July 2005.
- O. P. Turgut. Expressive typography as a visualisation of ideas. *New Trends and Issues Proceedings on Humanities and Social Sciences*, 4(11):164–170, 2017.

- B. Turner. Some practical aspects of qualitative data analysis: one way of organising the cognitive process associated with the generation of grounded theory. *Quality and Quantity*, 15:225–247, 1981.
- H. van Oostendorp and S. Aggarwal. Modeling and Supporting Web-Navigation. *Journal of Interaction Science*, 3(3), 2015. doi:10.1186/s40166-015-0008-9.
- A. Vasconcelos, B. Sen, A. Rosa, and D. Ellis. Elaborations of Grounded Theory in Information Research: Arenas/Social Worlds Theory, Discourse and Situational Analysis. *Library and Information Research*, 36(112):120–146, 2012.
- W. Veen. Homo Zappiens and the Need for New Education Systems. Paper presented at OECD seminar on Digital Natives and Education. Florence, Italy: OECD-CERI, 2007. URL <http://www.oecd.org/edu/ceri/38360892.pdf>. Accessed: 04.05.2019.
- L. Venta-Olkkonen, N. Iivari, A. Lanamaki, M. Jurmu, H. Kukka, and K. Kuutti. People lining up to use a cool new gadget in the city? Surprise and variety in technology appropriation of multipurpose public displays. *Interaction Design and Architecture*, 29:136–158, 2016.
- B. Vesin, K. Mangaroska, and M. Giannakos. Learning in Smart Environments: User-Centered Design and Analytics of an Adaptive Learning System. *Smart Learning Environments*, 5(1), 2018. doi:10.1186/s40561-018-0071-0.
- B. von der Heiden, S. Fleischer, A. Richert, and S. Jeschke. Theory of Digital Natives in the Light of Current and Future E-Learning Concepts. *International Journal of Emerging Technologies in Learning*, 6(2):37–41, 2011.
- K. Vredenburg, J.-Y. Mao, P. W. Smith, and T. Carey. A Survey of User-Centered Design Practice. *CHI Letters*, 4(1):471–478, 2002.
- R. Walker, J. Voce, J. Nicholls, E. Swift, J. Ahmed, S. Horrigan, and P. Vincent. 2014 Survey of Technology Enhanced Learning for higher education in the UK, 2014.
- N. Walliman. *Social Research Methods 2nd Edition*. Sage Publications Ltd, London, 2016.
- M. Wang and B. Yen. Web structure reorganization to improve web navigation efficiency. In *Proceedings of the 11th Pacific Asia Conference on Information Systems, Auckland, New Zealand*, pages 411–422. PACIS, July 4-7 2007.
- M. Weller. The vle/lms is dead. http://nogoodreason.typepad.co.uk/no_good_reason/2007/11/the-vlelms-is-d.html, 2009. Accessed: 05.09.2018.
- K. Whitenton. Flat vs. deep website hierarchies. <https://www.nngroup.com/articles/flat-vs-deep-hierarchy/>, 2013. Accessed: 18.06.2019.

- C. Willig. *Introducing qualitative research in psychology*. Open University Press, Maidenhead, Berkshire, 2013.
- V. Wilson. Research Methods: Triangulation. *Evidence Based Library and Information Practice*, 9(1):74–75, 2014.
- S. K. B. Wong, T. T. Nguyen, E. Chang, and N. Jayaratna. Usability metrics for e-learning. In R. Meersman and Z. Tari, editors, *On The Move to Meaningful Internet Systems 2003: OTM 2003 Workshops. OTM 2003. Lecture Notes in Computer Science*, volume 2889, page 235–252. Springer, Berlin, Heidelberg, 2003. doi:10.1007/978-3-540-39962-9_34.
- H. Wright. Using an emergent design to study adult education. *Educate*, pages 62–73, 2009.
- B. Yen, K. Ni, and L. K. Chu. Graph transformation based guidance for web navigation. In *Proceedings of the 17th International Conference on Electronic Business, Dubai, UAE*, pages 125–131. ICEB, December 4-8 2017.
- S. Young and H. E. Duncan. Online and Face-to-Face Teaching: How Do Student Ratings Differ? *MERLOT Journal of Online Learning & Teaching*, 10(1):70–79, 2014.
- P. Zaharias. E-learning design quality: A holistic conceptual framework. In C. Howard, J. Boettcher, L. Justice, K. Schenk, P. Rogers, and G. Berg, editors, *Encyclopedia of Distance Learning, vol II*, volume II. Idea Publishing, New York, 2005.
- P. Zaharias and A. Poylymenakou. Developing a Usability Evaluation Method for e-Learning Applications: Beyond Functional Usability. *International Journal of Human-Computer Interaction*, 25(1):75–98, 2009. doi:10.1080/10447310802546716.
- P. Zaphiris. Depth vs breadth in the arrangement of web links. In *Proceedings of the 44th Annual Meeting of the Human Factors and Ergonomics Society*, pages 139–144, 30/07/2000 – 4/08/2000 2000.
- P. Zaphiris. Age differences and the depth-breadth trade off in hierarchical online information systems. In *C. Stephanidis (Ed.), Universal Access in HCI, Lawrence Erlbaum, Mahwah, USA*, pages 540–544, 2001.
- P. Zaphiris, B. Shneiderman, and K. L. Norman. Expandable indexes vs. sequential menus for searching hierarchies on the world wide web. *Behaviour & Information Technology*, 21(3):201–207, 2002. doi:10.1080/0144929021000009045.
- J. Zeldman. *Taking Your Talent to the Web: A Guide for the Transitioning Designer*. New Riders Publishing, Indianapolis, Indiana, USA, 2001.
- Y. Zhang, H. Zhu, and S. Greenwood. Web site complexity metrics for measuring navigability. In *Fourth International Conference on Quality Software, 2004. QSIC 2004. Proceedings.*, pages 172–179. IEEE, Sept 2004.

- Z. Zhang, V. Basili, and B. Shneiderman. Perspective-based usability inspection: an empirical validation of efficacy. *Empirical Software Engineering*, 4(1):43–69, 1999.

