An Exploratory Study of the Development of Virtual Learning Environments for Adult Literacy Education.

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Declaration

I hereby certify that this material, which I now submit for assessment on the programme of study leading to the award of Ph.D. is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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Abstract

This thesis fundamentally was derived from the increasing demand for more flexible models of adult literacy education, within a wider agenda that aimed to improve accessibility to a wide range of users with different learning styles and to promote the use of Information and Communication Technology (ICT) as a necessary life-skill.

A study in 1997 by the Organisation for Economic Co-operation and Development, OECD, reported that one in four Irish adults lacked the basic literacy skills needed to function in society. In 2001, anecdotal evidence suggested that as low as four percent of Irish adults with literacy problems were receiving literacy tuition and support in established adult literacy centres in Ireland. A proposed solution to the problems of access and support, retention of anonymity and provision of flexibility in literacy education involved the establishment of virtual learning environments.

The focus of this research was to present a synthesis of developments in the area of the adult literacy tuition and support, and, furthermore, to ascertain whether there existed elements of a '*workable process*' for designing and integrating technology in literacy programmes that could be utilised in future developments of virtual learning environments. The focus of this investigation was primarily on design team and stakeholders engagement in the software design and development processes, as opposed to an investigation into the suitability of the learning processes adopted from an instructional perspective.

The findings of this research present a four-level 'workable process' that can be used to guide design teams through the process of software development. A contextual review of the area in which the software is to be embedded, and an analysis of the needs of the various participants, is considered pivotal to the success of this four-level process. The findings also emphasise the importance of collaborative teamwork, and furthermore the engagement of design team members in a dialectical process in consensus formation, as being critical to the successful implementation of this '*workable process*'.

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Abbreviations

ALO	Adult Literacy Organiser
BTEI	Back to Education Initiative
DBRC	Design Based Research Collective
DES	Department of Education and Science
EFA	Education For All
EU	European Union
FAS	Foras Aiseanna Saothair
FETAC	Further Education and Training Awards Committee
IALS	International Adult Literacy Survey
ICT	Information and Communication Technology
NALA	National Adult Literacy Agency
NLS	New Literacy Studies
OECD	Organisation for Economic Co-operation and Development
OTA	Office of Technology Assessment
RTL	Return to Learning
UK	United Kingdom
UNESCO	United Nations Educational Scientific and Cultural Organisation
URL	Uniform Resource Locator
WCAG	Web Content Accessibility Guidelines
WWW	World Wide Web

Chapter One

Introduction to the Study

1.1 Introduction

This thesis fundamentally was derived from the increasing demand for more flexible models of adult literacy education, within a wider agenda that aimed to improve accessibility to a wide range of users with different learning styles and to promote the use of Information and Communication Technology (ICT) as a necessary life-skill.

A study in 1997 by the Organisation for Economic Co-operation and Development, OECD, reported that one in four Irish adults lacked the basic literacy skills needed to function in society. In 2001, anecdotal evidence suggested that as low as four percent of Irish adults with literacy problems were receiving literacy tuition and support in established adult literacy centres in Ireland. A proposed solution to the problems of access and support, retention of anonymity and provision of flexibility in literacy education in Ireland involved the establishment of virtual literacy-learning environments.

This thesis centred on examining how virtual literacy-learning environments were developed in Ireland. The focus of this research was to present a synthesis of developments in the area of the adult literacy tuition and support, and, furthermore, to ascertain whether there existed elements of a '*workable process*' for designing and integrating technology in literacy programmes that could be utilised in future developments of online learning environments.

The focus of this investigation was primarily on design team and stakeholders' engagement in the software design and development processes, as opposed to an investigation into the suitability of the learning processes adopted from an instructional perspective. The reasons for less emphasis on the learning processes in this thesis were three-fold: Firstly, it was difficult to identify centres where online learning was being utilised on a daily basis. The integration of online learning in literacy education was a fairly recent development in Ireland and many centres were awaiting advice and / or training before embarking on online learning. Secondly, many literacy learners wanted

to retain their anonymity, and requested confidentiality whilst attending literacy centres. Therefore, it was extremely difficult to identify literacy learners that would be willing to participate in this study at that time. This could be circumvented in future research by contacting those literacy centres, as identified in the contextual analysis as part of this research, where literacy is '*out of the closet*'. Thirdly, due to the newness of the technology, most online software for the Irish market was in pilot mode and thus was incomplete from a literacy content or instructional point of view. Therefore, these pilot innovations would not have been sufficiently developed to allow meaningful findings, from a learning point of view, to be drawn from learner interactions. It is important to state here that end-users did engage in the evaluation of the virtual learning environments as part of this research. However, their feedback was used to illuminate the findings on the software design and development processes, rather than on the learning processes in this instance.

Therefore, this thesis offers a practical framework – *a workable process* - for guiding the development of technological enterprises to be integrated in literacy tuition and support, and also identifies contextual and development issues that may arise in the development of these enterprises. The findings also emphasise the importance of collaborative teamwork, and furthermore the engagement of design team members in a dialectical process in consensus formation, as being critical to the successful implementation of this '*workable process*'.

1.2 Intellectual Foundations

This thesis is situated in an intellectual continuum that was influenced by the work of technologists, such as Seymour Papert and his Logo group in the sixties; by the investigations of literacy practitioners, such as Paulo Friere in the seventies, by the work of literacy researchers, such as Jim Gee in the eighties, by the New Literacy Studies (NLS) movement in the nineties; and, finally, by the more recent work of technologists, such as Badrul Khan, on the development of e-learning or online learning environments at the turn of the millennium.

In the 1960's, Seymour Papert and his Logo group developed programming languages aimed at helping children think in new and abstract ways. Constructionism was one of the theories that underpinned the design and development work of the Logo group. They believed that people learned better if they were engaged in the design and creation of personally meaningful artefacts in a learning community (Umaschi Bers, 2001, pp. 23-24). In the 1970's, Paulo Friere's theory of literacy as a liberating force, that encouraged adults to think about the conditions they found themselves in, began to influence literacy practice. In the context of technological enterprises, he also believed that information and communication technologies could be used to liberate or oppress. In the 1980's, Brian Street promoted the concept of literacy as a manner of social practices. He contended that particular practices and concepts of reading and writing depended upon the context, and that they were *'already embedded in an ideology and cannot be isolated or treated as 'neutral' or merely 'technical'* (Street, 1984, p.1). In the 1990's, the socio-cultural approach to literacy and new forms of literacy, such as electronic technologies, were examined by the New Literacy Studies movement. (Lankshear & Knobel, 2003) Knowledge and meaning were seen as emerging from social practices or activities in which the learner was embedded. This constituted a move away from literacy as an individual skill towards a view of literacy as a social practice.

At the turn of the 21st century, the rapid expansion of the Internet led to a whole new era of online information and communication technologies. As the use of the Internet spread, educators became increasingly interested in finding meaningful ways of integrating the Internet into their teaching and learning environments. Initially, the Internet was primarily used as a resource for information. However, as applications for creating web-based information became user-friendly, educators became interested in using the Internet as a tool for publishing information, and for creating and transforming the learning experience. This led to the growth in online educational enterprises; initially these constituted the publication of web pages of student work, this progressed to interaction in online activities, such as WebQuests, and led to the formation of bulletin boards and chat-rooms. At the turn of the millennium, educators became interested in developing their own dedicated online learning environments. This led to calls for frameworks or guidance on best practice in designing web-based materials or

activities for use in an educational or training context. Badrul Khan's (1997) Framework for E-Learning was a response to the need for guidance in this area.

1.3 Overview of Research Process

This research set out to examine how virtual learning environments were developed in Ireland. This investigation utilised a Hybrid Design Research Model to structure the research process at three levels; namely, the contextual, developmental and experiential levels. At the contextual level, the core investigation involved an analysis of the Irish adult literacy sector, focusing on the critical examination of the development and integration of technology in adult literacy programmes. Secondly, at the developmental level, the design and development of a 'macro' online learning environment was examined. Thirdly, at the experiential level, the manner in which end-users interacted at a 'macro' level was examined.

1.4 Contributions of this thesis

This thesis traverses different disciples and domains of knowledge: such as adult literacy education, ICT and instructional design. The contribution of this thesis to the existing body of knowledge falls into two dimensions: contextual and developmental.

At the contextual level, this thesis presents an overview of developments in literacy tuition and support in adult literacy centres in Ireland. It informs the reader of how literacy learners are recruited or referred, the profile of learners at the centres, the programmes on offer, the format of literacy tuition and support, and other innovative developments at the centre. It summarises issues and barriers to literacy education in Ireland. Furthermore, it examines how technology is integrated into literacy programmes, highlights attitudes to the use of technology in literacy education and it also identifies issues in using technology in literacy tuition and support at adult learning centres in Ireland.

At the developmental level, the process of developing and implementing online and electronic 'offline' literacy-learning environments is examined. Issues that arise in the development process are highlighted. A *'workable process'* for developing online learning environments is proposed. This process emerged from a review of the literature, the contextual examination of the usage of technology in adult literacy programmes that was undertaken in the preliminary stages of this research and an analysis of the development and implementation of two contemporary *online* and one *offline* digital learning environments. The *'workable process'* details a four-level process that can be used to guide the development of a virtual learning environment.

1.5 Genesis of this thesis

Whilst trying to ascertain the genesis of this thesis, I retrieved the original submission document for this thesis in a battered pink folder that had long been relegated to the bottom shelf of a disused wardrobe. In some respects, I dreaded reading what I had submitted back in 1999/ 2000, as I felt that the path taken since then may have greatly diverged. It was reassuring to discover that the central concept, of investigating how online technology could be integrated in literacy education, still formed the core of the final thesis submission. However, there had been a shift in my ontological and epistemological perspectives during the intervening years, which is discussed later in the thesis.

When first embarking on this research, three areas of interest were uppermost in my mind: Adult Education, Collaborative Learning and Information and Communication Technologies. Much of the initial reading focused on Collaborative Learning, and involved trying to distinguish between collaborative and co-operative learning. During this investigation, other pedagogical approaches such as Independent learning, Multiple Intelligence theory and Constructivism came to the fore. This prompted further reviews into teaching and learning methodologies and strategies. It expanded into other disciplines such as Curriculum Development and Instructional Design, Curriculum Assessment and Evaluation, Psychology of Teaching and Learning, Values, Identity and Multiculturalism, Motivation Theory, and finally, Equality, Access and Inclusion.

After this initial reading, it became clear that a focus would be needed within the vast Adult Education area. A chance conversation with a colleague in 1999, in which the extent of the literacy problem amongst Irish adults was highlighted, resulted in the genesis of my interest in Adult Literacy education. My professional experience originated with seven years experience as a post-primary teacher, followed by seven years experience as a lecturer mainly interacting with those in the adult and further education sector at third level. This professional experience was beneficial in terms of entering into research in the adult education sector. However, I had no experience of adult literacy education, and, thus, came to this research with the advantages and disadvantages of being to some extent an outsider to the adult literacy community under investigation. Therefore, a large amount of time was spent initially reviewing philosophies and ideologies underpinning adult literacy education.

Initial investigations into the use of technology in adult literacy programmes highlighted the challenges in trying to attract and maintain adult participation on literacy programmes in the established literacy centres across Ireland, as well as the difficulties inherent in the educational software packages being used for literacy tuition. The interest in ICT narrowed to virtual learning environments, as it was felt that an online digital learning facility would provide the most realistic opportunity to reduce accessibility problems, as well as providing anonymity for those users who wished to interact with literacy programmes, but who wanted to conceal their identity.

This research primarily involved an investigation into the development and implementation of a macro virtual learning environment, namely, the *LiteracyTools* website, to be used in literacy tuition and support in Ireland. It also involved an examination of two other software enterprises, one had been developed in the late nineties, and the other was in the initial stages of development in late 2004; namely, the *It Could Be You* software and the *MICRO* website respectively. The participants in the research process included literacy learners, literacy tutors, literacy co-ordinators, as well as technical experts in online and offline software development. My varied academic background (which ranged from a primary degree in Applied Physics, a Teaching Diploma and a Masters in Computers in Education) proved extremely useful, particularly, in understanding the various processes involved in developing and

integrating technology in educational settings; and when engaging in dialogue with the technological and educational professionals.

1.6 Overview of the chapters in this thesis

This thesis has eleven chapters, as outlined below:

Chapter 1 is an introduction to the thesis. It details the intellectual underpinnings for the research, describes the genesis of this thesis and outlines the contributions of this thesis.

Chapter 2 introduces the reader to the changing concepts and definitions of literacy. It critically examines the findings from the International Adult Literacy Survey (IALS) report on the extent of the global and national literacy problem (OECD, 1997). It describes the response of literacy providers and organisations to literacy provision in Ireland. It also expands on the penetration of ICTs in adult literacy education. Finally, it outlines barriers that exist to adult literacy education.

Chapter 3 focuses on software design and development processes. It describes and examines current models and frameworks for designing and developing online and offline learning environments.

Chapter 4 presents the research methodology. It details the rationale and philosophical underpinnings of the models of research and methodologies employed. It includes discourse on how rigour was introduced into the methodology employed in this research, and highlights the considerations that were made.

Chapters 5, 6 and 7 present an analysis of the information gathered at the contextual level of this research. **Chapter 5** examines the state of the adult literacy service in Ireland. It elaborates on issues that arose, and considerations made, in literacy tuition and support. **Chapter 6** presents an examination of the development of offline software, namely *It Could Be You*, geared for the literacy learner accessing prison education. It elaborates on issues that arose and considerations made in the design and

development of this offline software. **Chapter 7** presents an examination into the development of the initial prototype of the 'micro' online learning environment, namely, the *MICRO* website. It focuses on the initial communication process between members of the design team in preparation for the development of the first prototype.

Chapter 8 presents an analysis of the information gathered at the developmental level, where the development of an online learning environment, namely *LiteracyTools* website, was investigated. It elaborates on issues that arose and considerations that were made.

Chapter 9 presents an analysis of information gathered at the experiential level from literacy learners and tutors, who interacted with the *LiteracyTools* website. The information was gathered from log files on the website, from a survey with literacy learners and tutors and from feedback from tutors and co-ordinators interviewed at adult literacy centres.

Chapter 10 presents the findings from the research questions posed.

Chapter 11 presents an overview of the '*workable process*' used to guide the software development process, that has emerged from this thesis. Finally, the conclusions are presented, and future research work that may be undertaken is outlined.

Chapter Two

The Literacy Perspective

2.1 Introduction

The following discourse is divided into four sections. The initial section unravels the philosophical foundations of concepts and definitions of literacy. It examines some measures of literacy from its origins to current interpretations, and concludes with a critical review of current concepts and definitions of literacy. The second section elaborates on national and international responses to the extent of the literacy problem, and outlines the response of local literacy providers and organisations to literacy provision in Ireland. The third section presents a discourse on the role of technology in society and a rationale for the inclusion of technology in adult literacy programmes. It examines policies that emphasised the importance of the integration of ICT in literacy education. This section also presents a discussion on some innovations in online learning environments in global literacy education. The final section highlights some of the barriers to literacy education.

2.2 Towards a Concept of Literacy

Over the last thirty years, the concept of literacy has broadened significantly from a narrow traditional view that perceived literacy as a largely psychological ability to one that perceives literacy in terms of social practice. This shift in the perception of literacy has been impacted by the work of literacy practitioners such as Paulo Friere in the seventies; promoted by the work of scholars such as Brian Street in the eighties; transformed by movements such as the New Literacy Studies (NLS) movement in the nineties; and challenged by the rapid changes in society, caused by the integration of new technological developments in everyday life, at the turn of the millennium.

2.2.1 Origins of Literacy

Literacy has traditionally been associated with the ability to read and write. Writing has its origins in the first, semi-permanent marks made on cave faces by humans over 30,000 years ago. This was followed by cave paintings and other marks, until around

6000 years ago writing as we know emerged in at least three separate cultural areas: in Mesopotamia and Egypt, in China and in pre-Columbian America (Barton, 1994, pp. 108-116). Writing and reading originated in these early societies and civilisations to facilitate economic, administrative, religious and divinatory uses (ibid).

Tensions have arisen between researchers in deciding what should be considered as 'true' writing. Gelb (1963, as cited in Barton, 1994, p.110) suggested that '*writing is a form of human intercommunication by means of conventional visible marks*', whereas others such as Diringer (1968, p.10, as cited in Barton ibid) defined '*writing as the graphic counterpart of speech*', and writing as '*not a pure representation of the event but as a narrative of the event*'. Barton (1994) further added that the use of mathematical and logical notation, chemical formulae, maps and codes could be considered as a form of writing. Thus, the concepts of what constitutes writing proffered mainly vary in their inclusiveness of image-based forms and other notations in written communication. Interestingly, a parallel tension now exists in what constitutes literacy in the multi-literacies *versus* the 'mere' literacy debate. Multi-literacies focuses on modes of representation that include pictorial and other forms, which differ in meaning according to the culture and context in which they are embedded (Cope & Kalantzis, 2000). 'Mere' literacy focuses on language primarily. Therefore, there is a tension between the pedagogy of multi-literacies and the pedagogy of 'mere' literacy, as the concept of multi-literacies is much broader than the concept of 'mere' literacy, which centres on '*mastering sound-letter correspondence*' (Cope & Kalantzis, 2000, p.5).

In Plato's *Phaedrus* (as translated by Jowett, 2005, online), Socrates communicated his dislike of the introduction of the *written text*. He thought written communication was inferior to oral communication because the reader could not engage in meaningful dialogue with it. Yet skills in decoding and comprehending written text became the core competencies of literacy from the nineteen to the mid-twentieth century. The ability to read and write became closely aligned with the concept of literacy, and underpinned the basis of modern literacy.

Furthermore, the compulsory schooling system became responsible for the teaching of reading and writing in the nineteenth century. The proxy for literacy during this period

was being able to write one's name (OTA, 1993, p.3). This definition underpinned the manner in which 'literacy' was taught in traditional schools until at least the 1970's. According to Street (1984, pp.44-65), this autonomous model of literacy (promoted by social anthropologists such as James Goody in the sixties and seventies) viewed literacy as a technology of the intellect, where the underlying belief was that writing fostered the development of logic and intellect.

2.2.2 The Dynamic Concept – Literacy

The standard for what constituted literacy increased throughout this century as literacy demands became more complex. Assumptions of what constituted literacy were constantly challenged by new developments and practices (such as the adaptation and integration of communication technologies in society), and thus the concept of literacy had to be constantly re-examined.

A new model of literacy, the ideological model, emerged. In contrast to the autonomous model of literacy, the 'ideological model' as outlined by Street (1984, pp.95-125), viewed literacy as a set of social practices in which power relations were influenced. It offered a more culturally sensitive view of literacy practices as they varied from one context to another. According to Street (2003), this model '*posits instead that literacy is a social practice, not simply a technical and neutral skill; that it is always embedded in socially constructed epistemological principles*' (p.1).

Therefore, literacy has become a dynamic concept and '*definitions of what it means to be literate are always shifting*' (Crowther et al, 2001, p.1). However, tensions have developed between those who hold different views or concepts of literacy, and their proposed solutions ranging from short-term pragmatic and utilitarian approaches, to broad humanitarian idealistic approaches.

2.2.3 Functional Literacy

The term functional literacy was initially coined to represent the use of literacy in society. Gray's (1956, as cited in Barton, 1994) definition of functional literacy stated that someone was functionally literate if they were able to '*engage effectively in all*

those activities in which literacy is normally assumed in (their) culture or group' (p.193). In the 1990's, this view was expanded to include not only the ability to read and write, but to do so at various levels, and also being able to perform tasks using new information and communication technologies.

The functionalist view was aligned with those national and international organisations who perceived the development of literacy as mastery of a set of skills primarily to meet the needs of the economy – '*Literacy is seen as the means by which governments can improve their competitive edge by filling skills gaps, which require certain levels of literacy'* (Crowther et al, 2001, p.2).

This functionalist view of literacy underpinned the United Nations Educational, Scientific and Cultural Organisation, UNESCO, development of modernisation policies from the 1960's to 1970's, and in their promotion of literacy in under-developed countries. The ineffectiveness of their literacy campaigns soon became known, and UNESCO realised that their concept of functional literacy disguised '*the relationship of a particular literacy programme to the underlying political and ideological framework'* (Street, 1984, p.184). UNESCO revised their definition of literacy in 1978 to state that a '*person is literate who can with understanding both read and write a short simple statement on his everyday life... A person is functionally literate who can engage in all those activities in which literacy is required for effective functioning of his group and community...*'. This view of literacy, which was most likely influenced by the work of practitioners such as Paulo Friere in the seventies, was expanded in 1990, at the Education For All (EFA) conference in Thailand, to include that of basic learning needs or competencies; a combination of a mastery of the *three r's* – reading, writing and arithmetic - with other knowledge, problem-solving and life-skills.

Other organisations such as the OECD retained a functionalist interpretation of literacy. In 1995, the OECD stated that a person was literate if they could use '*printed and written information to function in society, to achieve one's goals and to develop one's knowledge and potential'*.

Criticism of the Functionalist Approach to Literacy

The functionalist approach to literacy could be perceived as 'dis-empowering', as the approach was 'skills-centred' rather than 'learner centred'. Secondly, there has been a suggestion that there exists a causal link between literacy skills and economic development, which hasn't been proven.

> *The terms literacy and technology are often used in rhetoric associated with preparing a workforce but curriculum that emphasises key skills at the expense of knowledge and creativity is unlikely to meet those needs.* (Gamble, 2000, p.7)

Furthermore, the functionalist approach was not locally responsive; it was difficult to 'diagnose' the functions of literacy in a particular context, and the functions were limited to employment and economic development. Therefore, the functionalist approach has resulted in the development of short-term, practical key-skills responses in an attempt to redress specific economic shortcomings.

2.2.4 Radical Perspectives of Literacy

In the 1970's, a new understanding of literacy based on the ideas of a Brazilian educator, Paulo Friere (1972), began to influence some literacy practices. Freire saw literacy as a liberating force that encouraged adults to think about the conditions they found themselves in. His work with peasant groups in South America provided a model of how literacy work could help rebuild critical social praxis. This radical view of literacy saw literacy embedded in social and cultural practices, rather than as a set of skills that had to be mastered.

> *It means developing the theoretical and practical conditions through which human beings can locate themselves in their own histories and in doing so make themselves present as agents in the struggle to expand the possibilities of human life and freedom... To be literate is not to be free, it is to be present and active in the struggle for reclaiming one's voice, history and future.* (Friere and Macedo, 1987, p.56)

Those who subscribed to this Freirian view, perceived literacy as a means of empowering citizens to challenge political structures that promoted inequalities. Literacy was used for emancipatory purposes, by enabling learners arrive at increasingly critical views of their reality. According to Friere (1972), '*What is important is that the*

person learning words be concomitantly engaged in a critical analysis of the social framework in which men exist' (p.38).

Criticism of Radical Perspectives of Literacy

However some critics were concerned about the spread of Frierian theories in literacy programmes, as it impacted not only from an educational perspective, but also from a political perspective. Giroux (1981) stated that '*it would be misleading as well as dangerous to extend without qualification Freire's theory and method to the industrialised and urbanised societies of the West*' (p.169). Interestingly, Freire's method of teaching literacy learners, by the emersion of learners in language that they would know and be familiar with (the Language Experience Approach), has permeated adult literacy pedagogy in the West with no reported ill effects to date.

2.2.5 Literacy as Social Practice

In the eighties, literacy came to be viewed by researchers as a social process, by which people in a community used spoken and written language to understand, communicate and accomplish tasks in their everyday lives. Jim Gee (1985), as cited in Lankshear (1997, p.2) perceived literacy as a manner of social practices, involving interactions within social, institutional and cultural relationships. Literacy was primarily something people did; it was an activity, located in the space between thought and text – '*Reading and writing are things that people do, either alone or with other people, but always in a social context – always in a place and at a time*' (Barton & Hamilton, 1998, p.23).

The New Literacy Studies movement was at the forefront of this paradigm or 'social turn' that resulted in a change from viewing literacy as the mastery of a set of skills to one that encompassed the socio-cultural practices associated with reading and writing.

> *For 'social turn' movements, networks are key metaphors: knowledge and meaning are seen as emerging from social practices or activities in which people, environment, tools, technologies, objects, words, acts and symbols are all linked ('networked' with) each other and dynamically interact with and on each other.*
> (Gee, as cited in Barton et al, 2000, p.184)

David Barton and Mary Hamilton (1998), together with other colleagues at Lancaster University, played an important role in the development of the NLS movement. Their

work built on the importance of social context in creating meaning. It also furthered the work of Freire, who developed the concept of the role of literacy in liberation or emancipatory education. The NLS view was that reading and writing only made sense in the context of the social and cultural practices in which they were embedded. The NLS challenged the idea that there was a single, unchanging concept of literacy; hence there were multiple literacies or multi-literacies. Crowther et al (2001) stated: '*We have to begin to think in pluralist terms about the variety of literacies that are used in different contexts in order to make meaning and in order to make literacy practices meaningful to people'* (p.2). This approach involved looking beyond educational settings to everyday practices and informal learning, and to all kinds of other settings in which literacies played a key role.

Therefore, the NLS were active in the social turn, in which the focus moved away from the individual behaviour (behaviourism) and individual minds (cognitivism - fact, logical, information processing) towards a focus on social and cultural interaction (Gee, as discussed in Barton et al, 2000, p.180).

One such approach to literacy emphasised the local, everyday life experience of literacy in communities of practice. Studies undertaken by Barton and Hamilton, as outlined in their key publication in 1998, highlighted the variety in everyday uses and practices of literacy in one community in Lancaster in the nineties – '*simply to state the diversity of people's engagement with literacy counteracts images of homes and people empty of literacy*' (Barton & Hamilton, 1998, p.149). Their local literacy study focused on the skills that people had rather than what they lacked, and sought to find what motivated them rather than something they needed. As Barton & Hamilton (1998, p.161) stated: '*adults with difficulties reading and writing are not empty people living in barren homes waiting to be saved and filled up with literacy.*'

Barton & Hamilton (1998) also recognised the many different ways people engaged with literacy, recognised difference and diversity, and challenged how these differences are valued. Hence, they recognised different literacy practices in domains such as education, religion, workplace, public service, families and community activities.

Criticism of viewing literacy as a social practice

In the latter half of the twentieth century, there has been a shift from perceiving literacy primarily as an individual skill, towards a view of literacy as social practice. This provided valuable insights into how people used literacy and literacies, but neglected the individual aspect of literacy. It ignored potential insights into how individual acquisition of literacy might best be structured, so that its social practices supported the pursuit of freedom.

2.2.6 Literacy & ICT

The invention of the printing press over four hundred years ago made textual information available to mass audiences. The development of computing technology, particularly in the last twenty years, made audio, visual, textual and graphical information available to mass audiences; furthermore, it provided the masses with the capability to manipulate, re-create and transform this information into meaningful interactions using computing technology. In addition, developments in information and communication technologies, such as computer networks and more recently the Internet, enhanced connectivity and facilitated the dissemination and transformation of knowledge over geographically large distances.

This change in media from 'page' to 'screen' - the change from 'traditional print-based media' to the new 'information and communication technologies' - and the recent improvements in connectivity presented challenges to literacy learners. The effective use of ICT required a certain kind of literacy – reading and understanding alphanumeric characters as well as large and small images and icons. It required keyboarding skills and an understanding of how programmes worked. The introduction of hypertext challenged 'orthodox' linear forms of text, and required additional demands of the literacy learner in terms of learning to navigate through the 'sea of hypertext' in a meaningful way. As Brindley (2000, p.17) commented, '*In much the same way as literacy theory was seen as a challenge to the very definition of literature and literary analysis, hypertext is seen as a challenge to canonical and established text and thereby traditional literacy skills.*'

ICT was used not just as a means of transmitting information but also as a means of accessing, disseminating, creating and transforming knowledge for the benefit of the individual and society. ICT was used to support and facilitate learning environments. However, as new technologies became integrated in everyday life, and as information became increasingly coded in digital form, additional skills were needed to operate the technologies and benefit from it.

Criticism of Literacy and ICT

New literacies have emerged from the technological revolution, which have presented new possibilities and new challenges for literacy education. ICT stands in interesting relation to literacy,*' being as it is capable both of supporting and promoting the basic skills of reading and writing – the dominant classroom definition of literacy'* (Brindley, 2000, p.11). The integration of ICT into literacy education could be used to support emancipatory education – they could be used to promote diversity and communicate emancipatory ideals. However, ICT can attempt to centralise and promote uniformity, which can have a counter effect on diversity. The introduction of ICT has the potential to create a digital divide between those who have access to and can use these digital technologies, and those who do not. Furthermore, the integration of technology has implications for the socio-cultural movements, particularly as the current developments in electronic technologies *'threaten to move us from print to post-print text cultures'* (Lankshear, 1997, p.3). If ICT's are to be used in literacy programmes, then careful consideration is needed to best identify the most appropriate manner and means.

2.2.7 Conclusion

Literacy is often presented as the *silver bullet* to end all ills in the world. The links between economy and literacy are thought to be several and direct. In particular, literacy is often linked with economic success or failure – a high degree of population literacy being linked with economic success, a low degree of population literacy being equated with economic failure. Therefore, high literacy skills are thought to be determinant of individual economic potential, higher employment participation, lower

unemployment probability and higher skilled employment. Countries with higher average levels of skills are thus thought to be better prepared to contribute to technological developments, as well as to adjust more effectively to them (Pont & Werquin, 2000). The functionalist view of literacy often results in governments implementing literacy policies that are aimed at redressing skills-gaps in the economy. This narrow functionalist perspective of literacy can result in failed literacy initiatives, as happened with UNESCO literacy programmes in the sixties and seventies. An interesting point to note here is that the OECD reported that one in four Irish adults had **low** literacy levels in 1997 during a period of *unprecedented economic growth*, more commonly referred to as the 'Celtic Tiger Economy' in Ireland. The numbers of literacy learners accessing literacy tuition was as low as 3% in 1997, and this figure has increased slightly to around 7% in 2004/2005. However, the unemployment rate has decreased, in response to increased economic growth, from a high of around 18% to approximately 4% in this same period. This raises questions either about the notion of equating economic growth with a **high** degree of population literacy OR raises questions about the extent of the literacy problem outlined in the OECD IALS report in 1997.

More ideological perspectives of literacy focus on literacy as a social practice. This can be useful in terms of situating the learning within the socio-cultural experiences of the learner. However, a narrow ideological perspective of literacy can equally result in failure; Giroux (1981, p.139) has warned of the potential damage of Friere's ideological 'emancipatory' perspective, if unleashed on Western urbanised society. Literacy does not always bring freedom, because it may be used in the service of the dominant and the powerful. Furthermore, the move from the individual to the social practice can reduce the individual's reflexive practice – may reduce or lose intra-personal critical reflection, whilst focusing on critical inter-personal interaction.

Multi-literacies encompass a wide range of literacies, including socio-technologically enabled literacies. However, new technologies may eventually replace traditional text-based media in particular contexts, and the resultant implications of this needs to be closely examined from a socio-cultural literacy perspective.

2.3 Literacy – Global to Local Perspectives

Literacy is a human right.

(Kofi Annan, 2003)

This section elaborates on the perceived extent of the literacy problem globally, and national responses to the literacy issue. It opens with a review of UNESCO literacy surveys and initiatives, and progresses to examine more recent literacy surveys undertaken by the OECD. The discussion centres on the extent of the Irish literacy problem, and examines proposed initiatives.

2.3.1 Global Extent of Literacy Problem

After World War Two, concerns about literacy emerged, and literacy was chosen as a key part of the mandate of the newly formed UNESCO. Subsequently, literacy has been adopted as a key component of almost all of the international and bilateral agencies.

In 1990, the United Nations, UN, world conference on 'Education for All' (EFA) in Thailand, included adult literacy as one of its six main goals. They aimed to reduce adult illiterates by half of the 1990 level by the year 2000, while reducing male and female disparity, and to improve learning achievement to an approved percentage of the appropriate age-cohort (UNESCO, 1990). Finally, they also wanted adult literacy schemes to introduce measurable learning outcomes rather than just noting attendance. The 1994 UNESCO survey on the estimation and projection of adult illiteracy revealed that there were 885 million illiterates globally in that year. In 2000, UNESCO estimated that there were 887 million illiterate persons; this constituted 27% of the adult population, the majority were women from the poorest sections of society. The relatively static state of this 'illiteracy' figure from 1994 to 2000 is disturbing, particularly, when one considers that the decade from 1990-2000 was supposed to see a reduction by fifty per cent of adult illiterates.

In January 2002, the United Nations General Assembly proclaimed 2003-2012 to be the United Nations Literacy Decade (UN, 2002). The Founding Resolution *56/116* reaffirmed the Dakar Framework for Action (UNESCO, 2000) in which a commitment

to achieve a fifty per cent improvement in adult literacy by 2015 was agreed. The International Action Plan for implementing resolution 56/116 stated that '*literacy for all is at the heart of basic education for all and that creating literate environments and societies is essential for achieving goals of eradicating poverties, reducing child mortality, curbing population growth, achieving gender equality and ensuring sustainable development, peace and democracy.*' (UN, 2002, p.3)

Literacy was perceived to be one of the fundamental instruments of freedom. UNESCO recognised that the use of written communication was embedded in the socio-political and economic systems at local, national and global levels – '*Literacy is set at the intersection of the institutional and the personal, the powerful and the powerless, the marginalized and the mainstream, the male and the female, the government and the communal*' (UNESCO, 2003, p.6).

Furthermore, UNESCO recognised that literacy could be a tool of empowerment or disempowerment; '*It is how literacy is used that matters, how it is acquired that will determine its value to the learner. The more we understand about the process in which literacy is embedded, the better chance we have, as a global community, to see literacy become a true instrument of freedom' (UNESCO, 2003, online).*

The United Nations Development Program (UNDP, 2001) presented a model that illustrated the relationship between technology, skill development and economic development. According to this model, a country's ICT investments could directly enhance the capabilities of its citizens. Personal participation in this technology-knowledge economic development cycle began with literacy. Economists also believed that knowledge and technology played a huge role in productivity and driving economic growth. Knowledge was perceived as both the engine and the product of economic growth, in the development of a knowledge economy.

In parallel to other developments, the information society resulted from the convergence of ICTs and their assimilation in society. ICTs became more accessible and embedded in society, they offered the potential to make education and health more accessible, to foster cultural creativity and productivity, to increase democratic participation and to enhance the social integration of individuals and groups with different abilities and of

different cultural backgrounds. According to the UN (2001), these economic, social and technological transformations had significant implications for the skills needed by both the employees of the knowledge economy and citizens of the information society.

2.3.2 Criticism of UNESCO policies

The terminology relating to adults with no *reading or writing* ability used in UNESCO documentation is inappropriate – words such as 'adult *illiterates* and *illiterate* persons' would appear to indicate that literacy is not viewed by UNESCO as a social practice, as one would expect from reading their mandates, but as a mastery of a set of arbitrary skills in which one is deemed 'literate' or 'illiterate'. It harks of past negative practices of labelling people with special needs as *disabled*. Defining people in terms of what they lack rather than what they can offer has already been accepted in civilised society as inappropriate. It is disappointing that a global organisation such as UNESCO doesn't appear to recognise this.

