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The challenges of implementing a virtual learning environment in a secondary school : an Irish case study

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The Challenges of Implementing a Virtual Learning Environment in a Secondary School

An Irish Case Study

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Abstract

This case study evaluates the challenges encountered in the implementation of a Virtual Learning Environment in a secondary school in Ireland. The VLE had been in use at the school for four years yet the take up by teachers had been modest. This study examines a variety of determinants that influence technology acceptance and successful implementation outcomes in respect of the VLE at the school.

A questionnaire survey of staff was carried out and semi-structured interviews with six teachers at the school. The VLE logs and statistics were examined along with documentation relating to the VLE. Data was analysed from the perspective of Innovation Diffusion Theory and Unified Theory of Acceptance and Use of Technology (UTAUT).

The study begins with an examination of technological factors influencing technology adoption including issues surrounding acquisition, management and support of a VLE in an Irish school. It also explores teacher level factors of VLE acceptance and how teacher attitudes to a VLE are developed. School level factors, the implementation process and teachers' experience and views of these are also examined. It then goes beyond these factors to look at the significance of the curriculum and assessment to teacher attitudes to a VLE.

The findings show that there are specific technological, teacher level and school level factors influencing VLE acceptance. They also show that teacher attitudes to the implementation of the VLE in the school are tied to their attitudes and responses to national objectives in education and national strategies for reshaping learning.

This study suggests that despite national strategies for effective investment in ICT in schools and the NCCA ICT Framework , it is likely that change in the curriculum and assessment will be the more significant drivers of technology integration and VLE adoption.

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Chapter 1

Introduction

1.1 Introduction

The recently published NCCA framework for ICT and the recent Strategy Group's Report, 'Investing Effectively in Information and Communications Technology in Schools 2008 - 2013', recommend the use of Virtual Learning Environments (VLEs). VLEs have in recent years been introduced in some schools in Ireland and it is likely that drivers, such as the NCCA framework for ICT, will result in an increase in VLE use in Irish schools. There is however a fundamental lack of data regarding the use of VLEs in Irish schools.

For schools facing the challenge of implementing a VLE, it will be useful to understand factors which might result in successful and sustainable use of a VLE. There is a lack of such information in relation to the experience of VLE implementation in Irish schools. There is however research, much of it in an Irish context, which examines technology adoption in teaching and learning which can inform the development of strategies for introducing a VLE to a school. Research of this kind examines aspects of technology adoption including technological factors, teacher characteristics but also school characteristics which take account of implementation processes. These issues, in some studies, are related to the wider culture of education through examining the significance of the curriculum and assessment to ICT integration.

1.2 Statement of topic

This paper presents an evaluation of the implementation of a virtual learning environment in a secondary school and sets out to understand technology acceptance in this context. It highlights the complexity and relationships between a variety of determinants that influence technology acceptance and successful implementation outcomes in respect of a VLE.

Much recent research has examined how teacher's dissatisfaction with the ICT infrastructure is a key issue in Irish schools which is further exacerbated by a lack of funding which impedes schools' ability to plan for ICT development (European Commission - Information Society and Media Directorate General 2006). Where resources are available, inadequate access and poor organisation of the facilities can diminish the potential benefits (Fabry and Higgs 1997). These issues will be relevant to the implementation of a VLE and need to be understood in that context.

In relation to implementing a VLE in an Irish school there are also specific technological issues. An integrated MIS and VLE solution is currently available i.e. Serco Learning's Facility MIS, and Etech Group's Studywiz, however there is only one available and the limited choice may not fit with the needs or budget of all schools. The NCTE has begun to offer centrally managed services to schools such as Scoilnet Maps and the Scoilnet webhosting-blogging service. It is feasible that a similar VLE service may be offered and there is a need to evaluate what the needs of Irish schools are and how an appropriate service might meet those needs.

The teacher level barriers to ICT acceptance, and therefore VLE acceptance, include lack of self confidence, lack of time and training (Ghua 2000). The type and quality of training

available at both pre and in-service levels is important (DES 2008). Research indicates that differentiated training which takes into account differences in ability and learning styles promotes technology adoption (Veen 1993). It also highlights that training which examines the issue of pedagogy but also specialist training for online education which recognises new educational roles in the development of VLEs at different levels is necessary (Barajas et al 2002). Teacher's fear of failure may be a factor in technology adoption however a change in pedagogical practice is an integral part of ICT integration and those who choose not to adopt a new technology, such as a VLE, may do so because they believe it does not enhance learning (Yuen & Ma & Preston et al cited in Becta 2003). Teachers' attitudes to such issues in Irish schools have yet to be understood in relation to using a VLE.

There is much research which examines the perception of entrenched values underpinning teaching in schools as a barrier to innovation and the need to temper this by a respect for the teacher as an autonomous professional (McNamara and O'Hara 2004). It is therefore important to examine the school culture and how this contributes to the challenge of implementing a VLE.

Attention also often focuses on change or a lack of appropriate change in curriculum and assessment and how this impacts on technology integration (Freeman et al 2001). In promoting the adoption of VLEs by schools it is necessary to gauge the pedagogical climate in the context of the current curriculum and examinations. In doing this it is appropriate to query what role the curriculum and assessment have in the development of teacher attitudes to technology integration and specifically the use of a VLE.

1.3 The objectives of this study

Given the context of implementing a VLE the main themes of this study's research will examine teacher's attitudes in terms of technological factors, teacher characteristics, school characteristics, curriculum and assessment in order to understand the process of implementing a Virtual Learning Environment and identify barriers to acceptance.

- Technological factors are a key element of ICT integration and this study will therefore seek to understand to what extent technological factors act as barriers to VLE implementation in an Irish school.
- Teacher level factors of technology acceptance are critical to an understanding of any new initiative in ICT in teaching and learning. This study will therefore examine teachers' attitudes to a VLE as an innovation in order to identify teacher level barriers to VLE acceptance.
- School characteristics are significant to the process of implementing a VLE and managing this type of change in an organisation. This study's research will seek to understand this by examining teachers' attitudes to the VLE implementation process in a school.
- The primary role of schools is subject to the curriculum and assessment. Any initiative to integrate ICT in teaching and learning is tied to national objectives in education and national strategies for reshaping learning. This study's research on the implementation of a VLE will therefore enquire into how the existing curriculum and assessment impact on VLE acceptance by teachers.

1.4 A case study approach

This study seeks to understand technology acceptance in the context of implementing a VLE through a case study of a secondary school which has been using one for four years.

A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.

(Yin 1994, p.13)

A questionnaire survey of staff was carried out and semi-structured interviews with six teachers at the school. The VLE logs and statistics were examined along with policy documents for the VLE and minutes of VLE review meetings. These facilitate understanding the implementation process over time and the development of teacher attitudes to it. This approach is varied and seeks to measure aspects of the implementation of the VLE but also explore through dialogue the context and the experience of teachers involved.

Data was analysed from the perspective of innovation diffusion theory (Rogers 1995) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al 2003). The UTAUT model was chosen for this research study because it can provide a good reference on influencing factors of technology acceptance in respect of a VLE. It will also complement Rogers' theories which provide a reference for description of innovation decisions in organisations related to VLE implementation.

1.5 Why schools need to know about implementing a VLE

There is little information or guidance available from the NCCA or NCTE in relation to the acquisition, implementation, use, management and support of a VLE in an Irish secondary school. A substantial amount of information on these issues is available in other countries e.g. publications by Becta and OFSTED in the UK. There is not much information on the use of VLEs in Irish schools and therefore not much evidence available which allows an analysis of the factors that enhance or inhibit institutional take-up of VLEs within the Irish secondary school sector.

The publication of the NCCA ICT framework and The recent Strategy Group's Report, 'Investing Effectively in Information and Communications Technology in Schools 2008 - 2013', are very significant eLearning strategy publication, and indicate that eLearning is firmly on the agenda nationally. It is therefore timely to conduct a study to identify the reality and extent of how the aspirations outlined in these publications are being realised and specifically in relation to the use of a VLE in a secondary school.

1.6 Significance of the study

This research may be of value to schools implementing a VLE as it seeks to identify barriers to VLE adoption and its findings might assist schools in developing strategies for successful implementation of a VLE. It will inform the school which is the subject of the case study with useful data for implementation of its VLE. It will also provide useful data to inform technology integration at the school which is particularly relevant at this time when it has been accepted as part of the department's 100 megabit broadband scheme. All schools nationally will eventually benefit from the roll out of the 100megabit broadband scheme. They may benefit from the experience of schools in the initial roll out and this study may contribute to that process.

1.7 Structure of the thesis

Chapter 2, the literature review, begins with an examination of VLE usage in schools in Ireland and then explains drivers for their adoption. It reviews literature on technology adoption in an Irish and international context with an emphasis on studies of VLE acceptance. It concludes with a review of Rogers' Innovation Diffusion Theories and The Unified Theory of Acceptance and Use of Technology (UTAUT) and their relevance to the study.

Chapter 3, the methodology chapter, examines the rationale for researching barriers to VLE acceptance in Irish secondary schools. Research methodologies, the sampling strategy and methods of data gathering for the study will be explained.

Chapter 4 presents the research findings followed by a discussion in Chapter 5 of the findings in the context of the literature review and the research questions.

Chapter 6 derives conclusions from the key findings of the study and presents recommendations based on these.

Chapter Two

The challenges of implementing a Virtual Learning Environment in a school in Ireland

2.1 Introduction

This chapter reviews literature on VLE usage in schools in Ireland and drivers for their adoption. It examines literature on technology adoption in education with an emphasis on barriers to VLE acceptance. It then looks at studies on the impact of the curriculum and assessment on the integration of ICT in teaching and learning and how this relates to VLEs. It considers theories of technology adoption for understanding the implementation of a VLE in a school. It concludes with a review of two models of technology adoption and their relevance to this study.

2.2 What are Virtual Learning Environments (VLE)?

A VLE is a computer system, predominantly a web-based system, used to facilitate learning. There are a variety of terms used in relation to the definition, functions and role of a VLE. VLEs can be referred to as a Learning Management System (LMS), Course Management System (CMS), Learning Content Management System (LCMS), Managed Learning Environment (MLE), Learning Support System (LSS), Online Learning Centre (OLC) or Learning Platform (LP). The term Managed Learning Environment refers to the infrastructure used to deliver a VLE and may include functionality required by an educational institution, such as attendance records, reports or room allocation. Scholaris Learning Gateway is a commercially available system in Ireland which includes this functionality together with a VLE. A product which integrates a VLE and Managed Learning Environment can be referred to as a Learning Platform.

There is no clear agreement as to how long VLEs have been in use. In 1953 in the USA there are examples of television being used to provide a form of remote learning. The Open University in the UK has been providing remote learning since the 1970s. The use of online technology was clearly established in 2000 with the patenting of Blackboard, a commercial computer based VLE, which is still in use today. The open source equivalent, Moodle, was trialled in 2001 and there are now 35,897 registered validated Moodle sites in 202 countries (moodle.org 2009).

2.3 VLE usage in Irish schools

The impact of such technology in England, as reported in the Becta LANs in Schools survey, is that 30 per cent of primary, 57 per cent of secondary and 26 per cent of special schools in England were using some form of learning platform (Becta 2006). This figure is likely to have increased considerably since. A list of institutions which use moodle in Ireland is available at moodle.org. As this is a list of those sites which were registered with moodle.org, and institutions are not required to register their site, it is not an indicator of the extent to which moodle is used in secondary schools in the Republic of Ireland. It is a recent development that commercial VLE solutions such as Studywiz, Scholaris and moodle based solutions have become available in the republic of Ireland. Figures for their uptake are not available although it is known for example that Meath VEC uses Studywiz and the City of Galway VEC uses moodle. There are currently, in effect, no figures available for the use of learning platforms in Irish schools.

The Hermes project, which was initiated by the Department of Education and Science (DES) in May 2003 among a cluster of nine primary schools based in North County Dublin, had a VLE introduced in 2006. The project, initially designed to evaluate a Thin Client based broadband wireless network in schools from both an infrastructure and pedagogical

perspective, will in time produce findings on the use of a VLE in an Irish school. The interim report published in March 2006 indicated that the project in the future will:

Given time and further support it has the potential to deliver a lot more, particularly by acting as a 'test-bed' for piloting new educational ICT initiatives in the school setting.

(DES Ireland 2006)

This project may inform future policy and planning by the DES however the final report has yet to be completed.

The Leadership Development for Schools (LDS) initiative was the first initiative to be facilitated with access to the NCTE VLE which was set up in 2006 and currently uses Fronter (NCTE 2006). This VLE is incorporated into all courses for school leaders and is also in use for the CPD of ICT coordinating teachers. The login for the VLE is embedded in the NCTE website and is titled eLinks. Various courses such as The Internet - A Teaching & Learning Resource are offered in eLinks and there is a developing community of practice in it for ICT coordinating teachers.

Approximately 3,000 school leaders work through the VLE while a further 400 use it for an NCTE online course and assorted activities (NCTE 2007). This is significant information in that it indicates at least that the use of a VLE is in some way becoming part of the culture of Irish schools. It does not however give any data regarding the attitudes of users to the VLE or the degree to which it is being used effectively. As the primary role of the NCTE VLE is to "help teachers manage online educational courses" as part of CPD then this gives no indication of the use of VLEs in teaching and learning in schools (NCTE 2007).

There is a fundamental lack of data regarding the use of VLEs in Irish schools however it must be acknowledged, as was the case in the 2009 Ofsted report on VLEs that the concept of VLEs is relatively new (Ofsted 2009). Where a VLE is being introduced in an Irish school it

is at an early stage and it involves development work with little support in terms of research or raw data.

2.4 Drivers for the adoption of VLEs in Irish schools

The context in which schools are introducing a VLE is a significant factor in VLE adoption. The use of ICT in teaching and learning has become an increasingly important aspect of provision in Irish schools in recent years. There is greater availability of computers, a raised awareness of ICT among learners and educators and, particularly in relation to VLEs which are predominantly web-based systems, universal availability of broadband access in schools. It is significant, for example, that the 100Mbps Post-Primary Schools Project was launched on 25th June 2009 and therefore the quality of broadband provision for Irish school is likely to improve in the near future. It is also significant that over 70 primary schools in which major construction work was completed in 2008 would each get €5,000 per classroom to buy computer hardware, software and digital equipment. This is the first time there has been an ICT allowance per classroom at primary school level and evidence of the commitment to building schools' ICT capacity in today's increasingly knowledge-based society (Department of Education and Science 2009).

Given various reports and guidelines for the integration of ICT across the curriculum, including the recently published NCCA framework for ICT, there is information on developing effective strategies to achieve this which includes recommendations for the use of VLEs. The NCCA framework for ICT includes references to the use of a VLE. The report '*Investing Effectively in Information and Communications Technology in Schools 2008–2013*' recommends that the development of the schools broadband services should "Make available a range of centrally-provided broadband services to schools including email, VLEs and web-hosting" (Department of Education and Science 2008). It is likely therefore that there will be a significant increase in the use of VLEs in Irish schools in the near future.

2.5 Barriers to teacher acceptance of Virtual Learning Environments

An increase in the use of VLEs in Irish schools would be a desirable outcome of the publication of various reports and guidelines for the integration of ICT across the curriculum. These publications outline strategies for the integration of ICT across the curriculum which in turn become reflected in strategy and policy documents of schools. These policy documents, such as the eLearning plan as recommended by the NCCA ICT Framework, are but the beginning of a complex process of decision making on the management of technology integration by school management (NCCA 2007). Nevertheless, the establishment of an eLearning plan, however comprehensive the document, does not in itself answer the challenge of implementing change.