Appendix A

The recruitment and interview documents of the pilot study

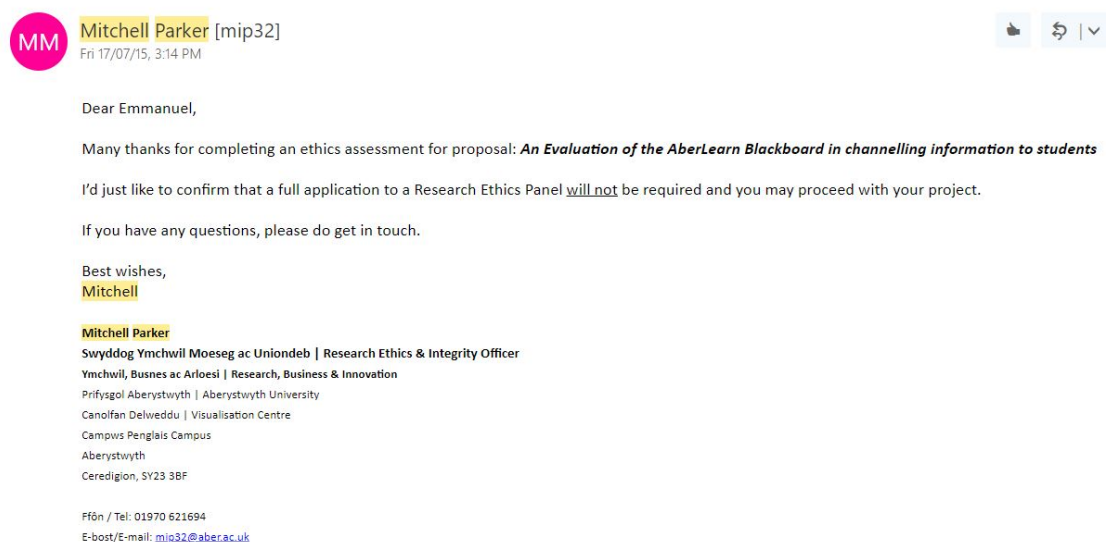


Figure A.1: Approval for the pilot study

Interview questions for the students of Aberystwyth University

- i. What feature(s) do you like most about the AberLearn Blackboard system and why?
- ii. How often do you use the blackboard during term time?
1. Always 2. Frequently 3. Sometimes 4. Occasionally 5. Rarely
- iii. What challenges (if any) have you encountered with using the AberLearn Blackboard system?
- iv. How has the use of AberLearn Blackboard system enriched your learning experience?
- v. In what ways have you been able to take advantages of the interactive features of the AberLearn Blackboard system?
- vi. In your experience, how student-friendly is AberLearn Blackboard system?
1. Very friendly 2. Friendly 3. Neutral 4. Unfriendly 5. Very unfriendly
- vii. How well have your individual and peculiar needs with respect to learning met through the use of the AberLearn Blackboard system?
1. Very Well 2. Well 3. Neutral 4. Poorly 5. Very Poorly
- viii. Have you ever attended the AberLearn Blackboard system training session? If yes, how useful did you find it? If no, how did you fill the skill gap?
- ix. How often do you contact the Blackboard team for support when you encounter some challenges with the use of AberLearn Blackboard?
1. Always 2. Very Often 3. Sometimes 4. Rarely 5. Never
- x. What changes would you like to see reflected in the AberLearn Blackboard system in the near future?

Pilot study questions for the teaching staff of Aberystwyth University

- i. How has the use of the AberLearn Blackboard helped and enriched your teaching experience?
- ii. In what specific ways, has the use of AberLearn Blackboard software helped you to better meet the needs of your students?
- iii. How would you rate the ease of use of AberLearn Blackboard system?
- iv. Have you ever attended the AberLearn Blackboard system training session? If yes, how useful did you find it?
 1. Extremely Useful 2. Very Useful 3. Useful 4. Slightly Useful 5. Not UsefulIf no, what other sources of information about AberLearn Blackboard did you use?
- v. How well have you used the following features of AberLearn Blackboard?
 - Uploading lecture notes
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - Providing video of each lecture
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - Aspire reading list each semester
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - Announcements
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - e-submission marking and e-feedback
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - Turnitin
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never
 - Retention centre
 1. Very Well 2. Good 3. Average 4. Poorly 5. Never

- vi. How would you rate the ease of use with respect to these features that you have used?
- Uploading lecture notes
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - Providing video of each lecture
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - Aspire reading list each semester
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - Announcements
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - e-submission marking and e-feedback
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - Turnitin
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
 - Retention centre
 - 1. Very Easy 2. Easy 3. Average 4. Difficult 5. Very Difficult 6. Never
- vii. In what ways (if any) has the use of AberLearn Blackboard system made your lecture materials and actual teaching more challenging?
- viii. How easy is it for you get the relevant software and hardware when preparing materials to be uploaded to the AberLearn Blackboard system?
- ix. How often do you contact the Blackboard team for support when you encounter some challenges with the use of AberLearn Blackboard?
1. Always 2. Very Often 3. Sometimes 4. Rarely 5. Never
- x. What changes would you like to see reflected in the AberLearn Blackboard system in the near future?

Pilot study questions for the staff of Blackboard team of Aberystwyth University

- i. What informed the deployment of AberLearn Blackboard?
- ii. In your experience, how do students interact with AberLearn Blackboard?
- iii. How well have the students embraced the following?
 - Module handbook
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Lecture notes
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Group discussion
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Aspire reading list
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Submission of assignments
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Lecture audio/videos
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Interacting with tutors
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Setting personal preferences in AberLearn Blackboard
 1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
- iv. How satisfied are you with students' use of AberLearn Blackboard?
 1. Very Satisfied 2. Satisfied 3. Neutral 4. Dissatisfied 5. Very Dissatisfied
- v. In what specific ways (if any) have the students' use of the AberLearn Blackboard system not met your expectations?
- vi. In your experience, how do the teaching staff interact with AberLearn Blackboard?