Secondly, whilst UNESCO's overarching purpose appears to echo aspirations of emancipatory literacy, their means of ascertaining the extent of literacy leaves a lot to be desired and is reminiscent of a more autonomous view of literacy. According to UNESCO's report (1995) on the 1994 global literacy survey, most countries adhered to the definition of a literate person as, '*a person is literate who can with understanding both read and write a short simple statement on his everyday life*', and furthermore, an illiterate person as, '*a person is illiterate who cannot with understanding both read and write a short simple statement on his everyday life*'. Furthermore, the methodology used to gather data and generate statistics in UNESCO's 1994 'Estimation and Projection of Adult Illiteracy' was somewhat flawed. Most of this information on literacy levels was collected during the national population census in 1994, and forwarded to UNESCO for processing. Participants in the 1994 survey were asked whether they were able to read or write, and judgements on their literacy or illiteracy was made based on their own interpretations. Predictive models were constructed based on participant's literacy level, age-group and their schooling level at that time. The problems inherent in the UNESCO 1994 study were as follows (UNESCO, 1995):

- The literacy definitions used in the 1994 survey, pertaining to predominantly reading and writing ability, represented a primitive outlook of literacy. They could be considered as an attempt to measure basic literacy represented by the 3R's – Reading, Writing and Arithemetic. There was no attempt to engage in an examination of functional literacy, which would have examined the use or application of reading and writing in everyday life.

- In addition, there were wide variations in particular countries as to what constituted literacy – in some cases, it included being able to read and write in more than one language and in another country the literacy ability was relative to the region that the person lived in – one example involved literacy being defined as the ability to read 2000 characters in urban areas and 1500 characters in rural areas. Furthermore, there were inconsistencies in what constituted illiteracy; one country defined illiteracy as –'*persons who are 14+ years of age and have completed at most 7 or 8 years of primary education*', another country '*children aged 0-9 were defined as illiterate by definition even if some could read and write*' and in another country illiteracy was defined as '*illiterate are considered those who have never been in school (organic illiterate) as well as those who have not finished the six years of primary education (functional illiterate)*'. The use of these primitive definitions of literacy and illiteracy, combined with variations in how individual countries perceived literacy, raised questions as to the validity of the data gathered.

- Also, this information was gathered predominantly from national censuses, and in the majority of cases, participants were asked to self-assess their literacy position. National censuses only allowed for very limited coverage of education and literacy variables, and they only happened every ten years. The infrequency of the data led to a reliance on predictive models of literacy or illiteracy in the intervening years, which may or may not have been accurate. Secondly, the national census was a very blunt instrument for gathering information about literacy; it relied on self-assessment generally and didn't present enough opportunities to ascertain levels of literacy. Therefore, it was very difficult to develop responses at local level from broad sweeping statements about the extent of literacy or illiteracy problem; without the help of corresponding

participant profiling mechanisms and some information of the extent of literacy or illiteracy of the individual i.e. their level of literacy.

At a conceptual level, UNESCO linked the development of literacy with the development of the intellect and the development of societies. They also perceived that literacy could be used as an international indicator to gauge the quality of human resources and human potential within a country, thus literacy was linked to socio-economic and cultural development phenomena.

According to Federico Mayor, Director General of UNESCO in 1996, UNESCO, education could help, '*eradicate poverty, reduce child mortality, curb population growth, achieve gender equality and ensure sustainable development, peace and democracy*' (1996, online). UNESCO's goal to liberate people by getting them to learn to read and then keep on reading, appears to be misguided. Education could certainly increase awareness of factors that may impinge on these elements, but I would question whether the functionalist view of literacy, in terms of mastery of a set of language skills, which appears to underpin the UNESCO policies would have any impact on the outlined societal issues. Liberation and freedom are linked to diversity and pluralism. The 'Education for All' and 'Literacy For All' banners that UNESCO promotes, suggest more uniform ways of learning, rather than diverse ways of learning. There is a real need to regain pluralist attitudes, which respect radically different ways of knowing, living and expressing. However, Munir Fasheh (2002, online) argues that UNESCO's universalism *'has been a main cause in killing diversity'*, which, in his opinion, *'is the essence of life'*.

The lack of funding made available to the adult literacy sector nationally in the early nineties was shocking, and would appear to have been counter-productive in terms of empowering adults to engage in and transform society. Whilst Kofi Annan may laud the localised nature and the low cost of projects run by volunteers in Congo and elsewhere, during the United Nations Literacy Decade (2003-2012) conference, it is surely imperative that realistic funding is provided to facilitate the transition of adult literacy education from being the *Cinderalla* of the education sector into the main education arena.

2.3.3 Local Extent of Literacy Problem

The International Adult Literacy Survey (IALS), conducted between 1994 and 1998, was a 22 country initiative (including Ireland), where representative samples of adults aged between 16 and 65 were interviewed and tested at home using literacy tests (Tuijnman, 2000).

The IALS survey included a number of sections to measure prose literacy, such as texts from newspapers and brochures; an array of maps, schedules, charts and graphs to measure document literacy; and arithmetic operations to test basic quantitative literacy (Pont & Werquin, 2000, online). Furthermore, each of the three domains of prose literacy, document literacy and qualitative literacy was sub-divided into five levels. Level 1 indicated only rudimentary literacy skills, level 2 indicated a low level of literacy proficiency, whilst level 3, 4 and 5 indicated varying degrees of ability in integrating several sources of information and solving more complex problems (Tuijnman, 2000).

In 1997, the OECD indicated that from the literacy data collected, it was estimated that at least one in four Irish adults lacked the minimum literacy skills needed for coping with everyday life and work in a complex, information-dependent society. The results from the IALS (Tuijnman, 2000) survey ranked Ireland in sixteenth place in terms of its overall mean score for the prose, document and quantitative literacy domains. The extent of this literacy problem came as a shock to many in Ireland; and pressure mounted to provide support for those with literacy problems.

2.3.4 Post-IALS – National Responses in Ireland

Prior to the release of the IALS survey in 1997, there was no *national response* or indeed *national position* on literacy in Ireland. Public policy generally developed in relation to public concerns in Ireland as elsewhere; hence pre-IALS neither the Irish public nor government appeared to have been *aware of* or *concerned about* the state of literacy in Ireland.

In 1998, the first Green Paper on Adult Education since the foundation of the Irish state in 1921 was published. This Green Paper was to provide the consultative backdrop to the publication of a White Paper on Adult Education in 2000. In its Executive Summary (DES Green Paper, 1998), the need for a national response to the literacy problem highlighted by the IALS survey was noted.

The Green Paper (DES Green Paper, 1998) emphasised the need not only to redress deficiencies in reading, writing and numeracy skills, but also to promote self-esteem, self-confidence and positive self-image amongst the learners. The paper also highlighted the need to embark on a multi-faceted national adult literacy programme in Ireland, that would recognise the need for a comprehensive framework of statutory policy, programming and funding, and take cognisance of the low numbers accessing the service, the student-centred approach already in-situ and the need for tutor training and better working conditions. It also recognised that literacy training provision needed to be flexible and varied enough to meet learner needs in a multiplicity of settings. Furthermore, it recognised that there was a need for a system of guidance and the removal of barriers to access. Finally, it recognised that a national literacy programme couldn't be confined to the adult, out of school population alone. Instead, it was recognised that a national literacy programme '*must be part of a broadly based and sectorally integrated programme which forms a continuum from early childhood to adulthood, embracing both the formal and non-formal sectors*' (DES Green Paper, 1998, p.70). The publication of the Green Paper in 1998 was followed by a wide-ranging consultation process with providers, users, funders, policy makers, researchers, social partners and community and voluntary sector interests.

A report by the Information Society Commission in July 1999, commented on the literacy problem in Ireland highlighted by the IALS survey, and recommended the expansion of Irish adult literacy programmes to include ICT, as a learning tool, to expose the literacy student to technology and as a necessary tool in Lifelong Learning enabling the individual to cope with new skills in an evolving information society.

In November 1999, the Irish government published the National Development Plan 2000-2006. This set out an integrated programme of education, training and infra-structural measures to promote social inclusion, employment, competitiveness and

growth, environmental sustainability and regional balance. Of particular significance within the adult literacy context, was the dedication of £73.8 million punts to the National Adult Literacy Strategy to redress the literacy problem highlighted by the IALS survey (1997); other initiatives which would also impact on literacy programmes were investments in Back to Education Initiatives (BTEI), which, indirectly provided support to Post Leaving Cert, Youthreach, Traveller Education and vocational training programmes.

Finally in 2000, the first Irish White Paper on Adult Education (DES, 2000) set out a blue-print for the future development and expansion of adult education. This paper placed the National Adult Literacy programme as the top priority in the programme for second-chance and further education. It reported that since the launch of the OECD survey, provision for adult literacy in the education sector increased from a base level of £0.85 million in 1997 to £7.825 million in 2000, plus an additional £0.95m for programme development. The initiatives funded ranged from '*promoting public awareness of literacy; developing new outreach strategies for those most in need; establishing referral networks'* to '*more flexible delivery mechanisms including group tuition'* (DES White Paper, 2000, p.86).

Other publications by the Irish Government and various commissions continued to highlight, and make recommendations to redress, the literacy problem in Ireland from 2000 onwards. Some like the Information Society Commission (2002) gave further commitments to support adult literacy programmes with increased research, funding or other initiatives.

2.3.5 Critical Review of the IALS Study

The 2002 UN *Education for All* Monitoring Report recognised '*that the present International data on literacy is unreliable'* and furthermore, that international initiatives should recognise diversity. Criticism of the IALS study (1997) included that a traditional or autonomous notion of literacy underpinned the design of the assessment strategies, i.e. examining reading, writing and comprehension of printed material as an indicator of literacy level - '*Traditional definitions of literacy have been used to develop*

national assessments' (Sussman, 2003, p.33). This echoed a primitive notion of literacy, whilst ignoring the socio-cultural aspect of literacy.

Furthermore, there were concerns as to whether the tools used to collect the literacy data in the IALS survey were culturally neutral, or whether the method of gathering the data on the 'door-step' was valid. Therefore, there were concerns over the reliability and validity of the IALS survey.

From a review of the Green Paper (1998) and White Paper (2000) on Adult Education in Ireland, it was clear that the stakeholders believed that there was a direct link between literacy, employment and the economy. Thus in my opinion, investment in literacy education was most likely prioritised by the stakeholders (particularly government), so that those Irish adults with low literacy levels could help maintain and nurture the Irish 'Celtic Tiger' economy. It is ironic that the literacy problem in Ireland was publicised during a period of rapid economic growth; as mentioned earlier, this raises questions either about the notion of equating economic growth with a high degree of population literacy OR about the validity of, or weaknesses in, the OECD IALS report in 1997. It may be beneficial in terms of exploring the former to do a follow-up survey on the 16-25 year olds identified in the 1997 survey as having a high probability of being unemployed due to their low levels of prose or document literacy, to ascertain whether they are still unemployed and whether their literacy level has improved in the interim. Nevertheless, the IALS survey (1997) has been pivotal in raising awareness of the extent of the literacy problem in Ireland and has brought improvements to the literacy service. Positive developments included the establishment of a national literacy framework and other literacy initiatives in Ireland and elsewhere.

2.3.6 The Role of Literacy Agencies and Providers

Based on the target population for the IALS survey of 2,200,000 adults in Ireland aged 16-65 (Tuijnman, 2000), and the premise that one in four adults had low literacy levels (OECD, 1997), potentially as many as half a million Irish adults were in need of literacy tuition at the turn of the millennium. In 1998, the literacy service was fragmented and supported around five thousand literacy learners (DES Green Paper, 1998, p.69). In 2000, there were over one hundred 'independent' literacy providers in Ireland, the

majority of whom fell under the remit of the local vocational educational centres. These literacy centres, more commonly referred to as Adult Learning Centres, ran literacy programmes that catered for approximately thirteen thousand literacy students (DES White Paper, 2000, p.87). However, the gap between those who were gaining access to or receiving literacy tuition and support in Ireland, and those who were not, was still disproportionately high.

2.3.7 National Adult Literacy Agency

The mission statement of the National Adult Literacy Agency, NALA, in Ireland was to ensure that all adults with literacy difficulties have access to high quality literacy tuition. Furthermore NALA recognised that '*adults with literacy difficulties are not a homogenous group and that different types of learners are at the centre of our practice*' (NALA, 2001, p.4). Inez Bailey, Director of NALA, commented in 2001 that the use and application of ICT in the literacy environment could also be used as an alternate form of access to literacy tuition. She saw the use of ICT as an attractive hook for people with literacy problems to re-enter the basic education programme.

In advance of the publication of the OECD report on the IALS survey in 1997, NALA was already looking at different ways of promoting the literacy service, recruiting students and improving the delivery in literacy tuition. One of the alternatives considered in terms of improving the delivery was to integrate technology into literacy tuition.

In 1998, NALA took part in an European Union (EU) funded project investigating '*Access and Participation in Literacy Schemes*', as there were concerns that there was an issue around people not accessing the literacy service and not participating in basic education programmes (Bailey & Coleman, 1998). As a result of that project, it was evident to NALA that there was a rather homogenous approach to education provision in basic education centres, and that the 'one size fits all approach' wasn't going to work.

Hence, NALA embarked on a number of innovative approaches to promote literacy in Ireland, these included educational broadcasting and the development of a literacy website. Initially, NALA decided to produce radio and television programmes to

support literacy tuition, as they felt that there wasn't the technology infrastructure, or the appropriate level of computer literacy, within the literacy schemes to support development of software for computer-mediated instruction. Then, in 1999, NALA created an online resource and support service in the form of the NALA website, http://www.nala.ie/, with the aim of providing resources and information on literacy services and activities to literacy tutors and students.

In Autumn 2000, NALA's educational broadcasting initiative in Ireland took the form of a television series '*Read, Write, Now'*, which promoted literacy. The series was supported with a learner pack and a free-phone tutor support line. They discovered that around one-third of all calls, ten thousand, came from independent learners requesting a learner pack so that they could interact independently with the television literacy programme. The independent learners did not wish to enrol on the existing literacy programmes run by literacy providers – '*It represents a leap of faith in educational broadcasting and the wide acceptance that adults with literacy learning needs want to improve their skills through a variety of methods, not just by participation in the adult literacy service*' (NALA, 2001, p.5).

From the evaluation of the television programme, NALA was able to show that distance education could work and decided to develop computer-mediated instruction. A growing number of literacy schemes had developed a technology infrastructure (from 1998-2003), whilst the TV programme was being developed.

In 2000, NALA were involved in designing a CD to be used in literacy tuition and from that experience would have been aware of the barriers that the centres faced in using technology. The adaptation of 'The New Reading Disk' software on CD was for use in a blended prison-literacy learning environment.

In 2001, NALA embarked on online tuition and support with the development of its literacy learning environment, www.literacytools.ie.

2.4 Role of Technology in Literacy Tuition and Support

Technology offers promise for dealing with some of the issues in literacy education. In particular, technology can be used to draw learners into programmes, and hold their interest. Technology based media – such as sound, video, graphics, animation and text - can be adapted for the individual learner and offers great scope as a tool for creating relevant and engaging curriculum. Technology in the form of computer databases may be used to collect information on student interaction, so that their progress can be evaluated. Technology in the form of networks, distance learning systems, software and video materials can be effectively used for the professional development training of full-time literacy staff and volunteers. Technology can offer resources for improving the co-ordination and efficiency of literacy programmes, whilst still allowing local flexibility and control. It can be also used to extend the range of services that are offered by literacy centres in a cost-effective manner.

Technology offers considerable potential for meeting the needs of adult literacy learners, as many adult learners associate technology with tomorrow's skills not yesterday's failures (OTA, 1993). Technology has the potential to deliver learning in places other than the classroom, to facilitate effective use of precious learning time, to enhance and sustain the motivation of adult learners and to reach many different learners in the way they learn best. Further advantages of technology include its capacity to protect the privacy and identity of the literacy learner, to reduce anxiety levels by incorporating appropriate forms of feedback, to allow opportunities for collaborative interaction and to support individualised instruction.

The importance of technology in literacy programmes is often not fully realised – '*In particular, technology holds promise for the future because it can reduce the isolation that is often a feature of such learning*' (McGill & Morgan, 2001, p.63). Privacy for the adult literacy learner does not mean isolation. Technology in the form of electronic networks, fax, telephone and other distance technologies can be used to share information and communicate with learners and tutors in other locations; whilst still allowing literacy students to retain their anonymity and allow them to participate in new kinds of schools or communities of learning (OTA, 1993).

2.4.1 Online Technology and Literacy

> *The challenge for the online environment in the development of autonomous lifelong learners rests in it's potential to help the learner make decisions, use new material, make connections between and amongst items, recognise and identify personal goals, take personal responsibility for their learning.* (Clarke, 2002, p.14)

The World Wide Web, WWW, has become a vehicle for information dissemination and a tool for communication, publishing, research and creation of learning experiences. The ability to access, interact and create learning experiences online may provide increased independence, help retain anonymity or privacy, enhance motivation and improve participation for those literacy learners who wish to take personal responsibility for their learning.

According to Hacker (2000, online), '*the Internet is a tool and resource that should not be omitted from adult literacy curricula*'. The Internet offers the opportunity to create online learning communities where the literacy learner can benefit from increasingly enriched virtual interactions with peers or tutors. In educational practice, the Internet offers *'the opportunity to create online learning communities where we can benefit from the casual interactions that help to create traditional classroom communities'* (Buchanan, as cited in Montgomery & Little, 1997, online).

The first online courses were delivered on command-line systems, which required considerable skill and patience from even the dedicated user (Mason, 1998, online). Systems, such as Archie, Veronica and Gopher, were used by course providers to give students access to resources, papers and databases of information, despite needing whole books to learn how to navigate the system. Early Multi-User Domains provided real-time, text-based communication but these didn't really migrate from the game-playing scenarios to educational environments. Web-based and computer conferencing systems supported audio and video, as well as text, completed the current image of an integrated environment with empowered users.

Some synchronous and asynchronous tools that might be utilised in online learning communities include (Montgomery & Little, 1997, online):

- Email – an email facility can be added to a course allowing one-to-one or one-to-many interaction among learners, instructors or guest speakers. It also allows for participation in 'listserv' groups.
- Chat Tools – Chat tools provide for real-time communication among students, instructors and guest speakers.
- Course Conferencing Systems – communication can take place among course participants that are in a discussion group or net forum.
- Video Conferencing – desktop video conferencing over the web offers a valuable opportunity to bridge the issues on face-to-face interaction. It offers a real opportunity to aid in the collaboration amongst a distance education class. New online conferencing systems are making voice, video and data communication over the net a reality eg. CUSeeMe at http://www.cuworld.com

Programmes such as WebCT, Lotus Learning Space and Top-Class were utilised in the creation of online learning environments, whilst also aiding in the management and maintenance of such places (Montgomery & Little, 1997, online). The flexibility of programmes, such as First-Class Conferencing System, to provide a range of discussion facilities made it an ideal tool for one-to-one or one-to-many communication. MOO (Multi-user Object Oriented) based synchronous communication, such as New York City University *Schmooze MOOsite*, was useful as a real-time language teaching tool (Javed, 1998, online).

2.4.2 Online Literacy Learning Penetration in Ireland and the UK

The Department of Education and Employment's *Moser* Report (DfEE, 1999) on 'Improving Literacy and Numeracy: A Fresh Start' highlighted the importance of the web in providing access to high quality learning materials and exciting opportunities for learning for literacy learners and tutors. The findings from the Moser Report prompted many literacy providers and agencies to consider offering online tuition and support in the United Kingdom (UK) and in Ireland. Initially websites were created by literacy organisations to raise an awareness of literacy programmes on offer in each of the centres. In Ireland in 2001, NALA embarked on online tuition and support with the development of a literacy web-site, www.literacytools.ie. In September 2002, NALA

published the initial prototype of this literacy website. This website allowed literacy educators and learners to interact in a series of activities in real-time or download printable worksheets for use at their own discretion. In August 2002 in the UK, the BBC launched their response to online literacy education in the form of the BBC Skillswise website, www.bbc.co.uk/skillswise/ which provides literacy learners and educators with opportunities to interact in online literacy learning experiences. Facilities include interactive exercises, multimedia activities and chat-rooms.

2.4.3 Global Online Technology Initiatives in Literacy Education

The following is an outline of some online services that were offered by literacy providers or agencies in 2002, and of the key features that were evident where *'tuition and support'* was offered directly to the literacy student:

- Cyberstep was a partnership of four literacy service innovators in America, i.e. Sacremento County Office of Education, Los Angeles Unified School District, Adult Literacy Media Alliance and Aguirre International, and was funded by the US Department of Education. It developed standards for the development of web and multimedia instructional resources for adults functioning at low literacy levels, http://www.cyberstep.org/. It also provided solutions for creating and distributing multimedia learning materials for adult literacy learners. An example of one of the online tools offered by Cyperstep was the WWW authoring tool *'The Study Place'*, http://www.thestudyplace.org/. Literacy tutors could create activities using the tools provided on this website, and literacy students could interact or track their progress with these activities or other online lessons.

- In 1998, the AlphaPlus http://www.alphaplus.ca/ centre was created in Canada as an information gateway for resources on adult literacy and language training in Canada. Among the many resources available on the Alphaplus web-site was an on-line literacy learning environment called AlphaRoute. AlphaRoute is unique in that it provided learners with on-going guidance and support in an

interactive literacy-learning environment, as each AlphaRoute literacy learner worked on-line with a trained AlphaRoute mentor.

- TV 411 was a television series produced by the Adult Literacy Media Alliance, ALMA, in New York for adults who want to strengthen their literacy skills. It was supported by the TV 411 web-site, http://www.tv411.org/ , which was an interactive literacy learning environment, with exercises to improve reading, writing, vocabulary, maths etc.

- The National Institute for Literacy LINCS project, http://www.nifl.gov/lincs/ and the University of Pennsylvania Literacy gateway, http://www.literacy.org were both portals to electronic resources and tools for the national and international adult literacy communities.

2.4.4 Challenges in using Online Technology in Literacy Education

> *But with all of technology's potential, how to choose and use the most appropriate and effective technological tools to support adult learning remains a challenge* (LiteracyLink, 1999, online).

Using the web can provide many difficulties for the average user and particular challenges for the learner with low literacy skills. Nielson (1999) writes on Designing Web Usability - '*Anyone can put up a site and increasingly, anybody does. As a result, users don't quite know what to make of information retrieved from the Web. It can be deep truth or the ramblings of a nut'* (p.10).

In a report on the study of adult basic education learners in Melbourne who participated in online literacy education, it was reported that literacy learners actively engaged in email, web-publishing, and synchronous communication (Javed, 1998, online). However, although those using technology to teach literacy have considerable anecdotal evidence of its effectiveness, very little empirical evidence is available to substantiate these claims (OTA, 1993).

2.4.5 Conclusion

The global penetration of online learning in literacy education was fragmented in 2002. However, there was evidence of interesting developments within online learning

environments, such as interactive, immersed, multimedia-enabled environments like Alphaplus, and between online learning environments and other media, such as the link between the television series TV 411 and the corresponding website. Interestingly, Ireland was at the forefront of these global developments in the integration of online technology in literacy education; with initiatives such as the TV series *Read, Write, Now* and the online learning environment, *LiteracyTools*.

2.5 Barriers to Literacy Education

In Ireland as elsewhere, making the initial decision to visit a literacy programme or attend the first class can often be a very difficult hurdle for adults with low literacy skills. The adult literacy service faces logistical limitations, particularly time restrictions on when courses can run over large geographical areas. Many adults in need of literacy education dislike the 'loss of anonymity' when embarking on literacy programmes and, hence, often choose to attend literacy programmes that are a long distance away from their own home and work environment.

Barriers to participation in adult literacy education are many and varied, and reflect the competing roles and responsibilities that adults encounter in daily life. Four main categories of barriers to participation in adult literacy education have been identified (Mark, 2002); the first three of these identified by Cross (1981), namely, *situational*, *dispositional and institutional barriers*, and the fourth category added by McGivney (1990), *informational barriers*.

Situational Barriers

Situational barriers include aspects such as a lack of time, prohibitive distance, loss of anonymity and associated costs, which make it difficult for adult literacy learners to avail of educational opportunities. Lack of childcare facilities would also feature as a situational barrier to participation (OTA, 1993).

Dispositional Barriers

Dispositional barriers refer to the attitudes, perception, and expectations that adult literacy learners possess that impact on their willingness to participate in literacy education, (McGivney, 1990). These may include low self-esteem, lack of confidence in one's own ability to learn, and hostility towards any form of formal education due to previous negative experiences in traditional school systems. They may feel shame and embarrassment about revealing a long-term secret such as illiteracy, the stigma attached to illiteracy, fear of public disclosure or blowing one's cover (OTA, 1993). They may have concerns about privacy or the loss of anonymity. A common theme among the profiles of adults with low literacy skills is that of self-reliance and independence (OTA, 1993). For many adults (with low literacy skills, painful past-experience in classroom-based learning and who want to retain privacy), learning in their own homes, library or community centres may offer a less stigmatising way to obtain literacy education.

Institutional Barriers

Institutional barriers result from poor experiences experienced by adults in formal education, and manifest in adult literacy learners' disinterest in taking part in adult education programmes that take place in institutional settings. They may fear that if employers found out that they had low literacy skills, that they would lose their job or it would negatively impact on their position in a work-place literacy scheme. Bailey and Coleman (1998) summarises the feelings of literacy learners as follows:

> *Many are wary of school buildings, of formal enrolment procedures which involve queuing and form-filling, of the traditional classroom setting, of the traditional teacher student relationship, of being treated like children, of being asked to read aloud, of being made to feel silly or stupid in a group, or of being expected to learn too much too quickly.* (p.27)

Informational Barriers

Raising awareness of adult literacy educational programmes is critical in the recruitment of adult literacy learners. Informational barriers result in difficulties for adults with low literacy levels in accessing or understanding information that raises awareness of educational provision. A lack of information on non-participants of literacy education

is a major problem facing those trying to increase student recruitment or participation rates and improve literacy tuition and support. Adult Literacy providers and programmes, regardless of funding source or sponsor, share many of the same problems and critical needs. They may have issues with recruitment and retention of literacy students, instructional issues dealing with curriculum, staff development and assessment, or administrative issues with funding (OTA, 1993). One recurring issue is the provision of professional development training for the full-time and voluntary tutors who are facilitating literacy education.

2.6 Conclusions

The initial section of this chapter presented a discourse on concepts and definitions of literacy; closely linked to two models of literacy, namely, the autonomous and the ideological models.

The second section elaborated on and critiqued the work of UNESCO and the OECD on establishing the extent of the literacy problem globally and nationally. It highlighted possible flaws in the manner in which literacy data was gathered and collated for both UNESCO and OECD surveys. However, it welcomed the role of the IALS survey (1997) in moving adult literacy education to the forefront of political agendas in Ireland.

The third section presented a discourse on the role and a rationale for the inclusion of technology in adult literacy programmes. It highlighted the importance of the Moser Report (DfEE, 1999) in promoting the integration of technology in adult literacy programmes. It also presented a discussion on some innovations in online learning environments in global literacy education, and noted that Ireland was at the forefront of these developments with innovations in television and online literacy programmes. The final section highlighted some of the barriers to literacy education.

Chapter Three

Software Design & Development

3.1 Introduction

This chapter presents a review of literature on models, frameworks, processes or guidelines for software development and design. It begins by examining Software Life-Cycle Models, and critiquing these with the development of web-based enterprises in mind. It continues with an examination of Models of Implementation, focusing on three models that are being used in the higher education sector in the Open University. It elaborates on Khan's E-Learning Framework, and explains how this framework can be used to guide the development of online learning enterprises. Finally, it centres on a discourse on Models of Instructional Design. The final part of the chapter expands on research on some aspects that may impinge on online learning environments.

3.2 Software Life-Cycle Models -Models of Systems Analysis and Design

Software development is the process of developing software through successive phases. It involves the preparation of the requirements and objectives, the design of the software, the implementation of the design through coding, and the testing and the evaluation of the software to ensure that it meets the requirements and objectives.

Software 'Life-Cycle' models were developed as a structured approach to information system development from conception until the software is delivered. They are used to guide all the processes from the initial needs analysis phase, to the design phase, implementation, integration, testing and finally to the maintenance of the resultant software application. The notion of using models to guide the development process of software really emanated from the development of commercial software applications; where clients needed to be informed of the progress at regular intervals. They are also influenced by elements of project management models used in architecture and the building trade.

When embarking on the design of software, whether for online or offline software, it is important to select an appropriate software Life-Cycle Model. The Software Life-cycle Model chosen has as much influence on a project's success as any other decision made.

The Software Life-Cycle models are many and varied; the discussion below focuses on the Waterfall Model, the Prototype Model and the Spiral Model.

3.2.1 The Waterfall Model

The Waterfall Model documented by Royce in 1970 was the first publicly documented life-cycle model. The Waterfall Model of software development, developed within an engineering context, focused on formalising the software development process and emphasised documentation of each step of the process. It is a method that is linear and sequential, with distinct goals at the end of each phase. The phases typically include requirements analysis, design, implementation and testing. Once a phase has been completed, the development proceeds to the next phase. Hence, the analogy with a waterfall, once the water starts flowing over the top, it can't be reversed.

The advantage of this type of model is that each step is clearly defined and doesn't overlap, so it's possible to fix durations and deadlines for each phase. This is good for projects that need to meet a particular budget within a specific schedule. Also it is useful in explaining to the 'un-initiated' what the phases of software development process might entail.

Curtis, Krasner, Shen, and Iscoe (1987, cited in Pfleeger, 2001) state that the major shortcoming of the Waterfall Model is that it fails to treat software as a problem-solving process. The Waterfall Model is representative of a manufacturing or assembly line enterprise from the sixties era, whereas the software development process is now perceived to be a creative enterprise that demands a more flexible, non-linear approach. The disadvantage with the Waterfall Model is that it's not a flexible model, so earlier phases cannot be revised once the phase has been completed.

Another criticism that could be levied at this model is whether it is possible to define all the requirements at the outset of a project, particularly if it's a new or 'unfamiliar' product. It may be impossible for the end-user to conceive of all the detailed requirements that would be needed in the design and development of a product that they are not familiar with. In addition, there is the likelihood of 'bugs' appearing at the coding stages that are the result of earlier omissions, and it is very difficult to return

'upstream' to fix these errors. Furthermore, the documentation load associated with the Waterfall Model is unnecessary for fast-paced, web-based software development. Also the difficulty in fully specifying the requirements at the outset makes the Waterfall Model unsuitable for web-based software development.

3.2.2 The Prototype Model

In this Software Life-cycle model, a prototype is built, tested and then re-designed as necessary until an acceptable prototype is achieved. The complete software product can then be developed based on the final version of the prototype. There are a number of different types of prototypes; the *Throwaway Prototype Model* and the *Evolutionary Prototype Model* are examined here.

Traditional 'Throwaway' Prototype Model

In this model, the prototype is used to capture the requirements and is thrown away as soon as the purpose is achieved. The approach is to construct a 'fast and dirty' partial implementation of the system during or before the requirements are defined. This prototype model is useful in situations where user's needs are unclear or poorly specified. However, in this traditional or 'throwaway' prototype model, the resultant prototype would be thrown away once the requirements have been realised. This is perceived to be unnecessary and uneconomical for typically smaller web-based projects.

Evolutionary Prototype Model

This prototype involves designing a prototype and testing it, then making changes and re-presenting the new prototype for evaluation. This prototype is developed in increments and continuously modified, based on evaluation by the end-user. The requirements get up-dated as the customer reviews a working prototype of the software. This is thought to be particularly applicable, by Braxton et al (1995, online), to '*situations where individual components of units or courses require development, and furthermore is thought to be applicable in the development of web-based educational resources*'. According to Tripp & Bichelmeyer, 1990, (cited in Gustafson & Branch,

1997, p. 80), the process of rapid prototyping is especially useful when developing technologically-based educational resources like CD-ROMs, videos or websites.

The Evolutionary Prototype Model decreases development time compared with traditional methods, but makes it more difficult to predict when the project would be completed. The problems that may arise with the use of the Evolutionary Prototype Model include unrealistic customer expectations, poor 'end-user' feedback, poor product performance, poor design, unrealistic performance expectations and feature creep. Also the increased access by end-users and clients to the work-in-progress can introduce risk to the end-user interface design.

The customer may expect faster completion of the software as heightened 'visibility' of the 'user interface' work-in-progress may give them the false impression that the work is near completion. The customer would need to be made aware of the limitations of the prototype, so that 'unrealistic customer expectations' can be controlled. Furthermore, there is a likelihood that end-users may not provide the 'high-quality' feedback necessary to enhance the prototype. Therefore, it is imperative that the end-users are helped in understanding, studying and given adequate time to review each prototype, so that 'poor end-user' feedback is avoided.

In addition, the prototype coding may not be as structured and efficient as a final version. However, the prototype should have enough functionality to allow an adequate level of product performance. The initial prototypes often have much better performance than the final product, as the full functionality hasn't been included in the prototype. This can create a 'false or unrealistic' impression of the performance.

Finally, poor design can result from 'patches' being added to prototypes that take the product in a direction that was unanticipated at the design phase. This may result in an overall deterioration in the design. As the user interface is developed first, it may result in too much focus on user interface and failing to take into account other areas, which should also have strong influence on the system's design. As end-users have direct access to the prototype, the list of features desired may increase indefinitely. This can create problems in terms of design and functionality.

3.2.3 Spiral Model

The Spiral Model was presented by Boehm in 1985, and focused on risk management. Most Software Life-cycle Models could be viewed as instances of the Spiral Model. The Spiral Model incorporates prototyping as a risk reduction strategy and accommodates evolution, growth and requirements changes. The Spiral Model combines the features of the Evolutionary Prototype Model and the Waterfall Model. It involves evolving prototypes until a prototype that accurately represents the desired end product is realised. When this 'final' prototype has been developed, it is scaled up to produce the final product. The Spiral Model is normally used for large, expensive and complicated projects.

The process involved in the Spiral Model of development is as follows: Firstly, the end-users are interviewed and the new system requirements are defined in as much detail as possible. A preliminary design is created. This is followed by the development of the first prototype of the system from the preliminary design, which is effectively a 'scaled down' version of the final product. Then, a second prototype is evolved by a four-step procedure that includes, evaluating the first prototype, defining the requirements for the second prototype, planning and designing the second prototype, and finally constructing and testing the second prototype. The customer can opt to abort the entire project if the risk is deemed too high; the risk could be any variable the customer decided on. Otherwise, the existing prototype is evaluated and if necessary, another prototype is developed from it. This is repeated until the customer is satisfied that the prototype represents the final product. At the end, the final system is constructed based on the refined prototype. The final system would be evaluated and tested.

3.2.4 Review of Software Life-cycle Models

Current Software Life-cycle Models originated from the development of commercial software applications, which typically were *disk-based* or *offline* digital applications, managed by computer programmers and took long periods of time to develop. The corresponding models as discussed here often rely heavily on documentation, require adherence to rigid processes or don't allow for changes in the development process.