There has been much research on the integration of new technologies in teaching and learning. This body of research has produced evidence about barriers to the integration of ICT in teaching and learning. In this literature review the objective is to examine factors which impact on the successful and sustainable use of a VLE in a school. The intention is to identify factors which act as barriers to VLE adoption and acceptance in the context of ICT integration.

In a Becta study which analyses research on barriers to effective use of ICT the literature is grouped into two levels: those relating to the teacher and those relating to the institution (Becta 2004). Prior research examining key factors affecting the use of media in classrooms can also be categorised into the three domains of: technological factors, teacher characteristics and school characteristics (Totter et al 2006). An empirical study using data collected from a survey of fifty two Swiss and Austrian teachers in 2006 first evaluated in its literature review differentiation between

studies analysing implementation processes and studies investigating the use of ICT or other aspects in parallel

(Totter et al 2006)

The study itself focused on teacher's characteristics and the role they play in the adoption of new technology in teaching and learning. This is a key area for review in a more narrowly focused study on the acceptance of a VLE however it is also important to consider the areas of technology, school characteristics and related implementation processes.

In examining the case of VLE acceptance the institution characteristics are of particular interest as a VLE is generally considered a whole school/institution facility and will therefore involve a process of implementation across an institution. The following sections will therefore examine technological factors, teacher characteristics but also school characteristics which take account of implementation processes. This is then related to the wider culture of education through examining the significance of the curriculum and assessment to ICT integration.

2.5.1 Technological barriers

2.5.1.1 Lack of appropriate ICT facilities

The technological barriers at an institutional level to VLE acceptance include the lack of appropriate ICT facilities. This is identified internationally as the principal barrier to ICT integration (Pelgrum 2001). It is an issue which is of particular concern in Irish schools as reflected in the 2006 European Commission Survey which reported that Ireland ranked

at the very bottom in Europe when it comes to teacher's satisfaction with the ICT infrastructure in their schools.

(European Commission - Information Society and Media Directorate General 2006)

2.5.1.2 Costs of purchasing and maintaining the ICT infrastructure

The costs to the institution of purchasing and maintaining the ICT infrastructure are a related and equally significant issue (Cox et al 1999). A recent European study established that 85% of Irish teachers believe there is inadequate support and maintenance for ICT in our schools. It makes clear the case that schools do not have a sufficient basic level of equipment and technical support to facilitate effective ICT integration. The study also indicates that the level of funding made available to Irish schools impedes their ability to plan for ICT development (European Commission - Information Society and Media Directorate General 2006). These issues which act as barriers to ICT integration are confirmed in recent publications in Ireland such as the Digital Hub Development Agency "Result of Schools Survey 2009" and a DES report which concluded

In brief: recent programmes for ICT in schools have been successful but this success has been tempered by a limited level of investment.

(Department of Education and Science of Ireland 2008)

2.5.1.3 Access to and deployment of facilities

Where resources are available, inadequate access to computer laboratories can be a factor and the organisation of computers into ICT suites as oppose to classrooms (Fabry and Higgs 1997). A recent report indicated that the context for the use of ICT in whole class teaching at secondary level which is most favoured by Irish teachers is a dedicated ICT suite. It further established that

The next most frequent teaching context involves group activity in a dedicated computer room followed by whole class teaching in a general or specialist classroom. It was found that the ratio of pupils to computers (PCR) in a school had a negligible effect on the usage of ICT in any of these contexts.

(Department of Education and Science of Ireland 2009)

This does not establish however whether there are issues surrounding the deployment of computers in schools and how this affects access. More information is required on this

matter which will require further research however if the PCR has a “negligible effect on the usage of ICT in any of these contexts” it does not negate the fact that an insufficient basic level of equipment will result in reduced access (Department of Education and Science of Ireland 2009).

2.5.1.4 Set up and management of a VLE

Another technological barrier to the adoption of a VLE is the ability of a school to set up and manage one in order to make it available to staff. This includes a variety of factors such as the availability of and costs associated with the technology also training for the administrator to deploy and manage it.

As the person charged with this task is likely to be the ICT coordinator it is necessary to consider the provision of training and resources available to enable them to do so. In a study which evaluated the ability of experienced ICT users, such as ICT coordinating teachers, to integrate ICT in teaching and learning it was established that

Although, many of the teachers felt that they had benefited from the training they had received, they wanted to receive more training and also felt that they needed better resources and more technical support and time to use ICT.

(Preston et al 2000)

In this study almost half (47.6%) were IT/ICT teachers or co-ordinators and most were identified as innovative teachers in the use of ICT and senior managers. Nevertheless issues of training, resources and technical support emerge in relation to technology adoption. Training opportunities for VLE administrators facilitated by the NCTE in education centres and others such as the MoodleBites course with Enovation Solutions, are available, although the choice and availability is limited.

A recent Ofsted report on VLEs established that while costs associated with introducing and running a VLE were not a major concern for large institutions, smaller institutions were struggling with the “routine maintenance of information technology systems and a VLE” (Ofsted 2009). In the case of four of the six primary schools involved in that study, there were concerns about their ability to provide a VLE however they anticipated that their local authority would provide a common learning platform.

The issues of training, resources and technical support to enable Irish schools to provide a VLE is not documented or examined in current research. The NCTE does not currently provide a common learning platform although the report ‘*Investing Effectively in Information and Communications Technology in Schools 2008–2013*’ recommends that the development of the schools broadband services should “Make available a range of centrally-provided broadband services to schools including email, VLEs and web-hosting” (Department of Education and Science 2008). There is however a limited range of providers of commercial VLEs such as Scholaris, Studywiz and moodle with Enovation Solutions. A school can of course host their own open source VLE such as moodle at a minimum cost.

There are however specific technological barriers in some instances. Should schools seek to deploy more integrated systems and thus integrate moodle or Scholaris with either ePortal or Facility this is not currently possible. Studywiz was described by Thomas Hennessy, Vice President for international schools and Ireland at Etech Group as follows:

Studywiz and Serco Learning are a perfect match and will provide all of the MIS and learning environment needs required to run a successful Irish school.

(ACCS 2009)

The new partnership between Serco and Etech Group will provide schools in Ireland with access to a school wide e-solution, including Serco Learning’s Facility MIS, and Etech Group’s Studywiz. Serco Learning is contracted by the Department of Education in Ireland to provide secondary schools with support of its ‘Admin Management Information Systems’ i.e.

Facility and consequently they are in a position to integrate these systems however at present they do not facilitate integration with Scholaris or Moodle which are currently the other principal VLE options available.

The result is that while an integrated MIS and VLE solution is currently available to schools, there is only one available and the limited choice may not fit with the needs of all schools. There is nevertheless a solution available which provides backup and support. The associated costs are a matter for individual schools.

It can be concluded therefore that services for introducing a VLE are available however the associated costs may be a barrier to VLE adoption particularly in an education system where programmes for ICT in schools “ have been tempered by limited investment” (DES 2008).

2.5.2 Teacher level barriers

Teacher characteristics play an important role as barriers to ICT acceptance and relate therefore to VLE acceptance. A number of teacher-level barriers have been identified in research literature on barriers to ICT adoption.

2.5.2.1 Time and training

Lack of time for both formal training and self –directed exploration is a significant barrier to ICT integration (Ghua 2000). This is confirmed in the “Results of School Survey 2009” where 33% of teachers identified this as an obstacle which placed it, in that study, as the third most significant barrier to ICT integration (DHDA 2009).

The Department of Education and Science's ICT Strategy Group recognises this as an issue particularly in respect of the availability of courses and the demands placed upon teachers to attend. Many teachers attend department training in a voluntary capacity and others, at their own expense, attend training in universities and colleges. This however is recognised as unsustainable and will not provide appropriate training or support necessary to enable teachers "to more effectively and consistently embed technologies in their practice" (DES 2008).

The type of training provided is a further variable as research suggests there can be deficits in the design and delivery of courses. A focus on basic ICT skills can fail to enable teachers to embed ICT in their pedagogy (Wild 1996). Another study however established that teachers new to ICT preferred training which addressed their basic skills needs before examining the issue of pedagogy in using ICT (Snoeyink & Ertmer 2001). However where curriculum support services have incorporated ICT into their programmes, it has subsequently led to greater ICT integration in the classroom (DES 2008). This is evidence of a successful integration of ICT training with pedagogy. The divergence of findings in research in relation to appropriate ICT training for teachers indicates the need for differentiated training which takes into account differences in ability and learning styles (Veen 1993).

It is also clear that specialist training is required for online education and use of a VLE.

Professional development. Teaching using VLEs needs technological and organisational competences and new skills in applying relevant didactical methods, new strategies for teaching/tutoring and moderating/facilitating. It is necessary to recognise new educational roles for those involved in the development of VLEs at different levels.

(Barajas et al 2002)

Many of the same issues regarding in-service training apply to pre-service training. There are deficits relating to resourcing and supporting initial ICT education between and among

providers of pre-service training (IFUT 2000). In a national drive to integrate ICT in teaching and learning, which includes the use of VLEs, it is likely that where ICT is not included as a core element of curriculum delivery in pre-service training then progress will be slower (DES 2008).

2.5.2.2 Lack of self confidence

The DHDA report “Results of School Survey 2009” confirms that a lack of confidence with ICT inhibits integration of ICT in teaching and learning in Irish schools (DHDA 2009). This lack of self confidence with ICT which can result in a perception of computers as difficult to use in teaching and learning corresponds with findings in other countries (Pelgrum et al 2008). The same teachers in the DHDA survey indicated in a later question a higher level of ICT confidence and a desire to build on their existing knowledge base. This suggests some differences as to what is meant by ICT confidence.

The 2006 European Commission Survey ranked Irish teachers who use computers in class top in Europe in their confidence using email and text processing while less confident downloading/installing software and creating electronic presentations (European Commission - Information Society and Media Directorate General 2006). The same survey, in evaluating teacher competence in using ICT in teaching and learning, found 30% of teachers as “ICT ready” which ranked Ireland 19th out of the 25 European Countries in this respect. Teacher ICT confidence it seems can vary depending on the context in which it is applied. Certainly there can be a variance between teacher ICT confidence and teacher competence in the use of ICT in teaching and learning.

There can also be a discrepancy between teacher’s perception of their use of ICT in teaching and their actual use. The post–primary teacher survey in the recent inspectorate

report noted a significantly higher degree of computer use in teaching and learning than that observed by inspectors (DES 2009). In the survey 55% of teachers reported using computers in their teaching at some time whereas only 18% of lessons observed during subject inspections reflected this.

These reports suggest that teacher ICT confidence as a variable is in a complex way somewhat unreliable as it is dependant on self perception and may not necessarily reflect teacher competence in the use of ICT in teaching and learning. However, much research has concluded that teachers who avoid computers in their work do so because of a lack of confidence or fear of computers (Russell and Bradley 1997).

2.5.2.3 *Fear of failure*

Lack of self confidence is not quite the same as fear of failure. Negative experiences with ICT (Snoeyink and Ertmer 2001) and fear of failure with a resultant loss of status are further impediments to ICT integration (Russell and Bradley 1997). This is clearly illustrated in a study of VLE adoption in a UK university where following technical failures with the VLE one professors evaluations plummeted making it safer not to experiment (Dutton 2004).

2.5.2.4 *Changing pedagogical practices*

Traditional teaching paradigms are reflected in some aspects of VLE design. Fronter names areas in the VLE as rooms and Blackboard uses the analogy of the 'chalk and talk'. New technology however unless coupled with a new paradigm in education will result in teachers carrying on teaching as before. Familiarity with the technology over time is required to learn how to do new things (Dutton 2004). Studies have shown however that motivation to do so is

an issue and lack of motivation to change pedagogical practices impedes ICT integration (Snoeyink and Ertmer 2001)

Some VLE design incorporates a constructivist philosophy of education e.g. Moodle (moodle.org 2009) and studies indicate that teachers who use computers tend towards a constructivist methodology more than those who do not (Becker cited in Totter et al 2006). This would seem to confirm that a change in pedagogical practice is an integral part of ICT integration. Those who choose not to integrate ICT in teaching may of course do so with good reason as they may believe that technology does not enhance learning (Yuen & Ma & Preston et al cited in Becta 2003). Change of pedagogical practice is a complex issue in VLE adoption.

2.5.3 Organisational barriers

The challenge for a school introducing a VLE is part of a broader challenge of developing an “e-learning culture” in the school. This is identified by the strategy group report as a difficult task which requires “leadership, time, investment, and policy imbued with vision” (DES 2008). The difficulty of introducing a new culture into an organisation is in how resistance develops due to conflict with existing cultures. The vision may not be shared by all and teachers may not feel an obligation to buy into the vision.

The strategy group report recommends that:

the successful integration of ICT in teaching and learning depends on a planned and coordinated approach, involving all staff and spearheaded by strong leadership at all levels.

(DES 2008)

In respect of developing an e-learning culture the primary role of the principal supported by the ICT coordinator is stated in the report. The role of subject coordinator can loosely be defined as one of curriculum leadership and co-ordination. This can be seen as an obvious extension to the routes for embedding an e-learning culture in a school which begins with the principal and ICT coordinator.

This route in the planning process may seem to some teachers to represent a top down approach. In a UK study of implementing a VLE in a university it was found that such an approach is fraught with difficulties and usually does not work. It identified instead that new ideas are more successfully diffused among the rank and file (Dutton 2004). In this instance the culture of academic freedom in universities in the UK was deemed an important influence. This raises the issue of the autonomy of teachers in the Irish education system and specifically in relation to curriculum change and development and the influence this may have in development of an e-learning culture.

In an article describing the conceptual and philosophical approach which informed the recent evaluation of the 'FIS' project in primary schools in Ireland there are particular positions taken on the influence of teacher autonomy in the project. The FIS project was designed to experiment with ways of using film education and film production to make the curriculum more relevant and more activity-based. It is an interesting project in respect of innovation using ICT because in its design it trusted the teacher to evaluate the potential of educational innovations and saw this as making more sense.

This is both because teachers are usually in a better position to make these judgements than external observers but also, crucially, because the making of such judgements is fundamental to the professional role of the teacher.

(McNamara, G and O'Hara, J 2004)

This decision to trust teacher judgement of educational innovation emerged from their questioning of the efficacy and ethical justification of a

tendency to impose abstract findings on schools and teachers with little discussion of local variations and necessary adaptations.

(Metz, cited in McNamara and O'Hara 2004)

This is seen to stem from a desire to limit or eliminate the professional autonomy of teachers which the authors see as counterproductive as it may lead to a de-skilling and disempowerment of teachers. They assert the centrality of the autonomous professional teacher to education.

The NCCA ICT framework is described as an “enabling framework”:

“The ICT Framework is not a curriculum area or a syllabus. It is not presented as an add-on to teaching and learning but as a tool to help teachers to integrate ICT in teaching and learning. The Framework provides a guide to teachers for embedding ICT in curriculum and assessment across curriculum subjects. It is an enabling Framework.”

(NCCA 2007)

It would seem in principal to recognise the teacher as an autonomous professional and in its design recognises that use of the framework will vary from school to school depending on school factors including “access to ICT equipment and resources, teacher competence and confidence with ICT and a school's level and stage of planning for ICT in curriculum and assessment” (NCCA 2007). In this respect it would seem to avoid discouraging schools and teachers from risk taking in adopting new technologies because the evaluation process will take account of local adaption of the expectations of the ICT framework due to local circumstances. The planning process promoted by the framework seems to support dispersion of innovation with ICT among teachers rather than a top down approach.