- vii. How well have the teaching staff embraced the following:
- Uploading Lecture notes
1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Providing audio/video of each lecture
1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Aspire reading list
1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - e-submission marking and e-feedback
1. Very Well 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Turnitin
1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
 - Retention centre
1. Excellent 2. Good 3. Average 4. Poorly 5. Very Poorly
- viii. How satisfied are you with staff's use of AberLearn Blackboard?
- ix. In what specific ways (if any) have the staff's use of the AberLearn Blackboard system not met your expectations?
- x. In what practical ways does the BB team support both students and staff with respect to the use of AberLearn Blackboard?
- xi. What challenges (if any) do you have in sustaining the use of the AberLearn Blackboard system?
- xii. Based on feedback and assessment of the AberLearn Blackboard system, are there plans to introduce some changes with respect to how AberLearn Blackboard system is being used to channel information to students?
- xiii. If yes, to what extent will the new system further boost and enrich the experience of students and staff?

- xiv. How do you manage the need to keep up with deploying the latest versions of Blackboard and the software and hardware requirements?
- xv. What steps are being taken to ensure that the technical details of these proposed changes are sorted out especially as they affect both students and staff?
- xvi. What will be the likely costs (if any) to students with regards to the proposed changes?
- xvii. How do you plan to carry students along with regards to the proposed changes?
- xviii. What will be the likely costs (if any) to staff with regards to the proposed changes?
- xix. How do you plan to carry staff along with regards to the proposed changes?
- xx. How has the AberLearn Blackboard boosted the distance learning programme of Aberystwyth University?

Letter of Recruitment for students (Pilot study)

Dear Student,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently doing a summer project on the ***Evaluation of the use of AberLearn Blackboard in channelling information to students of Aberystwyth University*** under the supervision of ***Dr. Edel Sherratt***.

As a stakeholder in the AberLearn Blackboard initiative, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a ***fifteen-minute*** interview in the lecture hall or postgraduate centre at a convenient time. There are no known or anticipated risks to your participation in this study. The questions are generally about your experience with the use of ***AberLearn Blackboard***. You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be kept for a period of ***(two months)*** in a secured location after which they will be destroyed.

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact ***Emmanuel Ehimare Isibor*** at eei@aber.ac.uk or ***Dr. Edel Sherratt*** at eds@aber.ac.uk or 01970 622448.

Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Letter of Recruitment for teaching staff (Pilot study)

Dear Teaching Staff,

My name is **Emmanuel Ehimare Isibor**, a PhD student in the department of Computer Science Aberystwyth University. I am currently doing a summer project on the **Evaluation of the use of AberLearn Blackboard in channelling information to students of Aberystwyth University** under the supervision of **Dr. Edel Sherratt**.

As a stakeholder in the AberLearn Blackboard initiative, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a **twenty-minute** interview in your office at a convenient time. There are no known or anticipated risks to your participation in this study. The questions are generally about your experience with the use of AberLearn Blackboard. You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be kept for a period of **(two months)** in a secured location after which they will be destroyed.

If after receiving this mail, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact **Emmanuel Ehimare Isibor** at eei@aber.ac.uk or **Dr. Edel Sherratt** at eds@aber.ac.uk or 01970 622448.

Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Letter of Recruitment for Blackboard team staff (Pilot study)

Dear Staff,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently doing a summer project on the ***Evaluation of the use of AberLearn Blackboard in channelling information to students of Aberystwyth University*** under the supervision of ***Dr. Edel Sherratt***.

As a stakeholder in the AberLearn Blackboard initiative, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a ***thirty-minute*** interview in your office at a convenient time. There are no known or anticipated risks to your participation in this study. The questions are generally about your experience with the use of AberLearn Blackboard. You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be kept for a period of ***(two months)*** in a secure location after which they will be destroyed.

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Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

The complete codes of the students of the pilot study

	Codes	Frequency of codes
1	Codes	
2	Accessible	1
3	Accessing the VLE	1
4	Always go back to it	1
5	Availability	1
6	Benefits	12
7	Can't download videos	1
8	Difficulty	2
9	Difficult to sign in	1
10	Dislike	2
11	Downloading videos	1
12	Easier to find	1
13	Easy access	1
14	Easy to find	2
15	Easy to use	1
16	Expectation	2
17	Finding things	1
18	Good system	1
19	Help from friend	1
20	Impact of teaching staff	2
21	Improvement	1
22	Issues	3
23	Like the videos	1
24	Like	4
25	Logging in issues	1
26	Maintenance	1
27	Not much impact	1
28	Perception	2
29	Redundant features	1
30	Self-taught	1
31	Straight to course page	1
32	System coaching	1
33	Too many sign-ins	1
34	Trained by tutor	1
35	Training for teaching staff	1
36	Unable to download videos	1
37	Use Blackboard for disability	1
38	Use Blackboard for more	1
39	Use Blackboard to connect	1
40	Use Blackboard to organize	1
41	User-friendly	2
42	Visibility	2
	Total	65

The complete codes of the teaching staff of the pilot study

	Codes	Frequency of codes
1	A progressive step	1
2	A lot to offer	1
3	A one-stop shop	1
4	Announcement platform	1
5	Another thing to learn	1
6	Area of improvement	1
7	Asking for help	1
8	BB training session	1
9	Beneficial to students	1
10	Benefits	4
11	Blackboard support	1
12	Changed the way I teach	1
13	Clunky	1
14	Coding not supported	1
15	Complex interface	1
16	Complicated interface	1
17	Constrained to use Blackboard	1
18	Constraints of Blackboard	1
19	Course search	1
20	Difficult to edit	1
21	Direct access	1
22	Discussion forum	1
23	Diversified teaching	1
24	Downloading Assignments	2
25	Driver's seat	2
26	Easy to use	1
27	Enriched experience	1
28	Expectations	1
29	Facebook page	1
30	Fewer clicks	1
31	Figure it out yourself	1
32	Find it useful	1
33	Friendly interface	1
34	Getting feedback	1
35	Help from colleagues	1
36	Helpful	1
37	Improved version	1
38	Integration	1
39	Interesting web pages	1
40	Interface	1
41	It helps their learning	1