Nowadays, there is huge interest in the development of *web-based* or *online* digital applications, which are generally faster to implement. With the increased interest in web-based applications, there is a need for more flexible Software Life-cycle models to guide the design team through the development process.

3.3 Models of Implementation for Online Tuition and Support

A Model of Implementation has implications for the extent and manner in which resources and support are integrated in the design of the software. Traditionally, the context for using disk-based software was set by teachers in the *physical* class-room. With the development of online technologies, there is a likelihood that learners will be accessing the online learning environment from a distance. In this event, support may not be readily available to set the context for materials, and so materials need to be integrated to facilitate meaningful learning experiences.

Students participating in a flexible interactive online learning environment may be offered a number of different modes of study. For example, in the case of the SCHOLAR interactive online programme in Scotland (MacKinnon et al, 2001, online), the options offered were, '*working remotely with local tutorial support, working locally with on-site tutorial support or working remotely with remote tutorial support*'. In a flexible online learning environment, adult literacy learners who have very small amounts of time to devote to learning, or other issues, such as retention of anonymity and privacy, can choose from a mode of study that best suits them. The focus in creating a flexible online learning environment is on presenting the key concepts and skills, where the outcomes and timelines are negotiated with students, and technology is used in a manner that helps to balance or adjust the workload (Kennedy & McNaught, 1997).

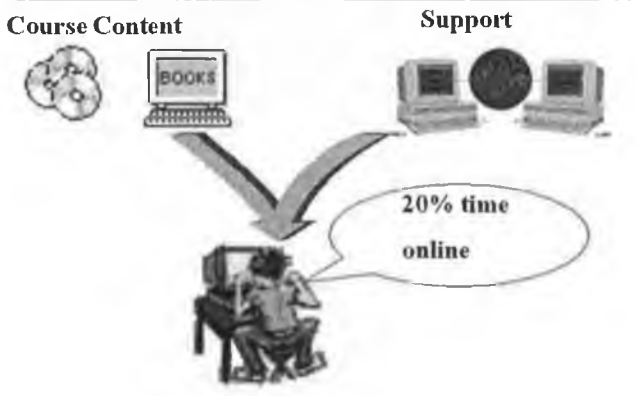
Deciding on a suitable model to implement an online literacy learning environment is not an easy task. The following is an outline of some online models of implementation that are in place in the delivery of higher education on the UK Open University programmes (Mason, 1998, online).

3.3.1 Content and Support Model

The Content and Support Model (see figure 3.1) is an online model of implementation that relies on the separation between the course content (which is probably delivered in print or possibly as a course package on the web) and tutorial support (which in its simplest form is delivered by email or computer conferencing). The content materials wouldn't really change. Collaborative activity amongst students, peer commenting and online assessments can be supported by computer or web conferencing but often aren't fully integrated with course materials. Only twenty per cent of the students study time is spent online. Therefore, the content would be prepared by a team of subject specialists in advance and put online, with a view to using computer or web conferencing or email to help students interact with the material in a constructive manner.

Figure 3.1 Content and Support Model

Figure 3.1 Content and Support Model



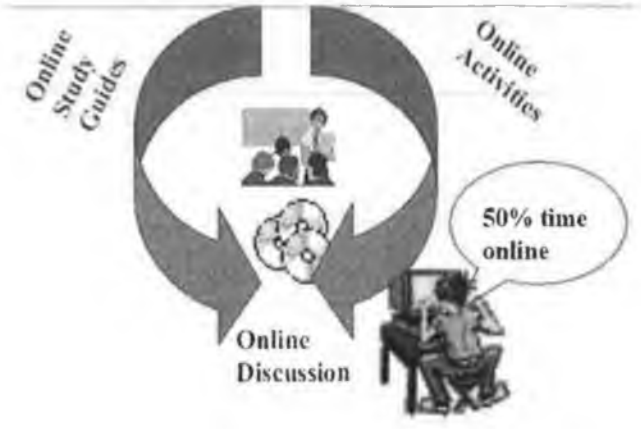
3.3.2 Wrap-around Model

The Wrap-around Model (see figure 3.2) is an online model of implementation that relies on tailor-made materials (study guide, activities and discussion) wrapped around existing materials (text-books, CD-ROM resources or tutorials). Students would spend fifty per cent of study time online, and would have more freedom and responsibility to interpret course materials for themselves. Real-time online events, with students and tutors interacting, feature. Screen sharing software is often used for problem solving so

that students and tutors can interact in one-to-one and one-to-small group situations. Tutors are more involved, as less of the course online is pre-determined, and hence much of the course is created through dialogue and activities, as the student and tutor progress through the course of study.

Figure 3.2 Wrap-around Model

Figure 3.2 Wrap-around Model

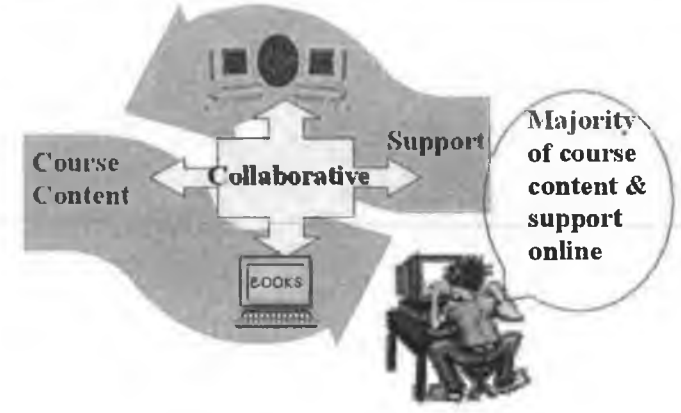


3.3.3 Integrated Model

The Integrated Model (see figure 3.3) is an online model of implementation consisting of embedded collaborative activities, learning resources and joint assignments. The heart of the course takes place online through discussion, accessing and processing information and carrying out tasks. Course contents are fluid and dynamic, as they are largely determined by individual and group activity. *'In a sense, the integrated model dissolves the distinction between content and support, and is dependent on the creation of a learning community'* (Mason, 1998, online). Real-time communication, in the form of video, audio and text, is fully used within small groups created to interact in this integrated environment. The overall aim of this model would be to build on the inputs of students within the carefully constructed online community, to create a self-sustaining learning community.

Figure 3.3 Integrated Model

Figure 3.3 Integrated Model



3.3.4 Review of Models of Implementation

A model of implementation indicates the type of learning environment that could be supported by the software, and by default the type of learner that can be supported.

Traditionally, educational software was developed on disk; a manual was usually provided with the disk highlighting the salient features of the software, and the user would decide from that whether the software could be used in a self-directed capacity or if it necessitated the support of a tutor. In online learning environments, the design team can no longer assume that there will be a tutor available to set the context or support the user. Instead, the design team must decide at the outset whether the online software will offer an immersed learning experience, in which case, all learning materials and support will have to be provided online; or whether the online software will facilitate a blended learning environment, in which case, the assumption will be that a tutor will work with the learner to help set the context and facilitate feedback.

Online technology can be a means of supporting learning by providing unique opportunities for teachers or tutors to expand their teaching approaches and for learners to engage in new ways of learning. It can enhance adult learning because it has the

potential to increase flexibility, provide access to expertise, facilitate discussion among learners who cannot meet face-to-face, reduce feelings of isolation, increase learner autonomy, and support and promote constructivist and collaborative learning (Imel, 1998, p.2). However, if the Internet and the WWW are used only to automate traditional teaching and learning practices their impact on student learning outcomes will be minimal.

3.4 Framework for Designing Online Learning Environments

Recent developments in education have seen various old frameworks, especially those based on behaviourist psychology, objectivist epistemology and didactic pedagogy, questioned and even replaced. '*While changing and improving the model [of teaching and learning] is more easily accommodated in the face-to-face educational context by changing the role of the teacher as expert to teacher as facilitator, it is more difficult to achieve this same change in the distance context*' (Parashar & Philip, 1998, p. 1).

When developing educational software, considerations need to be made regarding the target audience, their needs, the educational content, how the material is to be presented, assessed and of course how the effectiveness of the learning activity will be evaluated. It is useful to have a framework to guide this process. Khan's E-Learning Framework highlights eight factors that design teams should consider when designing educational software.

3.4.1 Khan's E-Learning Framework

Badrul Khan's (1997) framework for E-Learning consists of eight factors; namely, pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional.

The **first** consideration is the pedagogical aspect, which involves analysing the content to see if it's suited for use in an online learning environment. It also involves audience analysis to find 'adequate information' about the distance learners and goal analysis, so that the course provides clear expectations of what the student is required to do. The

role of the instructor within the online learning environment must be decided upon – 'instructor not required' or 'instructor as guide on the side'. Finally the multimedia attributes, such as text, audio, video and graphics, need to be examined to see if they can be transferred into an online learning environment.

The **second** consideration is the technological aspect, which involves examining the hardware and software infrastructure and staff available to support learning.

The **third** aspect is the interface design, which involves checking for cross platform and browser compatibility, ensuring that best practice is applied in the content design, examining the navigational aids to ensure that they are useful in directing the learner and finally, usability testing.

The **fourth** aspect is evaluation, which examines the website from two perspectives; firstly, examining whether the student learning is effectively assessed and secondly, whether the student can input on the effectiveness of all aspects of the online course, from interface design and the content presented to technical support available.

The **fifth** aspect is the management aspect, which examines whether there is a suitable tracking mechanism that keeps track of student interaction with content and assessments, and secondly, whether there is a communication channel that can be used to inform and interact with students on logistical and pedagogical issues that may emerge.

The **sixth** aspect is resource support, which examines whether there are online support mechanisms that provide technical or subject support, and also whether students can examine other students' work that has been published.

The **seventh** aspect is the ethical aspect, which covers the following areas; Social/Political Influence, Cultural Diversity, Bias, Geographical diversity, Learner Diversity, Information Accessibility, Etiquette and Legal Issues. The *Social/Political* Influence would involve an examination to ensure that key stakeholders are consulted and that their approval has been secured. To ensure that there is *Cultural Diversity*, the use of jargon, idioms, ambiguous humour and acronyms would be examined. In terms

of *Bias*, the course would need to be examined to ensure that more than one viewpoint has been included on controversial issues. In terms of *Geographical Diversity*, the course would need to be examined to ensure that support was made available for different time zones. In terms of *Learner Diversity*, the course would be examined to ensure that adequate provision is made for learners who have different learning styles or preferences, or who may learn at a different rate. In terms of *Information Accessibility*, the course would be examined to ensure that any potential issue for learners who may not have access to or be able to use this technology is adequately redressed. In terms of *Etiquette*, a clear set of guidelines on how to behave and interact in an online learning environment would be prepared. In terms of *Legal Issues*, permission, from those whose material is to be published in the online learning environment, would have been granted to avoid any legal problems.

Finally, the **eighth** aspect is the institutional aspect, which examines whether the institution is ready to offer online courses, whether the academic quality of the course is at least equivalent to the traditional course and finally, whether there are tutors and technical staff available for online orientation.

3.4.2 Review of E-Learning Framework

In traditional software, there was an emphasis on the instructional design process and as a result, there are many models of instructional design that can help the design team to structure learning activities. However, the move from disk-based to web-based enterprises has added new elements for design teams to consider; for example, cross-platform compatibility and online support, as well as ethical issues such as accessibility and cultural implications.

Hence, there is a need for a framework to guide the development of content from pedagogical, technological, ethical and many other perspectives in web-based enterprises. Unfortunately, there is a dearth of frameworks for guiding the development of online or E-Learning enterprises. Khan's (1997) E-Learning framework is therefore useful as a frame of reference when designing web-based educational applications.

3.5 Instructional Design Models Applicable in Design of Learning Environments

Whilst Software Life-cycle Models are necessary in managing the entire process of software design and development, *Instructional Design* Models are necessary for implementing the internal learning and pedagogic design aspects.

Instructional Design Models provide a useful service in translating learning content, instructional strategies and pedagogic aspects into meaningful instructional activities. They help us make sense of an otherwise incomprehensible problem by giving it a structure and meaning. Instructional Design Models help to visualise the problem and, if applicable, to break it down into discrete, manageable units.

3.5.1 Instructional Designer *versus* Subject Matter Expert

It is important at this point to differentiate between the role of the Instructional Designer and the Subject Matter Expert (SME) in courseware design. Literacy practitioners for example specialise in literacy education, and would be very familiar with the nuances of literacy practice. They would understand the subject matter and would be able to integrate appropriate pedagogies into their literacy practices in the traditional classroom setting. Therefore, literacy practitioners could be considered SME's in literacy education. An Instructional Designer differs from a SME in that he/ she understands how to design instruction for a wide variety of mediums, and therefore understands how to translate materials, concepts or practices undertaken in the physical classroom into a paper-based or electronic courseware. An Instructional Designer may not necessarily be a SME in the subject area under examination, but generally has experience with a wide variety of subject areas. An Instructional Designer understands the needs of the learner, and has the technical and design skills to translate materials into the new medium. Braden (1996, as cited in Northcote, 2000, p.25) classifies Instructional Designers as falling into one of six categories as in Figure 3.4 overleaf. From the researcher's perspective, the 'ideal' Instructional Designer would include a 'blend' of some of the above, with these structuring and management aspects coming from the 'pragmatists', the underpinning pedagogic philosophy contributed by the 'philosophers' and the design considerations from the 'evolutionists'.

Figure 3.4: Categories of Instructional Designer:

Defined by Braden (1996, as cited in Northcote, 2000, p.25)

1. The Patrick Henry Designers (the libertarians) who suggest that the instructional design process can just start at *any* stage of the process. Such unit designers don't want to be "fettered" by linearity.

2. The Benjamin Franklin Designers (the pragmatists) are the extremely practical designers who want to achieve at all costs, sometimes cutting corners to do so. They are often especially concerned with resource and time management issues.

3. The Picasso Designers (the artists) believe that instructional design is an art and challenge the other end of the continuum where instructional design is categorised as a system. Their brand is often labelled "Roll Your Own ID".

4. The Darwinian Designers (the evolutionists) suggest that instructional design processes can benefit from progress such as computer technology. These designers often produce automated instructional design procedures, sometimes labelled "second generation ID".

5. The Sartre-Heidegger Designers (the philosophers) are driven by either constructivism, anchored instruction-situated cognition, and postmodernism.

6. The "Jesse" Designers (the extremists) are those who are unlikely to compromise or make concessions and their radical ideas make them unlikely to ever change their instructional design beliefs.

Instructional Design Models are many and varied. The value of a model is determined within the context of its use. It can be measured by how well it mediates the designer's intention and that of its user, and how well it implements the learning activity.

3.5.2 Key Features of Instructional Design Model

A key feature of any Instructional Design Model would be the inclusion of cycles or even semi-cycles of revision of phases or stages. This feature would ensure both flexibility and systematic design. Furthermore, the importance of evaluating the learning resource cannot be underestimated in the Instructional Design process.

Most Instructional Design Models stress the importance of the initial 'learning needs' analysis, as the resultant instructional design processes are dependant on accurately identifying the learning objectives of the software. In an evaluation of recent instructional design models, Braden (1996) stresses the importance of an initial needs assessment analysis as it "unearths" many learning objectives that may or may not be achieved through future instruction. This stage directs all other processes in the unit development processes and especially focuses on the outcomes to accomplish.

In addition, the importance of contextual analysis is emphasised in order to create or re-create a more authentic learning environment, and to help decide what is taught as well as the strategies used to teach it. *'They [learner analysis and context analysis] provide the details that help shape what is taught and, especially, how it is taught'*
(Dick & Carey, 1996, p. 89).

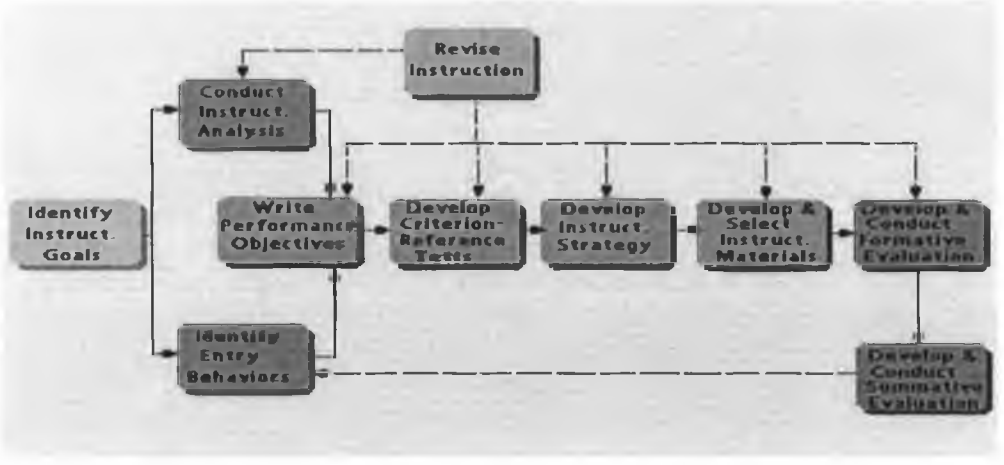
3.5.3 The Dick and Carey Instructional Design Model

The Dick and Carey Design Model (1996) uses a systems approach for designing instruction. One of the best-known models, its approach to designing instruction is similar to that of software engineering.

The Dick and Carey Instructional design model was influenced by Gagne's approach to instructional design. Gagne's model proposed nine events of learning or instruction, which were divided into two groups; the first five represented communication behaviours that occur before the acquisition of information, the remainder occur after acquisition has developed. The Dick and Carey model is based on the assumption that learning is based on mastering a set of behaviours which are predictable and therefore reliable. It is also based on a reductionist model of breaking instruction down into smaller components.

The design model (see figure 3.5) describes all the phases of an iterative process that starts by identifying instructional goals and ends with summative evaluation.

Figure 3.5 Dick and Carey Design Model as presented by Braxton (2005, online)



The Dick and Carey Model consists of ten elements (Dick & Carey, 2001), which includes: to assess the needs, to identify the goals, to conduct an instructional analysis, to analyse learners and their contexts, to write performance objectives, to develop assessment instruments, to develop the instructional strategy, to develop and select the instructional materials, to design and conduct formative evaluation of instruction, to revise instruction and to design and conduct a summative evaluation.

3.5.4 Instructional Design Aspects in Online Literacy Support and Tuition

To retain a focus on learning in the online environment, distinguishing between educational and structural design is useful. *Educational design* focuses on the

underpinning conceptual framework needed to achieve the educational intentions. Such frameworks may include collaborative learning or problem based learning. The *structural design* focuses on the interface design and the navigation pathways. (Jasinski, 1998, online). Interface design issues include the accessibility and usability of the web interface.

The discussion will now continue by looking at seven aspects in the educational and structural design of online literacy tuition and support, namely, facilitation of pedagogy, access, interactivity, flexibility, motivation, collaborative and independent learning.

Pedagogy in Online Learning

> *While a great deal of emphasis is being placed on putting courses and programs on the Web, less attention is being given to the other components that help foster a successful learning environment.* (Montgomery & Little, 1997, online)

Utilising web-based technologies requires changing the way we teach and learn. Rather than creating new ways for students to learn over the Internet, the common model emerging is to use web-technologies to draw more students onto a course. Often this model leaves learner dialogue partially, if not totally, unexercised. In an effort to embrace 'cost-effective' instructional delivery mechanisms, an unfortunate recourse is to employ traditional teaching mechanisms over new Internet technologies (Jasinski, 1998, online). An appropriate pedagogical approach is vital when designing online learning environments.

The traditional didactic model of learning assumes that complex skills can be broken down into simple skills, each of which can be mastered independently and out of context. Not until all the components are mastered can more complex thinking skills develop. The teacher or tutor would be the 'sage on the stage', with the student a passive participant in the learning process, i.e. teacher-centred paradigm. In didactic online learning environments, student learning that occurs is essentially passive learning. The course of study is teacher or tutor driven, there is relatively little student interaction with the material effectively 'books on screen', and there is minimal credence given to alternate models of representing knowledge. This environment is not conducive to stimulating or motivating students.

In contrast, the constructivist model of learning underscores the importance of students actively constructing his/ her knowledge. In this model, the teacher or tutor would act as facilitator, and students would actively collaborate in the learning process, i.e. student-centred paradigm, to constructively learn. In transformative online environments that adopt constructivist and collaborative principles, there are facilities for help online, the material is presented from multiple perspectives, there are multiple paths through the material, there is appropriate use of multimedia elements, there is recognition of student life experience and students actively engage with the material. Students are also able to reflect from their own personal perspective on material, interact in positive discourse, build and negotiate tasks and take-part in discussions online. This online environment would have discussion facilities, synchronous and asynchronous, and maximum user control of material.

In combination with the growth of the Web and increased connectivity, there is support for pedagogical approaches that promote more flexible and collaborative interaction and support communication tools that allow learners to access different sources of information in different formats at their own pace. Successful implementation of these new online communication tools depends on a change in teaching styles. This shift in pedagogy is a movement away from the teacher-centred paradigm. It translates into instructional design that uses *'collaborative technologies integrated with communication tools that facilitate group-work, discovery learning, mentoring and fostering continuous life-long learning'* (Montgomery & Little, 1997, online).

Ramsden, (as cited in Kennedy & McNaught, 1997), described elements of good teaching practice that were critical to teaching and learning. These included showing respect and concern, sharing love of subject, making material interesting and stimulating, engaging students at their level of comprehension, explaining the context using clear and appropriate language, improving and adapting to new demands and learning from students and colleagues. In an online environment, the above elements can be difficult to replicate and the challenge is to find ways to stimulate and motivate students so that they reach their personal goals.

Facilitation of Access

An adult with low literacy levels will have multiple concerns, as mentioned earlier, when entering a literacy programme for the first time. If the literacy programme on offer is web-based online, the importance of the initial experience cannot be underestimated. At the very least, the web interface must be made accessible to the adult literacy student by using easy-to-understand language, clear and consistent navigation and layout, and recognisable graphics. Literacy providers are working on three aspects of making the web more accessible for literacy students, which include, the development of standards for the creation of accessible web resources for adult literacy learners; the creation of new web and multimedia literacy products and the creation of maps so that these literacy resources can be found more quickly. (Hacker, 2000, online)

The WWW consortium, W3C, published the Web Content Accessibility Guidelines (WCAG) in May 1999, with the aim of explaining how to make web content accessible to people with disabilities. The document contained fourteen guidelines, (W3C, 1999), that address barriers in web interface design which people with physical, visual, hearing, and cognitive or neurological disabilities may encounter. Of particular relevance to those with low levels of literacy, the fourteenth guideline states to ensure that documents are clear and simple, so that they may be more easily understood. '*Consistent page layout, recognisable graphics, and easy to understand language benefits all users. In particular, they help people with cognitive disabilities or who have difficulty reading*' (W3C, 1999, online).

The Clear Language and Design (CLAD) tool is an online service (http://www.eastendliteracy.on.ca/), which is particularly useful to literacy content designers or providers, where the written content of a website can be tested for its readability using the online 'Reading Effectiveness Tool'. The Reading Effectiveness Tool is based on the SMOG (Simple Measure of Gobbledegook) readability formula, and grades the readability of the content to particular categories of readers from beginner to advanced level. Additionally, users can learn about various readability issues, including the use of language and its placement on screen.

The Bobby Validator, developed by CAST (http://www.cast.org/bobby/), and the W3C HTML Validation Service are both online tools that analyse web pages for accessibility for people with disabilities. Other tools such as Vischeck (http://www.vischeck.com/), developed by researchers at Stanford University, allows images on web pages to be uploaded and can display how these images are perceived by people with various types of colour blindness. Also useful the Web Design Group WDG (http://www.htmlhelp.com) have tools for checking browser compatibility.

Facilitation of Interactivity

The emphasis for a constructivist multimedia designer is to build learning environments, which can be adapted to the specific needs of individual students and actively engages the student in constructing new knowledge. An educator involved in interactive multimedia development must find out how to transform what is already known about what constitutes good teaching practice into interactive multimedia (Kennedy & McNaught, 1997, p.1).

Interactive features in an online literacy environment may exist in the form of simple navigation tools, which allow a user to move through the content, to scripts which allow the user to track or assess progress. Interactive features can allow the adult literacy learner to self-pace through activities or direct the literacy learner along certain paths, and can allow the literacy learner to communicate with other learners. Interactive Multimedia provides '*alternative paths for navigation which attempts to address different learning styles in students'* (Kennedy & McNaught, 1997, p.7).

With the development of Yahoo's JavaScript and Microsoft's JScript and VB Script authoring languages, web pages can be made to include the same kind of interactivity as in multimedia programmes like HyperCard and HyperStudio – '*What distinguishes the web as an instructional resource from more traditional print-based materials is its capacity to support interactive presentation of content*' (McEneaney, 2000, online). Web-based learning environments also allow better control of text, images and formatting and can support a more interactive engagement of students with the content

online. Scripts can be designed to guide students before, during and after reading activities.

Facilitation of Flexibility

Flexibility may be offered in terms of the manner in which adult literacy learners are allowed to engage with the online course content i.e. cognitive flexibility theory espoused by Jacobson & Spiro, as cited in McEneaney, (2000, online). They suggest that learning requires numerous carefully designed traversals (i.e. paths) across a particular domain, and that different traversals yield different insights and understanding. Flexibility is thought to arise from the appreciation learners acquire for variability within the domain and their capacity to use this understanding to re-conceptualise knowledge. If instructional materials are to promote flexibility, learners must first have knowledge that is effectively grounded. In the absence of thoughtful instructional design, efforts to promote flexibility may only lead to disorganised thinking among students – *'Simply dropping students into complex hypertext may do little more than confuse and frustrate them'* (McEneaney, 2000, online). This is one of the concerns often cited concerning the web as a learning environment – that it has so little intrinsic structure that the freedom it provides actually undermines learning in favour of a shallow browsing of material.

> *The central issue is one of designing appropriate levels of control so that learners can benefit from the experience and knowledge of others (especially teachers) while still finding room for their own unique insights and understanding.* (McEneaney, 2000, online)

One of the most powerful aspects of the new online technologies is that these levels of control can be adjusted 'on the fly'. Literacy learners who may find the support offered too intrusive may be able to scale it back, and those who are in need of greater degree of support can scale it up. This may be particularly useful to the 'independent literacy learner', who wishes to embark on self-paced tuition.

Facilitation of Motivation

Motivation is the force that propels voluntary adult learners toward literacy education. If they have strong motivation, barriers that they encounter, before and during course participation, can be overcome, whereas, if they have weak motivation they are unlikely to last the course. If literacy programs can develop recruitment and instruction, which is congruent to learners' motivation, success in attracting and retaining students will be considerably improved.

Motivation goes beyond a simple desire to improve basic literacy skills, the adult literacy students motivations may include employment goals, hopes related to their children or self-empowerment.

The novelty factor of technology can improve motivation, it may be perceived as a fun way to learn whilst mastering new skills. It can be used to sustain motivation because learning materials can be customised. It can provide multimedia opportunities to branch off and explore, and offer choices and immediate feedback to maintain motivation. The adult literacy learner can make mistakes without embarrassment, and enjoy immediate, helpful feedback.

Increasing learner control is likely to improve student motivation and interest in the context (Kennedy & McNaught, 1997). In addition, providing material that is relevant to the learner's background, can stimulate the learner to develop knowledge from a more personal perspective.

Facilitation of Collaborative Learning

According to Kennedy & McNaught (1997), '*the important point to remember is that effective learning does not occur in a social vacuum*' (p.3). It's useful to firstly differentiate between co-operative and collaborative learning as the two are often confused and used interchangeably. Co-operative learning is '*a protocol in which the task is in advance split into subtasks that the partners solve independently*', whereas, collaborative learning describes situations '*in which two or more subjects build synchronously and interactively a joint solution to some problem*' (Curtis et al, 2001).

Collaborative learning allows for greater student autonomy, uses higher level processes and hence results in better student learning. The emphasis in this discussion is therefore on collaborative learning.

> *If learners, particularly adult learners, respond best to collaborative opportunities, and the internet is a powerful mechanism for delivering learning opportunities to adults, then online courses should have elements of collaboration built-in to facilitate the learning community.*
> (Montgomery & Little, 1997, online).

The educational basis for collaborative learning is rooted in the constructivist model of the way people think and learn. Learning is '*not a matter of passively collecting concepts, but of constructing a conceptual edifice in which what is learned is integrated and linked to one's entire life experience*' (Alexander, 2001, online).

Learners need to be able to manipulate concepts, deconstruct them and look at their relationships to other concepts. The job of the instructional designer is to create learning situations in which learners find themselves actively engaging with the concepts they are learning. Particularly powerful is discussion. Learners participating in group activities are compelled to explain thoughts, in other words, verbalisation requires reflection.

With the rise in the popularity of the Internet, many educational institutions are putting courses online. However, many online courses are inadequate learning environments as they simply consist of 'cut and paste' hyper-linked lecture notes and an email facility. In recent years, collaborative models of education have been taken much more seriously, and have come to be seen as having important pedagogical advantages. The crucial ingredients in an online collaborative learning environment are that the online course is designed around collaborative activities in which adult literacy learners '*engage in activities and that a sense of online community is created and nurtured with skills of collaboration being developed*' (Alexander, 1998, online).

To obtain the benefits of collaborative learning, it is not sufficient to put adult literacy learners in small groups, instead a group ethos should be fostered, including skills of working together, and of giving and receiving comments and criticisms. Also the social

situation where literacy learners feel appreciated, supported and accepted with all their strengths and weaknesses should be developed.

There is a question about whether collaboration is justified in the case of online environments because interactions among students are mediated, there is an absence of non-verbal cues, and text-on-screen is a very limited mode for what should be a semantically rich environment (Curtis et al, 2001). In addition, as facilitators of learners in an internet-based course, adult literacy teachers or tutors '*no longer benefit from the verbal and visual cues that are traditionally used to gauge student engagement with and understanding of the course*' (Montgomery & Little, 1997, online). Also much online conversation occurs asynchronously with substantial delays in receiving a reply. However, the lack of spontaneity associated with a real world collaborative activity may be offset by the possibility of adult literacy learners having greater time for reflection and generation of a considered response.

Facilitation of Independent Learning

The phrase independent learning designates any mode of instruction that does not require learners to sit in a 'traditional' classroom at regular scheduled times. Independent learning is a mode of instruction where the learning is structured in a manner that emphasises individualised, self-directed learning, and where the responsibility for reception and subsequent processing of learning activities lies with the individual learner. The educational design models applicable in the online learning environment include the Individual Design Model, where the independent learner can self-pace through discrete units, and the Learning Network Model, where the emphasis is on learning through human interaction with underpinning design models of collaborative, problem-based and project-based learning.

Ramsden (1992, as cited in Kennedy & McNaught, 1997), emphasised independence as a criteria for effective teaching and learning. In an ideal situation, opportunities for students to become more independent would be provided. This could be facilitated by creating a learning environment, where the student could learn actively, act responsibly and operate cooperatively.

In an online literacy-learning environment that supports independent learning, there would be an attempt to engage the literacy learner in active learning and towards better explanation of content. Alternate paths for navigation, that address different learning styles, would be incorporated into the learning environment. There would be self-pacing activities, as well as problem-solving activities that require collaborative interaction. Different types of assessments and discussion would offer opportunities to reflect on the process of learning. Finally, there would be opportunities for the literacy learner to sequence the content according to own preferences.

3.6 Conclusions

This chapter presented a review of literature on models, frameworks, processes or guidelines on software development and design. The biggest challenge facing design teams is deciding when to use a particular model or framework. Software Life-Cycle Models are traditionally used if the software project is large, requires a lot of money or the client requires constant updates.

The Software Life-cycle Models on offer appear to be best suited to the development of offline software; more research is needed to ascertain their effectiveness in the development of web-based software. If the software is to be web-based then there needs to be careful consideration of the mode (Model of Implementation) in which the intended user will use the software i.e. whether they are targeting a self-directed learner or one that needs the support of a tutor at a centre. If the learner is self-directed, then the software will need to facilitate an immersed learning environment with all materials and support supplied online.

The examination of Khan's (1997) E-Learning Framework and Models of Instructional Design highlighted some interesting aspects that may impact on the design of web-based learning enterprises. However, further research is needed to ascertain the extent of impact, and whether these aspects can be prioritised or expanded upon.

Therefore, the **conceptual framework**, for the examination of the software design processes and products that were encountered in the examination of this thesis,

encompasses four aspects, namely, an investigation into whether a Life-cycle Model, Model of Implementation, E-Learning framework and/ or an Instructional Design Model has been considered by the design teams, and what impact this had on the resultant software.

Chapter Four

Research Methods

4.1 Overview of Research

> *The design of all research requires conceptual organization, ideas to express needed understanding, conceptual bridges from what is already known, cognitive structures to guide data gathering, and outlines for presenting interpretations to others.* (Stake, 1995, p.5)

This thesis set out to examine how virtual literacy-learning environments were developed in Ireland. The research involved an examination at three levels; the contextual, the developmental and the experiential levels. In the initial section of this chapter, three prominent research paradigms are discussed in light of the development of a new 'hybrid' paradigm for this research. The manner in which this new paradigm underpinned the philosophy at the contextual, developmental and experiential levels of this research is also outlined. In the middle section, the research method model that was employed is highlighted and the salient features are detailed. In the final section, the discussion centres on explaining what was examined at each of the levels in the investigation of this thesis.

4.2 Philosophical Underpinnings

The philosophical underpinnings for this examination involved a new *paradigmic* approach. This new paradigm, which is a hybrid of the *Post-Positivist* and the *Design Research* paradigms, could be considered to be on the 'right wing' of a trajectory that stretches from *Positivism* to *Post-Positivism* and onwards *to Design Research.*

The discussion of paradigms that ensues focuses on examining four aspects that contribute to the underpinning philosophy for each research paradigm, and furthermore, that impacts on how the research is conducted and how the information is interpreted. These four aspects are: ontology, epistemology, methodology and axiology. The ontology is an indicator of how the nature of *being* or the nature of *reality* is perceived – '*It involves asking what you see as the very nature and essence of things*' (Mason, 2002, p.14). The epistemology indicates how knowledge is perceived and what types of

knowledge are generated from the research – '*How do I know the world?*' (Denzin & Lincoln, 2005, p.183). The methodology indicates how the research is conducted, and how the information is treated. Finally, the axiology indicates what is valued in the research – '*How will I be as a moral person in the world?*' (ibid).

4.2.1 Positivist and Post-Positivist Paradigm

In the debate about research paradigms, two paradigms usually come to the fore, that of the *Positivist* and *Post-Positivist* paradigm (Guba & Lincoln, 2005). Whilst aspects of the *Positivist* and *Post-Positivist* paradigms are not mirror opposites of each other; it would be considered impossible to hold a *Positivist* and a *Post-Positivist* view at the same time because they conflict from ontological, epistemological, methodological and axiological perspectives.