The perception then of entrenched values underpinning teaching in schools as a barrier to innovation needs to be tempered by a respect for the teacher as an autonomous professional. The NCCA ICT framework can support a balanced approach to the development of an e-Learning culture as its fundamental premise is that it is an “enabling”

framework rather than a prescriptive one. It would seem to imply a conceptual and philosophical approach intended to empower teachers rather than one which might result in de-skilling and disempowerment of teachers. Innovation in the use of ICT in education and specifically implementation of a VLE will need to be managed in a manner which balances strategic objectives both nationally and at school-level with respect for the teacher's professional judgement on how to adapt and implement educational change.

National objectives in education and national strategies for reshaping learning will ultimately be reflected in the curriculum and assessment. Where change occurs in the curriculum and assessment it is incumbent on teachers to meet the requirements of both. The following section will examine educational change and innovation with ICT in the context of the curriculum and assessment.

2.6 The impact of the curriculum and assessment on VLE acceptance

A critique of the NCCA ICT framework is that an “enabling” framework which is not prescriptive avoids the setting of measurable objectives. Where e-Learning is not a subject and not a syllabus, as stated in the ICT framework, then it is not being assessed in state examinations except as an element of certain subjects such as technology. There is also only limited reference to ICT in the revised curricula at primary and secondary level. This becomes significant when it is argued as a critique of the Irish education system that

“For many learners at second and third levels the most important thing is not that they should learn, but that they should get good qualifications”

(Little, cited in Freeman et al 2001)

In 311 post-primary lessons observed as part of the recent inspectorates' evaluation, while 55% of teachers reported using computers in their teaching at some time, only 18% of

lessons observed during subject inspections incorporated the use of ICT (DES 2009). This would suggest that teachers do not yet see the integration of ICT as essential within the curriculum or in meeting the requirements of current assessment at examinations.

In a critique of IT 2000 in relation to similar initiatives in Finland and Sweden it was noted that contrary to the Irish initiative

“Finally, evidence of the recommendation of the evaluation of ICT for learning is evident in the incorporation of an adjusted rethinking of curriculum, assessment and learning environment in the action plans of both countries.”

(Freeman et al 2001)

In a study which focused on curriculum and assessment, and evaluation of the use of ICT in the classroom as tools to reshape learning it was made clear that much could be learnt from the approach taken in Finland and Sweden. From the data presented in the recent inspectorates report it would appear that much is still to be learnt and that the existing system of curriculum and assessment has not been sufficiently transformed to facilitate ICT integration and the reshaping of learning. As a barrier to implementation of a VLE this is a fundamental issue.

The review of literature up to this point has examined factors influencing VLE acceptance including technological, teacher-level, school-level and national-level in the curriculum and assessment. The following section will consider literature on adoption and diffusion theories in order to identify a coherent structure for analysis and data collection in this study.

2.7 Patterns of adoption of Virtual Learning Environments

The literature on ICT integration in institutions reveals a complex relationship between school-level and teacher-level barriers. While decisions about the need to adopt

technologies are often made at the national or school level it is the decisions made by individuals to accept or reject a technology which finally matters. Why does one teacher decide to accept a new technology and another reject it? What are the various social, cultural and institutional issues which affected this decision? These are the types of questions addressed in studies of adoption and diffusions theories.

This is a broad area of study which is entered into with the expectation that understanding adoption patterns “can help guide expectations and inform strategy” (Robinson 2001, p.21). In the context of ongoing initiatives to integrate ICT in teaching and learning and more specifically the implementation of a VLE it is necessary to understand not just the individual but also the social context. As Surry writes

There is no danger in being driven to improve society by improving instructional technology. The danger is to ignore the society we are attempting to improve.

(Surry 1997)

The results can impact significantly on an institution implementing a VLE as in the case of Northumbria University where understanding innovation adoption models was identified as a key factor in the successful implementation of a managed learning environment (Bell and Bell 2005).

2.7.1 Theories of technology adoption for understanding VLE implementation

Rogers’ diffusion theories are often referred to in studies on adoption and integration of ICT. He defines innovation as “an idea, practice or object that is perceived as new by an individual or other unit of adoption” (Rogers1995, p.11). This study examines the introduction of a VLE as a particular kind of innovation which is, in an objective sense a new technology, but certainly new in the context of the Irish secondary education system where

so few are deployed. It also fits in a broader sense with innovation in the context of integrating technology in teaching and learning.

Two models of technology acceptance will be examined for particular reasons. In examining the implementation process of introducing a VLE to a school, Rogers' (1995) description of innovation decisions in organisations will be examined. The model of UTAUT will also be examined to provide a reference for exploring influencing factors of technology acceptance.

2.7.2 Rogers' Diffusion Theories

Many theories of innovation diffusion are cited in studies however Rogers' Innovation Decision Process continues to provide a frame of reference for much work and is one of the better known (Surry 1997). It has also influenced the development of subsequent theories. The four theories presented by Rogers which are among the most widely used theories of diffusion: Innovation Decision Process; Individual Innovativeness; Rate of Adoption and Perceived Attributes.

2.7.2.1 Innovation Decision Process

The Innovation Decision Process theory (Rogers 1995) defines diffusion as a process which evolves through five distinct stages. The stages in the process, which takes place over time, are Knowledge, Persuasion, Decision, Implementation and Confirmation. As a potential user is introduced to a new innovation they must first learn about it, be persuaded as to the value of it, decide to adopt it, implement the innovation, and then the final stage, which is in effect an evaluation stage, where the decision is taken to confirm i.e. adopt or reject the innovation.

This theory does present the process in what appears a rather simplified linear manner as decisions to accept or reject an innovation may take place at any point along this continuum. It can be argued that other important theories are often overlooked while this theory, which is often cited, would seem to suggest that the only important information required by change agents is that there are five stages to the innovation adoption process (Sachs, cited in Surry 1997).

2.7.2.2 Individual Innovativeness

The Individual Innovativeness theory (Rogers 1995), which is often cited in relation to the adoption of VLEs, asserts that individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less so. It identifies five categories of adopters: innovators, early adopters, early majority, late majority and laggards. Each category of adopters has distinct characteristics which reflect their readiness to adopt a new innovation. On one extreme of the bell curve are innovators who are risk takers, open to change and likely to be the vanguard of adopting an innovation. This category type is reflected in a recent Ofsted report on the development of VLEs in the UK where in most cases the VLE “remained one small aspect of learning supported by enthusiastic staff and learners.” (Ofsted 2009,p.4). On the other extreme of the bell curve are the Laggards, perhaps an unfortunate choice of words, who adopt late in the diffusion process if at all.

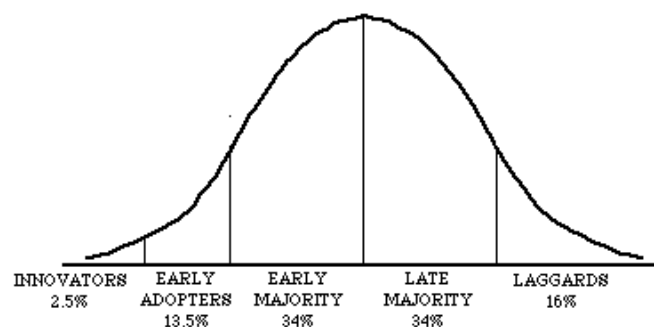


Figure 2.1 Bell shaped curve showing categories of individual innovativeness and percentages within each category

2.7.2.3 Rate of Adoption

The third oft cited diffusion theory presented by Rogers (1995) is the theory of Rate of Adoption. This theory maps innovations as taking place over time and represents this with an S shaped curve. The theory presents innovations as going through an initial slow period of growth followed by a period of dramatic growth and finally a period of stability or decline in growth as the adoption period comes to an end.

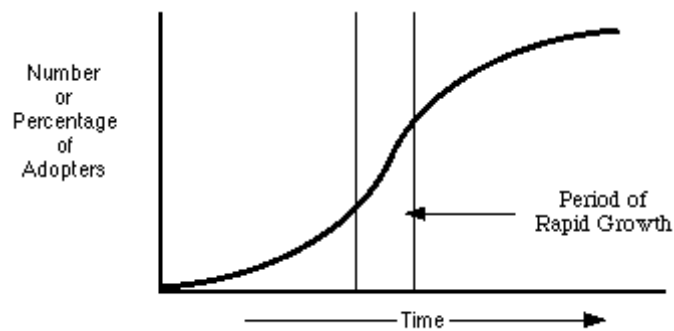


Figure 2.2 S-curve representing rate of adoption of an innovation over time

2.7.2.4 Perceived Attributes

Rogers Theory of Perceived Attributes (Rogers 1995) identifies five attributes of an innovation which influences the potential user's decision to adopt or reject: relative advantage, compatibility, complexity, triability and observability. This theory indicates that an innovation, such as a VLE, will have an improved rate of adoption if the potential adopter perceives that it can be tried before adoption, offers observable results, has an advantage over other innovations, is not unnecessarily complex and is compatible with existing practices and values. This theory has played a significant role where used as a basis for a variety of IT adoption studies (Surry 1997).

2.7.2.5 *The innovation process in organisations*

The organisational process of adoption reflects many of the stages above but according to Rogers (1995) divides into two stages, initiation and implementation. Initiation is further divided into two stages, agenda setting and matching and implementation into three stages, redefining/restructuring, clarifying and routinizing.

Agenda setting is that point in the process when an organisational issue is identified which generates the need for an innovation. At this point a performance gap, a divergence between an organisations expectations and actual performance is clear. To bridge the gap the matching stage involves tailoring the innovation to meet the needs of the organisation. The implementation stage begins with redefining/restructuring when the innovation is further modified to meet more precisely the organisational needs. Clarifying is that point in the process where through more widespread use the meaning of the innovation becomes clear to the organisations' users. Routinizing is the end of the process which is no longer an innovation and has become a part of the organisation.

2.7.2.6 *Limitations of Rogers' theories for the study*

Rogers' theories, though influential, have limitations. They are largely descriptive rather than prescriptive and therefore indicate how adoption occurs rather than how to facilitate it (Straub 2009). This view is also supported by Kirkup and Kirkwood when referring to Rogers' theories' as follows:

This framework is useful both to explain and predict a general cycle of technology adoption, but it cannot explain why some tools and technologies are adopted in the way intended and others are not.

(Kirkup and Kirkwood 2005)

Later in the same paper the dangers of forming judgements on the basis of the enthusiasm of early adopters regarding the use of and impact of technology on a larger scale is highlighted. The study of late adopters and even resisters is encouraged as the worry is that in much recent literature the behaviour of Laggards, as categorised by Rogers, has not been sufficiently researched.

Clearly, in a study of barriers to the adoption of a VLE, the response of late adopters and resisters requires careful analysis. Rogers himself concedes that a critique of diffusion theories is what he refers to as the pro-innovation bias.

Perhaps owing to the pro-innovation bias that pervades much diffusion inquiry, investigation of rejection behaviour has not received much scholarly attention

(Rogers 2003, p.178)

Equally it has been argued that the theory does not sufficiently enable understanding of how attitude leads to accept/reject decisions and how innovation characteristics fit into this process (Chen et al 2002)

Regardless of the limitations of DOI it is unrealistic to expect one model to generalise how positive or negative attitudes are formed in respect of different categories of adopters, aspects of an innovation, the adoption process and specifically the adoption of a VLE.

2.7.3 The Universal Technology Adoption and Use Theory (UTAUT)

This theory was designed specifically to answer questions about technology adoption. It has been applied in many educational settings. It can therefore provide a good frame of reference for a study of VLE adoption in a school.

The UTAUT model was formulated on the basis of a review of eight models. The disciplines which contributed to its formulation are either beliefs focused or system focused and as a model it is a synthesis of both.

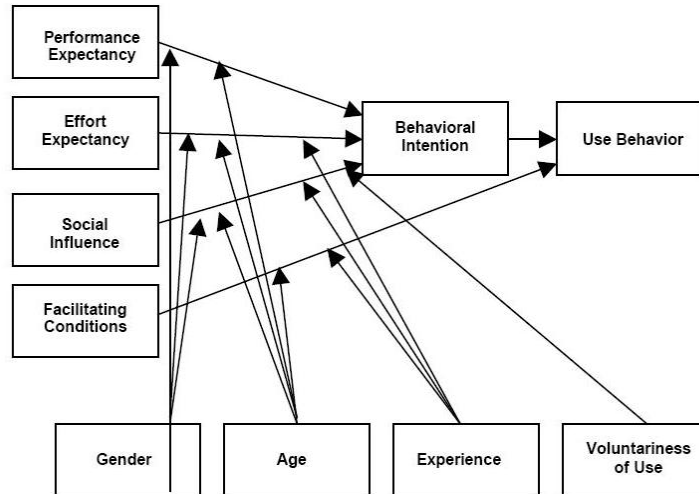


Figure 2.3 The research model of Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al 2003)

The four core concepts of UTAUT are Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. These four core concepts are independent variables which influence the dependant variables of behaviour intention and usage. Gender, age, experience and voluntariness of system use have an indirect influence on the dependent variables via the four core concepts. The various interrelationships of the model are depicted in figure 2.3.

2.7.3.1 Performance Expectancy (PE)

“Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance.” (Venkatesh et al 2003). In the model its influence on behaviour intention is moderated by gender and age and is stronger for men, particularly younger workers.

2.7.3.2 Effort Expectancy (EE)

“Effort expectancy is defined as the degree of ease associated with the use of the system.” (Venkatesh et al 2003). In the model its influence on behaviour intentions is moderated by gender, age, experience and more so for young women and older workers at early stages of experience.

2.7.3.3 Social Influence (SI)

“Social influence is defined as the degree to which an Individual perceives that important others believe he or she should use the new system.” (Venkatesh et al 2003). In the model it is seen as insignificant in voluntary contexts and significant in a mandatory context. In a mandatory context the social influence takes effect as compliance and particularly with those who are less experienced and when rewards/punishment apply. In voluntary contexts the social influence takes effect as influencing perceptions about the technology, known as internalization and identification. It is presented as moderated by gender, age, voluntariness and experience and is stronger for women, especially in a mandatory context in the early stages of experience.

2.7.3.4 Facilitating Conditions (FC)

“Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.” (Venkatesh et al 2003). In the model when both performance expectancy and effort expectancy are present, facilitating conditions are insignificant. It is anticipated that this effect will increase as users gain experience and find various sources of help and support. Consequently it is

thought to be moderated by age and experience, is stronger for older workers and particularly those with more experience.

2.7.3.5 Limitations of the UTAUT model for the study

This model provided effectively a synthesis of individual-level technology adoption research and has resulted in what is perceived to be a maturity of this field of research (Venkatesh 2006). There is therefore subsequent research with a tendency to develop the field in new directions.

This model is a key model of technology acceptance and is likely to provide a good reference on influencing factors of technology acceptance. It will also complement Rogers' theories which provide a reference for description of innovation decisions in organisations.

2.8 Conclusion

The introduction of a VLE into schools as indicated by the Ofsted report is at an early stage and as a concept is relatively new (Ofsted 2009). Any expectation that introducing such a technology will result in a shift in pedagogical practice is not borne out by research to date rather it involves complex challenges which require teachers to review their practice and consider new approaches. It is not likely that the design of new strategies and policies at national or school-level will easily persuade teachers to implement change in the use of ICT in education. Even where national strategies and their implementation processes recognise the diversity of attitudes and aptitudes at school and teacher-level a host of factors will continue to impact on ICT integration.

The anxieties of teachers regarding ICT integration must be addressed and given value in a process of review of progress with new initiatives such as the NCCA ICT framework. Investment in infrastructure and support is essential however pedagogical support and appropriate CPD combined with incentives for teachers to adapt and learn is equally important. Finally if fundamental change in the form of a reshaping of learning is the intention of ICT integration and the NCCA ICT framework then the existing curriculum and assessment processes must be adjusted so that they too can become an enabling framework in ICT integration and the transforming of learning.