42	Keep improving	1
43	Layout	1
44	Learning a new layout	1
45	Learning curve	1
46	Learning community	1
47	Lecture attendance	1
48	Login time	1
49	Looks more difficult	1
50	Lots of clicks	2
51	Lots of things	1
52	Managing tool	1
53	Marking issues	1
54	Meets needs	1
55	Minimum requirements	1
56	Mixed blessing	1
57	Module arrangement	1
58	More attractive webpages	1
59	Multimedia training	1
60	Needs improvement	1
61	Needs integration	1
62	Not always intuitive	1
63	Not easy to find things	1
64	Not easy to use	1
65	Not much Difference	1
66	Passive learning	1
67	Perception of teaching staff	12
68	Professional freedom	1
69	Provides resources	1
70	Rearrange the platform	1
71	Relevant training	2
72	Reorganization of home page	1
73	Rich platform	1
74	Rich software	1
75	Search function	1
76	Setting up issues	1
77	Shared space	1
78	Single login	1
79	Spoon feeding students	1
80	Students' experience	1
81	students' skills	1
82	Teaching preference	2
83	Technical issues	1
84	Terrible forums	1

85	Threads of comments	1
86	Too many clicks	2
87	Training	1
88	Training programme	1
89	Uncluttered homepage	1
90	Uploading issues	1
91	Uploading multiple files	1
92	Use of discussion forums	1
93	Useful	4
94	Useful to students	1
95	Useful tool	1
96	Useful training	1
97	User friendly	1
98	Very useful	1
	Total	121

The complete codes of the Blackboard team staff of the pilot study

	Codes	Frequency of codes
1	A bit of hesitancy	1
2	Acceptance of Blackboard	1
3	BB exemplary course	1
4	Benefits of the VLE	1
5	Changes	1
6	Consult with staff and students	1
7	Discussion board	1
8	Distance learning	1
9	Driving the BB project	1
10	Encouraging the use	1
11	End users' testing	1
12	Engaging stakeholders	2
13	Enrich the experience	1
14	Expectations of users	2
15	Feedback	1
16	Frustration for staff	1
17	Good practice	1
18	Good practice showcase	1
19	Help tools	1
20	How BB is introduced	1
21	How the staff use it	1
22	Impact of Blackboard	1
23	Inconsistencies	1
24	Increasing use of Blackboard	1
25	Introducing changes	1
26	IS surveys	1
27	Keep up to date	1
28	Lack of confidence	1
29	Lecture recording	1
30	Level of usage	1
31	Making it better	1
32	Making it easy for students	1
33	Making the system easier	1
34	Mixed success	1
35	Needed by universities	1
36	New look	1
37	Not taking too much time	1
38	Not tech savvy	1
39	One more thing on top	1
40	Perception Of BB staff	3
41	Perception of teaching staff	6
42	Pilot scheme	1

43	Required minimum presence	1
44	Resistance to BB	1
45	Running surveys	1
46	Saved the students money	1
47	Simplify the process	1
48	Small team	1
49	Staff Advocates	1
50	Staff support	1
51	Students' expectations	1
52	Students' perception	4
53	Students' recommendations	1
54	Students' surveys	1
55	Support for staff	1
56	Support for students	1
57	Support for teaching staff	2
58	Support for users	2
59	Supporting students	1
60	Supporting users	1
61	The converted	1
62	They lack good organization	1
63	Time issue	1
64	Training and advice	1
65	Training sessions	2
66	UK education system	1
67	University policy	1
68	University standards	1
69	Usage by older staff	1
70	Usage of lecture capture	1
71	Useful features	1
72	Voice in the department	1
73	We give guidelines	1
74	Works smoothly	1
	Total	89

Appendix B

The recruitment and interview documents of the main study



<p>Ymchwil, Busnes ac Arloesi Canolfan Delweddu, Penglais, Aberystwyth Ceredigion, Cymru, DU SY23 3BF Ffôn: (01970) 621694 E-bost: moeseg@aber.ac.uk Gwefan: www.aber.ac.uk/cy/rbi</p>	<p>Research, Business & Innovation Visualisation Centre, Penglais, Aberystwyth Ceredigion, Wales, UK SY23 3BF Tel: (01970) 621694 Email: ethics@aber.ac.uk Website: www.aber.ac.uk/en/rbi</p>
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Emmanuel Isibor
 Department of Computer Science
 Llandinam Building
 Penglais Campus
 Aberystwyth
 SY23 3DB
 Email: eei@aber.ac.uk

25th January 2016

Dear Emmanuel,

Re: Research Ethics Panel – Outcome for *An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales*

Many thanks for your recent application. I am pleased to confirm a ***favourable ethical opinion*** for the above proposal. This is subject to a minor request attached overleaf.

This favourable ethical opinion will be valid for the period of time stated in your application. If you intend to deviate or wish to make amendments to the approved proposal, please contact ethics@aber.ac.uk as soon as possible to ensure that the ethical opinion remains valid.

If you need to report any adverse events, please contact 01970 621694 or ethics@aber.ac.uk for immediate advice and support.

This letter may also be provided to project gatekeepers or collaborators to confirm that a favourable opinion has been provided. Should any gatekeepers or participants have any queries, comments or concerns, they are welcome to contact us using the details provided above.

If you have any queries, please do get in touch.

Yours sincerely,

Mitchell Parker
 Research Ethics & Integrity Officer, on behalf of the Research Ethics Panel

The favourable ethical opinion is subject to the following:

- i) The **student** participant information sheet should include a brief line stating that their participation or responses will in no way affect their academic studies.

EI/ES/01.16/MP

Letter of Recruitment for Students

Dear Student,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science, Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

As a stakeholder in higher education in Wales, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a *fifteen-minute* interview in the postgraduate centre or at a location suitable for you at a convenient time. The interview may also be conducted through Skype. There are no known or anticipated risks to your participation in this study. The interview consists of 10 questions which are about your experience with the use of Virtual Learning Environment (VLEs). You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Your participation or responses will in no way affect your academic studies. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be encrypted and kept for a period of (*thirty six months*) in a secured location after which they will be destroyed.

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact *Emmanuel Ehimare Isibor* at eei@aber.ac.uk or *Dr. Edel Sherratt* at eds@aber.ac.uk or 01970 622448.

Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Isibor

Student Researcher

Letter of Recruitment for Teaching Staff

Dear Teaching Staff,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

As a stakeholder in higher education in Wales, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a *twenty-minute* interview in your office at a convenient time. The interview may also be conducted through Skype. There are no known or anticipated risks to your participation in this study. The interview consists of 10 questions about your experience with the use of Virtual Learning Environments (VLEs). You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be encrypted and kept for a period of (*thirty six months*) in a secured location after which they will be destroyed.

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Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Letter of Recruitment for Directors of Studies

Dear Director of Studies,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

As a stakeholder in higher education in Wales, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a *twenty-minute* interview in your office at a convenient time. The interview may also be conducted through Skype. There are no known or anticipated risks to your participation in this study. The interview consists of 10 questions about your experience with the use of Virtual Learning Environments (VLEs). You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be encrypted and kept for a period of (*thirty six months*) in a secured location after which they will be destroyed.

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact *Emmanuel Ehimare Isibor* at eei@aber.ac.uk or *Dr. Edel Sherratt* at eds@aber.ac.uk or 01970 622448.

Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Letter of Recruitment for the e-learning Team

Dear Staff,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

As a stakeholder in higher education in Wales, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a *twenty-minute* interview in your office at a convenient time. The interview may also be conducted through Skype. There are no known or anticipated risks to your participation in this study. The interview consists of 10 questions about your experience with the use of Virtual Learning Environments (VLEs). You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be encrypted and kept for a period of (*thirty six months*) in a secured location after which they will be destroyed.

If after receiving this letter, you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact *Emmanuel Ehimare Isibor* at eei@aber.ac.uk or *Dr. Edel Sherratt* at eds@aber.ac.uk or 01970 622448.

Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Letter of Recruitment for the Admin staff

Dear Staff,

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

As a stakeholder in higher education in Wales, your opinion will be important to this study and I would appreciate the opportunity to speak with you.

Participation in this study is voluntary and would involve a *twenty-minute* interview in your office at a convenient time. The interview may also be conducted through Skype. There are no known or anticipated risks to your participation in this study. The interview consists of 10 questions about your experience with the use of Virtual Learning Environments (VLEs). You may decline answering any questions you feel you do not wish to answer. All information you provide will be considered confidential and grouped with responses from other participants. Furthermore, you will not be identified by name in my thesis or in any report or publication resulting from this study. The data collected through this study will be encrypted and kept for a period of (*thirty six months*) in a secured location after which they will be destroyed.

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Thank you for your assistance with this project.

Yours sincerely,

Emmanuel Ehimare Isibor

Student Researcher

Consent Form for Students

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

Funding

My PhD is partly funded by Aberystwyth University.

Procedures

It will involve taking part in an individual interview. The interview consists of 10 questions and will take approximately fifteen minutes. The questions will be about your experience with the use of Virtual Learning Environment (VLE). You may decline answering any questions you feel you do not wish to answer.

This study involves the audio recording of your interview with the researcher. However neither your name nor any other identifying information will be associated with the audio recording or the transcript. Only those directly involved with the research will be able to listen to the recordings.

Risks/Discomforts

There are minimal risks for participation in this study.

Benefits

There are no direct benefits to subjects. However, it is hoped that your participation will enable the researcher to be able to conduct this research and make recommendations about the role of technology in higher education in Wales at the end of the day.

Confidentiality

All information provided will remain confidential except in a situation where harm is disclosed. In processing the data, they will only be reported as group data with no identifying information. Your participation or responses will in no way affect your academic studies. All

data, including interviews' answers and audio recordings will be kept in a secure location and only those directly involved with the research will have access to them. The data collected through this study will be encrypted and kept for a period of *thirty six months* in a secure location after which they will be destroyed. Transcripts of your interview may be reproduced in whole or in part for use in my thesis, presentations or publications resulting from this study. Neither your name nor any other identifying information (such as your voice) will be used in such instances. The researcher has the rights to disclose the aims and background of the project, as well as publish and disseminate results in a conference paper.

Participation

Participation in this research study is voluntary. You have the right to withdraw at any time or refuse to participate.

Research Publication

Copies of the final report of the research will be made available to all the participants in this study.

Questions about the Research

If you have questions regarding this study, please contact Emmanuel Ehimare Isibor at eei@aber.ac.uk or Dr. Edel Sherratt at eds@aber.ac.uk or 01970622448.

If you sign this sheet, it means that you have read this form and that all of your questions were answered.

Participant:

_____	_____	_____	_____
Name of Participant	Email address	Signature	
Date			

Researcher:

Emmanuel Ehimare Isibor	_____	_____
Name of Researcher	Signature	Date

Consent Form for Teaching Staff

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

Funding

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_____	_____	_____	_____
Name of Participant	Email address	Signature	
Date			

Researcher:

Emmanuel Ehimare Isibor	_____	_____
Name of Researcher	Signature	Date

Consent Form for Directors of Studies

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

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_____	_____	_____	_____
Name of Participant	Email address	Signature	
Date			

Researcher:

Emmanuel Ehimare Isibor	_____	_____
Name of Researcher	Signature	Date

Consent Form for the e-learning Team

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

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Participant:

_____	_____	_____	_____
Name of Participant	Email address	Signature	
Date			

Researcher:

Emmanuel Ehimare Isibor	_____	_____
Name of Researcher	Signature	Date

Consent Form for the Admin Staff

My name is Emmanuel Ehimare Isibor, a PhD student in the department of Computer Science Aberystwyth University. I am currently carrying out a study on **An Evaluation of Technology intervention in Students Engagement in Higher Education in Wales** under the supervision of *Dr. Edel Sherratt*.

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If you sign this sheet, it means that you have read this form and that all of your questions were answered.