The *Positivist* perspective recognises the nature of *being* as one that is singular and probabilistic; that objective knowledge emerges through 'unbiased' observation using quantitative techniques and statistical analysis; and that the acceptance or rejection of hypotheses are valued. The *Positivist* perspective would be one held traditionally by researchers in the scientific community, and has underpinned scientific research for eons – '*Positivism may be characterized by its claims that science provides us with the clearest possible ideal of knowledge'* (Cohen & Manion, 1994, p.12). The *Post-Positivist* perspective recognises the nature of *being* as being socially constructed; that subjective knowledge emerges through qualitative, dialectical and participative research into participant interaction with their environment; and that understanding through the prioritisation of '*factors*' that emerge from the research is valued. The *Post-Positivist* perspective would be one held traditionally by researchers in the social sciences community; and has underpinned work of social scientists and anthropologists in particular.

Therefore in comparing these paradigms; the ontological difference is that the *Positivist* believes that there is one 'true' reality or 'being', whereas the *Post-positivist* believes that the nature of being is many – there are many different types of beings shaped by the social context. The epistemological differences are that the *Positivist* views knowledge gathered as objective - free from any external influences or biases; whereas the *Post-*

Positivist views knowledge as subjective – shaped by the social interactions and context in which the beings are embedded. The methodology used in the *Positivist* approach would be quantitative mainly, whereas the *Post-Positivist* would use qualitative methods mainly. Finally, the *Positivist* values proving or disproving an hypothesis, whereas the *Post-positivist* recognises that there are relative *goods* that may emerge in terms of the research question and process, and focuses on prioritising these *goods*.

Both the *Positivist* and *Post-Positivist* paradigms were dismissed in terms of being used to underpin this thesis; the former conflicted with this researcher's ontological, epistemological and axiological perspectives, while it was felt that a narrower focus in terms of ontology and epistemology was needed in the latter. This led to further investigation of other paradigms to source one that was more appropriate; hence this resulted in an examination of the *Design Research* paradigm.

4.2.2 *Design* Research (with a focus on *Design-Based* Research)

The *Design Research* paradigm has been pursued in educational research, particularly in the design of educational software. In education, design research has traditionally been called *design experiments*; however, this has now largely been replaced by the term *Design-Based* Research. The Design Based Research Collective (DBRC) has been helping define the theory and practice of this research paradigm.

Design-Based Research '*is an emerging paradigm for the study of learning in context through the systematic design and study of instructional strategies and tools*' (DBRC, 2003, p.5). It can help create and extend knowledge about developing, implementing and sustaining innovative learning environments. *Design-Based Research* goes beyond merely designing and testing particular interventions. It utilises qualitative and quantitative methods to analyse an intervention's outcomes and to refine the intervention.

The intention of Design-Based Research in education is to inquire more broadly into the nature of learning in a complex system and to refine generative or predictive theories of learning (DBRC, 2003). The intention of Design-Based Research in this instance is to investigate the various models or processes used in the design of the literacy-learning

environments – '*Models of successful innovation can be generated through such work – models, rather than particular artifacts or programs, are the goal'* (DBRC, 2003, p.7).

The Design Based Research Collective (2003) proposes five characteristics of good Design-Based Research, firstly, the central goals of designing learning environments and developing theories of learning are intertwined. Secondly, development and research takes place through continuous cycles of design, implementation, analysis and re-design. Thirdly, research on design must lead to shareable theories that help communicate relevant implications to practitioners and other educational designers. Fourthly, research must account for how designs function in authentic settings. Fifthly, the development of such accounts relies on methods that can document and connect processes of enactment to outcomes of interest.

The ontology, epistemology and axiology of Design-Based researchers are the same of that of the Design researcher; there is some additional flexibility in the methodology of Design-Based research. Therefore, for the purposes of the paradigmic discourse that follows, the broader term *Design Research* is used, although the term *Design-Based Research* may appear in quotes in later sections.

4.2.3 *Design Research* Paradigm

The *Design Research* paradigm recognises the nature of *being* as '*socio-technologically enabled'* (contextually-situated) beings. (The term 'socio-technologically enabled beings' refers in this instance to literacy learners who are active in the transformation of information, and construction of meaning, within the virtual learning environment.) It also perceives objective knowledge as emerging through iterative, developmental, impact-orientated research into objectively formalised construction within a socio-technological context. Furthermore the creation of progress through the controlled, purposeful prioritisation of 'factors' is valued.

The ontology of the *Design-Research* paradigm is aligned to a *Post-Positivist* ontology in terms of its recognition of the nature of *being* as embedded in a social context. However, the epistemology of the *Design Research* paradigm is more closely aligned to a *Positivist* epistemology, in terms of viewing knowledge gathered as *objective* at

particular points in the research. Furthermore, the methodology is geared towards a Positivist view – with its focus on generating empirical data sets from objectively formalised construction; and the axiology relates to a *Post-Positivist* view. Finally, the philosophical perspectives of the design researcher changes as progress is iteratively made through phases in the methodology of the research.

According to Vaishnavi & Kuechler (2005, online), '*neither the ontology, epistemology, nor axiology of the paradigm is derivable from any other*'. Whilst these aspects of the Design Research paradigm may not be *derivable* from any other *single* paradigm; in the researcher's opinion, the *Design Research* paradigm is *influenced* by both the *Positivist* and the *Post-Positivist* paradigms.

A number of tensions exist within the *Design Research* paradigm; firstly from a philosophical perspective, the ontology and epistemology conflict. On one hand, the *Design Research* paradigm recognises the nature of *being* as being impacted by socio-technological interaction; on the other hand the paradigm says that the epistemological knowledge gathered from these socio-technologically enabled beings can be objective - free from biases and influences of researchers and or other participants, free from the influences of the socio-technologically enabled interaction - at particular points in the research process. Secondly, some of the data generated from this process is treated in a positivistic manner, and the impression is that a situation can be contrived and measured in a controlled, positivistic manner. This also conflicts with the philosophy underpinning the ontology of this model - conflicts with the notion of socio-technologically enabled beings. Finally, from an axiological perspective, the creation of progress through controlled prioritisation echoes post-positivistic notion of valuing the relative *goods* of research.

Therefore, the *Design Research* model appears to *marry* aspects of a *Positivist* and *Post-Positivist (arguably Interpretist)* paradigm to arrive at ontological, epistemological, methodological and axiological perspectives that do not 'fit' well together from a philosophical perspective. Furthermore, arguments, and subsequent findings, that emerge from research that utilises this paradigm create a philosophical 'tension'; due to conflicting ontological and epistemological perspectives.

4.2.4 The Hybrid *Design Research* Paradigm

In the *Design Research* paradigm, the researcher becomes a *Positivist* observer objectively examining empirical data sets generated through interaction in an objectively formalised construction within a social-technologically enabled context. Therefore, the philosophical perspective of the researcher is closely aligned with a *Positivist* epistemology in the *Design Research* paradigm.

I would argue that rather than becoming a *Positivist* observer, the researcher can become a *Post-positivist* observer under a **revised or hybrid** *Design Research* epistemology more suitable to this thesis, subjectively examining the knowledge that emerges from the researcher-participant interaction within a socio-technologically enabled context or a virtual learning environment. The ontology in this hybrid paradigm would view the nature of being as '*contextually situated alternate beings*' or 'socio-technologically enabled beings'. The methodology would still be developmental; in this case, researcher-participant interaction in the virtual learning environment would be measured through qualitative, dialectical participation. However, the creation of progress through *appropriate* prioritisation (as opposed to controlled and purposeful prioritisation) of 'factors' emerging from the investigation would be valued. This hybrid model of the *Design Research* paradigm could be considered as an '*instance*' of the *Post-Positivist* paradigm within a socio-technological enabled context. Figure 4.1 summarises the philosophical underpinnings of the research paradigms discussed.

Summary: Philosophical Underpinnings of Research Paradigms

	Positivist	**Post-Positivist**	**Design-Research (Design-based Research)**	***Hybrid* Design-Research**
Ontology (nature of being)	Single being, knowable, probabilistic	socially constructed being	contextually situated alternative beings, socio-technologically enabled	contextually situated alternative beings, socio-technologically enabled
Epistemology	Objective	Subjective; knowledge emerges from the participant interaction with their environment	Knowledge through making; Objectively formalised construction within a socio-technological context, Iterative process	Knowledge through making; Iterative process, *Subjective; knowledge emerges from the researcher-participant interaction within a socio-technological context*
Methodology	Observation, quantitative, statistical	Participation, qualitative, dialectical	Developmental, measure artefacts impact on composite system Mixed Methods	Developmental, measure artefacts impact in socio-technological enabled context through *qualitative, dialectical participation*
Axiology	Absolute *good*	Many *goods*, prioritisation important	Creation of progress through *controlled and purposeful* prioritisation	Creation of progress through *appropriate* prioritisation

Figure 4.1 Summary of the Philosophical Underpinnings of Research Paradigms

4.3 Model of Research

In Design Research, the research method is structured into five main areas: Awareness of Problem; Suggestion; Development; Evaluation and Conclusion, as shown in figure 4.2. As illustrated by the arrows in diagrams, the research process is iterative, and there is circumscription from the development and evaluation phases to the initial phase.

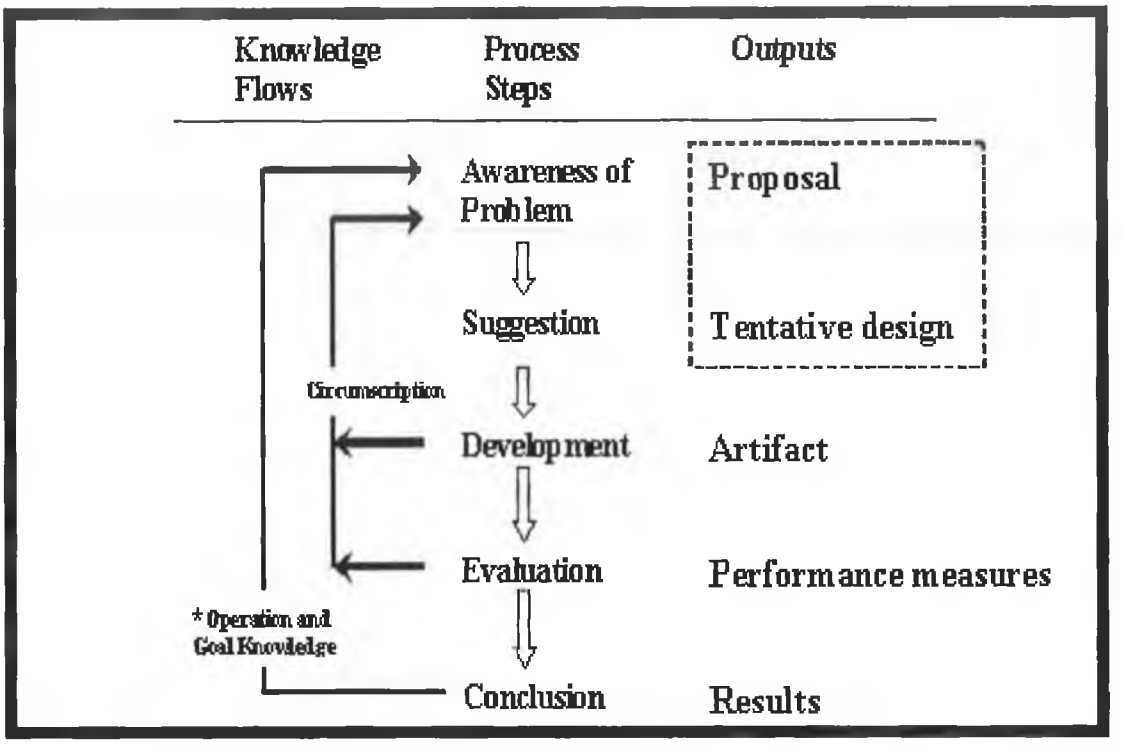


Figure 4.2 General Methodology of Design Research: Reproduced from Vaishnavi & Kuechler (2005, online)

The Design Research methods model as described by Vaishnavi & Kuechler (2005, online) typically proceeds as follows: Initially an awareness of a problem results from a source or multiple sources. The output of this phase would be either a formal or informal proposal for research to examine the problem.

The second step would involve the development of a tentative design; this step is interlinked with the proposal development. The tentative design would then be implemented as an artefact in the development step.

Once constructed, the artefact is evaluated according to implicit and explicit criteria. Deviations from both quantitative and qualitative expectations are carefully noted and

tentatively explained. The evaluation process contains an analytic sub-phase in which hypotheses are made about the behaviour of the artefact.

The conclusion marks the end of the specific research effort. There are iterative cycles of revision inherent in this design from the developmental and evaluation stages back to the 'awareness of the problem'; so that circumscription is introduced – understanding is generated from the specific act of construction.

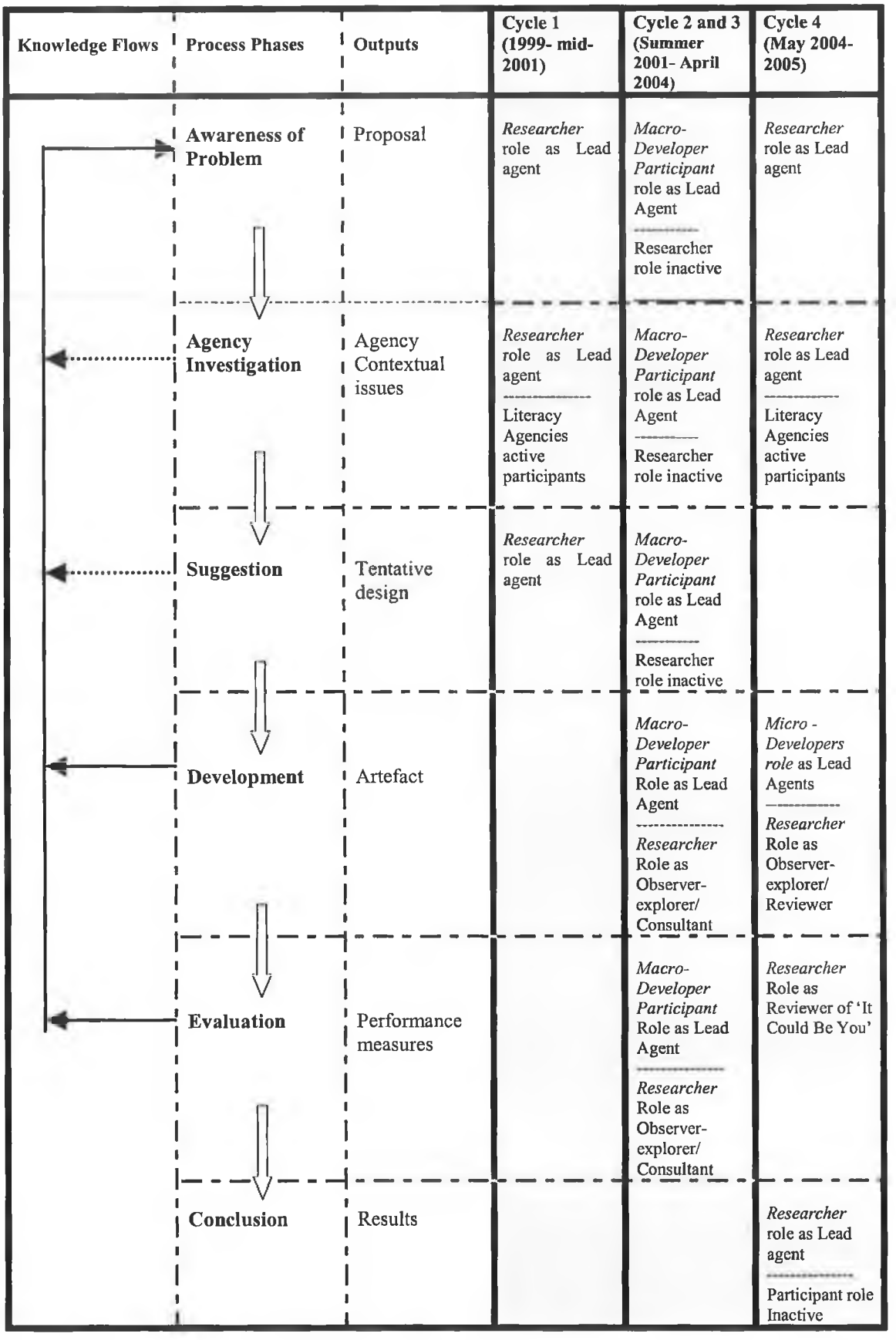
The problem with the traditional *Design Research Methods* Model is that it doesn't place enough emphasis on the analysis of the context. Furthermore, the *Suggestion* step was iterative in the context of this research. This resulted in a refinement of the model for use in this thesis as described below.

4.3.1 Hybrid Design Research Methods Model

In the *Hybrid Design* Research Methods Model used in this thesis, the research method was structured into six levels: Awareness of Problem; Agency Investigation; Suggestion; Development; Evaluation and Conclusion, as shown in figure 4.3. Furthermore, there are arrows from both the Suggestion and Agency Investigation phases to indicate that these can both involve revision, i.e. they are part of a cyclical process as shown in Cycle 1, 2 and 3 on figure 4.3.

The role of the ***researcher*** was as a lead *agent* in many stages of this model of research, which meant that the research design was researcher-led, as shown in figure 4.3 below. The exception was at the development and evaluation stages, where the researchers role was as *observer-explorer* of the development/ evaluation processes that had been enacted, in the case of the macro '*LiteracyTools'* website, (or which were in the process of being enacted, the micro literacy website) primarily, with a sub-role as *consultant* in the case of the macro-website, and as a reviewer in the case in the case of the '*It Could Be You*' software. The role of ***participants*** in this research model differed depending on the type of participant; there were three main types; literacy agency participants, macro-developer participants (i.e. developers of the macro '*LiteracyTools*' website) and micro-developer participants (i.e. *'It Could be You*' software and the 'micro' literacy website).

Figure 4.3: Specific Methodology of *Hybrid Design Research* Model



- **Awareness of the Problem**

The initial level involved the identification of the problem; in this case, the publicity surrounding the publication of the IALS survey (1997) raised awareness of the extent of the literacy problem. Further reading resulted in the genesis of the idea for the development of a technology artefact. A tentative design brief (see Appendix A) was generated indicating the form the research would take and loosely describing what it would entail in cycle one. The problem was revisited by the Macro developers in cycle 2 and 3, and again by the researcher in cycle 4 to ascertain what changes (if any) had occurred in the interim.

- **Agency Investigation**

In the second level, interviews were conducted by the researcher with twelve literacy agencies (organisations) in cycle one of the research in 2000/ mid-2001. There were two main reasons for this; the researcher had no experience of adult literacy education and felt that it would be useful to visit literacy centres to get an understanding of how the sector worked, the programmes it offered, the form of tuition, the profile of literacy learners and the issues facing the sector; furthermore, as this artefact was to be implemented in a socio technological setting, it was equally important to ascertain how technology was being integrated in literacy education and what the state was of the technology infrastructure that existed in the literacy centres. The outcomes from this phase resulted in information about the level of integration of technology in literacy education at these centres.

In cycles two (Summer 2001), the macro-developers also examined the agency context, focusing on examining the technological infrastructure and the levels of computer literacy amongst tutors at participating literacy centres.

The agency aspect was re-visited in cycle 4 of the research by the researcher in 2004/ 2005 to establish what changes, if any, had occurred in the context, and to re-examine the importance of the context in the development of the artefact. This resulted in the examination of two other artefacts in terms of the process used to develop them, which

led to a re-examination of the problem. This artefacts, namely, the *It Could Be You* software and the *Micro* literacy website, were examined using the conceptual framework outlined at the end of chapter three of this thesis.

Therefore, the arrow beside Agency Investigation in Figure 4.3 denotes that the examination of organisational or agency context was an iterative process, and in the context of this research, there would have been a number of cycles of contextual review.

- **Suggestion**

In the third level of this research, the design brief (see Appendix A) was presented by the researcher to the Director and staff of NALA in cycle one. This design proposed the analysis of the integration of technology in adult literacy education, loosely focusing on the development of a computer based product.

Following these initial discussions, the focus settled on the development of an online learning environment. A proposal for funding was prepared (see Appendix A), which involved revision of initial suggestion, and this was submitted to NALA for review. Initial indications were that funding would be awarded by NALA. Unfortunately, the money set-aside had to be diverted to allay a funding shortage in another area. This ended the notion of this project being implemented at that time.

The proposal to design an online learning environment was subsequently re-visited by the NALA team a few months later as shown in cycle two, and they decided to implement the online learning environment with the help of external web developers and consultants. The researcher was re-involved as a consultant in the process after the first prototype had been launched in November 2002.

The arrow beside Suggestion in Figure 4.3 denotes that there were a number of cycles during the lifetime of the project. Therefore, the Suggestion level is an iterative process.

- **Development**

In the fourth level, during cycles 2 and 3 of the research, a prototype of the macro-website was developed and launched. During the development phase, the design team worked together to produce the initial prototype. The researcher was not consulted on the design of the first prototype, but was consulted on aspects of the second prototype. However, interviews conducted in 2003 with members of the design team provided insights into the considerations, perceptions and interpretations that underpinned the development and evaluation of the initial prototype in cycle two, and also the development of the second prototype in cycle three. Furthermore, contact as a consultant on the second prototype also provided useful insights into how the design team communicated with each other. The design and development of the *LiteracyTools* website was examined using the conceptual framework outlined at the end of chapter three of this thesis.

Also, in cycle 4, the researcher conducted a mid-development review of a 'micro' literacy website that was in the process of being developed in 2004/2005. This involved engagement with the design team members in December 2004, with one follow-up visit in 2005.

Therefore, the arrow beside Developmental level in Figure 4.3 denotes that the development was an iterative process, and in the context of this research, the researcher examined the first two cycles of development.

- **Evaluation**

In the fifth level, tutors and learners were asked to interact on the macro-website and formally provide feedback on various aspects such as the interface, the content and the usefulness of the website after the launch of the first prototype in September 2002. This information was collated, and the findings from it resulted in a re-examination of the problem. The researcher was consulted on the analysis of findings from the evaluation of the first prototype in cycle two. The launch of this evaluation report marked the end of the researcher's formal engagement with the design process.

However, ongoing feedback was provided for the researcher throughout cycle 2 and 3 from software files (see Appendices P, Q, R and S) that logged the user interaction with the online learning environment.

Involvement in tracking the use of the artefact continued until the researcher had gathered feedback from tutors and learners who had used the second prototype in a survey in May 2004.

Furthermore, in cycle 4, the researcher conducted an evaluation/ review of a micro software product, namely the 'It Could Be You' software which had been developed and was actively used since 2001.

Therefore, the arrow beside the Evaluation level in Figure 4.3 denotes that the evaluation was an iterative process, and in the context of this research, there would have been a number of cycles of evaluation of the macro-website during cycles two and three, as well as an evaluation of the micro software during cycle 4.

- **Conclusion**

The research process finally came to an end in April 2005, when the context had been re-examined and other developments had been investigated. Therefore, the Conclusion level in Figure 4.3 was denoted as an end-point in cycle 4 to signify that this research investigation had concluded. Therefore, further development of the artefact was no longer of interest in the context of this research.

4.3.2 Rationale for Hybrid Design Research Methodology

The rationale for utilising this Hybrid Design Research approach was that it focuses on designing and exploring the whole range of designed innovations: artefacts as well as less concrete aspects such as activity structures, processes, contexts, supports, curricula and the models used to implement the design. It was particularly relevant in this case as one of the main goals of the research was to examine models, frameworks and processes that were being implemented in the design of the artefact, as well as studying the artefact in a local context.

4.3.3 Research Question

The main research question was: *How are virtual literacy-learning environments developed in contemporary Ireland?* These was investigated by identifying, reviewing and in particular, carrying out an in-depth examination of literacy software that was developed for the Irish market. Furthermore, there was an in-depth investigation into the Irish literacy practices 'on the ground'. This led to an examination of a number of sub-questions, which included the following:

- What considerations were missed about the target audience, their context and the development process?
- How were considerations about the target audience, their context and the development process prioritised? How did this prioritisation impact on the implementation?
- Did tensions exist between the priorities of instructional designers and web developers? Did tensions exist between the needs of end-users and the priorities of the design team?
- In relation to all of the above, were there any identifiable elements of a *workable* process for developing online learning environments in literacy education in Ireland?

The main research question "*How are virtual literacy-learning environments developed in contemporary Ireland?"* is explored in the following chapters 5, 6, 7, 8 and 9. Chapter 5 examines literacy 'on the ground', focusing on a comparison of the literacy services and practices, and the extent of integration of technology in literacy programmes, in the twelve participating centres between 2000/2001 and again in 2004/ 2005. Chapter 6 and chapter 7 examines the processes engaged and issues that arose in the development of the '*It Could Be You*' software and the '*micro*' literacy website. Chapter 8 and 9 examine the processes engaged, and issues that arose in the development of the '*LiteracyTools*' software, as well as presenting feedback from users at the experiential level.

The additional research questions, as outlined earlier, are examined in chapter 10. This chapter provides a critique of the practices and services on offer, and of the tensions that arise in the development of software in meeting the needs of literacy advocates, literacy practitioners, literacy learners and software design team members. It also presents identifiable elements of a 'workable process' for developing technology enabled learning environments.

4.3.4 Mixed Methods Approach

A mixed methodology, employing both *qualitative and quantitative* methods, was adopted to answer the questions posed.

> *Less well known than either the quantitative or qualitative strategies are those that involve collecting and analysing both forms of data in a single study.* (Creswell, 2003, p.15).

The researcher believed that this mixed methods approach was necessary in order to provide a better understanding of how virtual learning environments were developed. Denzin & Lincoln (2005) stated that mixed methods design presumed a methodological hierarchy in which quantitative methods were at the top and qualitative methods were relegated to '*a largely auxiliary role in pursuit of the technocratic aim of accumulating knowledge of what works*' (p.9). However, in this study, neither the qualitative nor the quantitative method superseded each other; they were both perceived to be equal partners in guiding their respective data collection processes in the context of the overall research.

In the study, the integrated tracking mechanisms on the *LiteracyTools* website were used to generate hard evidence in the form of statistical data, on how the end-users interacted with the artefact. This quantitative data was recorded from the launch of the initial prototype in September 2002, and continued throughout the research period. The software tool used to analyse the data changed three times over the period of the project, but the format of the statistical information presented only slightly varied for each period. The justification for using the statistics generated from the integrated tracking mechanisms was that the hard evidence generated from the user interaction could be used to triangulate the findings from the user and tutor surveys and interviews.

At the same time as the quantitative information was being generated, the design and development of virtual learning environments was explored using qualitative 'unstructured' interviews with the design teams of three different artefacts, namely, the *LiteracyTools* website, *It Could Be You* software and the *MICRO* website. The purpose of these interviews was to probe the software design and development processes, to establish what models, frameworks or processes were being used, and what challenges arose in using these. The justification for using interviews as a research instrument was that it was felt that the 'unstructured interview' process gave a greater degree of flexibility to investigate the research questions. The information gathered from each interview was triangulated with information gathered from other interview participants, as well as data gathered from the statistical logging files and surveys.

In addition, the Adult Literacy context, in which these learning environments were embedded, was also explored using qualitative 'unstructured' interviews at the outset of the research and again at the closure of this research. In some cases, group interviews were held as discussed in the latter sections of this chapter. The purpose of these interviews was to identify contextual factors that needed to be considered in the design and development of 'socio-technologically' enabled learning environments, and as mentioned previously, the information was triangulated with information gathered from other sources.

Furthermore, qualitative end-user surveys were conducted at two points in the research to ascertain what the learners and tutors thought of the design of the LiteracyTools website, and whether they would use it. The purpose of these surveys was to establish considerations that needed to be made in the design of the learning environment, as discussed in the latter part of this chapter. The information gathered from the surveys was used to illuminate the findings from the information gleaned using the other data collection instruments.

Therefore, the data collection instruments used, which included interviews, surveys, review of software artefacts and statistical logging files, were selected based on the opportunities they each provided to probe further into aspects of the research and thus illuminate the findings. Hence, the qualitative methods involved the use of interviews,

surveys and a review of software artefacts; whereas the quantitative element involved the use of statistical information generated from one of the artefacts under examination, namely, the *LiteracyTools* website. It was envisaged that the use of this concurrent mixed methods approach would enable better understanding of the area under investigation by converging both quantitative and qualitative data. The use of mixed methods, therefore, in this research has avoided the pitfall of exclusive reliance on a single method, and hence, avoided presenting '*only a limited view of the complexity of human behaviour and of situations in which human beings interact*' (Cohen & Mannion, 1996, p.233)

There were challenges in using both qualitative and quantitative data. These included the time-intensive nature of analysing textual and statistical data, and the requirement to be familiar with both qualitative and quantitative perspectives.

4.4 Overview of Research Process

This Hybrid Design Research Model was used to structure the process of investigation at the contextual, developmental and experiential levels, i.e. the analysis of the context, design and development processes, evaluation of products and interactions in the creation of virtual literacy-learning environments. A mixed methods approach was used in the collation of data; thus, presenting data gathered in both qualitative and quantitative approaches.

This section begins by discussing the role of the researcher, issues such as reliability and validity, and ethical concerns that arose. This is followed by an overview of how the research was structured; firstly, at the contextual level, the focus of investigation was the analysis of the Irish adult literacy sector, focusing on the critical examination of the development and integration of technology in adult literacy programmes; secondly, at the developmental level, the design and development of a macro online learning project was examined; and thirdly, at the experiential level, the manner in which the end-users interacted with the artefact was examined (see figure 4.4).

4.4.1 The Role of the Researcher

The role of the researcher in this initial phase of the three-dimensional research methodology could be equated to that of an *archaeologist*. The researcher firstly conducted a 'quest' to find the origins of the path that has led to the present practice of developing and integrating technology in adult literacy education. Then the researcher identified and examined 'artefacts' or 'relics' of technology that had been used in adult literacy programmes along this path. In addition to this, the researcher critiqued documentation outlining policies and practice and interviewed participants involved in adult literacy programmes during this period.

The role of the researcher in the second and third phase of the three-dimensional research approach could be equated to that of the 'two-headed' Roman god *Janus*, with two potentially conflicting roles continuously in operation. The first and foremost role of the researcher was to investigate the design processes and decisions that impacted on them for the purpose of this thesis. Furthermore, the researcher then examined the information gathered in light of the various frameworks and models that could be integrated when designing online learning environments. The second role was that of technical and literacy consultant to the NALA design team. This role was offered to the researcher after the initial prototype of the NALA *LiteracyTools* website had been launched. The researcher was asked to contribute to the evaluation process in terms of what could be improved on the website and was also consulted in the analysis of the data gathered from the evaluation process in November 2002. The researcher attended a meeting with the entire development team in January 2003, where factors impacting on this website becoming a 'learning tool of choice' were discussed. (See Appendix L) The researcher was also informally asked to comment on the revised prototype in April 2003.

4.4.2 External and Internal Criticism

Source materials were subjected to external criticism. The materials collected were examined to ensure that they were genuine and authentic. For materials sourced online, this involved a lengthy process of verifying the author, publisher and date of publication. Once the materials passed through the 'External Criticism' process, then

the content was evaluated for bias or inconsistencies and relevance to the purpose of the contextual research. This involved considerable cross-referencing of several documents to ensure the validity and reliability of the content in each document selected.

4.4.3 Reliability and Validity

Reliability and validity were both necessary to ensure rigour in the Design Research process. In the traditional Design-Based Research Model, techniques such as thick descriptive data sets, systematic analysis of the data with carefully designed measures and consensus building within the field around interpretations of data would be employed to ensure 'objectivity' and a 'scientifically sound enterprise'. However, as the Hybrid Design Research model' epistemology centred on 'subjectivity' (rather than 'objectivity'), there was a greater reliance on the process of triangulation to ensure reliability of the data gathered. The triangulation techniques employed include triangulating multiple sources and kinds of data to connect intended and unintended outcomes to the process of implementation. The recording of the implementation provided useful information as to how the outcomes resulted. Reliability of findings and measures were also promoted through repetition of analysis across cycles of implementation.

The validity of findings were addressed by the iterative nature of this type of research and by the participatory nature of partners in the project, which resulted in the alignment of theory, design, practice and measurement over time. There was a trade-off between the refinement of the project through successive cycles of improvement and the generalisation of findings from an ultimately highly refined and localised implementation – '*The challenge for Design-based research is in flexibly developing research trajectories that meet our dual goals of refining locally valuable innovations and developing more globally usable knowledge for the field'* (DBRC, 2003, online).

4.4.4 Ethical Considerations

As the researcher held a dual-role, that of researcher and technical consultant at the developmental level, the researcher had to be aware of her contributions or influences

that may have impacted on the design. There were no simple solutions to the unavoidable tension that arises from this dual role of critic and advisor, however, the researcher hoped that this tension was mediated by adopting the role of 'guide on the side', and in doing so, hopefully helped the design team to come to their own conclusions on design matters.

Other ethical considerations were that of informed consent. The participants were fully informed at the outset what would be required of them and what the research was for and what their contributions might involve. Participants were not invited to become co-collaborators or co-researchers in the process in terms of commenting on the analysis. However, they were sent a copy of their transcripts, in the case of those interviewed, and asked to advise if changes were to be made (see Appendix B).

Figure 4.4 Overview of Research Model

Research Model		
Research Levels	**What was examined?**	**Research Model**
Contextual Level	• Adult Literacy Context • Technology in use at Adult Literacy Centres • 'It Could be You' software artefact • Micro Level - micro website	**Hybrid Design Research (Mixed Methods Approach)**
Development Level	• Macro Level -NALA LiteracyTools website	
Experiential Level	• NALA LiteracyTools website • Skillswise website	

4.4.5 Research at the Contextual Level

The iterative process used at the contextual level of this research was unique. Furthermore, the analysis at the contextual level formed the initial phase of a three-pronged investigation in the overall research methodology, and as such, the contextual analysis contributed to aspects of the thesis presented, rather than attempting to derive or present evidence for the entire thesis.

This piece of contextual research looked to the recent past, concentrating from the present to the past five to seven years for primary and secondary sources of data and information. The justification for this was that advances in the development and integration of information and communication technology have been exponential in the last ten years, and it was in light of the integration of the more recent 'online' or networked technologies in adult literacy programmes at present, and in the past five to seven years, that the thesis was being considered.

When initially embarking on this research, I was surprised by the lack of books, articles and research on the use of technology in the Irish adult literacy sector. From an initial review of the literature, it was also evident that the role of technology in literacy education in Ireland hadn't previously been mapped. It appeared to me that what was needed in this piece of contextual research was to trace the origins of the path that has led to the present interpretations of how to develop and integrate technology in literacy education in Ireland and to consider certain implications of that view.

This analysis at the contextual level of the use of technology in adult literacy education helped provide an understanding of how and why current practices have developed in the Irish adult literacy sector. Through research at the contextual level, recurrent trends in the development were more easily identified and assessed, and the various guises in which technology had appeared in adult literacy education became evident. It was hoped that an analysis at the contextual level in this instance might throw some light on suitable *Models of Implementation* through which online technologies could be integrated in adult literacy programmes.

In this case of research at the contextual level, the primary source of information came from the examination of 'relics' or 'artefacts' of technology used in the adult education centres and from interviews conducted with participants involved in integrating these 'artefacts' in Adult Literacy programmes. Secondary sources of information came in the form of reports, papers and other documentation in areas of Adult Literacy education and technology.