These factors form part of the complex process of integration of a VLE in a school. As an initiative a school is best to view it as part of a longer and broader process of change which is likely to unfold in small increments over time.

Chapter 3

Methodology

3.1 Introduction

This chapter examines the rationale for researching barriers to VLE acceptance in a secondary school in Ireland. Research methodologies, the sampling strategy and methods of data gathering for the study will be explained. Validity, reliability, triangulation and ethical issues which were considered will also form part of this chapter.

3.2 Research methodology

To carry out the research a case study was undertaken in a secondary school in Limerick where a VLE had been in use for four years.

A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.

(Yin 1994, p. 13)

The case study approach has many advantages and limitations. As the author is the eLearning coordinator at the school and VLE administrator there are limitations in that a biased interpretation of events may compromise the study. A criticism of the case-based approach is that it may also yield unscientific generalisations in its findings which are not transferable. However it can be argued that the case-based approach enables the researcher to gather a rich, contextual understanding of a situation in context.

There are a range of different epistemological positions adopted by researchers in education and these are reflected in how the research is approached. Oliver et al. argue that this is often presented as a 'paradigm debate', characterised by a contrast between qualitative and quantitative methods (Oliver et al 2007). This study adopts a blended approach, empirical and theoretical, qualitative and quantitative which is typical of much social research (Research Methods Knowledge Base 2010). It seeks to measure aspects of the implementation of the VLE but also explore through dialogue the context and the experience of those involved.

3.2.1 The research model

The research model was based on the core constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al 2003) and Innovation Diffusion Theory (IDT) (Rogers 1995). These theories are described in the literature review. The UTAUT model was chosen for this research study because it is likely to provide a good reference on influencing factors of technology acceptance in respect of a VLE. It will also complement Rogers' theories which may provide a reference for description of innovation decisions in organisations related to VLE implementation.

The four core constructs of UTAUT used as the basis of the study are *performance expectancy*, *effort expectancy*, *social influence* and *facilitating conditions*. Two additional core concepts of technology acceptance from IDT were used: *perceived attributes* and *individual innovativeness*. These core concepts are defined in Table 1, Appendix A.

3.3 The research questions

1. To what extent do technological factors act as barriers to VLE implementation in an Irish school?
2. What are teachers' attitudes to a VLE as an innovation and therefore what are the teacher level barriers to VLE acceptance?
3. What are teachers' attitudes to the VLE implementation process in a school?
4. How does the existing curriculum and assessment impact on VLE acceptance by teachers?

3.4 Background to the study

The school chosen for the case study has been using a VLE since November 2006. The VLE uses moodle as the platform and training had been offered to staff in each of the three years prior to the study being initiated. It was both in policy and practice an optional facility for use by staff should they so chose.

The choice of this school was based on availability as the researcher is a teacher at the school and manages the VLE. Given the lack of available data on VLE use in schools in Ireland this was also the only school known to the researcher to have implemented a VLE in this manner and over such a period of time. It was therefore the only type of sampling possible which was manageable and realistic to administrate given the time constraints of the study. There is no exact way to generalise from such a convenience sample however the primary purpose of this study is to better understand the experience of implementing a VLE at the school rather than to generalise.

As a member of staff at the school it was possible to distribute the survey questionnaire and make all necessary arrangements for data collection through the normal channels of communication at the school.

3.5 The research tools

In order to answer the research questions a variety of approaches were employed. These included examination of the VLE logs and statistics using the reports facility of the site administration, a survey questionnaire and interviews. Policy documents for the VLE and minutes of VLE review meetings were also examined.

3.5.1 VLE logs and statistics

It is possible to adopt a variety of empirical approaches to data gathering in moodle, the VLE in use at the school in this case study, because it has a powerful reporting engine which logs all user activity. Maxwell's concept of 'interpretive validity', the ability of the research to extract the meaning, interpretations, terms, intentions that situations and events, i.e. data have for the subjects of the research is relevant here (Maxwell, cited in Cohen et al 2000). Knowledge on the part of the author as VLE administrator together with interviews will be used to interpret and contextualise the data gathered from the VLE reports.

3.5.2 The questionnaire

In order to gather data based on concepts of the UTAUT and IDT models a questionnaire was constructed measuring the six core constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, perceived attributes and individual innovativeness. The questions used to estimate the degree of each of the core constructs and the way in which they correspond can be seen in Table 2, Appendix B.

The various interrelationships of the UTAUT model are depicted in figure 4. Appendix F. Gender, age, experience and voluntariness of system use have an indirect influence on the dependent variables of behavioural intention and use behaviour via the four core concepts. There are therefore questions to gather the required information on gender, age, and experience in Section 1 of the questionnaire. Question 35, Section 3 serves as an indicator of voluntariness of system use as can be seen in Table 2, Appendix B. The teachers were asked to rate their level of agreement to each statement on a five-point Likert scale (“I disagree completely” to “I agree completely”). Section 3 contains the majority of questions designed to gather data on the core concepts and is largely based on Venkatesh et al 2003.

Section 2 “Professional Use of ICT” was used to collect data for a descriptive analysis of the teachers’ current level of use of ICT in classrooms. This scale was adapted from Bebell et al (2004) with 12 items covering the seven categories of teacher technology use outlined by Bebell et al. It allows an examination of the degree of technology adoption in teaching and learning to which the degree of VLE adoption can be compared. It also helps qualify information on how useful the VLE is perceived relative to those technologies, which is asked in Q 30, Section 3, and based on Rogers concept of Perceived Attributes.

Section 3 of the questionnaire includes questions intended to gather data on Individual Innovativeness and Lack of ICT Confidence, adapted from Ehmke et al 2004 as seen in Table 2, Appendix B.

The questionnaire includes both closed and open questions in order to determine teachers’ attitudes to VLE adoption. The intention is to enable respondents to give free responses in their own terms, to explain and quantify their responses and avoid the limitations of pre-set categories of responses (Cohen et al 2000).

All teaching staff were invited to participate as the larger the sample size the smaller the sampling error and for the purposes of statistical analysis it is advisable to overestimate rather than to underestimate the size of the sample required (Cohen et al 2000).As completing the questionnaire was voluntary there may be a bias in the profile of the respondents which may not represent the whole group. A purposive sampling in the interviews will attempt to balance this possibility. In respect of generating statistical analysis the minimum recommended number of thirty (Cohen et al 2000) was exceeded as the return was thirty seven from seventy distributed.

The survey was piloted with a group of five staff who were identified as frequent users of the VLE and non users in order to gather the views of a cross section of the study group.Five additional questions were included on the recommendations of teachers in the pilot. It was also suggested that teachers will have different views on the success of VLE training for them and therefore a five-point Likert scale in response to the statement was included for question ten section one. A variety of changes to wording in numerous questions were made in response to the pilot.

Despite the pilot one problem did emerge. Shortly after the questionnaire was distributed two teachers reported that the instruction at the beginning of section three was unclear and some participants may think they are not required to complete this section. This issue was clarified and all questionnaires returned were fully completed.Teachers new to the school, those on maternity leave cover and classroom assistants were not invited to complete the questionnaire.Of 70 questionnaires distributed a total of 37 (53%) were returned.

3.5.3 The interviews

In this study the purpose of the interviews is to facilitate a qualitative investigation in which the aim is to gain a deeper understanding of responses identified from the survey and to

explain teacher attitudes and the pattern of adoption of the VLE found in it (Garotte, cited in Garotte and Pettersson 2007).

The variables of gender, age, teaching experience and VLE usage are reflected in the purposive sampling for the interviews. The questions were designed to explore the variables of performance expectancy Q.11, effort expectancy Q.4, social influence Q.8, facilitating conditions Q.2 & Q.6, perceived attributes Q.9 and individual innovativeness Q.10. Other variables such as time Q.5, training Q.6 & Q.7, curriculum and assessment Q.13, ICT confidence Q.3 and VLE content Q.12 are reflected in the interview design. (See Appendix E. Interview Questions)

The questions are 'open ended items' which allow respondents to explain what they truly believe and may result in unthought-of relationships in the research (Cohen et al 2000). This makes the data produced more difficult to code and quantify. To contend with this difficulty the interviews were conducted as semi structured interviews but followed closely the wording and kept strictly to the sequence of questions, similar to a standardised open-ended interview. This helps to increase comparability of responses and gather data from each interviewee on the interview topics. It allows little flexibility to relate the interview to each individual and can result in a forced, unnatural response. However as the interviewees are colleagues of the researcher it was hoped that the interview would none the less retain an informal and natural manner.

The importance of putting the interviewees in the picture before the interview was accommodated by providing them with a copy of a brief background of the study and the interview questions (Nisbet and Watt, cited in Cohen et al 2000). An open question at the end of the interview invited the interviewee to make any important points they wished regarding the subject of the study. This recognised that they may "suggest a better way of expressing

the issue or may wish to add or qualify points” (Cohen et al 2000, p. 190). It also sought to address the issue of little flexibility to relate the interview to each individual which could result in a forced, unnatural response as mentioned above.

Six interviews were carried out as this was considered an adequate sample given the size of the group and the time constraints of the study.

3.5.4 VLE Documentation

There are a significant number of archived documents relating to the VLE available to the researcher. A variety of these documents were examined for data relevant to the research questions. These included the VLE Report 15/10/07, The VLE Plan Meeting 11/12/07, The VLE Plan 18/12/07 and The VLE Review 07/05/08.

The VLE Plan Meeting 11/12/07 was given particular consideration as it formed part of the school planning process. The objectives of the meeting were to review the implementation of the VLE at that time and make recommendations for implementation based on teachers’ own opinions of what were appropriate strategies. The meeting was minuted and the minutes agreed by the group. It was conducted effectively as a focus group. Although not held as a focus group per se the author judged it to meet the criteria for one (Cohen et al 2000, p.288). Organising such a meeting of staff is difficult and was only ever possible as part of the school planning process. The documentation of this was considered valuable to the research and has the added value of comparing attitudes to the VLE over time.

3.6 Data Analysis

The data from the questionnaire enables a simple statistical analysis of participant responses. As the interviews followed a strict sequence of questions and the questions followed closely the same wording this facilitates categorising the answers across the different interviews. The frequency of codes, i.e. of ideas in responses, can then be counted. From this “seeing plausibility” is possible, i.e. making sense of the data using informed intuition and arriving at conclusions as to its significance (Miles and Huberman, cited in Cohen et al 2000). Themes common to most or all of the interviews and individual variations allow a “composite summary” which can represent key findings of the research gained from the interviews (Hycner, cited in Cohen et al 2000).

The VLE logs provide data which will be cited where it supports or illuminates findings from other sources. The documentation will be analysed to identify themes and ideas using the same approach followed in analysis of the interviews, as described above.

Week beginning 18/01/10	Pilot Questionnaire
Week beginning 25/01/10	Administer Questionnaire
Week beginning 01/02/10	Interviews
Week beginning 08/02/10	Interviews

Research Schedule

3.7 Validity and reliability of research

A variety of research methods were used to aim for validity and reliability of the research. This allowed for triangulation of results. The intention was to approach the aims of this research in a descriptive rather than an evaluative manner. The semi-structured interviews

facilitate this however the use of rating scales, including a Likert type scale in the questionnaire allow for a simple statistical analysis of participant responses.

Validity applies to both the design and the methods of research. The approach in this study was based on two significant models of technology adoption, UTAUT and IDT, in order to apply a previously validated method to the research. In order to achieve the highest reliability, data was sought from all members of the group that is the subject of the study (Flick 2002). The selection of participants in interviews sought to identify a group, male and female, with varying years of service, of different age groups and with a range of different levels of adoption of the VLE in order to give a balanced description of teacher attitudes.

Findings can be said to be externally invalid because they cannot be extended or applied to contexts outside those in which the research took place. Given diverse variables, including those of differences in facilities, organisation culture and staff aptitudes across schools the findings of this study will inevitably have limitations in their application.

3.8 Ethics

The three main ethical issues of informed consent, confidentiality and risk of consequences were considered in the design of this research (Cohen et al 2000). All subjects of the case study were informed of its purpose and methods. They were also invited to participate voluntarily and withdraw from participation at any point. Complete confidentiality was guaranteed and all staff were assured that there was no risk of them taking part or indeed declining to participate.

It was deemed important not to presume upon staff perceptions of any aspect of the research and therefore the assurances outlined here were announced at a staff meeting, repeated in the questionnaire, in relation to examination of VLE logs and at the start of interviews.

Chapter 4

Findings

4.1 Introduction

This chapter presents the findings of research relative to each research question.

4.2 Findings by Research Question

4.2.1 Technological factors affecting VLE acceptance

The results of the study showed that there were significant differences in teacher perceptions of the ability of the schools ICT infrastructure to support the use of a VLE.

In response to the survey statement Q 17, "There is a good technical infrastructure to support use of the VLE" there were 45% of non users in disagreement as oppose to 17% of users in disagreement. This indicates that non users have significantly less confidence in the ICT infrastructure to support the use of the VLE (see Chart 4.1). This is confirmed in the questionnaire written responses with 44% of respondents indicating concern with the ICT infrastructure. Their concerns included primarily stability of the network and internet connection also lack of data projectors in rooms, lack of student access at home, security of examination coursework and the response time of IT support both in terms of ICT infrastructure and VLE issues.

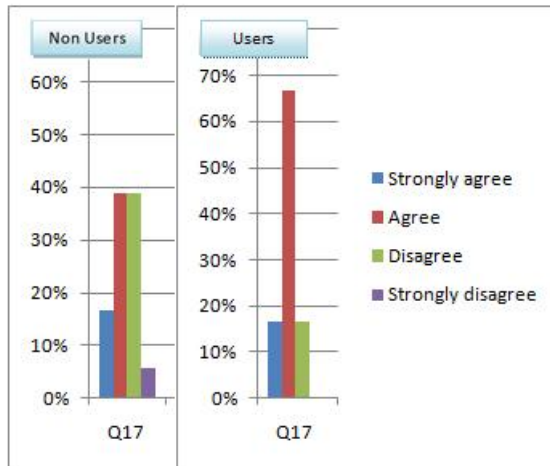


Chart 4.1 : Q 17, There is a good technical infrastructure to support use of the VLE

The interviewees, in contrast, all indicated their confidence in the ICT infrastructure to support use of the VLE. However half of those interviewed referred to access as the key issue in regarded to the infrastructure. They pointed out that with blocking of rooms for ICT and LCVP there were limited opportunities to bring classes to the ICT rooms.