Participant:

_____	_____	_____	_____
Name of Participant	Email address	Signature	
Date			

Researcher:

Emmanuel Ehimare Isibor	_____	_____
Name of Researcher	Signature	Date

Interview Questions for the Students

- i. What feature(s) do you like most about the present VLE and what features do you like least?
- ii. To what extent do you feel limited or empowered by the use of VLE with respect to your (a). Learning style? (b). Subject area?
- iii. What challenges (if any) have you encountered with the use of a VLE?
- iv. How has the use of a VLE enriched your learning experience?
- v. To what extent has the use of a VLE helped you to build digital skills?
- vi. In your experience, how student-friendly is the present VLE?
1. Very friendly 2. Friendly 3. Neutral 4. Unfriendly 5. Very unfriendly
- vii. To what extent are you satisfied with the following
 - a. Organization tools in the present VLE?
1. Very Satisfied 2. Satisfied 3. Average 4. Dissatisfied 5. Very Dissatisfied
 - b. Navigation tools in the present VLE?
1. Very Satisfied 2. Satisfied 3. Average 4. Dissatisfied 5. Very Dissatisfied
 - c. Communication tools in the present VLE?
1. Very Satisfied 2. Satisfied 3. Average 4. Dissatisfied 5. Very Dissatisfied
- viii. How would you rate the support from the e-learning team in your use of the VLE?
1. Excellent 2. Good 3. Average 4. Poor 5. Very Poor 6. Never
- ix. How confident are you with the use of a VLE?
1. Very Confident 2. Confident 3. Average 4. Less Confident 5. Lack Confidence
- x. If you were to redesign the present VLE, what features would you incorporate into it and why?

Interview Questions for the Teaching Staff

- i. How do you engage with the students using the present VLE?
- ii. Do you feel constrained in your use of the VLE in engaging with the students? And if yes, how would you prefer to engage with your students using a VLE?
- iii. In your opinion, to what extent does the present VLE support learning and teaching?
- iv. To what extent is the present VLE tailored to the specific needs of the modules that you handle? And any suggestions on how it can be improved upon?
- v. In your opinion, to what extent does the present VLE allow for interfacing with external tools and platforms?
- vi. In your opinion, does the present VLE allow you the freedom to make pedagogical decisions in your teaching?
- vii. To what extent were you involved in the articulation of the policy of the present VLE? And were your views and expectations adequately captured?
- viii. How satisfied are you with the present VLE?
- ix. To what extent do you feel that you own the VLE and are committed to its success as a teaching and learning tool in the university?
- x. If you were to redesign the present VLE, what features would you incorporate into it and why?

Interview Questions for the Director of Studies

- i. To what extent does the present VLE support learning and teaching within the university?
- ii. How well does the present VLE take advantage of the strengths of your institute / school / college and the departments within it?
- iii. How has the present VLE been used to build the following skills among students?
 - a. Digital skills
 - b. Research skills
 - c. Professional skills
 - d. Collaborations skills
- iv. How does the VLE provide you with opportunities in creating an exciting learning experience for students?
- v. To what extent, do the teaching staff have the freedom to use the VLE in their preferred ways?
- vi. To what extent is the interface and course design customisable to the different modules that are offered in this institute/school/college/department?
- vii. To what extent does the VLE allow for interfacing with external tools and platforms?
- viii. How satisfied are you with the present VLE?
- ix. To what extent were the students and teaching staff involved in the articulation of the policy, design and deployment of the present VLE?
- x. To what extent does the VLE offer opportunities for interaction and collaboration with lecturers and students?

Interview Questions for the e-learning Team

- i. To what extent does the present VLE support learning and teaching in the university?
- ii. (a) What do the students like best about the VLE and what do they like least?
- ii. (b). What do the teaching staff like best about the VLE and what do they like least?
- iii. How well does the present VLE take advantage of the strengths of the university and departments in delivering a rich experience for the students and teaching staff?
- iv. How has the present VLE been used to build the following skills among students?
 - a. Digital skills
 - b. Research skills
 - c. Professional skills
 - d. Collaborations skills
- v. To what extent, do the teaching staff have the freedom to use the VLE in their preferred ways?
- vi. To what extent is the interface and course design customisable to the different modules in the University?
- vii. What provision does the VLE have for interoperability with external tools and platforms?
- viii. To what extent does the present VLE accommodate the learning needs of all the categories of students?
- ix. To what extent were the students and teaching staff carried along in the design and deployment of the present VLE?
- x. To what extent does the VLE offer opportunities for interaction and collaboration with lecturers and students?

Interview Questions for the Administrative Staff

- i. How do you engage with the students using the present VLE (Blackboard)?
- ii. How do you engage with the teaching staff using the present VLE (Blackboard)?
- iii. What are the features that you like and dislike about the VLE?
- iv. In what ways has the present VLE been helpful in carrying out your tasks?
- v. Do you feel constrained in any way in your use of the VLE when carrying out certain tasks? And if yes, how would you prefer to perform those tasks?
- vi. How easy or difficult is the VLE for you to use?
- vii. How would you describe the navigation of the VLE?
- viii. How would you describe your level of satisfaction or dissatisfaction with the present VLE?
- ix. Have you gone on any training on how to use the VLE?
- x. Can you suggest some improvements or changes that you would like to see reflected with respect to the VLE in the near future?

The initial codes that were generated from the first coding of the sample transcripts of students

S/N	Codes	Frequency of codes	Remark
1	A fairly conservative user of Blackboard	1	
2	A more streamlined VLE with incorporated tools	1	
3	A single challenge I would say	1	
4	Availability of the content	1	
5	Average	1	
6	Average organisation	1	
7	Confident with VLE	1	
8	Confident	1	
9	Constraints on the content	1	
10	Dissatisfied	1	
11	Exploration of the VLE	1	
12	Feedback from Turnitin	1	
13	Flipping through an index and search	1	
14	Friendly VLE	1	
15	Help the learning of a person	1	
16	I can go anytime I open it	1	
17	I don't know much of what these tools are	1	
18	I haven't made much use of them	1	
19	I haven't really used them that much	1	
20	I know how to change a VPN	1	
21	I think it has helped me	1	
22	I would say I am satisfied	1	
23	I write emails.	1	
24	In the hands of laptops, phones and tablets	1	
25	Issues with the organisation of the VLE	1	
26	It doesn't limit me	1	
27	It has improved my skills	1	
28	It has really helped	1	
29	It has really helped me	1	
30	It hasn't so much helped me necessarily	1	
31	It is quite friendly	1	
32	It is very useful	1	
33	It's hard for me to go and obtain	1	
34	Lecture slides are great	1	
35	Lecturers need to play around with the VLE	1	
36	Lecturers using different styles	1	
37	Level of confidence	1	
38	Login path	1	
39	Make it clear and easy to use	1	
40	Materials are always there	1	
41	Most of the time it's slow	1	
42	My subject area	1	
43	Navigation	1	
44	Need for more user-friendly VLE	1	
45	Neutral on friendliness	1	