- **Data Collection of the Literacy Context**

Informal interviews were held at twelve literacy centres at the outset of the research in 2001-2002, and again in 2004-2005. The purpose of these interviews was to establish the context in which the technology was to be implemented, and in doing so, it was hoped that issues or barriers relating to the implementation or integration of technology could be identified.

Twelve meetings took place in Adult Literacy centres between December 2000 and March 2001 and each meeting lasted on average from 1.5 to 2 hours. Each meeting involved a qualitative analysis in the form of an interview, where the interviewee answered the questions on a prepared questionnaire as displayed in Appendix C. The feedback from these initial meetings was summarised (see Appendix D), and was considered in the context of the developing 'socio-technologically' enabled literacy-learning environments.

A follow-up series of meetings at the same twelve Adult Literacy centres took place from November 2004 – February 2005; each meeting took the form of an informal interview with discussion focused in five key areas (See Appendix E) and lasted between 30 minutes and 1.5 hours. In one case, a group meeting/ interview was held with a group of tutors at a literacy centre. One additional meeting was held with a group of five literacy learners at an undisclosed location in December 2004. The summarised feedback from all these meetings is presented in Appendix F.

The centres that participated in both 2000/ 2001 and 2004/ 2005 are listed in Appendix C.

- **Data Collection of the 'It could Be You' software development process**

The design and development of the 'It Could Be You' software (see Appendix H and Appendix I) was traced through a set of interviews with the design team members, and through a review of the software.

The meeting with the project director took place in February 2005 and lasted about one hour. The interview was unstructured, but focused on establishing where the initial idea for this software package came from, and what challenges were encountered by the project director in setting up the project. The interview was taped and hand notes were taken. The meeting with the project manager took place in March 2005, and lasted about an hour. The interview was unstructured but covered the areas of the prison context, the design and development of the 'It Could Be You' software and its subsequent publication. The interview was taped, and in addition hand notes were made. Finally, the meeting with the programmer took place in early April 2005 and lasted about forty minutes. The interview was unstructured but focused mainly on the role played by the programmer in the development of the software and the challenges that emerged during this process. The interview was taped and hand written notes were taken.

It was hoped that analysis of the data gathered in this process would throw some light on the design and development processes, and indirectly contribute to an analysis of Life-Cycle Models, Models of Implementation, E-Learning Framework and the Instructional Design Model.

- **Data Collection of the 'MICRO' software development process**

The design and development of the 'MICRO' software (see Appendix J) was traced through a set of interviews with the design team members, i.e. the project manager and web designer, and through a review of the software. Furthermore, it was also intended that this investigation into the MICRO project would yield additional information on Life-Cycle Models, Models of Implementation, E-Learning Framework and the Instructional Design Model. Figure 4.5 summarises the data collection process at the contextual level.

Figure 4.5: Data Collection Process at the Contextual Level

	What was examined?	Data Collection Tools	Analysis
CONTEXTUAL LEVEL	Adult Literacy Context Technology in use at Adult Literacy Centres 'It Could be You' software artefact 'Micro' website	• Interviews conducted in 12 adult literacy centres in 2000/2001 • Follow-up Interviews conducted in 12 literacy centres in 2004/2005 • Interviews with 'It Could Be You' & 'MICRO' Design teams • Review of 'It Could Be You' Software • Review of MICRO website	***Examine implications for*** • *Model of Implementation* How has technology been integrated in literacy centres/ programmes in the past? What issues or barriers have arisen? How would this impact on a Model of Implementation for an online learning environment? Examine implications for • *Life-Cycle Model* • *E_Learning Framework* • *Instructional Design Model* How has literacy software been Designed and developed in the past? What issues or barriers have arisen? What learning could be transferred to the above models/ frameworks

4.4.6 Research at the Developmental Level

The purpose of this research at the developmental level was to investigate the processes that were adopted in the design of the *LiteracyTools* website - whether aspects of a Life-Cycle Model had been adapted, whether a Model of Implementation had been considered and what considerations were made in terms of an E-Learning Framework and an Instructional Design Model.

The design and development of the *LiteracyTools* website (see Appendix K and Appendix L) was investigated through a series of interviews with the design team, through meetings with the project manager and project team, through examination of the report published on the evaluation of this website (See Appendix T) and through a review of the published website.

Figure 4.6: Data Collection Process at the Development Level

	What was examined?	Data Collection Tools	Analysis
DEVELOPMENT LEVEL	Macro Level - *LiteracyTools* website	• Interviews with the *LiteracyTools* Design Team • Review of the *LiteracyTools* website • Inputs from meetings and informal interaction with Design team • Review of the NALA report on the Evaluation of *LiteracyTools*	*Examine implications for:* • *Life-Cycle Model* • *Model of Implementation* • *E-Learning Framework* • *Instructional Design Model* How was the *LiteracyTools* website Designed and developed? What issues or barriers have arisen? What patterns have emerged in terms of Models or Frameworks used in the design and development process?

4.4.7 Research at the Experiential Level

The purpose of this research at the experiential level was to investigate and account for how the *LiteracyTools* website functioned in an authentic setting.

It was hoped that this investigation would provide information on the effectiveness of the E-Learning Framework and / or instructional design strategies that had been employed by the *LiteracyTools* design team. Also it was hoped that some feedback on a suitable model of implementation would be gathered, i.e. that the tutors and learners would indicate their preferred mode of using either website.

Figure 4.7: Data Collection Process at the Experiential Level

	What was examined?	Data Collection Tools	Analysis
EXPERIENTAL	LiteracyTools website Skillswise website	• Questionnaire feedback from tutors & learners on survey of both websites • Interview feedback from centres on usage of *LiteracyTools* website • User Interaction data from Log files on *LiteracyTools* website	Examine implications for: • *Life-Cycle Model* • *Model of Implementation* • *E-Learning Framework* • *Instructional Design Model* What information has resulted in terms of Instructional Design or E-Learning features? What information has resulted in terms of suitable modes of integrating technology?

The interaction of the tutors and literacy learners was gathered at the experiential level, through analysis of the logging files for the period under observation and through a survey conducted after the first and second prototype were launched. The survey was conducted with tutors and literacy learners, where they evaluated the effectiveness of the *LiteracyTools* website and the BBC *Skillswise* website. Furthermore, informal feedback on the usage and/ or integration of the *LiteracyTools* website from interviews with co-ordinators and/ or tutors at some of the literacy centres was included here. It was hoped that the collation of data from these sources (see Figure 4.7) could help answer a central question for this type of educational research, ' *How can knowledge of*

the ways in which adult literacy learners learn, and the means by which online learning environments achieve their goals, be verified, built upon and extended?'

Statistics Generated from logging files on LiteracyTools website

The *LiteracyTools* website had an in-built tracking mechanism that logged internal interactions on the website, as well as gathering external information about the client software that was used to access the *LiteracyTools* website. The information from the logging files was summarised by web based software, and statistics were generated for monthly, yearly or other fixed periods of time.

The initial statistical summary (see Appendix P) was generated by a programme called '*WebLog*' and covered the first period from the 21st January 2002 to 28th December 2002. The second statistical summary (see Appendix Q) was generated by a programme called '*SurfStats log-analyser'* and covered the second period from the 3rd September 2003 to the 16th May 2004. The change from the '*WebLog*' software to the '*SurfStats*' software was as a result of the normal software review process within the web development company, where software being utilised was evaluated and reviewed, and alternative software was considered, '*we were going through a stage of reviewing different* [software] *options so it was just a coincidence that it* [the change to SurfStats] *happened during this particular project*' (Team Member4). The third statistical summary (see Appendix R) was generated by a programme called '*Advanced Web Statistics'* and covered the period from April 1st 2004 to December 31st 2004. In addition, individual monthly reports (see Appendix S) were available for each month between April 2004 and February 2005. (It was assumed that the change from the '*SurfStats*' software to the '*Advanced Web Statistics'* software was also as a result of the normal software review processes within the company.)

It should be noted here that there were no statistics available for the period from January to August 2003, as the website was being re-designed during this period. Furthermore, there was an overlap in the statistical data that was analysed in the third period; the data for April 2004 and May 2004 was included in the statistical information generated for both periods two and three.

The format of the summary reports, generated from *WebLog*, *SurfStats* and *Advanced Web Statistics* software, varied in how the information was presented, but broadly they collated information in the following areas:

> They presented information on the number of 'hits' in total during the period to the *LiteracyTools* website. They also gave information on the 'total number of visitors' during the period, the 'average number of visitors per day', the 'average number of hits per visitor', the 'total number of page views' and the 'average number of page views per day and per visitor'. They gave information on the bandwidth used during the period. The SurfStats software presented additional information on 'visitors that visited more than once'.

In addition, the statistical software packages presented information on the most downloaded files, images and audio files. They also provided information on the top browsers used by clients, the top referring sites, the search engines used, and the most popular 'keywords and phrases' used to access the *LiteracyTools* website. Finally, they also provided information on technical error codes that were prompted during interactions with *LiteracyTools* throughout each period.

End-user Survey

A survey of end-users was conducted in April/ May 2004 to ascertain what literacy tutors and learners thought about the *LiteracyTools* website. The following is an overview of the data collection process for this aspect of the research.

- **Pilot Process**

Two questionnaires were piloted in late April 2004 with two groups of literacy learners and their tutors in the Dublin area, to ascertain whether either questionnaire needed to be modified (see Appendix M). The questionnaires were distributed by two literacy tutors who were known to the researcher and who agreed to undertake the pilot evaluation. In total, seventeen 'learner feedback forms' and four 'tutor feedback forms' were returned from the pilot phase.

Minor modifications in Question 1 in Section A and Section B were undertaken in the Literacy Learner questionnaire, as literacy learners had a problem with the manner in which two of the statements were phrased. In addition, the second question in Section A and Section B was re-structured into check-box type statements, as the answers generated from this question didn't always correlate to the question posed. Also, an extra question was added, Question 9, in Section A and Section B, to ascertain what the literacy learner would like more of in each website.

The same modification to Question 1 in Section A and Section B was undertaken in the Tutor Feedback questionnaire; i.e. two of the statements were re-phrased as they were in the negative and this had caused some confusion.

- **Overview of Questionnaire**

The end-user survey consisted of two different questionnaires, one for tutors and one for literacy learners.

The literacy learner's survey consisted of a questionnaire (see Appendix N), which was divided into three parts, the first part (Section A) contained ten questions about the BBC

Skillswise website, the second part (Section B) contained ten identical questions about the *LiteracyTools* website, and the third part (Section C) contained five questions on their Internet usage and access.

Section A and Section B of the literacy learner questionnaire basically sought feedback on the 'look and feel' of the BBC *Skillswise* website and the *LiteracyTools* website, respectively. Literacy learners were also asked what they might like to be added or removed, what they would like to see more of and where they would prefer to use the website. They were asked to detail any problems they had in doing the exercises, to give three reasons why each website was useful for them and to explain whether they would use the website again.

In Section C, the literacy learners were asked whether they had used the Internet before and where they normally would get access to the Internet. They were also asked to indicate whether they had used either of the two websites before. They were asked to name one website they had used in the past that they really liked, and to explain what they had liked about the website. Finally they were asked to indicate their age group.

The tutor survey consisted of a questionnaire (see Appendix N), which was divided into three parts, the first (Section A) contained nine questions about the BBC *Skillswise* website, the second (Section B) contained nine questions about the *LiteracyTools* website, and the third (Section C) contained eight questions on Internet usage and access.

In Section A and B of the tutor survey, the focus was on finding out what tutors thought about the two websites, i.e. *LiteracyTools* and BBC Skills wise. They were asked whether they would integrate either website into their literacy tuition and whether they would recommend either or both websites to their students. They were also asked what they might like to see added to or removed from either website, and to detail any problems they experienced whilst using either website.

In Section C of the tutor survey, the tutors were asked how often they had used the Internet in the past, where they usually accessed the Internet, whether they had used either *LiteracyTools* or *Skillswise* websites before and what they used the Internet for.

They were also asked to prioritise barriers to using the Internet in adult literacy programmes at their workplace. They were asked what they thought should be included in an adult literacy website designed for use in the classroom. They were asked for their opinions on the use of literacy websites in their literacy programmes, and were also asked what resources or sites on the Internet would be useful to their literacy students.

- **Postal Survey**

The questionnaires were amended as described above and two tutor questionnaires and five literacy learner questionnaires were mailed to forty literacy centres and a further ten Youthreach centres across the country in May 2004 (See Appendix N). The literacy centres were chosen randomly from a NALA booklet listing over one hundred literacy centres in Ireland. The Youthreach centres were randomly chosen from a web based list of Youthreach centres in Ireland.

The returns from this mail-shot were disappointing. Only twelve literacy learners responded to the survey and nine literacy tutors. Eight centres responded by post or by phone to say that they were unable to take-part due to lack of Internet access (see Appendix N).

As the questionnaires were anonymous, the only way of identifying the centres was using postmarks on envelopes received and the tutor or centre name on a few that were submitted. Using the postmark as a method of identification may have been flawed, as the questionnaires may not have been mailed in the locality of the literacy centre.

Follow-up phone calls in early June 2004 to a sample of fifteen of the centres revealed that many of the centres were extremely busy with examinations and portfolio preparation during this period, and so were unable to take part in the survey. Four of these also said that they didn't use the Internet and so couldn't take part in the survey. Three of the centres contacted had returned their questionnaires but unfortunately it was impossible to identify who had or hadn't returned, as discussed above.

- **Rationale for inclusion of postal and pilot survey data**

Even though there was a low response rate from the postal survey, those returned had to be included for a number of reasons. Firstly, it was difficult to get access to literacy learners to ascertain their thoughts, feelings and attitudes, and therefore any responses submitted by them had to be 'valued' and taken into account in the overall context of developing technologies for use in literacy tuition. Secondly, the tutor responses were also a valuable insight into how they perceived technologies, such as website development, in terms of their literacy tuition and support.

The decision was taken to also combine the feedback from the pilot survey with the postal survey, as only minor changes were made to the pilot questionnaire for the postal survey. Therefore, the responses from both the pilot and the postal survey were collated and this led to inputs from a total of 29 literacy learners and 13 literacy tutors. The summarised information (see appendix O) was coloured green for the pilot survey and coloured black for the postal survey, so that the reader could easily distinguish between the comments gathered in the pilot and the postal survey.

4.5 Conclusion

A new paradigm, namely the Hybrid Design Research paradigm, underpinned the philosophy of this research. The ontology underpinning this new paradigm recognised the nature of being as socio-technologically enabled alternate beings; the epistemology recognised knowledge through making – knowledge emerged through an iterative process from researcher-participant interaction in a socio-technological context. The methodology followed a six-level process (Hybrid Design Research Methodology) that examined the contextual, developmental and experiential of the artefact through qualitative, dialectical participation in the socio-technologically enabled context. The data collection tools used included interviews, logged interactions, artefact examination and surveys of literacy learners, tutors, design team members, project managers and project directors (see summary of data collection tools used in Figure 4.8 overleaf). Finally, the creation of progress through appropriate prioritisation was valued in this research.

Figure 4.8 Summary of Data Collection Tools

	What was examined?	Data Collection Tools	Analysis
CONTEXTUAL LEVEL	Adult Literacy Context Technology in use at Adult Literacy Centres 'It Could Be You' software artefact Micro Level - MICRO website	• Interviews conducted in 12 adult literacy centres in 2000/2001 • Follow-up Interviews conducted in 12 literacy centres in 2004/2005 • Interviews with 'It Could Be You' Design team • Review of 'It Could Be You' Software • Interviews with the MICRO website Design team • Review of the MICRO prototype website	Examine implications for • Model of Implementation How has technology been integrated in literacy centres/ programmes in the past? What issues or barriers have arisen? How would this impact on a Model of Implementation for an online learning environment? Examine implications for ▪ Life-Cycle Model ▪ E-Learning Framework ▪ Instructional Design Model How has literacy software been Designed and developed in the past? What issues or barriers have arisen? What learning could be transferred to the above models/ frameworks?
DEVELOPMENT	Macro Level - LiteracyTools website	• Interviews with the LiteracyTools Design Team • Review of the LiteracyTools website • Inputs from meetings and informal interaction with Design team • Review of the NALA report on the Evaluation of LiteracyTools	Examine implications for: ▪ Life-Cycle Model ▪ Model of Implementation ▪ E-Learning Framework ▪ Instructional Design Model How was the *LiteracyTools* website Designed and developed? What issues or barriers have arisen? What patterns have emerged in terms of Models or frameworks used in the Design and development process?
EXPERIENTAL	*LiteracyTools* website Skillswise website	• Questionnaire feedback from tutors & learners on survey of both websites • Interview feedback from centres on usage of *LiteracyTools* website • User Interaction data from Log files on *LiteracyTools* website	Examine implications for: ▪ Lifecycle Model ▪ Model of Implementation ▪ E_Learning Framework ▪ Instructional Design Model What information has resulted in terms of Instructional Design or E-Learning features? What information has resulted in terms of suitable modes of integrating technology?

Chapter Five

Contextual Level: Literacy on the Ground

5.1 Introduction

In order to establish the current use and application of ICT, interviews were conducted with the Adult Literacy Co-ordinator and/ or the technology instructor in twelve adult literacy centres in 2000 / 2001, and again in 2004 / 2005. The purpose of these meetings was to ascertain those aspects of the context and/ or technology landscape that could impact on the implementation of an online literacy-learning environment. The first section provides an overview of the literacy service; the second centres on the use and application of ICT in adult literacy centre in Ireland.

5.1.1 'Literacy' in Language Skills

The literacy schemes in Ireland provide literacy tuition and support to students that access their services. It should be noted that whilst the term 'literacy' is used here with 'English language literacy skills' in mind, there are *Gaeltacht* areas throughout Ireland where literacy learners accessing the literacy service are looking for 'Irish language literacy skills', or, in Gaelic, '*breacadh*'.

5.2 Overview of Literacy Scheme

Across Ireland, the literacy services provided were autonomous and were mainly administered by the Vocational Education Committee (VEC) in each county. This didn't change between 2000 and 2005.

The Adult Literacy centres visited were all under the umbrella of the local VEC, except in Centre 12, which was a limited company of charity status. Eight of the centres visited provided literacy services in a rural area, whilst the other four provided literacy services in an urban area.

All of the centres had outreach centres, although most had temporary access to community facilities rather than permanent outreach facilities. Dublin and other city literacy schemes were clustered into city regions, for example, one literacy scheme encompasses areas of the North-west of an inner-city; elsewhere in each county, there was a literacy service normally run by the VEC, which has outreach centres in towns and villages throughout the county. The permanent literacy facility was usually housed within the adult education unit, in some cases, this was a separate building, for others it was part of an existing VEC college or headquarters. The premises were either in the form of temporary structures, such as port-cabins, or were in the main VEC head-office building complex. Mostly, the external premises involved the rental of rooms in schools, public buildings and community centres.

In 2005, it was noted that some of the Literacy Schemes had moved within close physical proximity to Youthreach and VTOS schemes, as this was perceived useful in terms of progression outside the literacy scheme – their proximity helped raise students' awareness of the existence of these schemes and to 'familiarise' students with staff from these centres. It was hoped that those on the literacy courses would progress through Further Education and Training Awards Committee, FETAC, accredited modules, to Junior Certificate Level and onwards to Leaving Certificate.

In 2005, more of the literacy centres or schemes offered support services such as a crèche or child-minding facility. This was perceived as an essential service for non-nationals in particular.

5.2.1 Numbers accessing the literacy service

The number of students serviced in each of the centres in 2001 varied, however, all centres reported a marked increase in overall student numbers in the previous year. By 2005, student numbers had increased in almost all literacy centres sampled, except in Centre 2 whose numbers were slightly down possibly because they moved to new premises. One centre had experienced approximately a 400% increase in numbers since 2001; this was linked to the improved referral network with partner services (Coordinator 3, Appendix F, p.16). However, the increased numbers accessing the service has put additional pressure on funding, existing services and staff in some areas (Centre6, Appendix F, p.25).

5.2.2 Tutors in the Literacy Service

In 2001, most literacy centres had one full-time employee, typically the adult literacy co-ordinator. The centres had between two and twenty-two part-time group tutors who were paid an hourly rate. All centres had large numbers of volunteer tutors, who were used in 1:1 tuition. The number of volunteer tutors ranged from ten to one hundred and seventy (see Appendix D).

In 2005, the literacy service employed full-time (not permanent) tutors, who normally worked in group-tuition scenarios, and voluntary tutors who worked in the 1:1 tuition service. The use of voluntary tutors caused logistical difficulties for the service, as voluntary tutors were often only available in the evening time whereas many 1:1 students want to access the service by day.

In 2005, some of the centres up-skilled FAS and other external tutors in how to integrate literacy tuition into their course. In other cases, the literacy tutors delivered the tuition directly to the students over a fixed period at an external centre like FAS.

5.2.3 Profile of Students

In 2001, the student profile in most sampled centres was concentrated in the 25-54 age bracket, with typically 20% in the 18-24 and 10-15% in the over 55 age bracket. Centre one reported an unusual 50:50 ratio of men and women on their programmes (Appendix F). In 2005, the age-profile of students accessing the literacy services varied greatly but included a cross-section of students aged between sixteen and sixty who were not in full-time education. In two of the Dublin literacy schemes sampled, the majority of literacy learners that accessed their services were mature. The age-profile of students accessing these schemes was linked to the age-profile of the population that the particular centre was embedded in; in other cases it was linked to the age-profile of students that were referred from external programmes, such as, the Return to Learning programme and other initiatives.

In 2005, the profile of students included travellers, young mothers, those in back to work initiative and those returning to learning or undertaking FAS training schemes. In

addition, literacy students came from work-place literacy programmes and family learning programmes. The *non-referral* route included those who came from the 'general population' at less than intermediate second-level education.

In 2001, the 'academic' profile of people accessing Community Employment (CE) schemes was younger people with a '*higher education*'. However, by 2005 the level of literacy amongst those who signed up with CE schemes was much lower - '*you're talking about the ordinary man on the street now*' (Coordinator10, Appendix F, p.50). The literacy service providers were trying to tap in to help these people (ibid).

5.2.4 Non-national Migrant Worker / Asylum Seeker

In 2001, the numbers of non-nationals and asylum seekers increased dramatically at the literacy centres, mainly in Dublin and the surrounding areas. The asylum seekers were not permitted to attend courses, with the exception of the literacy service, until they had 'refugee status' - '*The literacy service has to look after asylum seekers as they can't access tuition anywhere else*'. (Coordinator4, Appendix F, p.21) This influx of learners looking for English as a Second Language (ESOL) put pressure on an already stretched literacy service.

In the intervening years up to 2005, there was an increase in the numbers of non-nationals and / or asylum seekers and migrant workers accessing the literacy schemes for English tuition, reported in most centres. They attended programmes, such as ESOL, to improve their communicative language skills. Most did not have a literacy problem in their native language – '*less than 3% come from non-literate societies, using alternative scripts such as Cyrillic*' (Coordinator2, Appendix F, p.6).

In some centres, such as centre 2, there was a waiting list for those wishing to access ESOL tuition. Some of the other centres (such as centres 3 and 11) saw a reduction in the number of asylum seekers accessing the centre since 2001, but an increase in the number of non-national migrant workers accessing the service. This increase in the number of migrant workers was thought by one coordinator (Appendix F, p.49) to be linked to the expansion of the European Union (EU), with more Eastern Block workers gaining employment in Ireland. FAS also referred migrant workers (Russians/

Latvians/ Poles) to the literacy service because they couldn't get a job without learning English. Some of the literacy centres believed that FAS should be providing this service themselves.

In other centres, the numbers of migrant workers accessing the service had reduced by 2005. One co-ordinators believed that this reduction was because migrant workers were '*getting on fine and are not bothering with language tuition*' (Coordinator11, Appendix F, p.53) and also that migrant workers preferred the mainstream ESOL courses - '*It seems that the paid classes look more attractive, they are not coming to the literacy (Service), they are coming to adult education and paying the 50 euro instead of free classes*' (ibid).

One of the issues highlighted in 2005 was that the mix of cultures within ESOL tuition could cause complications. Individuals within the groups that were formed may have had different expectations on what was delivered, how it was delivered or may have had cultural biases. This resulted in reduced group sizes of up to three or four. Furthermore, the migrant worker mix didn't work; the workers had a different focus for learning and wanted classes delivered in a different way to the literacy class – '*I want to learn spelling and grammar and I want to learn it the way we were taught in school*' (Coordinator9, Appendix E, p.42). They didn't like the relaxed way in which the literacy schemes offered tuition, and they wanted an outcome at the end of each session. In addition, some of the asylum seekers experienced a lot of trauma, and '*could be up in court every second week*' (ibid); this sometimes resulted in the group dynamic falling apart.

5.2.5 Recruiting Learners for the Literacy Scheme

In 2001 and 2005, the programmes on offer in all of the literacy schemes were advertised on local radio, at local businesses, at library and social welfare offices, and on websites. Some centres received referrals to their programmes by word-of-mouth, and would explain the services in subsequent phone calls.

In some centres in 2001 and 2005, the literacy aspect was not explicitly advertised in the brochure, and so people who wanted 'mainstream' adult education programmes

often mistakenly made enquires through the literacy hotline - *'It's like being on a trawler, dragging in the nets, you loose some... people you get, you try to work with at whatever level they are at'* (Coordinator7, Appendix F, p.28). The Art classes attracted a huge number of applicants who didn't have a literacy problem, so assessment was necessary to ascertain who had real literacy needs. They were informed that the programme on offer incorporated literacy tuition and re-directed to mainstream programmes, if they didn't want or need the literacy service. This was *'part of a hidden agenda to identify those who have low literacy levels'* (ibid).

In other centres in both 2001 and 2005, the literacy aspect was explicitly stated in published materials and advertisements; one centre had a poster advertising the 1:1 services, which clearly stated Reading, Writing, Spelling and Grammar (Centre3, Appendix F, p.15). One centre in 2005 advertised the literacy service in school diaries (Centre4, Appendix F, p.20). This centre also placed *'very vague ads'* in local newspapers. The advertisements usually contained the words *Reading, Writing, Numeracy, ESOL and Computers* offered at centre. Therefore, students would have been aware on entry that they were entering a literacy programme. Another coordinator commented on the effectiveness of the TV programme '*Read, Write, Now*' in raising awareness of literacy schemes and programmes on offer (Appendix F, p.36).

5.2.6 Referral from external agencies to the Literacy Service

One of the biggest changes between 2001 and 2005 was the improved multi-agency networking that resulted in increased referrals to and from the literacy service.

In 2005, a lot of students were referred to the literacy scheme through external agencies and organisations, *'Literacy is on everyone's agenda, there is a recognised need for literacy tuition'* (Coordinator8, Appendix F, p.36). Most literacy schemes adopted a multi-agency approach in tackling literacy problems, and their network extended from FAS and the VEC in all centres, to organisations in the disability services and a number of hospitals in other centres. In addition, referrals were made by the Youth service and the Probation service.

In 2005, the students were usually referred to the literacy service by a supervisor or tutor within CE schemes funded by FAS, Back to Education Initiatives (BTEI) funded by FAS, vocational training schemes run by the VEC and Return to Learning schemes funded by the Social Welfare department and organised locally by the County Council. In addition, the Home School Liaison Officer identified parents with literacy problems at secondary level, and advised them of the services on offer at the centre, whilst the 'Breaking the Cycle' co-ordinator brought in learners through their services at the primary sector.

This multi-agency relationship involved a reciprocal relationship and literacy students were encouraged to progress onto courses that many of these agencies provided on completion of their literacy tuition in 2005. For example, Return to Learning students often progressed onto Community Employment schemes on completion of the course. In addition, many of the centres had made connections with local education and community development groups to raise awareness of the literacy service. They met new groups that were formed and offered to do a Literacy Awareness group, that would explain to them how to identify those with low levels of literacy, how to refer them to the literacy service and where to refer them to within the literacy scheme.

5.2.7 Format of Tuition

In 2001 and 2005, students were informally 'assessed' on entry to a literacy scheme to ascertain what their wants and needs were – '*Some would say on entry that they have reading and writing difficulties. Some of them may want to know how to do timesheets, others may have difficulty writing their own name. A lot do request basic computers*' (Coordinator5, Appendix F, p.22).

There was no official recognition of literacy ability levels at the time of this research, although NALA were reviewing this with a view to introducing a beginning, middle and upper level that would arrive at a point below the FETAC foundation level on the proposed qualifications framework in 2005. Therefore, the initial assessment comprised of small exercises in oral communication, reading or writing skills – '*Sometimes they are really nervous, and you are really compromising them by asking them to do it (assessment on entry)*' (ibid). The students were then given an option of what area they

wanted to concentrate on. Each student was given a choice to attend either 1:1 tuition or group tuition.

Students that accessed 1:1 tuition were assigned a tutor that they worked with to develop their literacy skills. The 1:1 sessions were generally one hour long. The 1:1 sessions focused on improving the basic skills of the literacy student and also aimed to build the student's self-esteem and confidence.

Students that accessed group tuition joined a group of students (anywhere between two and eight students) in literacy tuition. The group sessions were generally two hours long. The group literacy sessions were usually presented in subject areas like 'Basic English' or 'Creative Writing'. Furthermore, some of the sessions were modules, like 'Communications', that were offered at Foundation or Level 1 by FETAC.

In 2005, some centres, such as centre 7 and centre 9, organised 'away' trips for literacy learners, which enabled learners to complete a '*months worth of work*' in a concentrated effort. The away trips were perceived to help to develop students' self-esteem and self-confidence (Coordinator9, Appendix F, p.44).

There was good flexibility in the scheme to allow 'time out' and completion of modules on FETAC over a longer period of time, for example, some students were allowed to take seven years to complete FETAC foundation maths or ECDL.

> *A student who did Foundation FETAC maths and it took her seven years, now she an absolute genius... she has done the ECDL... she had so many ups and downs, illness herself, with the children... if the scheme hadn't been there to pick up every time she came back, ...she'd have thrown in the towel.'* (Coordinator9, Appendix F, p.42)

5.2.8 Range of programmes on offer in literacy centres

Apart from the basic skills courses, like reading, writing, comprehension and numeracy, most literacy centres offered non-accredited courses like 'Basic English' or 'Creative Writing', and a range of FETAC accredited modules from Communication to 'Arts and Crafts' type modules in 2001 and 2005.

By 2005, some centres were offering intensive literacy programmes, that differed from the norm by offering from four to twelve hours a week in literacy rather than one or two hour courses that would have been offered in 2001. The Return to Learning initiative is organised by the County Councils and is four hours per week for twenty weeks. The BTEI involves nine to ten hours of tuition per week. Literacy tuition would be integrated into these programmes.

Numeracy courses were offered in all of the centres but would not have been as heavily used as the literacy courses. In one of the centres in 2005, the numeracy course was linked to technology usage. The students learned to use the calculator, used interactive worksheets from the Internet, and did some interactive games on the Internet on a website that allowed them to check their answer (Coordinator4, Appendix F, p.18).

By 2005, some other interesting themed programmes were on offer; including learning literacy through gardening, cooking, driving theory, learning to live in a diverse society and personal development through Art. These themed programmes aimed to de-stigmatise the notion of literacy by embedding it in more 'acceptable' programmes - *'...it takes away from the whole stigma of people coming back and looking for literacy'* (Coordinator7, Appendix F, p.28). The Arts courses offered literacy through personal development, so the emphasis was on the social aspect of learning – *'It's a social gathering, so we make room for a break... try and have a longer break than normal, so that people can interact with one another'* (Coordinator7, Appendix F, p.30).

Generally, by 2005, technology was seen as an effective 'hook' for attracting students into the Literacy Scheme - *'It was the computers that drew in most of the people but they stayed for the maths and English – we try to sell it as a package – those that come for computers only we tell them that it's a package'* (Coordinator 11, Appendix F, p.54)). Some of the centres in 2005 commented on the effectiveness of using technology programmes as a means of inducing men to attend the literacy programme - *'In some cases, with men in particular, we've had to come up with technology as ways of getting them in and getting them interested... they seem to have more of a mindset for that than women'* (Coordinator 7, Appendix E, p.28).

5.2.9 Accredited Modules & Alternative

By 2005, all the centres offered FETAC accredited modules, the majority offered these modules at Foundation, some offered at Level 1. In some centres, such as centre 7, the numbers of students that progress beyond Level 1 FETAC modules was capped, and they were encouraged to progress the students onwards to other FETAC or higher service providers to avoid duplication of services. Some centres allowed students to undertake Junior and Leaving Certificate subjects.

As an alternative to formal accreditation in non-accredited courses, some centres offered individual education plans (IEPs) or learning logs as a means of letting the students know how they were getting on. This was only in its infancy at these centres. The tutor set goals with the learner for a period ahead, each learner had his/ her own learning plan. Students signed off after the period, some items on plan were on-going, some were completed. The goals were small enough to be achievable over the particular period. The IEP was used to enhance motivation and encourage the learner. '*Learners do love the IEP, find it affirming'* (Coordinator8, Appendix E, p.40).

5.2.10 Progression *within* and *beyond* Literacy Programmes

In most centres in 2001, the numbers accessing 1:1 tuition, as opposed to group tuition, were high and this made the centres heavily dependent on the service of voluntary tutors. There were some concerns expressed about the low progression rate from 1:1 to group tuition. Across the centres, the progression rate varied from six months to six years in centres. Their confidence was gradually built-up in the 1:1 tuition and most students progressed to group tuition when they were ready. If students had a low level of confidence, their rate of progression would be affected (Coordinator4, Appendix F, p.18).

In one of the centres in 2005, the numbers accessing the 1:1 tuition had slightly reduced, with a corresponding increase in the numbers accessing group tuition, the centre co-ordinator associated this with the adoption of a new 'ethos' of openness at the centre that has brought the literacy service 'out of the closet' (Appendix F, p.16). Students

were progressing directly into group tuition, as literacy had been de-stigmatised at the centre.

In another centre, the technology tutor noted the reduction in literacy learners wanting 1:1 tuition, stating that they '*still have people who want the 1:1 tuition, but they are fewer than they were'* (Coordinator 10, Appendix F, p.50). She associated the reduction of the numbers accessing 1:1 tuition with the improved level of awareness about literacy amongst external agencies that are referring students to the literacy service. The literacy service ran a training programme for FAS supervisors in this literacy scheme, and she pointed out that the FAS supervisors would know and be supportive of '*their own people'* so there was no stigma attached to attending literacy tuition – '*The supervisors are quite aware of their own people, as it is a small rural area, ... and they would have a fair idea of who might need it (literacy tuition)... and they are very supportive*' (ibid).

Once the student had decided that he / she was ready to progress to group tuition, his / her interests were ascertained and matched with interests from other students who were ready to progress or who had recently progressed to group tuition. Since 2001, some of the centres had received an improved guidance support in the form of Adult Guidance Counsellors. The role of the guidance counsellor was seen as valuable in helping students progress and in identifying students who may have needed literacy tuition.