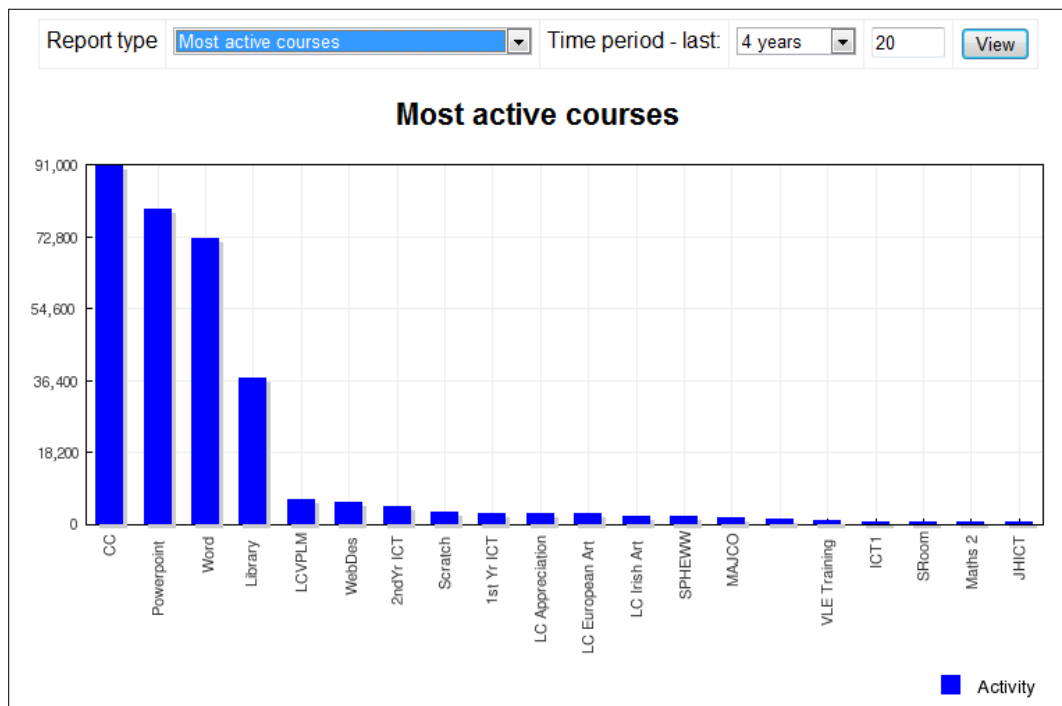


Chart 4.2 Most active courses in the VLE over 4 years

This issue of the impact of limited access to ICT rooms on VLE usage is reflected in the VLE logs (see Chart 4.2). These show that the first eight most active courses over a four year period were in ICT and LCVP, all of which are timetabled in ICT rooms. The next three most active courses, courses in Leaving Certificate art history, made activities available for students from home and only occasionally involved use of ICT rooms. The three courses of most significance, those with activity in excess of 36,400, were in ICT. The most active users of the VLE are clearly timetabled classes in ICT rooms.

In answer to Q, 20, "Access to ICT facilities in order to use the VLE is satisfactory", only 16% of participants were in disagreement suggesting that this is not the primary issue acting as a barrier to VLE acceptance.

The significance of access to ICT rooms for use of the VLE must be considered relative to how often staff use IT rooms with their classes generally. Of the 14% (5 teachers) who answered that their students work individually on computers several times a week, four are timetabled in ICT rooms for LCVP and ICT and the fifth uses computers with individual students as a support teacher. Of the 16% (6 teachers) who answered that their students work individually on computers several times a month, one is timetabled in an ICT room for LCVP, 2 teach science subjects, 1 SPHE and science, 1 languages and 1 SPHE and geography. This indicates that the majority of teachers, not timetabled in ICT rooms for ICT and LCVP, make only occasional use of ICT rooms for teaching and learning in their subjects.

Never	Once or twice a year	Several times a year	Several times a month	Several times a Week
49%	19%	16%	8%	8%

Chart 4.3 Q.1, Section 2: Frequency of use of the VLE (all teachers)

The significance of access to ICT rooms must also be considered in relation to how many staff use the VLE and in what way (see Chart 4.3). The response to the statement regarding use of the VLE, Q. 1, Section 2, indicates that only 16% of respondents make any significant use of it. Of the 8% (3 teachers) who use it several times a week, one uses it for ICT, one for ICT and Art and the other for science (primarily for managing resources for presentation using a data projector). Of the 8% (3 teachers) who use it several times a month, 1 uses it for science, one for SPHE and science and one for LCVP and ICT. These findings indicate that weekly use of the VLE, involving whole classes logged in, is confined to ICT classes which are timetabled in ICT rooms. The other teachers who use the VLE, with whole classes logged in, and as confirmed by the VLE logs, do so occasionally.

In conclusion, non users have significantly less confidence in the ICT infrastructure to support the use of the VLE than users. Access to ICT rooms is not the primary issue acting as a barrier to VLE acceptance but is important. Findings indicate that the majority of teachers make only occasional use of ICT rooms to enable students to work individually on computers. Occasional use of the VLE with whole classes logged in fits with this pattern of use of ICT rooms rather than being a specific indicator of VLE use. Use of the VLE in general outside of ICT classes is occasional. The most frequent use of the VLE with whole classes logged in is in ICT and LCVP.

4.2.2 Teacher attitudes to the VLE as an innovation

4.2.2.1 Performance expectancy

The survey shows that there are conflicting views about whether the VLE would improve teaching and learning.

In response to Question 1, Section 3, "Using the VLE would improve teaching and learning in my subject", only 6% of users disagree while 22% of non users disagree. This indicates that a significantly larger number of non users do not believe the VLE would improve teaching and learning, however, the majority of teachers believe that it can. This is further evidenced as 68% of teachers surveyed, in their written responses, listed examples of how the VLE can improve teaching and learning. This conflicts with the finding that 59% disagree with the statement "The benefits of the VLE are commonly known among staff" a view which was supported in all interviews.

All teachers interviewed were ambiguous about staff perceptions of the benefits of the VLE in teaching and learning or believed that staff in general did not understand clearly the benefits. This ambiguity about the benefits of the VLE in teaching and learning has persisted over time as it is mentioned clearly in the minutes of the VLE Plan meeting of 11/12/07.

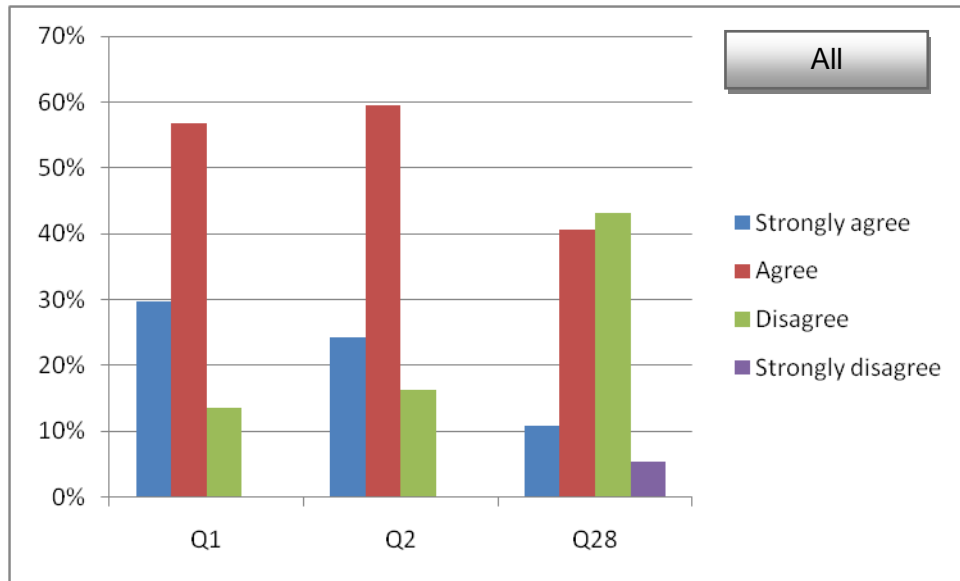


Chart 4.4 Performance Expectancy for:

- Q.1 Using the VLE would improve teaching and learning in my subject.
- Q.2 I would find the VLE useful in my job.
- Q.28 Use of the VLE will help promote success at examinations for students.

A more significant indicator of teacher perceptions of the benefits of the VLE is in response to Q.28, Section 3, “Use of the VLE will help promote success at examinations for students”. While 34% of users disagree or strongly disagree, a significant 67% of non users disagree or strongly disagree with this statement. This contrasts sharply with a majority of teachers who in answer to statements Q.1 and Q.2, show a positive attitude to the usefulness of the VLE and its value in improving teaching and learning (see Chart 4.4).

In conclusion, there is for teachers a dichotomy between knowing that the VLE can improve teaching and learning but not clearly seeing how the benefits might apply in their own practice. The significant reservations about performance expectancy, i.e. gains in job performance, in respect of the VLE, are in relation to whether or not it will help promote success at examinations. This is more pronounced for non users 67% as oppose to 34% of users, suggesting it is a significant barrier to VLE adoption.

4.2.2.2 Effort expectancy

The results of the study indicate that effort expectancy, the degree of ease associated with the system, is viewed by teachers in terms of ease of use from a technical perspective and ease of use in the application of the VLE in teaching and learning.

As compared to established methods, 46% of teachers believe the VLE requires more effort. A substantial 22% of users and 28% of non users find it takes too long to learn how to use the VLE to make it worth their while. The time a teacher must invest in using the VLE is considered unacceptable by 22% of teachers. The time factor as a determinant of VLE use is confirmed in the questionnaire written responses with 27% of respondents citing the time involved, particularly in preparing content, as a problem. It is also confirmed in the VLE Plan Meeting of 11/12/07.

In response to the questionnaire statement Q.10 Section 3, I find learning to use the VLE easy; a total of 61% of users report finding the VLE easy to use as oppose to only 39% of non users. This indicates that ease of use is a more significant issue for non users and a significant barrier to adoption. The most significant finding is that 78% of all teachers surveyed believe the VLE is perceived by staff to be difficult to learn how to use.

This is contrary to the view of all the teachers interviewed who described it for example as “very easy to use”. One teacher interviewed however, said it was “quite straightforward and quite user friendly”, and then went on to explain

but I think I was approaching it from my subject which was Irish and I was under the...inclined to think that its easy to use if your coming from a science subject, maths subject, but I'm not sure it would be that easy to use from my subject viewpoint. I haven't used it but from what I did see of it... I felt that it was a little bit subject specific.

This indicated a clear distinction between understanding how to use the VLE as software as oppose to how to use it in teaching and learning which may have contributed to conflicting results from the questionnaire on the issue of ease of use.

This issue of not knowing how to use the VLE in teaching and learning was also reflected in the minutes of the VLE Plan Meeting of 11/12/07 and records of the pilot programme, the VLE development strategy for that year. A number of subject departments declined to participate in the pilot; only eight subjects ran a course, on the basis that it was not compatible with their subject and difficult to use in practice.

There is however further evidence which clarifies how staff perceive the VLE to present difficulties from a technical and skills perspective and how this relates to staff ICT competence in general. The VLE Plan meeting of 11/12/07 records

“Lack of ICT skills leading to an inability to make use of the system was discussed.”

and

“There was also a request for more training to be made available in basic ICT skills.”

The VLE review of May 2008, recognising that staff in training, had found learning to use the VLE difficult, pointed out that:

This issue of basic ICT skills is identified as a whole school issue in relation to ICT rather than a specific VLE issue.

In response to a request to rate their level of proficiency using ICT in their classroom teaching 46% rated it as good and 16% as very good. A teacher’s self assessment in this matter is however not necessarily a good indicator of their actual level of proficiency and is not specific to ability to use a VLE. A review of documentation regarding the VLE indicates that a significant proportion of staff have a need for basic ICT skills training before learning to use a VLE.

In summary, teachers find using the VLE takes more time and requires more effort than other more established methods. The findings show that teachers perceive it difficult to use technically and require a good level of ICT skills before learning to use it. Teachers also find the VLE pedagogically difficult to use.

4.2.2.3 Social influence

The study indicates that 67% of teachers believe the school staff support the use of the VLE however a significant 39% of non users disagree with this. All users believe the school management support the use of the VLE with only 11% of non users in disagreement. A significant 56% of non users do not believe that other staff will perceive them as competent through use of the VLE. It is also notable that 50% of non users as oppose to 33% of users believe there is resistance among staff towards use of the VLE. The greatest level of agreement in respect of social influence and perhaps most significant is that 76% of all teachers believe they will not increase their chance of promotion through use of the VLE. Equally significant is that 67% of all teachers do not believe that it is more prestigious for staff to use the VLE than not to use it. There is little fundamental difference between users and non users in this response.

These findings were reflect in all interviews and could be summarised by one interviewee's observation:

So I think, from my point of view, and from the people I spoke to, nobody had anything bad to say about the VLE but people were quite dismissive of the fact, you know, they dismissed it because they hadn't used it and that they weren't going to use it, if you like, you know.

In summary, the findings indicate that teachers perceive there is little gain in being seen to be using the VLE.

4.2.2.4 Facilitating conditions

Many of the findings regarding facilitating conditions are covered in the section Technological Factors. It is significant that 89% of all teachers believe a single login facility which integrates ePortal and a VLE will improve take up of the VLE by teachers.

A clear majority of 98% , 36 of 37 teachers surveyed, believe pre installed courses in the VLE, of a good quality, and to suit the Irish curriculum, will improve take up of the VLE by teachers. This belief is reflected in all interviews.

A specific person is considered available for assistance with use of the VLE by 78% of teachers. This however was qualified by minutes of the VLE Plan Meeting of 11/12/07 where it was noted:

“More time for support should be available because the time the administrator is available allows little flexibility.”

The issue of time for training featured prominently in all sources examined. The preference is clearly for training in school time with 95% approval of that as oppose to 65% outside of school hours. 63% of teachers who attended training at school agreed that it was sufficient to allow them to begin use of the VLE. All teachers interviewed emphasised more training with three of the six interviewed emphasising subject specific training and one advocating one to one support. 49% of teachers reported in written comments on the questionnaires the need for more training with a variety of suggestions regarding the type of training and the appropriate time. The significance of training to teachers is evident as it featured in 58% of written responses to suggest what will improve teacher take up of the VLE. Two teachers interviewed believed VLE training should form part of pre service training. In all sources examined, differentiated training was seen as more appropriate than training in large groups, as reflected in the VLE Plan Meeting of 11/12/07 where it was noted:

The training provided in the first year was thought not to suit some staff. It was recommended that small groups of similar ability in ICT skills would work better.

In summary, an integrated VLE/ePortal solution, appropriate pre loaded content, a person easily available for VLE support and appropriate training are all high priorities for teachers in supporting use of a VLE.

4.2.2.5 Perceived attributes

Rogers Theory of Perceived Attributes (Rogers 1995) identifies five attributes of an innovation which influences the potential user's decision to adopt or reject: relative advantage, compatibility, complexity, triability and observability. A significant 73% of teachers surveyed and all teachers interviewed believe few staff use the VLE. A substantial 73% of teachers indicated the VLE fits into the way they like to teach with 67% of non users, entirely in conflict with their own reported usage, indicating the same. A majority of 90% of teachers agree that using the VLE in teaching and learning requires new approaches and methodologies.

Interviews and a review of various minutes of meetings regarding the VLE confirm the perception that use of the VLE involves a change of methodologies. They also indicate clearly, clearing up the apparent contradiction in the questionnaire findings that the VLE does not fit with the way teachers like to teach. They suggest that staff in general do not view the VLE as compatible with established practice. Furthermore they indicate that the general perception is that use of a VLE involves a change of methodologies which teachers, for a variety of reasons, including its relative advantage, are unlikely to adopt easily. This is summarised in one teacher's observation:

I suppose it would involve an adjustment because a lot of teachers still rely on chalk and talk.

While 84% agree that the VLE is readily available to try out and experiment with before using with students a total of 67% of teachers do not believe the VLE is more advantageous than other technology available to them.

In summary, on the basis of perceived attributes, apart from the ability to trial the VLE before use, teachers have clearly rejected it. The findings indicate that teachers find the VLE complex and believe it requires a change of methodologies which does not fit with the way they like to teach.

4.2.2.6 Individual innovativeness

The survey questions designed to evaluate this are notable in that there was no significant difference in responses between users and non users. It can be summarised by saying that the majority of teachers support new media and change in methodologies and practice.

The interviews all suggest that teachers are careful about change and innovation however there is insufficient evidence to suggest to what degree individual innovativeness is a factor in VLE acceptance.

4.2.2.7 ICT confidence

In summary the teachers surveyed indicated a high level of confidence in ICT with little difference between users and non users. When asked to rate their level of proficiency using ICT in their classroom teaching ,there was an exact correspondence of 33% fair and 6% poor in users and non users. While a review of various documentation indicates differences

in ICT skills levels among staff there is nothing to indicate a significant lack of ICT confidence among staff or a relationship between this and VLE acceptance.