The initial codes that were generated from the first coding of the sample transcripts of students

S/N	Codes	Frequency Codes	Remark
46	Never	2	
47	Never thought of it	1	
48	Never used it	1	
49	No contact with e-learning team	1	
50	No discussion forum	1	
51	Obvious help section	1	
52	Organizational tools	1	
53	Passing information around	1	
54	Quick in responding	1	
55	Quite good for sending messages	1	
56	Quite good for subject area	1	
57	Quite helpful	1	
58	Quite satisfied with it	1	
59	Really helpful a lot of the time	1	
60	Record the lectures and play them back	1	
61	Satisfied	2	
62	Smart links to the useful stuff	1	
63	Statistics video downloads	1	
64	Support from e-learning team	1	
65	The recordings are always useful	1	
66	There are a few things I like about it	1	
67	Things to help with your learning	1	
68	Using Panopto App	1	
69	Very confident	2	
70	Video covers a broad range of topics	1	
71	With respect to my subject area	1	
	Total	76	

The initial codes that were generated from the first coding of the transcripts of students

S/N	Codes	Frequency of codes	Remark
1	A bit complicated to find things	1	
2	A single challenge	1	
3	A lot of extra reading	1	
4	A more user-friendly system	1	
5	Able to author	1	
6	Access can be quite brief	1	
7	Availability of the content	1	
8	Be more streamlined	1	
9	Better than other lecturers	1	
10	Blackboard app	1	
11	Conservative user of Blackboard	1	
12	Contact details	1	
13	Copyright issues	1	
14	Covers a broad range of students	1	
15	Different things and views	1	
16	Difficult to find things	1	
17	Documents in different folders	1	
18	Down for maintenance	1	
19	Easier to message them directly	1	
20	Email that have updates	1	
21	Everything we need is there	1	
22	Everything you need is there	1	
23	Few things I like about it	1	
24	Find it hard to browse	1	
25	Find it useful	1	
26	Having spent four months on it	1	
27	I can't access it	1	
28	I can't think of any really	1	
29	I don't feel limited by anything	1	
30	I don't like the features of update	1	
31	I feel a lot more comfortable	1	
32	I find it quite useful	1	
33	I get information easier	1	
34	I got used to it	1	
35	I had those skills	1	
36	I have never come across them	1	
37	I have never heard of it	1	
38	I haven't been exposed to it	1	
39	I haven't learnt anything new	1	
40	I haven't made much use of them	1	
41	I haven't really taken time to	1	
42	I haven't really used them	1	
43	I just don't think about	1	
44	I made a wiki page	1	
45	I never had the training	1	

S/N	Codes	Frequency Codes	Remark
46	I really like that	1	
47	I think it's underused	1	
48	I think those are downloadable	1	
49	I would say it's okay	1	
50	If they can work together	1	
51	Information was not passed	1	
52	It could be easier	1	
53	It could be improved	1	
54	I don't think it limits me	1	
55	It enables me	1	
56	It has exposed me	1	
57	It has really helped	3	
58	It hasn't changed my digital skills	1	
59	It hasn't so much helped me	1	
60	It helps my learning style	1	
61	It helps to go back	1	
62	It is limiting to me	1	
63	It logs you out	1	
64	It needs a little bit of playing around	1	
65	It needs to be more flexible	1	
66	It really helps	1	
67	It should be in a more prominent place	1	
68	It takes a long time	1	
69	It's more face to face	1	
70	It's always useful	1	
71	It's better than whatever I'm used to.	1	
72	It's empowering	1	
73	It's underutilised	1	
74	It's very empowering	1	
75	It's very useful	1	
76	I'm quite confident	1	
77	Lecture	1	
78	Lecture content	1	
79	Lecturers do include extra materials	1	
80	Lecturers that use the tool brilliantly	1	
81	Lecturers using different ways	1	
82	Limited to my style of learning	1	
83	Interface a lot easier	1	
84	Materials are going to be there	1	
85	More catchy and something	1	
86	More helpful digitally	1	
87	Multidisciplinary course	1	
88	My own notes	1	
89	Navigate round	1	
90	Panopto app I cannot access	1	

S/N	Codes	Frequency Codes	Remark
91	Prejudices a lot of people	1	
92	Presentation sent in advance	1	
93	Quick in responding	1	
94	Quite complicated	1	
95	Quite difficult	1	
96	Quite helpful	1	
97	Reading more	1	
98	Record the lectures and play them back	1	
99	Search for something	1	
100	Search function	1	
101	Search function on every page	1	
102	Search the index	1	
103	Smart links to the useful stuff	1	
104	So that we can keep them	1	
105	Sometimes it's the quizzes	1	
106	Such content to cover everything	1	
107	System is down	1	
108	Talking about more of the statistics	1	
109	The correct answer	1	
110	The problem that arose	1	
111	The videos are very self-explanatory	1	
112	The way it's organised	1	
113	There are no videos or audio recordings	1	
114	There is a limit for that day	1	
115	There wasn't any training	1	
116	They don't explain much in class	1	
117	They use two folders	1	
118	Until I eventually got used to it	1	
119	Upload presentation	1	
120	We can't download such videos	1	
121	We contributed to the wiki page	1	
122	We haven't had it	1	
123	What is VLE?	1	
124	What period it will be maintained	1	
125	When we observe and see how	1	
126	Without having to wait for 24 hours	1	
127	You can send messages	1	
	Total	127	