By 2005, funding constraints sometimes demanded that a certain percentage of students progress to complete FETAC modules. Tutors' reaction to this was mixed; some saw this constraint as an imposition that turned some students off the programme and others saw it as unrealistic, as some literacy students took a long time to complete FETAC modules (Coordinator1, Appendix E).

One of the centres in Dublin was trying to eliminate the dependency culture and progress students onto part-time formal educational courses, such as the Junior Certificate or Leaving Certificate or other adult courses (Coordinator7, Appendix F, p.29). However issues arose where the literacy student had not been able to successfully make the transition from the literacy scheme to 'mainstream courses' due to low self-esteem or low self-confidence - '*We've seen people going over to other courses and coming straight back, as they weren't ready for it. Either their confidence*

or their skills weren't at a stage where they're ready to deal with it' (Coordinator4, Appendix F, p.19). One centre attempted to make the transition smoother by inviting staff from the BTEI centre next door, in for coffee regularly, so that the literacy students could become familiar with staff from BTEI.

The Adult Literacy Officer (ALO) in centre 9 believed that tutors got sidetracked by administration, projects or VEC strategic planning, and tried to force student progression through literacy programmes onto external programmes. She also believed that issues such as confidentiality and anonymity were sidelined by the drive to create lifelong learners.

5.2.11 Innovative Developments at some Centres since 2001

A number of centres, such as centre 6 and centre 12, had established their own Open Learning Centres by 2005. The idea was that learners could use computers and software in their own time, and they could call on a tutor for help if they got into difficulty. They had full access to the Internet; there was software like NetNanny to prevent usage of unauthorised websites.

In 2004, the adult learning centre in centre 1 introduced an innovative way of assessing students' progress by using a Logbook. The students wrote down their own perceptions of their progress and their tutor/s added in their comments on how the students had interacted and progressed. This was reviewed every six months. One tutor commented that it was difficult to measure increase in levels of confidence but the Logbook is seen as a step in this direction (Tutor1, Appendix F, p.5).

Centre 3 devised a learning journal in 2004, which was designed by an advisory group for the Literacy service. The student and tutor reflected on the progress once a term, and discussed goals. The journal had green pages, as Dyslexic students found it better to read from green pages. Each week the date, topics covered and comments were inserted by the student into their journal. It was not used to assess the specific learning outcomes, such as ability to spell certain types of words. It was really an opportunity for students to record what they were doing and how they felt about it. The learning journal was needed for quality controls at the centre and to give a chance to tutors and

students to record their experiences. One centre coordinator stated that the learning journal was useful for keeping track of student's progress, and '*It gives them a chance to record 'fine''* (Coordinator3, Appendix F, p.15).

Centre 6 compiled an anthology of student writings, and this anthology was subsequently published by the County VEC. This anthology contained many inspiring accounts of students accessing the adult literacy service in the area, and some detailed first encounters with computers.

5.2.12 Barriers to Literacy tuition identified in 2005

The barriers to participation in literacy programmes identified in 2005 included low self-esteem or low self-confidence, fear of loss of anonymity, fear of literacy stigma, health problems and prior negative experience of education. The biggest barrier to participation and progress in literacy tuition was the learners' low self-esteem and low self-confidence.

Some students travelled long distances to maintain their anonymity. Many students entered the literacy scheme 'covertly' in order to retain their anonymity. One example was a man who had been in 1:1 tuition for two years in centre nine. His tutor changed, but he was very nervous of meeting a new tutor, and he wouldn't come back if he was forced into a group setting. His centre manager insisted that he was ready to progress into group tuition. However, the adult literacy organiser felt that he was 'not ready yet' to do group-work, as he still had an issue with anonymity.

A related concern was that of confidentiality – many literacy students didn't want anyone to know that they were on a literacy course. Some students refused to take-part in class photos as they were afraid that someone would find out about their literacy problem; the coordinator in one centre (Appendix F, p.5) mentioned a photograph in her office that had most of the literacy students' faces *tippexed* out. Many in the photo were people of 'standing' in the local community and did not want to be identified. Other students refused to take part in group tuition, unless they knew in advance who was in the group.

Many of the literacy centres offered workplace literacy programmes. Students tended to hide their literacy problems from employers due to concerns about the stigma of literacy impacting on progression within their employment. In addition, there was generally a lack of awareness about literacy problems amongst employers and they didn't see the value of literacy tuition.

Issues such as employers being unwilling to let students go were often put forward as barriers to participation in basic education schemes. Many employers were willing to send their employees on technology or driving skills based training courses offered by the literacy centre but didn't see the benefit of sending them to literacy classes. In the county councils, some supervisors '*can't afford to let him go for four hours tuition a week because they have a job to do... but they would let them off to do a four-hour forklift driving course'* (Coordinator9, Appendix F, p.45). Those involved in the Community Employment (CE) schemes were entitled to up to nine hours a week of basic education, including literacy and numeracy and computers and job-seeking skills. This take-up of Basic Education from CE schemes depended on the top-level FAS personnel involved and their relationship with the VEC, and in addition the supervisors within the FAS scheme needed to be aware of the literacy scheme. The full support and advocacy of FAS supervisors was needed, otherwise they wouldn't push it enough to make it work.

Students with low literacy levels often presented with a series of health problems; for example, they may have needed glasses or they may have had challenging behaviour, in which case they were referred to a psychiatric service. Students who presented with eye-sight or migraine could have had problems with computers. Health problems around computers forced tutors to ask questions, such as 'Do you suffer with tennis elbow?' or 'Do you suffer from migraine?' (Coordinator7, Appendix F, p.31). Also there was concern about the Health and Safety aspect, such as the requirement to provide anti-glare screens and a suitable chair (ibid). Tutors needed to be briefed on Health and Safety procedures.

A criticism of some literacy initiatives, such as the Return to Education programme, was that the focus wasn't realistic given the over 50's age profile of the people they

were attracting. Furthermore, the use of rooms in 'formal school settings' caused discomfort to literacy learners, particularly if the learner had a past-negative experience at school. Finally, one centre highlighted the importance of the inclusion of principals of local schools, in meetings and decisions made about the literacy service, to reduce barriers to literacy tuition; as their involvement was critical in terms of the provision of resources in most literacy schemes.

5.3 Technology Infrastructure at the Literacy Centres

This section provides a description of the computer facilities and computer programmes on offer at the literacy centres. It provides an overview of the software used at the centre, and its usage by tutors and students in 2001 (see Appendix C) and in 2005 (see Appendix E).

5.3.1 Technology Infrastructure

In 2001, the number of computers available for adult literacy activities in permanent centres varied from two or three, up to a room of sixteen computers. The computers were networked in a number of centres, and this was usually across one room. Typically the stand-alone computers were in the adult literacy co-ordinators office or a resource room. The operating system used was Windows. Some centres had mobile computers, or mobile computing units, that were used to service outreach centres.

Computers in all centres, except in centre 7 where they were approximately five years old, were at most three years old. Most had standard multimedia configurations, with CD-ROM, printer, scanner, modem etc. However, whilst all had speakers, very few had microphones, DVD drives or Zip Drives. Touch Screen Technology or Computer pens were not used at all. Digital cameras were available in a number of centres. A few centres also had TV/ Video. One had an A3 plotter. One had headsets for students (centre 8) and interestingly, Centre 9 had a palmtop for the co-ordinator. None of the centres used distance education technologies, such as video or audio conferencing. Technical support varied across the centres. Four of the centres had a service contract with a company, two used a service engineer employed by the VEC, two had paid internal staff, and the remainder relied on volunteer internal staff to help out when problems occurred.

Half of the centres did not have an Internet connection, even though only one of the centres didn't have a modem or ISDN connection. Of those that did have the Internet, a dial-up modem was used, except in centre 9 and centre 11 who had an ISDN connection. In one centre, the Internet was supplied to the office only. Having only one phone line in the building was commented on in some cases as an obstacle to use of

Internet. Internet access was recorded as 'inadequate' in seven centres, with three centres saying that it was 'ok for present only' and two other centres confirming that their Internet access was 'fine now and for the future'. (Of the seven that recorded inadequate Internet access, six recorded insufficient funds as being relevant as an obstacle to use of Internet, and four recorded lack of computers, insufficient staff training and concerns about security, as obstacles to use of Internet.)

Eight centres in 2001 felt that their computing facilities were 'adequate for present-use only', with two centres feeling that their facilities were 'inadequate' and two others feeling that their facilities were 'adequate for present and future needs'. Most literacy centres did not have a technology plan (i.e. one, two or three year IT plan), and were not aware of the existence of a separate budget for technology.

By 2005, all of the twelve centres had improved the number and quality of computers. Most centres had computers situated in 1:1 tutorial rooms, as well as computer rooms that ranged in size from holding four to twenty computers. In addition, student access to these services had improved in the centres. Most computers were personal computers, with some centres also using laptops. All centres had printers. In addition, all centres had TV and video players; some also had DVD players. Some of the centres had digital cameras, scanners and video cameras.

All of the centres had at least one computer connected to the Internet by 2005, and many had suites of computers connected to the Internet. Some centres availed of Internet access through external centres, like Internet cafes or local schools. The type of Internet connection varied from a dialup connection, to ISDN and Broadband access.

5.3.2 Tutor Computer Skills in 2001 and 2005

In 2001, very few volunteer tutors used computers in literacy instruction but most used them in preparation. Each centre had at least one IT group tutor. The group tutors in general, were usually qualified teachers or had a recognised teaching diploma. IT group tutors had some certification in computing.

Formal technology training was available for tutors in ten out of twelve centres and this was provided either by an internal staff member (in four centres) or an outside consultant (in six centres). The training was in Basic Skills, Internet, European Computer Driving License (ECDL) or National Certificate Vocational Award (NCVA) in Computing. The number of hours training per tutor per year ranged from two hours to forty hours, the higher number usually depending on whether ECDL or NCVA certification was being sought. The volunteer tutors usually completed a ten or twenty hour literacy-training course, and this involved a few hours on using computers. All centres felt that more basic training was required in computing. Four centres felt that their instructors' access and training in computers was 'inadequate', three felt that it was adequate 'for the present only', whilst five felt it was 'adequate for now and any future developments'.

By 2005, most full-time staff had a computer qualification at ECDL level. The computer skills of the volunteer and part-time staff varied, some had no skills, others had basic skills and some had an ECDL qualification. The co-ordinators said that having technology skills was not a requirement for being employed in literacy tuition. However, some centres ran training courses to up-skill their staff in computer applications and specialised literacy software, and also to demonstrate how software could be integrated in literacy tuition. In addition, NALA provided IT training.

In addition to technology skills, some centres were insisting on tutors having the NALA/WIT module on teaching methods in literacy tuition. There were issues for some tutors who couldn't attend this course full-time.

5.3.3 Manner in which Technology was integrated in 2001 and 2005

In 2001, students typically worked in groups of two to ten during group instruction in technology. Technology was also used in 1:1 tuition in a few centres. Each student had on average one to two hours per week of computer usage within literacy programmes.

The number of students using technology in the literacy programmes varied greatly across centres, typically from fifteen up to fifty per cent.

The computers were used in literacy programmes in all twelve centres; for ESOL programmes in seven centres, for life-skills programmes in four centres and for career guidance in two centres. The context in which the technology was used was primarily for technology skills classes (Word Processing etc), however, half of the centres did use the technology as a research or resource tool and allowed students access to do private drafting inside and outside class. Student access to computers was felt to be 'inadequate' in three centres, 'adequate for the present only' in seven centres and 'adequate for present and future' in two centres.

In 2005, computers were introduced gradually to students in 1:1 settings by their literacy tutor. In the first year, students were generally encouraged in groups to attend a 'Basic Computer' course. The 'Basic Computer' course would involve literacy tuition. The duration of the computer classes were typically one to two hours.

Initially, students were encouraged to become familiar with the mouse and keyboard, using software like Solitaire and Mavis Beacon Teaches Typing. Other students used Microsoft Word to improve alphabet and keyboarding skills. Generally students were then encouraged to type up material on the computer and to print it off. One coordinator commented that students wanted to see results, even if it was just a piece of paper with their name on it (Coordinator2, Appendix F, p.27).

Technology was integrated in a number of ways. Some students used computers to complete parts of Further Education Training Awards Committee (FETAC) modules like Communications, where they were required to present their work in a particular format and retain it in portfolios.

Students also used technology in computer modules accredited by FETAC, or the ECDL, where they had to demonstrate their ability to complete various tasks on computer. Some students used the computer for FETAC Foundation level IT module; they learned to use Word and other MS Office applications. Eventually they were introduced to the Internet. Technologies like the digital camera or the video camera were also used to record activities, so that they could show the FETAC examiner that the particular activity was completed.

In some centres, such as centre 8 and centre 10, learners with advanced literacy levels would be promoted to an Intensive Literacy programme, that offered one and a half hours of literacy and one and a half hours of computing each week. Most centres agreed that this was better for level two or level three readers, rather than for those with lower levels of reading ability.

In addition, students were encouraged to undertake self-directed study in centres that had an Open Learning Centre, where the learner could sit-down at a computer and add to or re-enforce what was being done in class using software.

Most students were taught how to use email and search engines in 2005. The Internet was used for researching topics that students were interested in. The tutor would show the students how to get on the Internet and how to research different topics. For the Back to Education schemes and a number of FETAC modules, the students needed to be able to research on the Internet.

In a few cases, the training was combined with literacy tuition and embedded in a local context. In centre 1, they used the Internet to access local information on florists for example. In other programmes offering Internet access, the students were shown how to use online encyclopaedias/ dictionaries. In one centre, students with a 'mild disability' booked a holiday online to Gran Canaria (Appendix F, p.31). They had a savings club, where they logged the names of those who wanted to go and went through the whole procedure themselves, including the online booking. They were supervised whilst undertaking official business like banking. Other students used the Internet to download FETAC module descriptors and to learn how to fill out license and passport forms that had been downloaded from the web. Asylum seekers used the Internet to access information on what was happening in their own countries.

Some centres used interactive online websites like NALA LiteracyTools website and the BBC Skillswise website. Some tutors commented that there was not enough time to properly engage in online activities in 1:1 tuition, and, furthermore, playing 'games' online was not always perceived to be constructive by the student - '*They mightn't feel as if they are doing anything quite as constructive, if they are playing games on the*

computer, especially with adults, even though it could be adult-based material' (Coordinator4, Appendix F, p.18).

5.3.4 Co-ordinator/ tutor usage and perceptions of technology in 2005

Tutors used the Internet in 2005 to gather materials so that they could develop resources, like worksheets for classroom use. Some tutors used the Internet to keep in touch with colleagues. Most tutors commented that the Internet was useful in keeping them up-dated on what was happening in terms of literacy tuition. One tutor used the Internet to access interactive literacy tuition on the BBC Skillswise website.

A number of the centres sampled had their own websites, that highlighted their services and, in one case, had sample worksheets and other resources available to download.

One tutor commented that they went to websites that have been recommended, as otherwise they had to '*wade through an awful lot of rubbish and just, not rubbish, but just stuff that's not great.*' (Tutors12, Appendix F, p.77) Generally, the Internet didn't appear to be much used much in class.

In one literacy scheme, the attitude from management towards technology had slowly changed, in particular in relation to its use its use in organisational communication. The co-ordinator of this centre commented that the management had been slow in embracing the new role of technology in the changing nature of the workplace - '*They weren't taking it on board that it (technology) is a whole ethos or way of life if you like... it's included in all of life whether you like it or not'* (Coordinator9, Appendix F, p.43).

Most co-ordinators agreed that technology was useful as a 'hook' in attracting students to the centre, and furthermore, once they were in, the students were far more likely to admit having a problem with reading or writing or maths. One tutor believed that students preferred to tell people that they were attending a computer class rather literacy tuition (Tutor1, Appendix F, p.5). However, another tutor commented that technology was no replacement for face-to-face tuition, and that the '*computer is not going to replace the literacy tutor'* (Coordinator11, Appendix F, p.54). Some co-ordinators commented on the usefulness of technology for students with learning difficulties. One

tutor commented that when computers were positioned in tuition rooms, students were more willing to try to use them (Coordinator1, Appendix F, p.4).

In some centres, students signed-up for the Basic Computing programmes not realising that they encompassed literacy tuition. Those with high literacy levels were directed to mainstream computing courses, but for one co-ordinator this re-direction of students conflicted with the expanding notion of literacy.

However, in some programmes students didn't appear to be aware of technology on entry to the literacy programme. Students came for help with literacy, and were gradually introduced to technology through programmes such as the 'Basic English through Computers'.

In one centre, the ESOL groups were very keen on technology, and the technology classes tended to be a great 'leveller', nobody seemed to mind what cultural group they came from.

Some tutors commented on the positive impact of the use of technology on some literacy learners – *'I have seen people with low literacy cope better with computers, than someone who can read but can't follow pictures'* (Coordinator4, Appendix F, p.21). One tutor believed that many literacy learners developed a good memory for visual information, which helped them learn how to use computers more quickly.

5.3.5 Software usage in 2001 and 2005

In all centres in 2001, the software used in instructional activity or preparation, included word processing, drill and practice, educational games and multimedia reference software (see Appendix C). Spreadsheet and Database software was used in the majority of the centres, followed by Desk-top Publishing and Problem Solving software in around three quarters of centres. The Internet and authoring software was used in almost one third of centres. No centres made use of digitised speech software. The software was used for reading and writing and adult literacy in all centres. It was used for maths in three quarters of the centres, and also for assessment, ESOL and work-related training in about half of the centres. One third of the centres used Careers

software in their programmes. The literacy instructor and adult literacy coordinator were the main participants in choosing software. The software was generally chosen from recommendations by other instructors or from a NALA publication or workshop.

In 2005, all centres used MS Office application (Word, Excel, Paint), as well as, Mavis Beacon Teaches Typing and Solitaire. Some used Microsoft Publisher and Microsoft Access. The MS Office applications were typically used for presentation purposes, Mavis Beacon Teaches Typing was used for learning to type and Solitaire was typically used to enhance mobility and learn how to control the mouse.

However, software that had been integrated in literacy tuition to some degree at centres included Starspell, Issues in English, It Could Be You, NumberShark, The Driving Theory Test, Equal Skills, Kurzweil, Measuring up and Ultimate Phonics. More obscure software like Ihelper, Netdays, Europew, StoryBook Weaver, Superspell, Lectra32 and Tell Me More was listed in single centres.

Some centres used the DVD that accompanied the 'Read, Write, Now' television series. Programmes such as '*Read, Write, Now*' were raising an awareness of the importance of technology for literacy learners – 'It's really like an advertisement for the literacy service'. One tutor commented that the students '*...particularly like when the life story starts with a learner explaining what level they started at and where they're at now and how long it took them to get there'* (Coordinator8, Appendix F, p.38).

Online websites that were used in literacy tuition included, NALA's *Literacytools* website, the BBC *Skillswise* website, BBC Adult and the BBC Post-primary website.

5.3.6 Issues with dedicated literacy software in 2001

In 2001, each of the centres highlighted a number of issues that they had with existing software. Generally, there was perceived to be a lack of adult-based software for use in adult literacy tuition.

The Adult Literacy Organiser (ALO) at centre 11 commented that the content of software was unsuitable for use with adults. This was echoed by the other centres who

added that the content was often geared towards children and childish topics and themes were presented. The ALO in centre 5 commented on the lack of variety in the material that was included in a lot of software. This same centre also highlighted the problem with material being covered rapidly. She added that there was no real recognition of prior experience within the readings or worksheets presented on the software. It was felt that there were better paper-based resources that could be utilised.

Another issue was that the content rarely addressed the 'Irish' context. The ALO in centre 9 commented on the dearth of software designed for an Irish audience. She added that the greatest step in Irish text-books was the introduction of Irish based texts, Irish road signs and the Irish social welfare system. The ALO in centre 5 also commented on the New Reading Disk software saying that it was expensive, the situations were not Irish, the social issues were not Irish and the maps were not Irish. One piece of software that she had used in the past in traveller literacy tuition, that she found very good, was based on Elvis. The travellers loved it, as many were huge fans of Elvis. It helped reinforce their own experience.

The ALO in centre 1 commented that 'English', 'Australian' and 'American' accents in existing software, could be difficult for the Irish literacy learner to understand. The ALO in centre 5 commented on particular difficulties with the English accent on the 'New Reading Disk' software. Also American spelling was different and this causes confusion for literacy learners. The computer tutor at centre 8 commented that the New Reading Disk was not good for 'beginner' literacy learners (those with low literacy levels), as the words were too long and there was a problem with the font used. In addition, the use of a British accent and context didn't motivate Irish learners. She added that an Irish version of software was needed for literacy tuition. The ALO in centre 9 commented that some students have a good ear for sounds and they would have a problem relating to 'foreign' accents on the software. She also noted the issue with American spelling in literacy tuition.

The ALO in centre 5 commented that the software developed for adults was dull and boring. She pointed out that adults wanted more games. The ALO in centre 10 commented that the New Reading Disk was good but that students got bored with it very quickly.

The ALO in centre 5 further added that most of the software was designed for one particular literacy level, with no other levels within. The ALO in centre 10 added that the literacy level chosen for particular literacy software was too high, and that students would find the software too difficult to use. For example, in one piece of software the first one hundred words used for a spelling exercise were too hard for the literacy learner to spell. She commented that the spelling needed to be structured into appropriate levels of ability.

The ALO in centre 11 commented that the feedback mechanisms were not appropriate in the majority of software packages available to literacy centres; most of the software was geared for children and the feedback was considered childish i.e. 'sound' or 'stars' or 'cheering / happy faces'. In addition, the computer tutor in centre 8 said the menu on the Starspell software was confusing, that there was navigation problems and that the feedback was inappropriate within an adult context.

Another problem that was highlighted by the ALO in centre 1 was that not all software providers provided a 'trial' version of software in advance of purchase. The issue here was that a lot of software was bought without knowing whether it was appropriate or not. It was too late to change your mind once the purchase had been made. Samples of potential software should be made available for evaluation in advance of purchase.

The ALO in centre 1 further highlighted that there were no booklets supplied with some software. An example here is the '10 to 10' series, which has no accompanying booklet. The ALO in centre 9 also commented that a lot of time was spent reading manuals to find the value in software, and that it was easy to miss out on 'good' functions in the software. She added that more training should be provided so that tutors become aware of the important aspects of each piece of software. In some software, the help-file wasn't visible onscreen. This also made it difficult to progress if any obstacle was encountered.

Another problem highlighted by the ALO in centre 3 was that the expense of the software available, which made it difficult for both the centres and students to buy. In addition, some software available on CD, required network licenses or else a separate

CD had to be bought for each computer; the costs involved in doing this was prohibitive for some centres.

The ALO in centre 9 commented that sometimes technical problems with the computer caused software problems.

5.3.7 Issues with the Dedicated Literacy Software in 2005

Generally the co-ordinators at the centres commented that the tutors didn't use dedicated literacy software in their literacy tuition in 2005. The focus seemed to have shifted to using MS Office type applications in integrated literacy tuition, or to produce evidence for FETAC accredited modules in 2005.

The reasons why the dedicated literacy software wasn't being used in 2005 ranged from the software being too childish, to not having an Irish context. Some co-ordinators commented that there was a lack of software for adults with low literacy levels. Software designed specifically for literacy programs was thought to be childish, might be '*more suited to special needs than adult context'* (Coordinator5, Appendix F, p.22). One tutor believed that some of the software designed for ten to sixteen year old group could be used in adult literacy tuition.

One co-ordinator commented that problems arose because most '*software doesn't match in with what they have learned in class.*' (Coordinator1, Appendix F, p.5). Furthermore, it was felt that the tasks had to be relevant to the context of the user and to what they were currently engaged in. Also if the overall importance was not immediately apparent, it could cause motivational problems for the literacy learner.

Some tutors wanted to see software that had various levels of literacy tasks embedded in it, and also that contained a tracking system that recorded the student interaction with the software and marked their progress through the literacy levels (Tutor3, Appendix F, p.17).

One tutor commented on the issue of controversial topics, for example euthanasia or vivisection, being embedded in the learning materials (Coordinator2, Appendix F, p.7).

Furthermore, many coordinators thought that the cost of the software was prohibitive in some cases.

Some of the tutors commented on the difficulty in sourcing software within the adult literacy context. Software was found by looking on the Internet for companies selling software, by looking for recommendations from websites of literacy organisations and by checking family literacy websites to see what software they recommended. In addition, software catalogues, such as the one by PrimEd, were reviewed by adult literacy organisers in order to source software, but these catalogues were generally geared for child education not adult education programmes.

5.3.8 Issues in using technology in Literacy tuition in 2001 and 2005

In 2001, the main obstacles to the use of technology were lack of relevant software, followed by lack of information on how or when it could be used, not enough time to train staff and a lack of adequate training for staff. Furthermore, all centres agreed that evaluations and reviews of hardware and software were extremely relevant as an incentive to increase use of technology. This was followed by three quarters recording the need for a help-line for programmes using technology, a further sixty per cent needing research/ case studies showing benefits of technology use and finally, half centres recorded training as extremely relevant. Concerns about security on the Internet were recorded as extremely relevant by half of the centres and relevant by another quarter in 2001. This was closely followed by almost fifty per cent of centres recording not enough computers with Internet access and insufficient staff training in the use of the Internet as being extremely relevant as an obstacle to use of Internet. Half of the centres recorded insufficient funds for Internet Service Providers (ISP) charges and phone costs as being an obstacle to Internet use.

With improved computing facilities, access and use of the Internet in all centres in 2005, most co-ordinators focused on identifying issues with using the Internet in literacy tuition and support.

Some students were afraid of using the Internet, and their confidence had to be built up so that they could feel comfortable using it. One tutor commented that the Internet was

useful once they had the basic skills and the confidence to use it' (Tutor1, appendix F, p.3), and another tutor emphasised that students sometimes weren't ready, and were afraid of messing things up' (Tutor6, Appendix F, p.26).

One co-ordinator felt that it was better to use the Internet in group-work, as it was useful in fostering a good group dynamic and reduced the fear for the individual student - '*It's important that they support each other when they use it, it takes the fear out of it when there is a gang of them... four or five of them around it... creates a dynamic in the room'* (Appendix F, p.32). One tutor felt that the Internet was best used with the better-able student (Appendix F, p.17). Other less-able students needed more guidance from a tutor - '*I think it's just that you'd need constant tutor guidance, I know with my group you couldn't say look up this web site and find this information without a lot of guidance, you'd need a lot of competency to do that'* (Tutors12, Appendix F, p.80).

Some tutors believed there was a connection between the age of student and the degree of computer literacy. Many older people used the Internet to communicate with relatives abroad.

The reading level of the material on the Internet demanded a good degree of literacy - '*the reading level tends to be quite high for any of the stuff that I would be looking for (on the Internet) you have to be fairly on the ball to follow it through...*' (Coordinator9, Appendix F, p.46). Another tutor commented that, '*the problem with the internet for a lot of our students is that even once you get on to certain web sites the language is too difficult so that's a permanent barrier'* (Coordinator12, Appendix F, pp.86-87).

Two tutors commented on the difficulty with students accessing websites that they shouldn't have been on; raising issues around netiquette. One of the DALC tutors commented on the difficulty of using the Internet in a short time-frame. Another tutor recommended careful planning for Internet based classes, as: '*Time can be an issue if using the Internet. If doing research, preparation takes time and not everyone is quick on computers'* (Coordinator4, Appendix F, p.20).

Furthermore, some students found basic concepts, such as the Internet, search engines, and inputting a web address difficult to understand – '*Even getting your head around a*

lot of the concepts like what is the internet or a search engine' (Tutors12, Appendix F, p.68).

The tutor at one centre believed that the reading level of students accessing the Internet wasn't as important as their ability to work by themselves – '*A lot of them would come from 1:1 so they'd probably be the most basic group in the centre but they're not very, very basic either, they have a certain amount of reading and writing, it's just more about competency and independence and that sort of thing, they wouldn't need a lot of guidance with reading and writing...*' (Tutors12, Appendix F, p.80).

Finally, one co-ordinator cited the difficulty for those in rural areas to access literacy tuition because they don't have the technology infrastructure or resources (Coordinator2, Appendix F, p.9).

5.4 Summary: Literacy Context

The literacy service in most schemes was based in temporary structures spread out over large geographical distances; this had implications for the quality of service on offer and also may have discouraged the installation of permanent technology network structures at outreach centres. The numbers accessing the service increased in practically all of the schemes that were re-visited in 2005; this increase in numbers impacted on the funding, staffing and programmes that the centres could offer. There were still large numbers of non-nationals accessing the service in 2005; however, this consisted more of migrant workers in a number of schemes who were looking for communicative English tuition, as opposed to, the large number of refugee or asylum seeker accessing the literacy service in 2001. One tutor commented on the cultural difficulties that emerged when doing group-work with non-nationals with different motivations, expectations and varied backgrounds – technology may be useful in offering individualised instruction to these groups.

Whilst the number of full-time staff had increased at the literacy centres, there were still large numbers of volunteer tutors. The use of volunteer tutors created logistical difficulties, in terms of matching their availability with the needs of the literacy student.

In terms of advertising the literacy services on offer, some centres used explicit literacy campaigns, whereas other centres 'hid' the literacy aspect under generic titles such as 'Reading, writing, numeracy, computers' or under themed headings such as 'Art & Crafts' or 'Gardening'. Technology was perceived to be a 'hook' in drawing people into literacy education. The non-disclosure of literacy often resulted in large numbers of literate people making enquiries through the literacy hotline; however, this was perceived as unavoidable in the race to identify those with real literacy needs. The advertisements were run in mainstream media, such as radio, television and newspapers. There was also improved communication between partner referral networks since 2001; with agencies such as FAS, VEC, Probation Service, County Council and Social Welfare all engaged in identifying students who needed literacy tuition and guiding them to the nearest literacy scheme. The literacy schemes in return, referred students towards ongoing learning in the partner centres. These partners need to be engaged in all developments pertaining to literacy education, such as technology innovations, as it may impact on their services.

The assessment procedure for students involved informal examination of oral, reading and writing skills on entry; students were advised whether they were eligible for 1:1 or group tuition. Students were then given a choice of what area they wished to concentrate on. The 1:1 tuition focused on improving basic skills; the group tuition focused on themed literacy initiatives or progressing students towards FETAC or other accredited modules.

The process of initial examination of literacy skills raised questions for developments in the online learning setting; in particular, designers needed to think about how to guide students towards appropriate material or activities on the site. There was also a real need for guidance and conformance on varying degrees of literacy. Furthermore, the composition of material on the website needed to offer literacy learners the opportunity to improve basic skills or progress to accredited courses if so desired. In addition, partner services need to be included in the design consultation process so that linkages to the partner services in an online capacity could be fully explored. For example, literacy learners may want to submit part of their portfolio assessment online direct to bodies such as FETAC. Also, the design team needed to think about how online

learners can be advised of their progress – i.e. how would the Individual Education Plans or learning logs transfer to an online learning environment? What supports would need to be put in place? What training would need to be provided to tutors to support online feedback or support mechanisms? Finally, technology could be used to support those students who have taken time out; it could support a flexible learning environment and allow students to complete modules over a longer period of time.

In terms of progressing literacy learners within and beyond literacy programmes, technology was perceived as being useful in motivating students to advance from 1:1 to group tuition; it certainly provided the anonymity that some literacy learners craved and could provide the flexibility for learners who wished to access tuition from home. However, as many literacy learners feared technology, it could equally be argued that the use of technology was a barrier to literacy tuition.

The development of Open Learning Centres within many literacy centres was a positive development for the integration of online learning environments. These centres allowed students to independently study literacy, whilst also having a tutor available if they needed additional support – they could also effectively support either a blended learning initiative or self-direct learning.

By 2005, the technology infrastructure was in-place to support both 1:1 and group literacy tuition; improvements could always be made in terms of the numbers of computers and the type of Internet access on an ongoing basis. The main need was for tutor training in how to effectively integrate technology in literacy education. In 2001, the main focus was on up-skilling students in using the computer and MS Office applications. By 2005, this had shifted towards showing the students how to use the Internet to resource materials, and using Word or Publisher to format materials for FETAC portfolios. Whilst this was an improved use of technology, tutors needed guidance on how to integrate online and offline dedicated literacy software in their literacy schemes.

The problems with literacy software were varied in both 2001 and 2005, and ranged from concerns about cost and lack of supporting material provided with the software to concerns about the style and content of the actual software material itself. The latter

proved problematic in a number of ways – some material was regarded as more suitable for children than adults, often material was set in an irrelevant context or of a controversial nature and finally, some material required high levels of literacy for students to interact with it. These issues needed to be addressed by design teams when designing software.

Concerns about using the Internet, expressed by tutors in 2005, focused on security issues and netiquette issues. Furthermore, some tutors believed that students needed a high reading level and to have self-directed skills in order to effectively interact in an online environment.

Therefore, from the review of the context, it was clear that the infrastructure existed to support online learning at these centres; however there was a need for additional modes of accessing literacy tuition in light of the increased numbers; tutor training was needed to support the integration of an online learning environment and to diminish concerns about Internet safety; there was a need for discourse on how to redress weaknesses in current software implementations to prevent them re-appearing in an online context; the Open Learning centres should have been harnessed to support and examine a blended online learning environment; clarity was needed on reading levels and there was a need for discussion on how best to guide students through the online learning environment. Finally, all partner services needed to be involved in the design consultation process for any technology developments.

Chapter Six

Contextual Level: 'It Could Be You' software

6.1 Introduction

Anecdotal evidence of the popularity of an Irish-based software package called '*It Could Be You'* emerged from the series of interviews held at the literacy centres in 2004/ 2005. This was interesting from a research perspective because the software was purportedly designed to facilitate the self-directed literacy learner with different learning styles and preferences. Therefore, the manner in which it was developed was investigated, and the following discussion outlines the findings from this process.

6.2 Rationale for investigating development of '*It Could Be You'* software

Even though this software was a CD-based, product for an offline literacy context, its focus was to support the self-directed or independent literacy learner. Therefore the researcher felt that an examination into how this software was designed could help provide useful information or insights for the design of software or material for an online literacy context. Hence, the design team that developed this software was contacted and a set of interviews took place with the project director, project manager and one of the software programmers for this package in early 2005. The objectives of the interviews were to ascertain how the software was developed and what had influenced the design and development processes. Some of the co-ordinators and tutors in the twelve literacy centres visited, commented on the effectiveness of 'It Could Be You' software, and in some cases, mentioned ways in which it could be improved. Their inputs have also been integrated into the discussion here.

6.3 Overview of the Education Service in Prisons

TeamB Member3, City of Dublin VEC appointed organiser of Prison Education at one prison, perceived developments initiated in prison education as innovative and successfully meeting the needs of the target population; hence, prison education projects tended to be successful. According to him, the underlying philosophy in prison

education was honesty in relationships between each staff member and prisoners at the education unit. He commented that tension in the prison was reduced with the introduction of the prison education scheme in the 1970's – *'He [prison officer] knew his job was easier because they [prisoners] were going to school'* (Appendix H, p.18).

Attending prison education courses was on a voluntary basis; students opted to attend education in the prison education unit. They weren't paid extra to attend the education unit, and a criterion for acceptance into the education unit was that the student must want to be there. Whilst attendance at the Education Unit was voluntary, it was not a 'drop-in' centre. If a student presented more than three times with implausible excuses for being absent, then the student had to withdraw from the service.