4.2.3 Teacher attitudes to the VLE implementation process

All teachers surveyed agree that use of the VLE is voluntary. It is in policy and in practice voluntary. Many suggestions emerged in interviews regarding the implementation process and focused almost exclusively on appropriate training.

Reviews of various documents indicate that whole staff training in large groups did not suit staff. Differentiated training in small groups and subject specific training were preferred. The pilot programme was generally considered an appropriate strategy and still advocated in interviews. Several interviewed believed that one champion in a subject area, supported by the VLE admin would result eventually in a cascade effect.

Other comments examined restructuring access to ICT rooms to enable all subject departments to have timetabled access. However, the primary interest for staff in the implementation process was appropriate and ongoing training at a suitable time and with good support.

All teachers interviewed referred to external drivers as a key factor. This included the need for published reports on the benefits of a VLE in education and appropriate methodologies in using a VLE . This pointed to the view that the implementation process is not confined to the actions of management or staff in the school. The key external drivers which teachers referred to were the curriculum and assessment. They clearly identified curriculum and assessment as barriers to adoption. This is further explored in the next section. However,

one teacher interviewed articulated this tension between internal and external drivers in the implementation process as follows:

The issue of a VLE in schools is ultimately an argument between do you want to grow it from grass roots level or do you want to force it from the top down. Our education structure is fairly rigid so how do you force people to use technology. If we are going to be left behind by our counterparts in Europe and America, how do you make teachers ICT literate, I do not know?

There will have to be an Education Department, Governmental drive to force change in teaching practices otherwise it is difficult to see how teachers can make the time to voluntarily change.

4.2.4 The impact of the curriculum and assessment on VLE acceptance

A clear majority of teachers surveyed, 84% non users and 72% users, believe the VLE is not necessary in order to meet curriculum requirements. 67% of non users do not believe the VLE will help promote success at examinations and a significant 34% of users believe likewise. The perception that the VLE will not help promote success at examinations is clearly the more pronounced differentiator between users and non users and appears the more significant determinant of VLE acceptance.

All teachers interviewed express the opinion that, in the majority of subjects, the curriculum and assessment were incompatible with use of the VLE and particularly with examination classes. Two comments by two separate teachers characterise teacher opinions:

Without a doubt, a 100% yes, absolutely. Ill try not to be subject specific again but if you are geared towards exams, your focus is wholly on exams, and you don't want to get off the beaten track and I think the VLE, to me at the moment, in my head is off the beaten track

Our system is exam driven, it is teaching to the test and it is not very sympathetic for learning new practices. It does not, that I have seen, require that we adopt new practices.

This reflects the findings of the survey however, 68% of teachers surveyed, in their written responses, listed examples of how the VLE can improve teaching and learning. A number of examples were given by teachers in interviews of how the VLE could promote e.g. “higher order skills”, “independent learning”, “social learning” , “active learning”, “discovery learning”. It was also the opinion of all those interviewed that the curriculum is adaptable in some subjects however for most subjects it is not and will not lend itself to use of a VLE.

In summary, the pressure of exams, the nature of assessment and the pressure of curriculum coverage, as one teacher put it “because the curriculum is so charged” led all teachers interviewed to view the VLE as incompatible with the curriculum and assessment and reflects the survey findings.

Chapter 5

Discussion

5.1 Introduction

This chapter discusses the findings in the context of the literature review and the research questions.

5.2 Discussion of findings by research question

5.2.1 Technological factors affecting VLE acceptance

The lack of appropriate ICT facilities is identified internationally as the principal barrier to ICT integration (Pelgrum 2001). This study has indicated that this is certainly a factor in VLE adoption with 45% of non users of the VLE indicating that they do not believe there is a good technical infrastructure to support use of the VLE. The school has a good ICT infrastructure, relative to the majority of schools, and further analysis of data in the study unravels the greater detail of what teachers perceive as necessary for the support of the VLE.

Teachers (44% in their written responses on the questionnaire), quite rightly emphasised the need for a stable network and internet connection, data projectors in all classrooms, also ICT support both in terms of the ICT infrastructure and the VLE. This emphasis on support reflects a recent European study which established that 85% of Irish teachers believe there is inadequate support for maintenance for ICT in our schools (European Commission – Information Society and Media Directorate General 2006). Support in the context of the VLE emphasised a prompt response to technical issues e.g. issues with the wireless network but also some basics of VLE management such as password resets. Put simply, teachers maintain that to use a VLE with confidence the ICT infrastructure and the VLE must work all of the time and support should also be available with a minimum of delay.

There are clearly issues to be addressed here however there was further evidence that it is also perhaps an issue of organisation of the existing ICT facilities in the school. All teachers interviewed believed the ICT infrastructure to be good but emphasised access to ICT suites as a key issue. Examination of the VLE logs confirmed that this does indeed appear to be a factor. The VLE logs indicate that principal use of the VLE is in classes timetabled in the ICT rooms. This would appear to reflect findings of studies which indicate that inadequate access to computer laboratories can be a factor and the organisation of computers into ICT suites as oppose to classrooms (Fabry and Higgs 1997). The school has moved towards placing more PCs in classrooms and survey findings suggest that access is not the key factor in regard to VLE adoption. Another teacher, when the VLE logs for course activity is examined, makes significant use of the VLE primarily to provide students with learning opportunities outside of school. Those classes rarely use the ICT rooms. The VLE can offer learning opportunities anywhere any time and its application is not exclusive to whole classes logged on in an ICT room.

Looking further at the issue of access the study shows the most frequent use of the VLE is in timetabled classes in the ICT rooms, but importantly it is also, as confirmed by the VLE logs, primarily in two subjects, ICT and LCVP. The significance of this is best understood when one examines how and why it is used in those subjects. The two teachers who set up the courses in ICT in the VLE were also the VLE administrators. They have adapted their methodology over a period of three years to a blended approach based on primary delivery of the course via teacher instruction, the VLE and testing software. It may be stating the obvious but they clearly understood the benefits the VLE had to offer and saw value in using it. The LCVP course was developed by a teacher who simply decided that the best way to manage all the documents students produce on the course was by using the VLE. The course became essentially a document management facility. Again, this teacher clearly understood a benefit of the VLE and others followed but not all LCVP teachers because not all found this suited their approach. When the most active courses are compared, what they

have in common is not primarily access rather it is teachers who understand the benefits of the VLE and see value in adopting it in their practice.

The VLE was perceived by teachers in interview as better suited to some subjects. One could argue this based on which subjects make primary use of the VLE. However teachers in interview had divergent perceptions of which subjects they thought best suited working with a VLE. This ranged from “technology oriented” subjects to subjects which demanded “higher order thinking” as opposed to “recollection of facts” to subjects which favoured “project oriented, discovery learning”. This would in fact cover a broad range of subjects although teachers did name specific subjects they found difficult to see making use of a VLE. Looking again at the primary users of the VLE, after ICT and LCVP, the next most significant users are art history and SPHE. Quite different subjects but once again, in looking for the common denominator, it appears to be teachers who understand the benefits of the VLE and see value in adopting it in their practice.

Other findings of the survey show that teachers, outside of timetabled classes in ICT rooms (LCVP and ICT), only make occasional use of PCs with their students. The occasional use of the VLE outside of ICT and LCVP is not then a distinct failure or distinct case of rejection of an innovation rather it fits within a context where use of PCs with students is occasional.

One finding regarding technological aspects of a VLE and barriers to adoption emerged clearly. This is that teachers favour an integrated MIS (Facility and ePortal) and VLE solution. As 89% of teachers favour this then it is certainly necessary to consider that an integrated MIS and VLE solution is likely to help facilitate VLE adoption. Although the question was never directly asked in the study it can be implied from this that multiple logins for services frustrates teachers and is to be avoided.

In conclusion this study indicates that teacher confidence to use a VLE is conditional on meeting their high expectations of the ICT infrastructure and support. It is also conditional on access to ICT rooms and data projectors in all classrooms. This however is as much about teacher confidence in facilitating conditions and perceptions of the benefits of the VLE and how it can be used rather than an enabling structure which would necessarily in itself result in increased VLE usage. While technological factors are significant there are many other determinants of VLE adoption.

5.2.2 Teacher attitudes to the VLE as an innovation

There are many aspects to teacher attitudes to the VLE as an innovation. The degree to which teachers believe the VLE will help them make gains in job performance, i.e. performance expectancy, is complex. The evidence of the study certainly confirms Rogers Decision Process theory (Rogers 1995) and common sense in that teachers clearly have to be persuaded as to the value of an innovation before adopting it. There are inevitably many factors which influence a teacher's decision in this regard.

There was evidence that a majority of teachers, 87%, understand that a VLE can improve teaching and learning in their subject however 59% also believe that the benefits are not commonly known among staff. This conflict between believing the VLE has value but not knowing exactly what that is emerged in interviews and in VLE documentation to reflect their lack of understanding of how to apply it in their own practice. Teachers appreciate the value of the VLE in theory but most do not know how to put it into practice. More importantly they are not easily convinced of the benefits for their students.

It was apparent in interviews that teachers reflect on their practice and the value of any changes made to their students. Their decision to adopt or reject the VLE was not without

consideration. There was much evidence in interviews, of teachers' reluctance to change their practice e.g.

I don't think there's anybody against a VLE, anything that adds but, being a teacher, you're set in your ways. You have your own methods of teaching and anybody who comes in and tries to introduce something new, you kind of feel you have your own methods, you have your own time, your planning, you've it all done out and if somebody introduces something which is time consuming, which involves learning, very few people, actually most people would be, in my opinion, reluctant to do it.

This might appear out of context to fit with Rogers concept of "laggards" who adopt an innovation late if at all due to their not being predisposed to being innovative (Rogers 1995). In reality teachers have an uneasy relationship with innovation. There is, as can be seen in the quotation above, the issue of time and appropriate continuing professional development. There is also the need for the innovation to be proven. Teachers need to feel confident that adopting an innovation will not undermine their ability to support their students in becoming successful, not only as learners but also at examinations. Given these factors it would seem prudent for teachers to be careful about a new innovation such as a VLE rather than being reluctant to innovate in their practice. This study suggests that teachers are reluctant to take risks and innovate with a VLE if they are concerned that student learning and performance may suffer.

Given the uncertainty about the benefits of a VLE what is the cost to a teacher of using it? The results show that 46% of teachers believe the VLE requires more effort than established methods. In interviews this was inevitably related to a lack of time as evidenced from the quotation above. This is consistent with other studies (Ghua 2000) and teachers in interview explained that with other commitments such as extra curricular activities they have many demands on their time.

The issues are all interconnected. The idea of "effort expectancy" the degree of ease associated with the system as described in the UTAUT model cannot be isolated (Venkatesh

et al 2003). Teachers indicated they would be willing to make the necessary effort but only with appropriate training and time allocated. The survey evidence indicates teachers find the VLE difficult to learn how to use, both technically and pedagogically which confirms studies in other countries (e.g. Pelgrum et al 2008) regarding technology adoption. The only way to address this is through training which in the case of a VLE requires considerable effort and commitment.

The issue of time was reflected also where 98% of those surveyed agreed that pre installed courses in the VLE, of a good quality and to suit the Irish curriculum will improve take up of the VLE by teachers. The recent Strategy Group Report acknowledges “a lack of relevant, engaging and educative digital content is a concern for time-pressured teachers” (DES 2008). The school had responded to this issue which had been raised early in the implementation process by subscribing to an online repository of digital content which included material specifically for use in a VLE e.g. scorm packages. The content was over time found not suited to the Irish curriculum and much of it of a poor quality. The service is designed and marketed primarily in the UK although claims were made in its marketing that it was being mapped to the Irish curriculum. The yardstick of relevance to the Irish curriculum and a good quality of digital content, a point emphasised in the Strategy Group Report, was confirmed by the school in this trial.

The report also quotes the NCTE’s Digital Content Strategy three most effective approaches of “procure, build and share” and the potential for VLEs to facilitate this. Teachers in interview thought it unreasonable to envisage that any substantial body of high quality digital content could be created by “time-pressured teachers”. They believe it requires specialist skills both technological and pedagogical which the average teacher will not have. Some teachers in interview were reluctant to share their “notes” or other material in a VLE and believed there would not be an equivalence of value in all the material shared or sufficient

incentive to do so. The concept of a community of practice was new and difficult to appreciate.

Their expectation, which the school responded to with the trial of an online repository of digital content, is that digital content should be available in the same way as a text book.

This was clear in one interview where the teacher explained:

Looking at the online textbooks from the major publishers, if the kind of material their offering starts turning up on VLEs, multimedia materials for subjects, if that was readily accessible and detailed then teachers would find it so interesting and so useful they would feel a need to get at it. If you build it they will come. At the moment teachers ask what is in it for me, the kind of time teachers have to invest to make their subject on it interesting. If a teacher feels they are going to have to spend hours putting material up, are they going to bother? That's the point. When they can get away with the text book, when nobody is forcing teachers to use modern technologies, then they are unlikely to use them.

This would appear to reflect, more or less, the view of 98% of teachers in this study and underline the need for the provision of appropriate digital content for use in a VLE.

In conclusion, the majority of teachers appreciate the value of the VLE in theory but most do not know how to put it into practice. The VLE is considered difficult to use both technically and pedagogically and requires a considerable effort from teachers. The key to solving this is allocated time for appropriate training. Teachers are reluctant to innovate and take risks by using it when concerns exist about its impact on student learning and performance. Appropriate digital content must be made available in order to promote VLE adoption by teachers.

5.2.3 Teacher attitudes to the VLE implementation process

The strategy group report recommends that:

the successful integration of ICT in teaching and learning depends on a planned and coordinated approach, involving all staff and spearheaded by strong leadership at all levels.

(DES 2008)

This study revealed that 95% of teachers at the school believe that the management support use of the VLE. In interviews and written responses on the questionnaires there were many attitudes to the VLE implementation process which focused almost exclusively on provision of appropriate training and support.

The requirements for training and support in implementing a VLE in a school are substantial. In the same school when ePortal was introduced the implementation process took place over several weeks working towards an agreed deadline for completion. There were some initial difficulties however it is, compared to a VLE, a very basic system with a simple application. It required a relatively brief induction during one staff meeting. The introductory course for the VLE in contrast required six after school sessions of one and a half hours each. There is without doubt a substantial effort required of a teacher to adopt a VLE in their practice. The issue of training and time allocated for it is very significant.

This study confirms research which indicates the need for differentiated training which takes into account differences in ability and learning styles (Veen 1993). This is precisely what teachers in the study identified as necessary for promotion of the VLE. In addition they strongly recommend subject specific training. This emphasis on training points towards the pedagogical aspects of using a VLE which for the teacher is the bridge between appreciating that a VLE has a certain currency and not knowing how to use it in their own practice. Where curriculum support services have incorporated ICT into their programmes, it has subsequently led to greater ICT integration in the classroom (DES 2008). This study suggests that a similar linked up training between curriculum and technology is what teachers want when a school is implementing a VLE.

The survey shows that they also want this type of training regularly, in small groups during school time. Time emerged as an issue in relation to different aspects of adopting a VLE but very strongly in relation to training. Lack of time for both formal training and self –directed exploration is a significant barrier to ICT integration (Ghua 2000). This study indicated that 28% of non users see lack of time as an issue and particularly in respect of preparing content. It is apparent from this study that invitations to teachers to attend training in a voluntary capacity outside of school hours is not effective in embedding use of a VLE in their practice. This is consistent with findings of studies of ICT integration in Irish schools (DES 2008). It is therefore necessary for VLE implementation to address issues of time and training as much as possible.