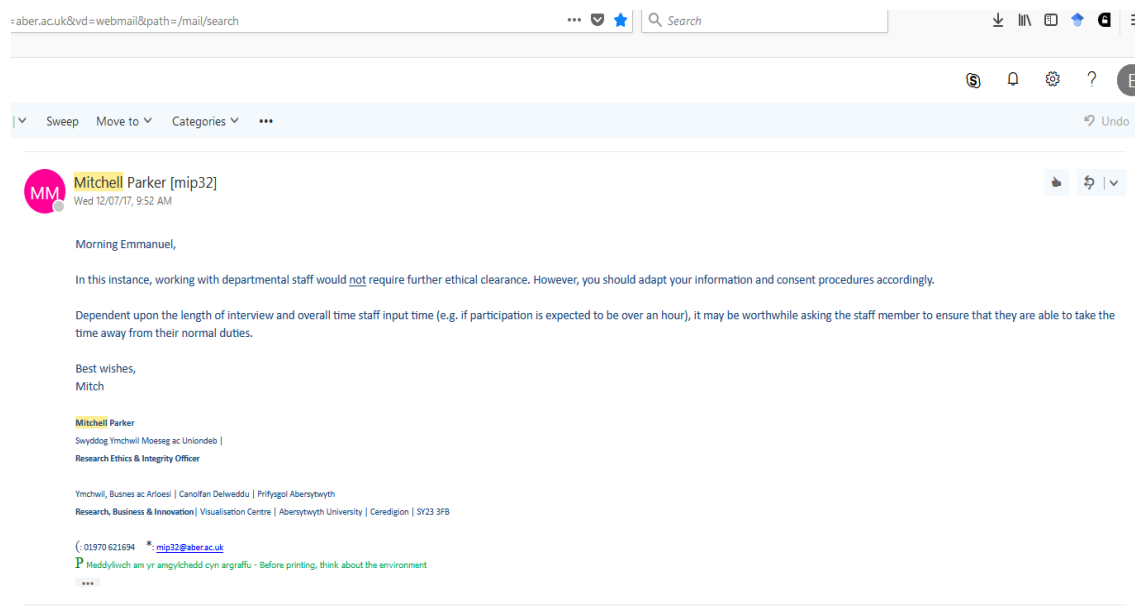


Figure B.1: Approval for the data analytics of students' log on Blackboard BR11710 module

Appendix C

Glossary

Basic Social Process: A theoretical construct that explains the behavioural patterns in social settings. It is the building block for integrating the final theory.

Category: Category denotes a pattern that has been discovered through constant comparison of ideas within the sampled data. It also denotes a family of related codes.

Classic grounded theory: This refers to one of the strands of grounded theory in which the final theory is propagated through an integrated set of concepts and hypothesis that capture the relationships among the concepts with respect to the main concern of the study and how it is resolved. **Code:** A code is a descriptive label assigned to an incident in the data. The label could be in vivo or analytic. In vivo when the label is from the words of the participants and analytic when the label is from the concept denoted by the code.

Coding: This is the process of breaking the data into a chunk of transcripts and giving such chunks a label.

Concept: This is a higher level of abstraction of an idea that runs through the data. It is used interchangeably with the term “category”.

Constant Comparison: This is a major technique employed in classic grounded theory. Constant comparison is the method for generating concepts, and occurs throughout each of the coding stages. It involves basic comparisons such as: incident to incident; concept to incident; and concept to concept. It is used all through the stages of selective and substantive coding. It is what shapes the direction of theoretical sampling.

Core Category: The core category (also known as core variable) is the category that captures most of the variation in the data about the main concern of the participants and how it is resolved.

Data: This is the empirical unit that makes up the transcripts in the case of a qualitative study or figures as in the case of a quantitative study.

Dimension: This is a representation of the degree of the category in the study.

Emergence: This is the process of discovering a concept within a study

Fit: One of the requirements for judging the credibility of a grounded theory. Fit refers to the validity of the concepts, and how well the concepts espoused captures the pattern of behaviour conceptualized from the data.

Formal grounded theory: This is a theory that can be generalized for all

areas beyond a particular substantive area

Framework: This refers to a conceptual model that explains the relationship between certain parameters

Incidents: Incidents could refer to the unit of analysis in the form of observed ideas or sections of empirical data that indicate a particular code or category.

Main concern: This refers to the identified issue or problem that cuts across the data in the research setting.

Memos: Are analytic notes that capture the striking observations and thoughts of the researcher about the data or research topic. They explain the Researcher's conceptual ideas and relate them to the codes, categories and their properties and emerging theory. Memos are written by the researcher throughout a study, thereby giving rise to a memo bank that gets sorted theoretically in order to help conceptualize the data.

Methodology: The research approaches or techniques employed by the researcher in a study.

Modifiability: One of the criteria for judging the credibility of a grounded theory and it refers to the ability of the theory to be altered as new data are compared.

Navigability: This refers to the process of moving from one webpage to the other in search of information.

Open coding: This is the first stage in substantive coding whereby the researcher codes line-by-line for all possibilities in the data.

Preconceived ideas: This refers to the perceptions of the researcher that assumed to be of relevance to the study.

Property: A property is a lower level concept about a category. They are the characteristics of the categories.

Relevance: One of the criteria for judging the credibility of a grounded theory. Relevance is determined by the "grab" of the emergent theory. The theory is meaningful to participants rather than simply satisfying academic concern.

Selective Coding: Coding for data that relates only to the core category, its properties and related categories.

Substantive area: This refers to the specific research setting under investigation.

Substantive Coding is the process conceptualizing the empirical substance of the data through both open and selective coding.

Substantive grounded theory: This refers to the grounded theory that has been developed within a particular research setting.

Theoretical code: This refers to the conceptual model that specifies the relationship between the core category and its properties, and all the other (non-core) categories. Theoretical codes conceptualize how substantive codes relate to each other in an integrated set of hypotheses.

Theoretical coding: This is the process of conceptualizing how the core category and its supporting concepts are related to each other. The process results in a model that is not imposed on the theory but emerges by earning its way into it as the best representation that integrates the core category and its related concepts.

Theoretical sampling: This refers to an approach in which sampling is guided by the emerging theory as opposed to some predefined samples. This determines the direction of the researcher as respect to where to go next and gather more data.

Theoretical Saturation: The point at which the researcher stops collecting new data. It is arrived at when the core category and its supporting categories are fully dense at which point data gathering ceases.

Theoretical Sorting: This is a key tenet of classic grounded theory whereby memos are sorted by comparing and organizing them for the purpose of discovering a theoretical outline that best explains the happenings within the study. It is through this process of sorting that theoretical codes emerge and are ultimately integrated into a final theory.

Work: One of the criteria for judging the credibility of a grounded theory. A theory works if it can explain, with as much variation as possible, the resolving of participants' main concern.