Each student was interviewed individually on entry to the Prison Education Unit. Most students had prior negative experiences of school. According to TeamB Member3, the fact that the unit operated on first-name terms helped break through this barrier. Also positive experience at the Education Unit was spread through word-of-mouth, which resulted in increased numbers of students entering the Education Unit. The education organiser generally knew from the manner in which the initial application forms were filled whether potential students had literacy problems - '*... you wouldn't need to be a scientist to see they had difficulties writing'* (TeamB Member3, Appendix H, p.18). They had a lot of students who were educationally disadvantaged and many with special needs over the years in the prison Education Unit. However, TeamB Member3 believed that all learners could make considerable progress in prison.

In the mid-1970's there were no materials for adult education or the material available in the literacy scheme was from England and not relevant to Irish culture, so the prison Education Unit started to devise their own materials - '*We would get a guy to talk to a tape-recorder and then type up the story, and that would become the (classroom) material'* (ibid). The materials developed grew into courses, and by 2005 the prison Education Unit had a long history of creating materials for literacy learners that had matured into a range of subjects in a variety of areas like Art, Home-economics and Maths, at levels ranging from very basic education levels, to post-primary junior and leaving certificate levels, and in some cases to tertiary education level.

The Education Unit was generally open for around three hours in the morning, two hours in the afternoon and two hours in the early evening. *Some students attended all day every day, others came for two or three mornings or afternoons a week.* Each student followed his/ her own individual timetable. In terms of literacy, 1:1 tuition or group tuition was offered at the outset. The students on the literacy scheme tended to have good peer support, it was considered positive to be in the Education Unit. Also, they did attend classes on a voluntary basis, so if they didn't like what was on offer they could 'vote with their feet'. '*There's peer pressure for them to attend... if they're still coming after 2 weeks they're getting something out of it'* (TeamB Member3, Appendix H, p.19). According to TeamB Member3, there weren't the same hang-ups about reading and writing in prison; the students developed a sense of camaraderie. There was also a lot of humour and students were extremely honest, TeamB Member3 commented that there existed '*unadulterated honesty*' between students, and furthermore that it was difficult to have '*phoniness*' in prison because '*they're* [prisoners] *at the bottom of the heap'*. He also said the honesty was reciprocated from student to tutor, although in some cases the feedback on courses in the unit could be too positive - '*They wouldn't be doing it to bull-shit me, they'd be doing it because it's not every day they get the chance for their opinion to be heard... they can sometimes exaggerate the positive'* (Appendix H, p.20).

Students accessed computers for use of basic applications, such as word processing, others progressed to complete the ECDL and MOS accredited computer examinations. The education co-ordinator emphasised the importance of presenting work on paper first before using technology to present information - '*For our guys the fact that they can see something on paper and feel comfortable with it on paper before they ever go near a computer screen is hugely important'* (TeamB Member1, Appendix H, p.12). There were also dedicated literacy software packages available. However a cohort of students in the prison Education Unit were total beginners in terms of using technology, and there was no software at that level. The software available was either too childish or insulting for them to use - '*We would get a lot of people who are total beginners, there isn't anything out there at that level or if there is, it's very childish'* (ibid).

The Prison Education Unit in the two prisons visited had an Internet connection, and some students were allowed restricted access to computers to complete computer exams

online. The 'live' use of online software, such as NALA *LiteracyTools*, was prohibited in the Education Unit as there was only limited access provided to the Internet. The students could only use offline versions of websites that had been downloaded by tutors from the Internet. Websites that were popular amongst students at the Education Unit in one prison in 2005 included www.penandclink.com and www.irish-prisonart.com. Staff in the prison Education Unit at the other prison used the Internet to source materials. In the TeamB Member1's opinion, teachers had to be enormously careful about who was allowed to use the Internet for security reasons. She commented that there was '*a huge nervousness around using the Internet in prisons'* (ibid) due to concerns relating to prisoners accessing inappropriate materials. However, she hoped this would change in the future with stricter safeguards in place.

6.4 Extent of the Literacy Problem in Irish Prisons

The International Adult Literacy Survey (IALS) in 1997 did not include an examination of the levels of literacy in Irish prisons. There was a perception amongst prison educators that the literacy problem was much worse in prisons than elsewhere - '*For a long time those who have worked in prisons have felt that it (literacy) is much worse here than outside'* (TeamB Member1, Appendix H, p.2), and that the degree of literacy was much lower inside prison than the degree of literacy outside - '*We would go to in-services and find that we were talking about people who couldn't read or write at all'* (ibid).

The prisons decided to do their own survey to find out what the levels of literacy were like in Irish prisons. Dr. Mark Morgan from St. Patrick's College in Drumcondra was brought in to help design this survey. The IALS tools for establishing literacy were not adequate or sensitive enough to test the literacy levels in the prison service, so they designed tools that could measure lower levels of literacy than had been examined in the IALS - '*We had a meeting where we decided that we would like some sort of a survey done... Mark Morgan who had designed the original IALS was brought in on it... we introduced a lower level... and carried out the survey in all of the prisons in the country...*' (ibid).

The survey was carried out in prisons in 2001, officially released in 2004, and it proved that 52.8% of the prison population had a lower level of literacy than the lowest level measured in the IALS – '*We had always thought that more than a third of our students had lower literacy levels, but we were surprised at the extent of the problem'* (ibid).

6.5 Background to the Creation of 'It Could Be You' Software

The design and development of the software, 'It Could Be You', predated the Prison Literacy survey that highlighted the extent of the literacy problem in prisons. In 1996, the proposal for re-integration of offenders in society was awarded with a condition that technology had to be included in the project. There were two aspects – pre-release and post-release phases. The management at one of the prison Education Units decided to develop interactive software with multi-media aspects in three distinct areas – one in literacy 'It Could Be You', one in electronics and one in Irish. They had a small budget for the three programmes, and found four teachers willing to work on the project on their own time.

The rationale for developing the literacy software was a direct response to the lack of tutors available to support 1:1 tuition, and also the desire to provide extra flexibility in the manner in which literacy tuition could be accessed. There were large numbers of students requiring 1:1 tuition. However, it was difficult to get adequate tutor provision for 1:1 tuition within the prison service, as the voluntary tutor-system that operates in external literacy programmes couldn't operate within the 'closed' prison literacy scheme.

Open Learning Centres had been established in three prisons to improve accessibility outside normal tuition hours in a number of programmes. These Open Learning Centres afforded literacy students the opportunity to continue their literacy tuition outside of 'normal' class time. However, a further restriction in terms of accessing tuition was the prisoner 'lock-up times' in the early evening, which impacted on the length of times learners could access the educational services on offer – '*There is no full-time education here... it's very difficult to give as much provision to a literacy student as you would like*

to do because access to them is actually quite restricted' (TeamB Member1, Appendix H, p.3).

It was envisaged that a software pack could be developed that would broaden and extend opportunities for students with low literacy levels to extend their skills. This resulted in the development of the 'It Could Be You' software, which consisted of a set of readers (storybooks) that were closely linked with core material on CD, with tapes supplied for those who needed help to read the readers. The whole pack supported reading and writing using a range of media. The idea was that students would first attempt activities or exercises on paper before moving to computer - '*Most of these guys wouldn't have touched computers before, so they're so scared of the whole notion of computers, so that if they had done a little bit of text on paper first which is a much less threatening form of media, that they would feel more comfortable when they went to the computer'* (ibid).

The education co-ordinator had observed that beginner computer students spent a lot of time and energy trying to learn keyboarding skills when interacting in literacy activities in the Open Learning Centre. All of the software available for literacy tuition required keyboarding skills. She wanted to design software that didn't require a keyboard - '*... so instead of concentrating on what was on the screen, people were using all their energy trying to figure out where things were on the keyboard... I totally empathised with that...*' (ibid).

The software development process took about two years, and was launched in Dublin Castle in 2001. The prison education service gave away more than one thousand copies and gave one to each literacy scheme in the country. The funding didn't include the cost of the postage for sending out the software package to the literacy centres; however, the organisers of the National Reading Initiative donated the money to cover the postal costs of distributing the software to literacy centres in prisons and across the country.

6.5.1 Development Team for 'It Could Be You'

TeamB Member3 had worked in prison education since the 1970's, and was based in a prison Education Unit since 1978. The proposal for the 'It Could Be You' software emerged from a project meeting that he attended regarding EU Integra funding.

TeamB Member1 was education co-ordinator in a Dublin prison. She had been involved in innovative developments such as the establishment of an Open Learning Centre at that prison. She agreed to take on the role of project manager when she became involved in the design of 'It Could Be You' software in 1998.

TeamB Member1 contacted other co-ordinators and literacy tutors in Education Units in other Irish prisons, and subsequently formed a team of four (that dwindled to three) to design and develop the software. Each team member worked on this project in their spare time, outside their own work commitments as co-ordinators or tutors within the prison education system. For the first year, TeamB Member1 and three colleagues met every Saturday morning for three hours and sometimes had follow-up lunchtime meetings during the week to design the materials that were to be used in 'It Could Be You'.

At the outset of the second year, two software programmers were identified to programme the exercises. Neither programmer had worked with Computer-based Training (CBT) products before working on 'It Could Be You'; they had mainly worked on commercial business applications.

6.5.2 Life-cycle Model

The Life-cycle Model chosen to develop the 'It Could Be You' software didn't exactly fit any 'known' life-cycle model. The design team didn't mention following any explicit life-cycle model for software development. The 'Model' used could be considered loosely aligned to a 'Waterfall Model, where the needs were ascertained and materials developed, evaluated and re-developed at stages throughout the development until the final product emerged. However, the development process was more fluid and

less structured in this case than the Waterfall Model. Also documentation and tight specification of requirements on paper was not a feature of this development process.

6.5.3 Development Stages

The development happened really in three stages – '*in the first phase, all the content was put into it, and then all the exercises were done, then in the second phase the sound was added and in the third phase the graphics were added.. Now in real terms, you should put the graphics in first... The look and feel is very important*' (TeamB Member2, Appendix H, p.15). Firstly, the theme of the software was decided, and exercises and worksheets were designed with this theme in mind. The 'educators' also designed the *Readers*, which were text-based storybooks that were included in the software pack. The programmers were engaged to implement the exercises and worksheets. The programmers examined these exercises in light of technical constraints. This process led to the re-development of some of the exercises and worksheets, and by default the 'look and feel' of the various screens that would form the interface between the user and the exercises. In addition, the design team and other 'testers' reviewed the programmers' work and fed back on what should be changed. Secondly, the sound was added. The audio voice-over for the instructions and textual information was added to the CD. The tapes for the accompanying Readers were also developed. Thirdly, the graphics were added to the CD. The package was then put together and launched.

6.5.4 Time-span for Development

The software was developed slowly over a two-year period. They didn't have a clear time-span in mind when they started out, although they did think they would have completed it much faster than in reality. The time-span for development was roughly as follows:

- 1997-1998 Team worked on developing materials for the CD
- 1998-2000 Team worked in conjunction with programmers to implement materials for CD
- 2001 – Launch of the Software package publicly

6.6 Development Phase

The focus of the software was to offer literacy tuition that would cater for learners with different learning styles or preferences. In particular, it was designed for use by literacy learners who were self-directed learners or who wanted to extend their tuition beyond the 'formal literacy tuition classes' offered within Education Units in prisons.

The target audience for the 'It Could Be You' software was adults with basic literacy levels in prisons. This audience subsequently expanded to literacy learners, who wanted to access literacy tuition, in literacy centres across Ireland. According to TeamB Member2, the context of the target audience of literacy learners was unfamiliar to him and therefore he felt that, *'the basic assumptions you make about the target audience may or may not be flawed'* (Appendix H, p.14). He added that other designers may have made it more childish based on false pre-conceptions about adults with literacy problems –

> *Age is the first issue, a lot of people would have tried to make it childlike because they would have assumed that the audience wouldn't be capable of tacking anything else at a technical level, but the audience were much more sophisticated than that. They just have reading difficulties, or learning difficulties. It's challenging in so far as it is sometimes very hard to get your head around this.* (ibid)

He commented further that the literacy learners context needed to be closely examined, particularly when technology was being integrated into their learning environment – *'So you have to think about how happy the literacy students will be, how computer literate was the adult literacy student or how comfortable will they be using this software with a mouse, keyboard and graphical / images'* (ibid).

6.6.1 Choosing the Theme for 'It Could Be You'

First on the agenda was the search for a suitable theme for the package. One of the design team members came up with the *'Lotto'* theme of the 'It Could Be You' software; he had read somewhere that 67% of the Irish population played the lotto and therefore, the context was easily recognisable for potential literacy students.

The underlying philosophy for the literacy programme was 'Language Experience Approach', which believed in immersing learners in a context that they were familiar with. They believed that if the literacy learner could read the first word, their confidence levels would increase - '*We knew that we could come up with all sorts of phrases that people knew before they even needed to read them, and that's a huge boost to people's confidence*' (TeamB Member1, Appendix H, p.4).

6.6.2 Design Process

According to TeamB Member1, the process that followed after the consensus on theme was tortuous. Each member of the group had a different forte, and there were a lot of arguments about theoretical aspects of the language - '*It was hugely focused on the language experience but we also focused on the Dolche list, that we were repeating words... all of those sorts of technical things'* (ibid). In one case, deciding on the position of the word 'only' in a sentence took three hours - '*There was all sorts of stuff like that... people disagreeing... we literally paired back the verbiage'* and '*There was a lot of argument about theory'* (ibid). Sorting out the levels was also time-consuming; each exercise in the *Readers* had to be written for three different levels of literacy.

All of the initial work was done on paper and in total it took about a year on a part-time basis. The *Readers* were written first, and then these were edited as needed. Images to go with the *Readers* and exercises were also described in detail and positioned beside text boxes.

At the end of the first year, one of the team emigrated, which left just three of them working on the software. During the first summer, all the exercises for the CD were written based on the text in the *Readers*. There was a gamut of exercises that literacy students could work on, reflecting exercises that had been '*tried and tested'* in class, and prepared for insertion on the CD - '*there's nothing revolutionary there, they're all tried and tested... the thing about them is that when they are in a different format... for a lot of people they work in a way that they don't work on paper... because it's visual'* (TeamB Member1, Appendix H, p.5).

6.6.3 Communicating the Software Requirements

At the first meeting, TeamB Member1 brought a *text-based* diagram to the programmers, illustrating the main components of the programme. This diagram (See Appendix I, p.1) showed that the textual material, i.e. the *Readers*, was central to the programme, and that eighteen different types of exercises radiated out from the core text. As TeamB Member1 explained, '*... I would have written exactly what I wanted to do... because the first thing for me to do is to write not to draw pictures... and they couldn't make head nor tail of that... words didn't work for them*' (Appendix H, p.7). The literacy exercises radiated outwards in three distinct regions illustrated by concentric circles and explained in textual terms:

- In the inner-most circle, 'sentence building', 'comprehension' and 'cloze' exercises were the main types of exercises illustrated.
- In the second-outer circle, 'contractions', 'digraphs', 'beginning consonant blends', 'consonant blend endings', 'initial consonants', 'y', 'vowels', 'words in words', 'syllables' and 'b+d' were examined.
- In the outer most circle, 'homophones', 'opposites', 'word squares', 'alphabetical order' and 'compound words' were examined.

TeamB Member1's first impressions was that the educators and programmers were each speaking a language that the other didn't understand but they learned from each other. TeamB Member1 commented that the programmers had great difficulty in understanding the '*terminology*' and the design requirements from the initial diagram. Likewise, TeamB Member1 had difficulty understanding what information the programmers needed in order to implement the exercises that had been designed. They didn't understand the diagram, and she didn't understand what their requirements were - '*When I first went along to them, I tried to show them that the text was at the centre and all of these things came out from it... and they could not get their heads around that... they couldn't figure out how this would work*' (Appendix H, p.5). The communication of the educational requirements to the programmers, and the communication of the technical aspects by the programmers to TeamB Member1 was therefore initially problematic.

TeamB Member2 said that he explained to TeamB Member1 at the first meeting that he needed a mind-map type diagram in order to understand her requirements - *'That's a more traditional mind-map, that's mapping the traditional flow, the drop down menu, where you are progressing from one piece to the other...Most programmes have a menu bar, with sub-menus, cascade style' (Appendix H, p.16).* So, a second meeting was planned. TeamB Member1 prepared a new diagram to explain the requirements for the second meeting, (see Appendix I, p.2).

In the follow-up meeting TeamB Member1 brought the new diagram showing the information in tabular form, and the programmers understood what her requirements were, and commented that *'they immediately could see what I was talking about'* (Appendix H, p.5). TeamB Member1 re-presented what she wanted to implement using a 'hierarchy' type diagram, displaying what may appear on a main menu or drop down menus. At the core of the diagram (see Appendix I, p.2) was the main menu, which was represented by three headings 'Readers', 'Word Attack', and 'Sort it Out'.

- From the 'Readers Menu', users could access three different types of exercises focused on sentence building, cloze tests and comprehension.
- From the 'Word Attack' menu, users had to choose from two options, 'Look' or 'Listen'. Word Attack looks at '*how words are made – looking at the bones of words*'.
    - From the Look menu, they could try out four types of exercises on 'Words in words', 'b+d', 'contraction' and 'compound words'.
    - From the Listen menu, they could access exercises on 'initial consonants', 'vowels', 'consonant blended endings', 'beginner consonant blends', 'y', 'digraphs' and 'syllables'
- From the 'Sort it out' menu, they could access exercises on 'alphabetical order', 'opposites', 'homophones', 'word-squares' and 'numbers'.

The programmers understood the requirements from the second diagram that was presented, and vice versa - *'It took two meetings before we began to understand each other... I'm coming from a non-technical background, it took a while for me to figure out how to explain and for them to figure out how to explain what they were doing to me'* (TeamB Member1, Appendix H, p.7). Everything was also written out so that the programmers knew exactly what had to be input (see Appendix I, pp.3-6). TeamB

Member1 said she got used to working with the programmers, but it took about a year for the exercises to be implemented as a large amount of time was spent going over and back from the programmers to the educators.

6.6.4 Instructional Design of the exercises

Each exercise that was designed for the CD was initially hand-written by the educators, then typed by the secretary in a word-processing package and presented to the programmers to implement. The secretary misunderstood some of the hand-written exercises or instructions, so TeamB Member1 had to revise and re-check everything to ensure that it was correct - '*The number of revisions was just amazing*' (Appendix H, p.5). A set of instructions for each exercise was also hand-written, typed and then presented to programmers for implementation - '*It's physically drawn out what will be shown on the computer*' (See Appendix I, pp. 3-6). The programmers then looked at the exercises to see if they could be implemented in their initial format. If they couldn't be implemented, then they would try to make changes to them in consultation with TeamB Member1. There was discussion over exercises that couldn't be implemented in a particular way, and a consensus was reached on what changes had to be made so that it could be implemented. The team worked on the *Readers*, whilst the programmers were implementing the exercises for the CD.

TeamB Member1 led the design team in thinking about how the Homepage and other screens would look from a practical and an educational perspective – '*All the exercises were doable after a re-think*' (Appendix H, p.9). She explained that she began to visually imagine how the software would look. Some exercises had to be re-thought, such as the contractions. TeamB Member1 also had to re-think about an exercise on joining compound words.

The activities designed were flexible in terms of how they could be used, for example, exercises in the workbooks could be completed without using the CD. All the activities and exercises were designed to be used by literacy learners with low or no keyboarding skills; hence, all the exercises had 'Click and Drag' elements so that mouse control skills, rather than keyboarding skills, were required (See Figure 6.2). TeamB Member2, commenting on this 'kiosk-style' design of the 'It Could Be You' software, said that

this also resulted from pressure to develop the software to be 'instantly comfortable' for literacy learners to use. The reasoning behind this was the limited exposure or access to technology that literacy learners might have, and the resultant need for it to be easy and comfortable to use.

Trying to get illustrations was a problem for the design team. Everything had to be done at low cost, so they hired a graphic designer in a local college to produce the graphics. They would ideally have liked better quality images but they had very little money in budget so had to accept the low quality images (see Figure 6.1) -'*We ended up with pretty awful illustrations'* (Appendix H, p.8).

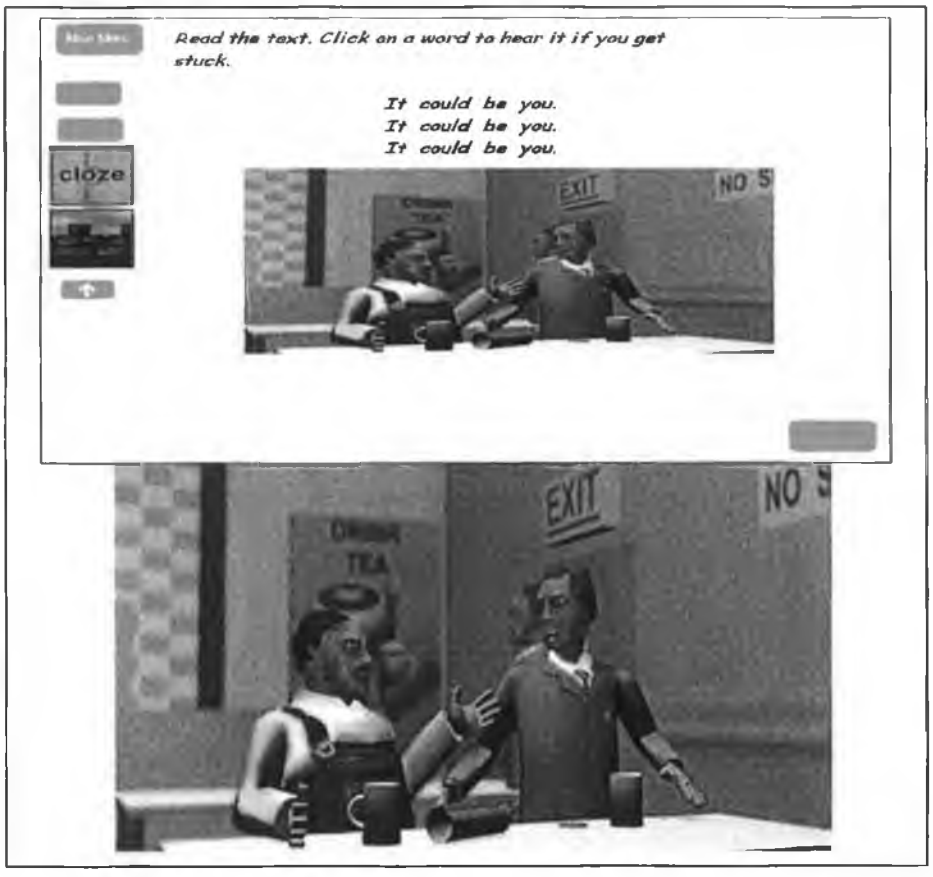
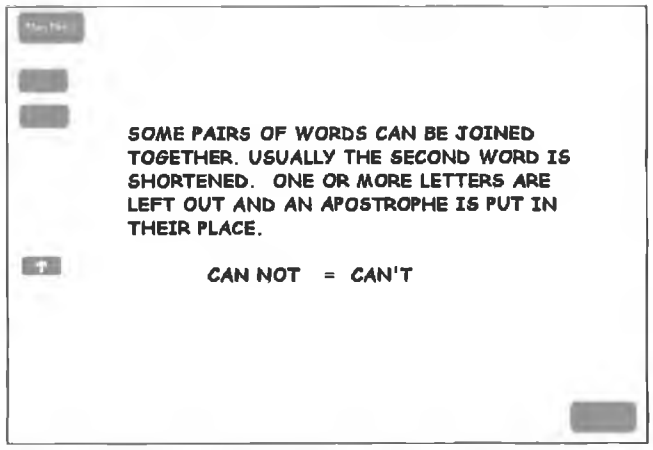
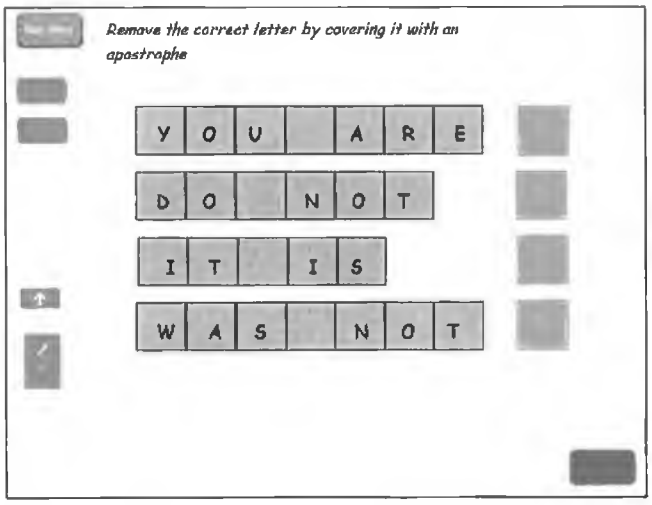


Figure 6.1 ***'It Could Be You'*** **– Low Image Quality**

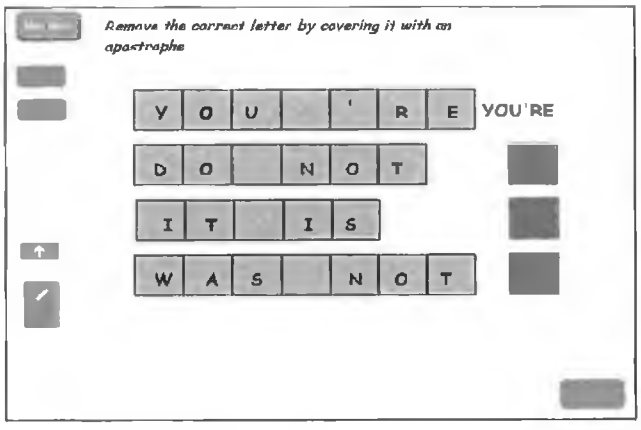
Figure 6.2 *'It Could Be You'* Overview of Contractions Exercise



Step 1: It Could Be You *Contractions Instructions On-screen (Instructions are read out)*



Step 2: *It Could Be You* Contractions Exercise



Step 3: *It Could Be You* Contractions - Click and Drag to correct position

They decided that they wanted an audio facility that would read individual words in an accent-less Dublin accent on the CD, and a taped voice-over for the *Readers*. The audio was recorded by an actor. It was recorded in the music room at another prison and in a studio at the national broadcasting agency. According to TeamB Member1, recording the instructions wasn't too bad because he just said the instructions slowly. However, recording the words for the *Readers* was '*desperate because he had to pronounce every word separately...*' (Appendix H, p.9), which was extremely monotonous and time-consuming for Lawrence - ' *I don't think any of us that got involved in it realised how much work would be involved... and the amount of time that it would actually take...*' (ibid).

The audio facility on the CD was designed to only read one word at a time, after the student had clicked on the word. If the sound facility had been left 'fully on', the students may not have bothered to try to read the instructions or the exercise. Therefore, the designers believed that this forced the student to read more than they otherwise might. Furthermore, the audio tapes that accompanied the *Reader*s had an extremely slow reading of the text on Side A, whilst side B had a slightly faster reading of the text in the *Readers*. The idea behind including audio tapes was to facilitate learners who wished to extend their tuition beyond the formal classroom setting.

The final pack consisted of a Reader/ Audio Tapes/ Work-book and CD. They are all interlinked. Some comprehension exercises were repeated in the workbook and CD, however the majority were different. The workbook moved beyond the textual information presented in the *Readers*; there were word puzzles. There were also opportunities in the workbook for personal writing. The CD was completely language-based and was very functional.

6.6.5 Pedagogic Considerations

TeamB Member1 commented that teaching methods in 'regular' literacy tuition were similar to those used in dyslexia tuition; the onus was usually on the tutor to figure out the learning style of the student first and then to progress to a suitable programme of learning for the particular student. However, the software needed to be able to support self-directed learners with different learning style and preferences. Therefore, a range

of multimedia facilities were integrated into the software package, including the CD, the audio tapes, the *Readers* and Workbooks, to provide flexibility in terms of how the student could interact with the materials.

One of the educators tested the software pack in a prison setting. The learners liked the software. He noted that one student had huge difficulty completing '*b+d* exercises' in normal literacy class for years, and couldn't overcome it using normal channels. However, after one session on 'It Could Be You', he completed the exercises related to 'b+d' and never made the mistake again. TeamB Member1 commented that she believed that the technology had helped overcome a particular literacy difficulty in this instance - *'For some reason,.. visually he figured it out when he saw the two things moving separately on the CD.. he had done exercises on paper but hadn't been able to figure it out'* (Appendix H, p.11). TeamB Member1 added that some students couldn't handle *lists*, they tended to have problems with days of the week and months of the year. They didn't have dyslexia but had similar problems to dyslexic students. She commented that the 'It Could Be You' software was useful for these students as well.

TeamB Member2 commented that the target audience needed to be guided very carefully through the content. In particular, he noted the difficulty in explaining how to use the software without being able to rely on a manual or 'help' button. He said that providing intuitive navigation added to the complexity of the design process:

> *When dealing with an audience that are not familiar, you have to guide them intuitively, ...you can't give them a manual on how to use it, you can't use written instructions, you're limited to given them a very limited introduction and a sound introduction... how do you express 'press' the icons or press this this... you're very limited... you can't say press the help button, the design work involved is quite complex...* (Appendix H, p.15)

Users were advised whether their answer was correct or not in a number of different ways. In the interactive exercises on the CD, the learners knew their answer was right if it stayed in position after it was dragged down from the menu of possible answers. Otherwise, students got feedback in the form of one of three messages '*you did well, you did badly or you had to do it again'*.

6.6.6 Testing and Launching the Software

The software was tested informally, during its design, by the one of the programmer's children. Their feedback was fed back to the design team. In addition, the software was introduced to a number of other prison education units before it was launched, but no structural changes were made to the software as a result of the trial; spelling and grammatical errors were corrected.

TeamB Member1 did trial the package with some students in the prison service. There were all sorts of quirky things or mistakes in the workbooks. There weren't too many mistakes on the CD. They tested the software a few times during it's implementation in prison settings, the students on the whole liked it instantly - '*We had a copy of it before it was published... there were loads of mistakes... there still are mistakes'* (Appendix H, p.10).

TeamB Member1 felt that with more money they could have made a more marketable product. The budget was low and so the whole development was kept low key within the VEC. TeamB Member3 handled the distribution of the software, and other than contact from his secretary informing her that there were requests for more copies, TeamB Member1 wasn't aware of the wider popularity of the 'It Could Be You' software. There were some mistakes made with the final package; more *Readers* should have been produced (not just a set of *Readers* and a work-book) as these disappeared in practice. They were also trying to get funding to do another 'run' of the 'It Could Be You' package. TeamB Member1 added that they would certainly look at doing a set of the *Readers* separately.

TeamB Member3 felt that the package didn't need to be up-dated, as he believed it still meets the needs of the target group. However, TeamB Member1 did note that the widespread integration of new technologies such as DVD players, now threatened the usefulness of audio-tape technology; future developments would have to take into account storage of audio information using the newer technologies.

6.6.7 Good Points of the 'It Could Be You' Software

According to TeamB Member1, the good thing about the software was that it did what the design team set out to do; it supported self-directed learners who wished to extend literacy tuition beyond the classroom setting. TeamB Member2 commented that he thought that the educational or 'technical' design of the exercises was very good.

Both commented on the importance of the context being Irish-based, so the language experience was familiar to Irish literacy learners. Therefore, the students had knowledge of the text before they used the software. TeamB Member1 also felt that it was very important that they didn't need to use the keyboard to interact in the exercises – it was all 'click and drag' type operations. Furthermore, she felt that it was good that teachers would recognise the types of exercises included in the software, as they were similar to what was done with students in-class – cloze tests, contractions, homophones - *'The exercises aren't new, the way we got them to work on the screen is new'* (Appendix H, p.11). The workbook could be photocopied and contained additional exercises based on the material in the *Readers*.

In addition, both commented on the fact that the software was not threatening and was user-friendly. The text was presented very simply. It was also the nearest thing to a proper multi-media interactive programme, according to TeamB Member1. The *Readers* were very popular. The CD related to the *Readers* and the cassettes. The CD forced them to become active readers; they had to ' *put the cursor on every word, in order to hear the sound'* (TeamB Member3, Appendix H, p.21).

Learners using other dedicated software like 'Issues in English', would have needed to be quite literate. However, the 'It Could Be You' software wasn't text-based, and thus learners with low literacy levels could use it.

According to TeamB Member1, the benefit of the 'It Could Be You' software was that it could be used by the self-directed learner, as a stand-alone piece of software – *'Students could put their earphones on and learn alongside other students who were doing Open University courses, there was no stigma attached and it was 'independent learning'* (Appendix H, p.22). Furthermore, the literacy learner could use their walkman to listen to the tapes whilst reading the *Reader* back in their cells. However,

the software was also designed to supported a blended learning environment, in which the software would be used to extend the work done in existing literacy tuition in-class.

6.6.8 Positive comments from Literacy practitioners on 'It Could Be You'

The positive comments from literacy practitioners included that the Irish context was good, the interactive multi-media support materials were appropriate, it was user friendly for tutors and students and that the range of levels were good.

One of the most frequent comments made by co-ordinators was that the students liked the software and continued to use it. The topic of the 'Lotto' was considered to be very appropriate within an Irish adult context, as it has ' *an Irish voice on it and is designed for adults*' (Tutor8, Appendix F, p.38), and furthermore, '*The topic is very good, the idea of doing the lotto, and the Irish accent'* (ibid). The storyline was good for promoting discussion – *'The story is nice, it's a great talking point, you can bring up discussion or debate on anti-gambling or squandering your salary. Every one will have an opinion on it (topic)' (Coordinator9, Appendix F, p.49).* The presentation of the interface, in terms of the colours used being visually appealing and the language used being easy-to-understand, and the fact that the software relied primarily on mouse skills to interact in activities was perceived to be very useful in terms of ease-of-use – The mouse is all that's required to 'drag and drop'.

The inclusion of the Irish accents in the voice-over was perceived to be very important in terms of motivating students to use the software. Also the integration of this audio facility was perceived to be very useful - *'The thing about it is you don't have to listen to it, you can just click on, if you don't know the word you click on and the computer tells you the word'* (Tutors12, Appendix F, p.62).

The range of exercises provided, both printable and interactive, and the manner in which these exercises were linked to the storyline was perceived as particularly good in providing flexibility for learners with varied learning needs – '*it's a complete package, the exercises are tied into the storyline'* (Coordinator4, Appendix F, p.21). Also the feedback mechanisms were perceived as appropriate – *'The feedback is good, not negative – Try Again'* (Coordinator9, Appendix F, p.45). The fact that the software

could support different levels of literacy ability was perceived to be very important in meeting learner needs.

6.7 Main Challenges in the Design of the Software

This section highlights some of the issues that have emerged in the design and implementation of this software. The contributions here are primarily from one of the programmers, TeamB Member2, and from a small number of co-ordinators who made some critical comments on the software during the interviews conducted in 2004/ 2005.