The study findings also indicate the need to give greater currency to ICT integration within the school culture and the wider culture of education. It indicates that teachers perceive there is little gain in being seen to be using the VLE. The UTAUT model, in voluntary contexts, sees the social influence taking effect as influencing perceptions about the technology, known as internalization and identification (Venkatesh et al 2003). As use of the VLE is voluntary in the school which is the subject of this study, the social influence appears to have given the VLE a poor rating with for example 67% seeing no prestige attached to use of it. This may be due to the school culture as much as the greater culture outside the school. It highlights though the need for incentives for and recognition of teachers integrating ICT in their practice both within the school and wider culture. In this study deficits in this regard have had a negative impact on VLE integration.

A top down approach to VLE implementation, which was found in a UK study to be fraught with difficulties and ineffective, has not been adopted at the school (Dutton 2004). In an approach consistent with the NCCA ICT framework the school has instead sought to diffuse innovation with ICT and the VLE among the teachers, an approach found more successful in

the UK study. Efforts have been made both in provision of an appropriate infrastructure and training to enable teachers to use the VLE.

The professional role of the teacher and teacher autonomy in making judgements to evaluate the potential of the VLE has been respected. This is because teachers are considered best placed to make these judgements as was the case in design of the FIS project (McNamara and O'Hara 2004). This also reflects the NCCA ICT framework design as an enabling framework and the need for local variations and necessary adaptations. Put simply teachers were encouraged to use the VLE but entirely at their own discretion.

This approach has had some success however the study shows that VLE use is modest with only 16% of teachers surveyed making any significant use of it. All teachers interviewed referred to external drivers in relation to the implementation process and expanded the implementation process beyond the actions of management and staff at the school. The key influence was seen to be the curriculum and assessment although other factors such as investment nationally in the ICT infrastructure and training were also cited. The study shows that teacher attitudes to the implementation process of the VLE in the school are tied to their attitudes and responses to national objectives in education and national strategies for reshaping learning. The implementation process at local level in the school and its success is dependent on developments in education at a national level.

In conclusion, the implementation process of a VLE receives the support of teachers where it respects their autonomy as professionals to decide on the value of it to them and their students. Incentives are needed to give currency to integrating ICT in education and adoption of a VLE. Allocated time for appropriate training is required which is differentiated and deals with the pedagogical affordances of the VLE. Strategies and measures at school level for implementing a VLE are dependant on external factors. Teacher attitudes to these

are tied to their attitudes and responses to national objectives in education and national strategies for reshaping learning.

5.2.4 The impact of the curriculum and assessment on VLE acceptance

Incentives and recognition for innovative practice with a VLE may help motivate teachers to adopt it however this study findings show, as do others (Snoeyink and Ertmer 2001), that lack of motivation to change pedagogical practices impedes ICT integration. Most teachers in the study, 90%, believe that using the VLE requires new approaches and methodologies. Issues of time and effort emerged in the study to contribute to teachers deciding not to undertake this change in methodology along with an array of issues such as available content and confidence.

In considering teacher motivation for change of pedagogical practice the study identified the curriculum and assessment as key factors. The most significant reservations about performance expectancy in respect of the VLE were found in relation to whether or not it will help promote success at exams. A clear majority of teachers surveyed, 76%, believe the VLE is not necessary in order to meet curriculum requirements. Most importantly, 67% of non users do not believe the VLE will help promote success at examinations and a significant 34% of users believe likewise.

The degree to which teachers believe the VLE will help them make gains in meeting the requirements of the curriculum and assessment is no different to difficulties which might present with any other technology in teaching and learning. This study however indicates that it is not simply about knowing how to apply the technology in practice. It shows that teachers want to see the benefit and how it is applied not only in terms of improved learning but ultimately in performance at examinations. Understanding the value of the VLE and knowing how to put it into practice is for teachers also about having the confidence that

using it effectively will enable students to succeed at examinations. In interviews it emerged that many teachers require that this benefit is proven and demonstrable.

This emphasis on the benefits of the VLE being measured in how it helps improve examination performance is reflected in the following statement by a teacher in interview:

Our system is exam driven, it is teaching to the test and it is not very sympathetic for learning new practices. It does not, that I have seen, require that we adopt new practices.

Another teacher in interview explained that as a methodology it had to be proven before he would adopt it and he would want a demonstration of how to use it in teaching his subject. In saying this he emphasised proof in respect of improving results at examination. It was also an issue of good use of class time. In interview when teachers referred to the curriculum as “knowledge laden” and “charged” they also explained that the pressure to cover the syllabus and have students exam ready meant that class time was precious. As one teacher explained:

If you are geared towards exams, your focus is wholly on exams, and you don't want to get off the beaten track and I think the VLE, to me at the moment in my head, is off the beaten track.

Rogers Theory of Perceived Attributes explains that an innovation will have an improved rate of adoption if the potential adopter perceives that it “offers observable results” (Rogers 1995). The UTAUT model defines performance expectancy as the degree to which an individual believes that using a system will help him or her to attain gains in job performance (Venkatesh et al 2003). Both qualitative and quantitative findings in this study indicate that for teachers “observable results” and “gains in job performance” relates to ensuring success at examinations. It also shows that teachers have difficulty in seeing how a VLE can facilitate this. This is a challenge not only for implementing a VLE but also for the development of an e-learning culture in schools. Teachers in this study are positive about e-learning but they have difficulty in seeing the compatibility of “achieving a powerful learner-centric, e-learning

culture” as recommended by the recent Strategy Group Report and supporting students in achieving at examinations (DES 2008).

Those who choose not to integrate ICT in teaching may do so with good reason as they may believe that technology does not enhance learning (Yuen & Ma & Preston et al, cited in Becta 2003). This study confirms this, with the measure of enhanced learning for teachers being success at examinations. This is their measure, not necessarily because they view success at examination as the best measure of learning, but because it is the measure to which they are accountable. This brings to bear a critique of the Irish education system that

For many learners at second and third levels the most important thing is not that they should learn, but that they should get good qualifications’

(Little, cited in Freeman et al 2001)

Change of pedagogical practice and adoption of the VLE is inextricably linked to curriculum and assessment. Change in one is more likely to be linked to change in the other. This study shows that this type of change is not taking place in any significant way. It indicates that a critique of the IT 2000 initiative for lack of an adjusted rethinking of curriculum and assessment as compared to similar initiatives in Finland and Sweden is relevant still (Freeman et al 2001).

In conclusion this study shows that teachers find it difficult to see the compatibility of using a VLE with promoting success at examinations. The benefits of the VLE must be proven before teachers will adopt it. The NCCA ICT Framework is a valuable tool for schools. However, this study indicates that despite such initiatives, as with IT 2000, an impediment to ICT integration and in this case VLE adoption, is the existing curriculum and assessment.

5.2.5 Summary of answers to research questions

This study indicates that teacher confidence to use a VLE is conditional on meeting their high expectations of the ICT infrastructure and support. Issues such as access to ICT rooms and data projectors in all classrooms are important however addressing technological requirements alone will not result in increased VLE usage.

The majority of teachers in this study appreciate the value of a VLE in theory but most do not know how to put it into practice. The VLE presents challenges both technical and pedagogical and requires a considerable effort from teachers. The key to solving this is providing time for appropriate training. Appropriate digital content must also be made available in order to support VLE adoption by teachers.

The implementation process of a VLE receives the support of teachers where it respects their autonomy as professionals to decide on the value of it to them and their students. Incentives are needed to promote development of an e-learning culture in schools and training which deals with the pedagogical affordances of the VLE. Teacher attitudes to implementation strategies at school level are tied to their attitudes and responses to national objectives in education and national strategies for reshaping learning.

The benefits of the VLE in improving student learning and performance at examinations must be clear before teachers will adopt it. The NCCA ICT Framework is a valuable tool for schools however; this study indicates that despite such initiatives an impediment to ICT integration and in this case VLE adoption is the existing curriculum and assessment.

Chapter 6

Conclusion and Recommendations

6.1 The rate and extent of VLE adoption

Significant progress has been made in the implementation of a VLE in the school which is the subject of this study however the actual use of it in practice is modest. The transformative impact of the VLE on teaching and learning at the school has yet to be realised.

This is consistent with findings on VLE implementation in the UK (Ofsted 2009) and not surprising in the context of a the recent Strategy Group's Report which included information on "certain difficulties around generating and sustaining innovative ICT activity in our schools"(Department of Education and Science 2008).The evidence of a successful VLE implementation would be in changes in curriculum delivery with VLE dependent instruction and widespread teacher and pupil participation as part of the mainstream activity of the school. This target and the changes required to meet it will not be met for some time.

6.2 Technological factors affecting VLE acceptance

This study examined technological factors affecting VLE adoption and made clear that the recent Strategy Group's Report recommendations regarding the development of schools ICT infrastructure is a fundamental and long overdue element of ICT integration. In particular it made evident that the more complex ICT infrastructural requirements necessary for implementation of a VLE are not in place and require also a very efficient technical support. The provision of a high speed broadband connection is a specific requirement as the

existing bandwidth provision has been found in this case study to be inadequate for use of a VLE.

The report recommends the provision of centrally provided broadband services such as VLE environments. This area requires careful consideration as this study shows clearly that teachers would welcome an integrated MIS and VLE solution. The current LDAP login system for teachers devised and developed by HEAnet in collaboration with the NCTE for services such as Scoilnet Maps and the Scoilnet webhosting-blogging service is a likely gateway for a centrally provided VLE. This will need to not only facilitate teacher's use of services but also encourage it. This study found that multiple logins for services frustrates teachers and this is to be avoided. It is desirable therefore that a centrally provided VLE incorporates or allows for an integrated MIS and VLE solution which requires a single login.

There exists a commercially available integrated MIS and VLE solution however the costs may not be within the reach of many schools. The benefits in the short term may not appear to justify the investment by a school when uncertainty surrounds the likely take up of a VLE in teaching and learning. The school in this case study used an open source solution at minimum cost however given the actual usage of the VLE it is questionable if the initiative could have been justified had a commercial solution been adopted. It is desirable therefore that such a service is provided centrally although schools may also welcome the option to purchase alternative solutions. In that case it is desirable that measures are taken to facilitate more and better market offerings of integrated MIS and VLE solutions.

These are complex issues and likely solutions will no doubt have difficulty in accommodating all the variables outlined here. The infrastructural provisions eventually available will also create a need for appropriate advice and support for schools. Technical support was identified in this study as needing to be prompt but also should ensure efficient management

of a stable VLE solution. The report suggests investigation of the feasibility and practicality of a VEC-provided technical support service to schools. This and other suggestions in the report for development of technical support to schools need to be implemented if the use of a VLE is to be promoted because this study showed clearly that teacher confidence in the use of a VLE is conditional on a high quality ICT infrastructure and technical support.

6.2.1.1 Recommendations

1. An adequate level of broadband internet should be made available to schools.
2. A centrally provided VLE service should be made available to schools.
3. The centrally provided VLE service should incorporate or allow for an integrated MIS and VLE solution which requires a single login.
4. Measures should be taken to facilitate more and better market offerings of integrated MIS and VLE solutions.
5. The NCTE broadband service desk or a dedicated service should be developed to include technical support for a centrally provided VLE service.
6. A centrally provided technical support service should be made available to schools.

6.3 Teacher attitudes to the VLE as an innovation

The recent Strategy Group's Report recommendations on continuing professional development reflects the suggestions made by teachers in this study to promote use of the VLE. In particular the report's emphasis on embedding the pedagogical affordances of technology in in-service programmes would help address the findings of this study that teachers find a VLE difficult to use both pedagogically and technically. The recommendation that "In- school CPD has a strong impact in improving staff's understanding of the role of ICT and how to plan for ICT usage in familiar teaching contexts." was found accurate and true in respect of VLE adoption in this study (Department of Education and Science 2008). Teachers surveyed placed an emphasis on the issue of time in relation to CPD and a preference for regular subject specific in-school CPD in small groups.

Its recommendation for development of communities of practice among teachers in line with Web 2.0 developments and VLEs relates to its recommendations on ways of providing software and digital content for learning and teaching. In this study 98% of teachers surveyed believe pre installed courses in the VLE, of a good quality, and to suit the Irish curriculum, will improve take up of the VLE along with differentiated CPD and support specific to using a VLE. There are many examples internationally of centrally provided services which provide support of this kind to schools using a VLE. The example of CLEO, Cumbria and Lancashire Education Online, is one such model which might offer an idea of how services and support might be offered in the future by the NCTE. It uses open source software which is encouraged by the report and was used by the school in this case study to good effect. This study indicates that such a model which provides content, exemplars of good practice, services, support and a community of practice is a desirable model and one which merits investigation.

6.3.1.1 Recommendations

1. CPD in ICT integration should form part of in-service for new and revised curricula/syllabi.
2. CPD should include an element on the pedagogical affordances of technology.
3. CPD should be provided in-school and form part of whole-school professional development initiatives.
4. CPD of this kind should be provided regularly over time.
5. A national education network should be developed which links schools nationwide and provides access to national digital resources. This could be accessible via the centrally provided VLE service.
6. The NCTE working with other services (e.g. SLSS, LDS, SDPI, and SDPS) should make available consultants to work on schools multimedia rich curriculum projects and ideas including training and support for VLEs.

6.4 Teacher attitudes to the VLE implementation process

This study revealed that the implementation process receives the support of staff where the professional role of the teacher and teacher autonomy is respected. The NCCA ICT framework as an enabling framework was shown to support this approach and provides a template for planning strategies for ICT integration reflected in the approach adopted in the implementation of the VLE. Developing an e-learning culture in a school is a complex process and more measures need to be taken nationally to incentivise teachers to buy into e-learning.

This study would conclude that teacher attitudes to the implementation process of the VLE in the school are tied to their attitudes and responses to national objectives in education and national strategies for reshaping learning. Where a school is undertaking the implementation of a VLE this study indicates that strategies adopted should be devised with that context in mind.

6.4.1.1 Recommendations

1. CPD should be provided for principals which includes support for their role in integrating ICT in their school.
2. The role of ICT coordinator should be reviewed and given appropriate recognition nationally in schools.
3. CPD for ICT coordinators should be enhanced and include training on VLEs.
4. Incentives for teachers to promote ICT integration should be considered e.g. accreditation for undertaking CPD, establish eLearning coordinator as an additional role in schools to ICT coordinator.
5. Pre-service training should incorporate an element of ICT integration in teaching and learning including use of a VLE.

6.5 The impact of the curriculum and assessment on VLE acceptance

The study has shown that changes in the design of new strategies and policies at national or school- level will not easily persuade teachers to implement change in the use of ICT in education. The recent Strategy Group's Report, 'Investing Effectively in Information and Communications Technology in Schools 2008 -2013' makes many recommendations which , if implemented, will address most of the core issues identified in this study as barriers to VLE acceptance and technology acceptance generally. Investment of that kind will see greater levels of technology adoption however this study indicates that in promoting technology adoption attention must shift to curriculum and assessment as the core of the education system which shapes the character of teaching and learning.

The NCCA ICT framework and the Strategy Group's Report is a blueprint for developing ICT integration in teaching and learning. Many of their recommendations are in part reflected in the work of the school in this study and the initiative to implement a VLE. They are also reflected in recommendations by teachers in this study for strategies for promoting use of the VLE. While change will be incremental, and the school's initiative to implement a VLE reflects that, this study shows that the blueprint for ICT integration will ultimately hinge on a reshaping of curriculum and assessment.

This study suggests that the ongoing review and implementation of junior and senior cycle education will be the more significant catalyst for change in respect of technology adoption in the future. The role of ICT in the preparation and presentation of coursework for assessment purposes and the question of how student achievement in ICT would be recognised and rewarded are key issues which emerged in both quantitative and qualitative findings of this study.

A study which critiqued the IT 2000 initiative for lack of an adjusted rethinking of curriculum and assessment as compared to similar initiatives in Finland and Sweden (Freeman et al 2001) is a cautionary reference point for consideration of the NCCA ICT framework and the recent Strategy Group's Report. The NCCA publication 'Innovation and Identity: Ideas for a new Junior Cycle' in its introduction makes the following point about the current Junior Cycle as reflected in the TALIS report:

The TALIS report reassures us that teacher-student relationships are good. But it also tells us that more than any other country in the study, teachers focus more on what the study refers to as 'structuring practices' (how learning is structured and organised) than on student-oriented practice or enhanced learning activities.

(NCCA 2010)

This reflection on teachers focus in respect of the Junior Cycle is a revealing counterpoint to the following recommendation from the recent Strategy Group's Report:

Integrating ICT in school life hinges largely on its successful curricular application. Schools must take a learner centred, rather than a technology-centred, approach to ICT in order to create positive learning outcomes.

(Department of Education and Science 2008)

It is revealing of the conflict between the current emphases of teacher focus, in this case in their role in the junior cycle classroom, and the very different direction which they are intended to take for successful curricular application of ICT.

That conflict was revealed in this study as a key issue in teacher attitudes to the VLE. It emerged in teacher's perceptions of the constraints of the existing curriculum and assessment as primary barriers to VLE adoption. Most teachers in the study, 90%, believe that using the VLE requires new approaches and methodologies. A significant 76% believe the VLE is not necessary to meet curriculum requirements and 48% do not believe the VLE will help promote success at examinations. In summary, it is likely that significant change will only occur when the ongoing reviews and implementation of junior and senior cycle education finally establish the role of ICT as an integral part of the curriculum and assessment in all subjects.

In this case study in a school with a comparatively good ICT infrastructure, a planned and coordinate approach to VLE implementation informed by the NCCA ICT framework with supportive staff and management, the adoption of a VLE in teaching and learning is modest. The key finding of the study, in seeking to understand this modest take up of the VLE, is in relation to the impact of curriculum and assessment on VLE acceptance by teachers. It is that despite national strategies for effective investment in schools and an ICT Framework which is not a curriculum area or a syllabus, it is more likely that change in the curriculum and assessment will drive technology integration. This study would conclude therefore that, as an initiative, a school is best to view the implementation of a VLE as part of a longer and broader process of change which is likely to unfold in small increments over time.

6.5.1.1 Recommendations

1. New and revised curricula/syllabi should provide for ICT integration.
2. The State Examinations Commission in its work should provide for ICT integration.

6.6 Limitations of the study

There is no reliable way to generalise from a small convenience sample which formed the basis of this research however its primary purpose is to better understand the experience of implementing a VLE at the school rather than to generalise. The results are limited in that they are dependent on the unique characteristics of the sample. As more research of this type is undertaken the credibility of findings will be enhanced.

6.7 Recommendations for future study

The findings open up for further research the question of how the curriculum and assessment influences attitudes of teachers to technology acceptance and how opinions about educational technology among teachers are developed. Information from this case study supports the view that teachers have positive attitudes towards ICT and the potential benefits of technology use for them and their students. Results show that factors influencing technology acceptance are largely consistent with those identified in technology acceptance models. There are however inevitably complexities and unique characteristics of technology acceptance in the Irish education system which these models are limited in their ability to understand. Further enquiries of technology acceptance in schools in Ireland will generate knowledge which can help improve the integration of ICT in teaching and learning. Further study initiated by the Department of Education and Science (DES) to evaluate how VLEs are developing in Irish education would assist schools in bringing them into mainstream learning.

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Appendices

Appendix A.

Model	Core construct	Definition
UTAUT	Performance expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh et al 2003).
UTAUT	Effort expectancy	The degree of ease associated with the use of the system (Venkatesh et al 2003).
UTAUT	Social influence	The degree to which an individual perceives that others believe that he or she should use the system (Venkatesh et al 2003).
UTAUT	Facilitating conditions	The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system (Venkatesh et al 2003).
IDT	Perceived Attributes	Rogers Theory of Perceived Attributes (Rogers 1995) identifies five attributes of an innovation which influences the potential user's decision to adopt or reject: relative advantage, compatibility, complexity, triability and observability.
IDT	Individual Innovativeness	Individuals who are predisposed to being innovative will adopt an innovation earlier than those who are less so (Rogers, 1995).

Table 1.

Appendix B

Model	Core construct	Statement
UTAUT	Performance expectancy	<p>1. Using the VLE would improve teaching and learning in my subject.</p> <p>2. I would find the VLE useful in my job.</p> <p>The benefits of the VLE are commonly known among the staff.</p> <p>28. Use of the VLE will help promote success at examinations for students.</p>
	Effort expectancy	<p>5. The VLE can be used in teaching and learning for the same amount of effort as established methods.</p> <p>6. Use of the VLE requires an acceptable investment of time.</p> <p>7. Use of the VLE can decrease the time needed for my important job responsibilities.</p> <p>10. I find learning to use the VLE easy.</p> <p>11. It takes too long to learn how to use the VLE to make it worth the effort.</p> <p>12. The VLE is considered by staff to be easy to learn.</p> <p>22. Learning to use the VLE requires a significant amount of training.</p>
UTAUT	Social influence	<p>8. Other staff will perceive me as competent through use of the VLE.</p> <p>9. I will increase my chance of promotion through use of the VLE.</p> <p>13. The management of the school support the use of the VLE.</p> <p>14. The staff in general supports the use of the VLE.</p> <p>15. There is resistance among staff towards use of the VLE.</p> <p>16. It is more prestigious for staff to use the VLE than not to use it.</p>
UTAUT	Facilitating conditions	<p>17. There is a good technical infrastructure to support use of the VLE.</p> <p>18. A single login facility which integrates ePortal and a VLE will improve take up of the VLE by teachers.</p> <p>19. Pre installed courses in the VLE, of a good quality, and to suit the Irish curriculum, will improve take up of the VLE by teachers.</p> <p>20. Access to ICT facilities in order to use the VLE is satisfactory.</p> <p>21. A specific person is available for assistance with use of the VLE.</p> <p>23. Time is allocated for training in a way which is suitable to staff.</p>

IDT	Perceived Attributes	<p>4. The VLE is used by many staff at the school.</p> <p>26. Using the VLE fits into the way I like to teach.</p> <p>29. The VLE is readily available to try out and experiment with before using with students.</p> <p>30. The VLE is more useful than other technology available to me.</p>
IDT	Individual Innovativeness	<p>31. I like to experiment and try out new approaches in my work.</p> <p>32. My role as a teacher makes it necessary to support the use of new media in the classroom.</p> <p>33. Using the VLE in teaching and learning requires new approaches and methodologies.</p> <p>34. My work as a teacher regularly changes in order to stay up to date with new methodologies and practices.</p>
Model	Dependant Variables	Statement
UTAUT	Voluntariness of Use	35. Use of the VLE is perceived as being voluntary.
None	Lack of ICT Confidence	36. If I have to explain computer programs to others, I think that I can do it well.
		37. I'm too old to learn how to deal with computers.
		38. I can do new things with computers without asking anyone.
		39. I can familiarize myself quickly with new programs.
		40. The "mindset" of the computer is alien to me.
		41. Students can exploit my ignorance of computers which makes using them a challenge for me.
		42. If I encounter problems using computers I believe I will find a solution.
		43. I feel good about using computers.

Table 2.

Appendix C

Letter to prospective Participants

January 2010

Dear Colleague,

I am currently engaged in a research dissertation which is part of a Postgraduate course in Digital Media Development in education which I am currently undertaking in the University of Limerick. This questionnaire survey is part of a programme of research designed to evaluate barriers to VLE (Virtual Learning Environment) adoption. It seeks to understand why some teachers might not use a VLE and why others do.

The survey consists of sixty questions and should take approximately 10 minutes to complete. There are no "right or wrong" answers. The only answers I am interested in are the ones that most accurately reflect your own personal opinion.

Instructions:

Tick one box in each row to indicate your answer.

The final two questions can be answered with a brief statement or using key words.

All information about individuals will be strictly confidential to the researcher, and no person will be identified in my work.

Thanking you in anticipation.

Yours sincerely

Joe Shortt

Appendix D

Questionnaire

Section1

Please complete ALL questions; it should take approximately 10 minutes of your time.

1. Gender.

Male

Female

2. Age.

20 - 25	26 - 35	36 - 45	46 - 55	55 -63

3. Subjects you teach

Irish	English	Maths	Science Subjects	Languages	Geography History	Technology Subjects	Art Music	PE	CSPE
Home Ec	ICT	LCVP	Business subjects	RE	SPHE/Life Skills				

4. Do you have a computer available to you at home?

Yes

No

5. Rate your level of computer usage.

	Computer usage Home	Computer usage School
Never		
Rarely		
Once a month		
Weekly		

Daily		
-------	--	--

6. How many years teaching experience have you?

1-5	6-10	11-15	16-20	21-25	26-30	30+

7. Rate your level of proficiency in ICT skills for general use.

Very Basic	Poor	Fair	Good	Very Good

8. Rate your level of proficiency using ICT in your classroom teaching of pupils.

Very Basic	Poor	Fair	Good	Very Good

9. Did you attend any VLE training provided at the school?

Yes No

If the answer to question 9 is Yes then please answer question 10. If not please proceed to the next section.

10. The VLE training was sufficient to allow me begin using the VLE.

Strongly agree	Agree	Disagree	Strongly disagree

Section 2.

Professional use of ICT	1 Never	2 Once or twice a year	3 Several times a year	4 Several times a month	5 Several times a week
1. How often do you use the VLE?					
2. How often do you make handouts for students using a computer?					
3. How often do you create a test, quiz or assignment using a computer?					
4. How often do you perform research and lesson planning using the internet?					
5. How often do you use email in your work?					
6. How often do you use a computer to deliver instruction to your class (e.g. using a digital projector)?					
7. How often do you adapt material to students' individual needs using a computer?					
8. During your classes: How often do students work individually using computers?					
9. During your classes: How often do students research/find information using the internet or CD-ROM?					
10. During your classes: How often do students use a computer for writing (e.g. coursework)?					
11. During your classes: How often do students use a computer to present information to the class?					
12. How often do you ask students to produce multi media projects using technology?					

Section 3.

If you have never used the VLE please complete this section based on what you know or think about it.

Questions about : The VLE, Using Computers and The Role of a Teacher	Strongly agree	Agree	Disagree	Strongly disagree
1. Using the VLE would improve teaching and learning in my subject.				
2. I would find the VLE useful in my job.				
3. The benefits of the VLE are commonly known among the staff.				
4. The VLE is used by many staff at the school.				
5. The VLE can be used in teaching and learning for the same amount of effort as established methods.				
6. Use of the VLE requires an acceptable investment of time.				
7. Use of the VLE can decrease the time needed for my important job responsibilities.				
8. Other staff will perceive me as competent through use of the VLE.				
9. I will increase my chance of promotion through use of the VLE.				
10. I find learning to use the VLE easy.				
11. It takes too long to learn how to use the VLE to make it worth the effort.				
12. The VLE is considered by staff to be easy to learn.				
13. The management of the school support the use of the VLE.				
14. The staff in general supports the use of the VLE.				

	Strongly agree	Agree	Disagree	Strongly disagree
15. There is resistance among staff towards use of the VLE.				
16. It is more prestigious for staff to use the VLE than not to use it.				
17. There is a good technical infrastructure to support use of the VLE.				
18. A single login facility which integrates ePortal and a VLE will improve take up of the VLE by teachers.				
19. Pre installed courses in the VLE, of a good quality, and to suit the Irish curriculum, will improve take up of the VLE by teachers.				
20. Access to ICT facilities in order to use the VLE is satisfactory.				
21. A specific person is available for assistance with use of the VLE.				
22. Learning to use the VLE requires a significant amount of training.				
23. Time is allocated for training in a way which is suitable to staff.				
24. I am willing to attend VLE training during school hours.				
25. I am willing to attend VLE training outside school hours.				
26. Using the VLE fits into the way I like to teach.				
27. Use of the VLE is necessary in order to meet curriculum requirements.				
28. Use of the VLE will help promote success at examinations for students.				

	Strongly agree	Agree	Disagree	Strongly disagree
29. The VLE is readily available to try out and experiment with before using with students.				
30. The VLE is more useful than other technology available to me.				
31. I like to experiment and try out new approaches in my work.				
32. My role as a teacher makes it necessary to support the use of new media in the classroom.				
33. Using the VLE in teaching and learning requires new approaches and methodologies.				
34. My work as a teacher regularly changes in order to stay up to date with new methodologies and practices.				
35. Use of the VLE is perceived as being voluntary.				
36. If I have to explain computer programs to others, I think that I can do it well.				
37. I'm too old to learn how to deal with computers.				
38. I can do new things with computers without asking anyone.				
39. I can familiarize myself quickly with new programs.				
40. The "mindset" of the computer is alien to me.				
41. Students can exploit my ignorance of computers which makes using them a challenge for me.				
42. If I encounter problems using computers I believe I will find a solution.				

43. I feel good about using computers.				
44. What advantages can a VLE offer in education?				
45. What problems do you associate with a VLE in education?				
46. What in your opinion will improve teacher take up of a VLE in education?				

In order to further develop this investigation, would you be interested in participating in a brief interview comprised of short questions which will include some questions based on this questionnaire.

Yes

No

If you answered yes above, could you please fill in the following information?

Name_____

Please note that this survey will be treated with the strictest confidentiality.

Thank you for your time, your opinions are very important.

Appendix E

Interview Questions

1. Do you use the VLE and if so how do you use it?
2. Is the ICT infrastructure in the school and access to it satisfactory for use of the VLE?
3. Do you feel confident enough in your ICT skills to learn how to use the VLE?
4. Do you think the VLE is easy to use?
5. Is time an issue for you in using the VLE?
6. Has the VLE training provided been suitable for you?
7. What kind of training do you think you need to use the VLE in your work and when do you think this training should be provided?
8. Do you think staff in general support the use of the VLE?
9. Do you think using the VLE involves new approaches to teaching and different methodologies to your current approach?
10. Do you like to try out new approaches in your teaching?
11. Do you think using the VLE would enhance or improve teaching and learning in your classes?
12. Would good quality learning resources designed for the Irish curriculum and available in the VLE change your perception of its usefulness?
13. Does the curriculum and assessment have an influence on your decision to use the VLE or not?
14. Are there any important points you would like to make about the introduction of the VLE to the school?

Appendix F

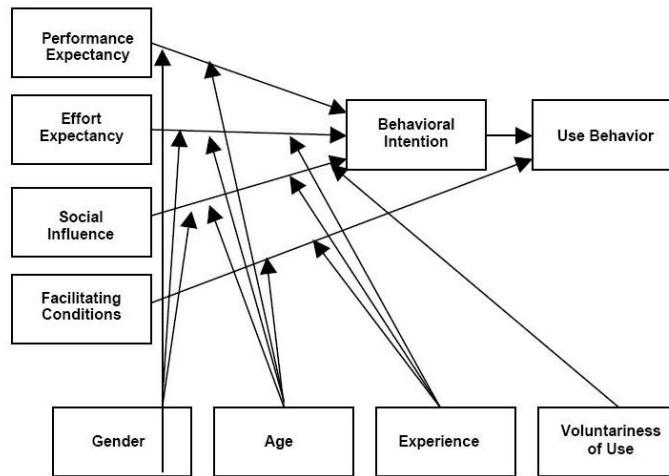


Figure 4. The research model of Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al 2003)