According to TeamB Member2, more work should have been done to establish the degree of computer literacy that the target audience had before the design was implemented. Furthermore, he said that a prototype model of development would be his choice if he were to start-over, so that users would have an opportunity to test the software more frequently before it was launched. He added that he would present a low-content front-end prototype to the target audience so that they would become familiar with the navigation - *'If I were to do this again, I would do a prototype which would be a front-end prototype, which would be very low on content but just get people familiar with going through (navigation)'* (Appendix H, p.15). In addition, TeamB Member2 commented that he would change the order of development, so that the graphics (buttons/ icons/ images) would be developed first and then the content and exercises afterwards.

He rated the 'Look and Feel' of the software as very important, and felt that this should have been prioritised in the initial development process - *'in the first phase, all the content was put into it, and then all the exercises were done, then in the second phase the sound was added and in the third phase the graphics were added.. Now in real terms, you should put the graphics in first... The look and feel is very important'* (ibid). One of the tutors commented that the size of the font could be improved - *'A lot of our learners have issues with sight, ... and it* (type-face on It Could Be You interface) *looks to be a 12 , whereas if it was much larger it would make it more legible and usable by our learners'* (Tutor8, Appendix F, p.38). TeamB Member2 thought that the graphics used could have been better - *'I thought it was weak in so far enough work wasn't done*

on that, on designing the images that was going to be used..' (Appendix H, p.14), this was echoed by a co-ordinator who noted that '*The pictures in the actual books themselves are almost like plasticine-type figures'* (Tutor8, Appendix F, p.38). Also TeamB Member2 felt that the quality of audio on the CD was poor, and there could have been more audio. He also felt that there could have been a randomly picked message for feedback instead of presenting one of three standarised feedback messages.

He felt that literacy learners needed to be guided more intuitively using graphics to aid navigation, as they wouldn't have been able to cope with reading a user manual for the software. TeamB Member2 believed that storyboards could and should have been used to present the initial concept to literacy learners and get early feedback on the interface.

A number of co-ordinators commented that the size of the pictures needed to be increased, and the quality of the pictures could be improved – '*A lot of the pictures are so small that the students start trying to guess what's in the pictures*' (Tutor8, Appendix F, p.38). The importance of appropriate images being used was commented on by one co-ordinator who stated that, ' *I think it would have been lovely to have pictures of real people, as these are adults and they are often very sensitive about the materials that you've produced and you've got to work hard at making sure their dignity or your respect for them doesn't look like it has been compromised by the materials that you're working with*' (ibid).

TeamB Member2 also believed that the learning curve could have been reduced, if the interface of 'It Could Be You' mirrored that of more popular applications, such as Microsoft Office applications, that the learners would have been familiar with – *'The other difficulty was that its design was very different to common applications like Microsoft Office that some of the target audience may have been familiar with. It was a unique CBT product'* (Appendix H, p.16). He also thought that the product didn't have as much functionality as was potentially possible, due to the 'primitive' version of the authoring software that was used on the product.

He pointed out that there was very little effort or research on what constituted 'good or bad' in terms of designing the graphical user interfaces of the software. TeamB Member2 believed that the instructional design of the material or content of the

software and the Reader could have been improved. He felt that the sequencing of the learning activities was very linear, and directed the learner as opposed to the learner being self-led.

A number of tutors commented that the level of reading was not low enough – *'There is very little in it for basic learners, a little on alphabet work, it needs to be more basic', 'It's aimed at level 2 or 3 readers', 'Need something on a more basic level'* (Tutor8, Appendix F, p.38).

TeamB Member2 believed this project was undertaken with '*Great vision-very poor funding*'. The programmers were paid a modest amount of money for their work, which wouldn't have covered the time and effort that was expended by them. There was an enormous amount of work, which, according to TeamB Member2, wasn't evident when they signed up for the project. He also felt that they were very limited in terms of the budget that had been awarded for the design, development and publication of the software package.

6.8 Summary: Development of 'It Could Be You'

The 'It Could Be You' software was a stand alone piece of software, that was initially designed to be used by literacy learners at Open Learning Centres in prisons, or by themselves in their cells. The following summarises the considerations in terms of the target audience, their context and the development process of 'It Could Be You'.

Life-cycle Model

The Life-cycle Model chosen to develop the 'It Could Be You' software didn't exactly fit any 'known' life-cycle model. The design team didn't follow any explicit life-cycle model for software development. The fairly linear development echoed the 'Waterfall' Model but there wasn't any attention given to detailed requirements specification that would be a necessary feature of this model. Perhaps it is best to consider it as an '***Dialectical*** *Evolutionary Process*', where the elements of the design were teased out,

discussed, presented and evaluated within a restricted grouping, and the elements were re-worked or re-developed using a dialectical process until the final product emerged.

Design Team

The design team basically consisted of literacy professional and software developers. The team was directed by the literacy professional. The literacy tutors were committed to the development of this software, and worked on its development entirely in their free time over a period of two years. The software developers became involved in the second year of development, and although they were paid, they also appeared to have contributed beyond their brief.

Every aspect of the design was written down on paper for programmers to implement. There was a perception that once the pedagogic content was developed on paper, the programmers would be able to implement it from the written brief.

Model of Implementation

The Model of Implementation was a CD based (offline) enterprise, with additional multimedia support in the forms of audio tapes and support books. The resources could be used either in the Open Learning Centre or in a cell. The software was designed to be used by the self-directed learner. It was anticipated that this model of implementation would allow the literacy learner in prison the freedom to learn at his own pace and place. There was a perception that there was a cohort of self-directed learners who would use a stand-alone piece of software to extend their literacy tuition in prison. In addition, there was a perception that these self-directed learners were able to use technology. The CD based resource was not dependent on 'keyboarding skills'. There was a perception that this *kiosk type* design would help support those learners with low keyboarding skills and limited exposure to technology.

Learning Framework

The considerations, in terms of elements of an Learning Framework, centred on meeting the pedagogic needs of the literacy learners, within the confines of the logistical and

technological constraints of the prison institutional setting. There were some consideration of accessibility issues, and the interface design. There was good examination of instructional design issues, particularly content analysis and design.

- ***Technological considerations***

Technology usage in prisons was usually integrated into formal modules, and thus literacy learners got limited exposure to technology. The development of the Open Learning Centres in prisons afforded learners the opportunity to extend their learning beyond formal classroom settings.

Considerations of the context made by the design team of 'It Could Be You' included the development of a software pack that could be utilised outside the formal literacy scheme in prison education. The software pack was designed on CD for ease of use within the prison context. The multimedia elements included tapes, so that the literacy learner could listen to the *Readers* either in the Open Learning Centre or in the cell. The CD could be used in the Open Learning Centre, and also included audio that could be listened to through head-phones.

- ***Pedagogic Considerations***

The software was designed to support those with the lowest literacy levels, as the base literacy in prison in 1998 was suspected to be much lower than elsewhere in Ireland. It was subsequently proven in 2004 that the *base* literacy level in prison was much lower than elsewhere.

There was a perception that the CD-based implementation would be useful in presenting literacy material in a 'new light', and would therefore, 'hook' the learners into literacy education.

The multi-media elements catered for students with different learning needs and preferences, whether they were aural, oral, visual or kinaesthetic. There was a perception that a multi-media approach would enhance motivation and support different learning styles and preferences, i.e. the inclusion of text, graphics and audio would meet the needs of a wide variety of learners. There was a perception

that the flexibility offered by this type of multimedia pack would motivate literacy learners to use it.

There was a perception that the literacy learner would become a more 'active' reader with the inclusion of the 'click-each-word and listen' option.

There was a perception that literacy learners in prison could use this without a tutor. Multi-media elements were incorporated into the software to facilitate the literacy learner in directing his or her own learning.

There was a perception that the use of 'mouse' operated navigation, i.e. non-use of keyboard, would focus the learner on the literacy activity, as opposed to the distraction of trying to keyboard in information.

- ***Interface Design Considerations***

The considerations in terms of the interface were that it shouldn't be cluttered, and should include graphics and minimal text.

- ***Accessibility Considerations***

The 'kiosk-style' of the software (i.e. the inclusion of 'Click & Drag' mechanisms) and the non-reliance on the keyboard, focused the learner on the literacy learning activity, whilst enabling learners with low computer literacy to interact with the material.

- ***De-stigmatising Literacy***

There was a perception that the multimedia elements could help reduce the stigma of literacy. Multi-media elements allowed literacy tuition to take place in a de-stigmatised setting. The use of the audio-facility allowed literacy learners to learn literacy in the Open Learning Centre, whilst others nearby may have been learning languages or a degree course. Therefore, there was a perception that the inclusion of the audio facility in particular, would help to normalise literacy within the Open Learning Centre.

- ***Management of the Learning Environment Considerations***

There was no content management facility, so users' progress could not be tracked or monitored remotely.

- ***Evaluation Considerations***

There was an informal evaluation of elements of the software whilst the materials were being developed by the design team, but there were no evaluation mechanisms post-production for learners to feedback on what they thought of the materials.

In terms of the assessment of the learning content, the feedback to learners in the interactive facility was instant; the feedback let the learner know whether they had got the answer right or wrong, or whether they had to try again. In the assessment of the exercises in the workbooks, the learners would have needed the support of a tutor to find out whether they were right or wrong.

- ***Institutional Considerations***

The design team had considered the institutional setting. There was a lack of voluntary tutors in the prison literacy scheme to support 1:1 tuition, so the design of this software was a direct response to that – it was to afford literacy learners the opportunity to engage in self-directed learning.

Instructional Design Considerations

Whilst no specific instructional design model was chosen, there was huge consideration of the instructional design of the materials for the software-based setting. The team would have *unknowingly* followed most of the steps outlined in the Dick & Carey Model in the design of the materials, with the exception of possibly the summative evaluation. The instructional materials were evaluated in an informal formative manner.

The context was embedded in the 'Language Experience Approach'. The topic of the LOTTO was familiar to learners, therefore, the language used was also familiar and it was hoped that this would enhance motivation. There was a perception that embedding

the context in the Language Experience approach would enhance usage of the software by the target audience.

The literacy content was provided in a range of levels to meet the needs of a variety of literacy learners. However, some tutors thought that a lower level and several higher levels of reading needed to be introduced into the software. There was a perception that learners with low literacy levels would prefer to use less text-based software.

There was a perception that what was 'tried and tested' in the 'physical' literacy tuition could be adapted successfully for use on the CD. Furthermore, there was a perception that tutors would recognise the types of exercises chosen for transformation to the online environment, and this familiarity would encourage tutors to use the facility. Furthermore, having material that could be photocopied easily was important to tutors.

6.9 Conclusion

The 'It Could Be You' software was developed as a response to the perceived need for an Irish-based, integrated software package that would enable self-directed learners with different learning needs and preferences to interact in a meaningful way in literacy tuition.

The '*It Could Be You'* software was designed to extend literacy tuition outside the formal literacy programme within prison education. Anecdotal evidence suggested that this software was meeting the needs of literacy students. It would appear that, in this instance, the tutors were able to assess the needs of their learners within the prison context, without having formally consulted their learners at the outset.

The prison context was a 'fixed' environment with a *captive* audience. This allowed tutors pinpoint strengths and weaknesses of their system perhaps more readily than those in external institutions or associations. They knew what their technological infrastructure could support, and indeed the restrictions imposed by the institution on innovations like the Internet limited the platforms on which they could develop –i.e. they had little choice but to go down the route of developing a CD as opposed to

developing a web-based product, as the learners in prisons were only allowed to access the Internet for examination purposes (ECDL) or other strictly limited access.

The project leader was very experienced in delivering or facilitating literacy tuition in prison education, as were the other literacy tutors. The literacy tutors also appeared to have a good idea of what the target audience needed. They were aware that their learners were using technology and enjoyed using it. However they were also aware that literacy learners were spending a long time getting to grips with keyboarding from anecdotal evidence, and that this was delaying meaningful interaction with the literacy aspect of the learning. Their focus on the reduction of the need for 'keyboarding skills' for use of the CD, and the inclusion of a variety of multimedia elements, seemed to have been important in meeting the needs of their target audience.

In addition, learners voluntarily attended prison education programmes – they were there because they wanted to learn. If they did not enjoy what they are doing, they didn't attend. In external settings, many people who attended literacy schemes by day were in Community Employment or FAS schemes and attendance may have been linked to financial gain – this could have been perceived to be *forced* tuition, and therefore learners may have presented with no intrinsic motivation to learn.

Furthermore, learners and tutors interacted more 'honestly' in prisons than in external setting – *'there is no room for phoniness as these people [prisoners] are at the bottom of the heap'* (Team Member3, Appendix H). Literacy learners were not trying to hide what they were studying in prison settings; this was not the case in most external settings where anonymity and confidentiality were barriers to literacy tuition.

Chapter Seven

Contextual Level: MICRO website

7.1 Introduction to *MICRO* website

The design and development of the website at centre two was an example of a 'micro' online learning development. The rationale for the examination of the development of the *MICRO* website was that it offered an insight into a local or a 'micro' response to online literacy provision. Furthermore, it was hoped that additional detail would emerge on decisions made by design teams in the development of the *initial* prototype, from this examination.

The interview with the design team took place in December 2004, and at that stage the team had completed the frame of the website and were finalising the interactive literacy game that was to be added to the website. The website was not 'live' at the time of interview, as the design team were in the process of registering a domain for the website. They anticipated launching the website in January 2006, and therefore it was not possible to gather feedback from literacy learners or tutors on the effectiveness of this literacy website for the purpose of this thesis.

The discussion that follows provides useful insights into how the initial prototype was being developed. Furthermore, the final section summarises the underlying perceptions and assumptions made throughout the initial development process.

7.2 Background to the creation of the *MICRO* website

Centre two had difficulties in developing the literacy and numeracy service in the south of the county. The problem was that the potential students lived in remote southern parts of the county and there was no regular bus service to bring them in to the literacy centre. There were also issues of anonymity; the potential literacy students didn't want people to know that they were accessing literacy tuition. The development of the *MICRO* website was seen as a partial solution to redressing the access and anonymity

problems experienced by students in the southern part of county. It was also anticipated that it would highlight the basic services on offer at the centre, whilst providing a 'hook' to entice people to join the literacy service. Furthermore, it was envisaged by the designers that this website would become a 'focused' online learning tool for literacy learners; as opposed to the unfocused learning opportunities that were available online at that time.

The design team included a project manager, web developer and literacy tutors. The project manager and literacy expert is coded as TeamC Member1. The web designer, TeamC Member2, was the owner of a local software company. Other tutors in the centre would have been involved in informal meetings to establish what should be included or excluded.

7.3 Life-cycle Model and Development Phases

The *MICRO* website was in the early development phase at the time of the interview in December 2004. The co-ordinator and designer had looked at some literacy websites and some business/ training websites to get ideas. They were using a prototype model of development; the initial prototype of the website was in the process of being developed and tested. It was anticipated that changes would be made to this initial prototype after its implementation and then the cycle of evaluation would take place again. They were completing the design of the first prototype at the time of interview.

It was originally anticipated that the website would go 'live' by mid-March 2005. The main problem with publishing was trying to get the right domain, i.e. the right address for the *MICRO* website. TeamC Member2 didn't see an end-date for finishing work on the website, however, for phase one he anticipated July/ Aug 2005. He intended to up-skill staff at *MICRO* on uploading information to the website. He felt that he could always contribute more with the development of new technologies; the website could always be improved upon in the future.

The design team intended for students and staff to test the prototype website once it was publicly launched, and afterwards they intended to survey staff and students to find out what they thought.

7.4 Phase 1: First Prototype

The purpose of the MICRO website was two-fold; it would give the centre a profile on the Internet and it could provide access for those students who wished to extend their learning from the centre to home. It would also provide focused learning opportunities for the students. It was envisaged that the website would be accessed by student who could not or would not want to come to the literacy centre.

The initial requirements definition process was fluid and focused on members of the design team communicating each others' needs through a series of informal conversations. TeamC Member 1 decided it was important for the centre to develop this website, so she initiated discussion with the web designer. Teamc Member2 said that they had a loose conservation around whether this website could be developed. TeamC Member 1 had a vision in her head of what she wanted but wasn't sure how practical it was. TeamC Member 1 and TeamC Member 2 had a further series of meetings together and with staff at the centre, discussing what they wanted to do and what they wanted to get out of the enterprise. TeamC Member 1 spent time explaining the ethos of the literacy centre to TeamC Member 2, as she felt that this would positively influence the design process of the designer. TeamC Member 2 then broke down her 'ramblings' into structures. Team C Member 1 felt he did an excellent job interpreting her ideas, A number of templates were then prepared by the designer. This dialectical process between the design team members was to become the cornerstone of the design process.

The first step in the design process was researching other websites to see what was online. Both team members discussed good and bad features of existing websites and discussed in detail what could be learned from these websites. The main learning was that content had to be divided into steps, and that ' you can't cut corners' in terms of grammatical guidelines.

Initially, the influences for the *MICRO* website came from the NALA *LiteracyTools* website. Ideas such as having interactive exercises similar to those on the NALA website were perceived to be good by the team. They also reviewed American and Canadian websites. One corporate website that dealt with improving language skills was particularly useful in terms of its use of simple exercises to draw in the user.

TeamC Member2 watched the '*Read, Write, Now*' television series to get ideas on the best way for literacy learners to learn. In particular, he noted the structured set of steps that were presented for learning spelling etc. He felt that it was important not to make the exercises too easy, as learners would get bored. He felt that by developing well-structured questions, it would keep it challenging for all learners with varying abilities in literacy. He said that he also anticipated including grammatical guidelines with the exercises.

Then the design team reached a consensus on what the aim of the website was and how that fitted in with the ethos of the centre. They came to a common understanding on this, but there was no written brief. The process involved a 'conversation over months' - *'Ideas flow more fluently in conversation, can elaborate on some point if needed'* (TeamC Member2, Appendix J, p.7). They agreed that the design and features had to be driven by the vision for the centre and feed into that vision. TeamC Member2 led the technical design. He emphasised a clean design, which consisted of an uncluttered interface with careful consideration of colours used. The visual aspect was very important. Also, it was very important that the website was accessible to the target group. They had lots of informal meetings and casual conservations - '*More information came through conservation'* (ibid). After numerous meetings, they spiralled inwards to agree on the design of the website - '*Given a flavour of what was needed'* (TeamC Member1, Appendix J, p.7). TeamC Member1 felt that she was 'vague and nebulous' at times, whilst TeamC Member2 came back with 'structure'.

The literacy website was to include interactive literacy activities so that learners could engage in a meaningful way with the literacy content. The original frame of the *MICRO* website was also to include: Publicity area, Link to other literacy centres and NALA, Staff section – with names and pictures of staff so that potential students could become

familiar with individuals within the organisation. Furthermore, there was a notes section – with specific worksheets, downloads and a link to the main VEC website.

The design team were still working on the content at the time of interview. For the first phase, they intended to put up a 'scaled-down' version first, which would consist of the homepage and further pages on services, staff, courses, section for downloads and a links page. TeamC Member2 felt that if there was too much content that the learners would get lost. He tried to simplify the content into basic steps and then build it back up. The prototype was to include interactive tasks, similar to '*Who wants to be a millionaire'*, as well as *Word-search* type activities that could be downloaded and printed for use in class. It was anticipated that the activities would be updated regularly. The content was to be decided upon and designed by TeamC Member1 and research workers; TeamC Member1 felt that it was important to keep the number of researchers down from her workplace, as she would need some '*independent*' staff to review the website.

TeamC Member2 was in the process of designing an interactive game similar to 'Who wants to be a Millionaire' as a 'hook' to bring students back to the website (Appendix J, p.6). There would be about fifty questions graded in difficulty from one to five and a random question generator that picks the question to be presented to the learner in the final version of the game. He anticipated that the learner would start with basic questions in reading, writing or arithmetic. There would be ten different levels, so it wouldn't matter what level the literacy learner was at. The learner would have to choose from four possible answers, a, b, c, d. There would be immediate notification of the answer being right. There would be fifteen steps to the top. If the learner couldn't answer a question, then he / she would have to go back to the first question. There would be 'Hints' instead of '*Phone a friend'* or '*Ask the Audience'*. TeamC Member2 felt that this game would serve as a 'hook' to get learners to use the website, and that more publicity would be generated (ibid).

A number of other innovative exercises were in the process of being developed. Interestingly, the web developer initiated the design of a number of these exercises. In one case, the web developer devised a method of showing basic literacy learners how to write alphabetic and numeric characters, by breaking them down into a series of six

strokes or shapes (in the case of alphabet letters), and a series of four strokes or shapes (in the case of numeric figures). The resultant exercises were to be used to demonstrate to beginners, or those learners with very low literacy skills, how to form numbers and letters.

The design team felt that it was important that no stigma was attached to the website and that it should '*be open to everyone'*. They emphasised that the wording '*won't offend anyone'* and that the learning resources will be open to all - '*everyone can learn no matter what level*' (Appendix J, p.7). TeamC Member1 had worked with other web designers in the past but she felt that they went overboard by having too much content. The resultant websites were ineffective as a learning tool. Thus, TeamC Member 2 agreed to avoid design overkill, i.e. he didn't include '*bells and whistles'*. There was no audio, in particular no '*jingles',* used for 'entertainment' purposes as he felt that these would detract from intention of website. Instead, audio was used as a pedagogical tool in explaining character and number recognition. Future use of audio was expected in activities/ games geared towards phonic pronunciation. The games would require the use of Macromedia software.

7.5 Current Limitations of Prototype

TeamC Member1 felt that the website was potentially lacking in terms of pedagogy, as they were waiting for the technology to improve so that the website could be designed to cater for multiple intelligences and other learner styles and preferences. She felt their website only catered for visual, linguistic and text based intelligences, but that there were opportunities for the additional use of audio. Also, she felt that the inclusion of kinaesthetic based activities would be applicable in the literacy context.

TeamC Member1 felt that there might be room for development of chat-rooms / message boards sometime in the future. However, she felt that the management of discussion groups could cause legal problems, and they could be difficult to moderate. She felt that 'message boards' would be much more manageable.

TeamC Member1 also felt that it would be useful to have some facility for 'voice to text' online but there would be huge problems with that, due to regional accents. Multi-user functionality would present a real problem here.

7.6 What would constitute success?

TeamC Member1 stated that she would consider the *MICRO* website to be successful if it brought in new learners and if other 'recognised' literacy providers, provided a link from their website to the *MICRO* website.

The web designer believed that success could be measured in terms of progress through the development phases, whether people got 'value' from the website and whether other organisations referred the website – they were not concerned with getting a certain number of hits a month.

It was perceived by the design team that the launch of the test version would in itself indicate progress and also, that it would allow correction to material presented. They also intended to measure success by the number of hits to the website. Furthermore, they intended to ask students entering the website how they heard about the centre, and perceived this as a means of determining if the website was useful for raising awareness of existence of the literacy centre.

7.7 Perceptions and/ or assumptions made in developing *MICRO* website

The *MICRO* website was designed for literacy learners in remote locations who couldn't or wouldn't access the literacy service, as well as for use with a tutor in a centre. This final section summarises the perceptions and assumptions made by the design team throughout the development of the *MICRO* website.

The prototype model of development was chosen to develop the *MICRO* website. The *MICRO* website was to be developed in phases using this prototype model. The perception was that this model would be useful in getting feedback from users at

various stages in the development process - there was a perception that literacy learners wouldn't be able to express what they wanted, due to inexperience with the online medium, unless they had a prototype of the website to comment on. It was felt that the initial prototype model should have limited content so that the target audience wouldn't be put-off. Subsequent models would be scaled-up, in terms of additional content and features, as deemed appropriate. It was anticipated that the interface on the initial prototype would have reduced elements and that the wording would be carefully chosen to improve accessibility for the target group.

The design team consisted of two people, the web developer and the literacy co-ordinator. The approach taken was team-based and all decisions arrived at were explored in-depth by the design team before a final consensus was reached. Therefore, the ethos of the design team centred on building a consensus. There were inputs from literacy tutors at the centre.

There was a perception that literacy learners didn't need to be consulted directly at the outset, but would be involved in evaluating the prototypes. There was a perception that written design briefs were limiting, and that it was better to reach an 'oral' common understanding of the requirements for the website. There was also a perception that the ethos of the centre was best communicated through discussion and discourse.

A web-based model of implementation was chosen, as it was felt that this model could best address issues relating to accessibility and anonymity. Therefore, the web-based model of tuition was chosen so that literacy learners, who couldn't access formal literacy programmes in adult literacy centres due to geographical constraints or who wouldn't for fear of loosing anonymity, could access tuition remotely. The software was designed to be used primarily by the independent learner; therefore the model of implementation chosen was an immersed one, where the literacy learner would find all materials on hand at the website. There was a perception that there existed a cohort of potential literacy learners who wanted to learn by themselves, and would be willing to use the Internet to do so. Also there was a perception that this would draw learners into the centre, and raise awareness of the services on offer at the centre.

In terms of an E-Learning framework, no formal framework was undertaken or discussed. There were considerations of aspects of the pedagogical, the management of learning environment, the interface design and the evaluation elements in the development of the initial prototype. There were some assumptions made about the technological infrastructure.

- ***Technological considerations***

  There was an assumption that there was a cohort of independent literacy learners who were web-literate, and who would be able to find their way around the website and interact with the material in a meaningful way. In addition, there was an assumption that these independent literacy learners had access to technology and the necessary infrastructure from home (and furthermore, were comfortable using technology). A contextual analysis, to ascertain the extent of access to technology and the needs of these remote literacy learners, may have been beneficial in this instance.

- ***Pedagogic Considerations***

  There was a focus on presenting a website that would reflect the ethos of the centre, with content that would support different learning styles and preferences. There was a perception that current technologies were not able to effectively support multiple intelligences, and different learning styles and preferences. There was a perception that websites generally only catered for visual, linguistic and text-based mediums, with some opportunities for audio.

  There was careful consideration of multimedia elements; the design team chose not to include 'bells and whistles' i.e. non-essential multimedia elements, as it was felt that this would detract from the learning intention of the website. Interestingly, there was a perception that the inclusion of the games was good, as it would be a useful 'hook' to bring students back to the website.

  Discussion groups, message boards and voice-to-text were ruled out of the initial prototype for various reasons. There was a perception that discussion groups would be difficult to moderate and could cause legal problems. There was a perception that message boards would be easier to manage, but would be too

time-consuming to develop for the first prototype. In addition, there was a perception that there would be huge problems with implementing a voice-to-text facility in a multi-user context, due to the diversity in regional accents.

- ***Interface Design Considerations***

  There was a perception that the focus should be on clean design; an uncluttered interface with careful consideration of colours.

- ***Accessibility Considerations***

  The main accessibility issue considered was the design of an uncluttered interface. The accessibility guidelines developed by WCAG were not referred to or considered.

- ***Management of the Learning Environment Considerations***

  There was some consideration of how learners' progress would be tracked whilst using the interactive game. However, this was not considered pivotal in the design of the initial prototype.

  The feedback to learners was discussed in terms of feedback during the interactive game and centred on the provision of *appropriate* feedback to the learner.

- ***Evaluation Considerations***

  There was a perception that learner and tutor feedback from viewing the initial prototype would be important in terms of how to progress. It was anticipated that this would happen after the implementation of the first prototype. However, the engagement of end-users at the outset of the design process may have been more beneficial.

Whilst no instructional design model was used, there was consideration of instructional design issues. The basic premise was that the content should be broken down and simplified into steps. The web developer would then build the content back up into learning blocks. The design team believed that the grammatical guidelines needed to be prioritised, whilst designing the content. It was also assumed that learners would start

with basic questions in reading, writing and arithmetic and progress form there. It was anticipated that the website would have a range of reading levels to suit users at various stages. Furthermore, it was anticipated that the website would provide instant feedback on interactive exercises.

7.8 Conclusion

The *MICRO* literacy website was in the very early stages of development during this investigation, and one could reasonably ask why an examination of this website was included in this research. The development of the *MICRO* website was useful to examine for a number of reasons.

Firstly, it was the only one of the twelve literacy centres visited that had initiated the development of an online learning environment, and that, in itself, was unusual and prompted further investigation.

Secondly, accessing design teams during the early stages of software development is rare, and thus, the interviews with the MICRO website design team at such an early stage was extremely beneficial in terms of understanding the process of how a consensus is reached and/ or how decisions are made.

Thirdly, the dialectical process that was used to communicate the needs of the literacy service and the programming requirements was particularly impressive in this instance. The literacy professional and the software programmer committed a lot of time and consideration to understanding the ethos and culture of the literacy service, and the needs of literacy learners. Similarly, both the programmer and the literacy professional engaged in lengthy, thought provoking examination and discussion of the salient features for the website and how these could be implemented. This dialectical communication process was recognised by the design team to be pivotal in explaining each others' requirements and in reaching a consensus on how to design and implement the website. The importance of the dialectical process in website design is discussed further in the conclusions of this thesis.

Finally, the web developer devised a number of innovative literacy exercises, which illustrated a remarkable transition from web developer to subject matter developer. This blurring of the role of the web developer with that of the literacy practitioner was indicative of successful collaborative teamwork, which, in my opinion, is pivotal in the design of successful online learning environments as discussed further in chapter ten and eleven.

Chapter Eight
Developmental Level: LiteracyTools website

8.1 Introduction

The National Adult Literacy Agency (NALA) embarked on developing an online learning programme called '*LiteracyTools*' for use by literacy learners in July 2001. This online literacy programme was to provide another mode of accessing literacy tuition for those literacy learners who were not availing of tuition at established literacy centres – '*the amount of people actually using the adult literacy service was quite low in comparison to the numbers of people who were estimated to have a literacy difficulty. So there was attention focused on other methods of providing learning opportunities*' (Team Member 5, Appendix K, p.2). It was hoped that the establishment of the *LiteracyTools* website would provide a solution to the problems of access and support, retention of anonymity and provision of flexibility in literacy education in Ireland. The research for this dissertation involved tracking the development of the first two prototypes developed; there may have been new prototypes launched since this investigation ended. Therefore, the following outlines the context that led to the development of the first two prototypes of this learning tool.

8.2 Rationale for developing a Web-based Learning Environment

The initial idea of designing the website arose from requests from literacy tutors, who wanted more CD-based resources. However, the cost of producing CDs was prohibitive, and the learning curve for designing a CD was perceived to be much steeper than that for designing a website. Furthermore, the web was perceived as more accessible medium than a CD-based enterprise (Team Member 5, Appendix K, p.5). Therefore, the decision was taken to design a website instead of CD-based resources. In 2001, NALA embarked on online tuition and support with the development of its literacy-learning environment, www.*LiteracyTools*.ie.

8.3 Development Team for the *LiteracyTools* website

The development of the *LiteracyTools* website involved the participation of a number of people with expertise in particular areas in the development process, as well as the engagement of tutors and learners in the evaluation process. The following outlines the roles and responsibilities of the key players in the development process.

The key participants in the design process were five team members, labelled as Team Member1, Team Member2, Team Member3, Team Member4 and Team Member 5 for the purpose of this research. This team consisted of a project director, project manager, web-developers, technical and literacy consultants. There were additional inputs from literacy tutors in the design and production of the materials.

Team Member2 set up the team that was to design and develop the website, and was given full responsibility for its implementation. The rest of the team had their own objectives to meet, and focused on meeting their objectives. The person who had brought the project together was Team Member2 – *'we'd kind of a self standing project for want of a better word, everybody ...has their own defined goals, nobody was connected in with this project other than (Team Member2)'* (Team Member1, 2003).

Team Member1's brief was to pilot or to evaluate the current web site by inviting or getting six different learning centres to take part, use it and just get feedback on it, so really it was to record that feedback and to make recommendations for the next stage based on that feedback. The slightly wider brief was to look at technology use in general and to look at how the website would be used as a learning tool within the ICT. No design guidelines were presented at the outset of her involvement with the project. It was part of the project manager's remit to establish guidelines for the development of materials for the website. Team Member1 reported to the Team Member5 on a more regular basis than Team Member2 – *'the arrangement was that Team Member1 made contact if she needed a meeting and if she didn't need a meeting she just gave an update on how far she was progressing, against her objectives which were very clearly stated anyway'* (Team Member5, Appendix K, p.8). Formal meetings were not scheduled. Informal meetings were held with the Team Member5 to update on the progress of the

LiteracyTools website. Two main meetings were held with people of particular expertise.

Team Member4 were responsible for the programming of the website. Originally they worked with Team Member2 and Team Member3. Team Member3 and Team Member2 advised them what was needed and they responded accordingly. They didn't follow a specific set of guidelines in implementing the website. Their focus was on their contribution to the technical side of the development process. They saw their role as separate to content developers, such as Team Member2 and Team Member1, and didn't get involved in the content development decisions. NALA was the main communicator to the web developers, and neither had direct contact with the end-user.

The web developers were brought in to work on the *LiteracyTools* website for a fixed period in Phase 1, which ran from December 2001 through to Summer 2002. There was no 'fixed' documentation (no requirements specification) that tied down the requirements for the project. They were asked to develop an interactive element that would be easy to use and accessible – '*I think we essentially just looked at getting an interactive element going, looked at having a very easy to use, simple interface*' (Team Member4, Appendix K, p.41). The web developers guided NALA through the design process on what would work for the *LiteracyTools* website and what wouldn't work.

Team Member3 was the technology technical consultant on this project and also managed the technology team, i.e. web developers. Team Member3 got involved in the *LiteracyTools* project around May 2002, and liased closely with the web developers for the duration of the project.

In April 2001, the researcher approached the Director of NALA, with the idea of developing an online interactive literacy tuition website. A brief, outlining the projected features and costing for the proposed website (see Appendix A), was presented by the researcher at a meeting in NALA head-quarters in July of that year. NALA were initially very interested but, due to financial concerns with an existing programme, were unable to fund the initiative that was proposed. However, they subsequently received funding from the Community Application of Information Technology (CAIT) initiative, and started development of the *LiteracyTools* website in

December 2001. The researcher's role in the development of the *LiteracyTools* website was to give advice to Team Member 1 from November 2002 to April 2003. Furthermore, it involved attendance at a meeting in January 2003 (see Appendix L), where the team members and management were discussing how to progress the notion of the *LiteracyTools* website becoming a '*Learning Tool of Choice*'.

8.3.1 Team member 'Vision for *LiteracyTools* website'

The *LiteracyTools* website would be considered successful by the Team Member5 if advanced literacy learners accessed it to practice their literacy skills, and if the website proved useful for learning. The numbers of people accessing the website wasn't important. From Team Member5 perspective, the *LiteracyTools* website was not comparable to the TV programme in terms of the latter's ability to draw in mass viewers and very high numbers of purposeful learners – '*I think the mass nature of it isn't an issue for me at all, because that's quite a simple thing to do afterwards, it's really getting firm evidence that it actually, as we said first of all, that it doesn't do any harm and turn people off learning and then second of all, that it does actually seem to be a useful tool for learning*' (Appendix K, p.16).

The main criteria for success, according to Team Member1, was that people used it on an on-going basis and that people wanted to return to use it. She also hoped that learners would perceive the website to be 'active', and that material would be constantly added or updated dynamically.

Team Member4 also didn't believe that attracting large numbers of users was the objective. From his perspective, the aim was to draw adults with low literacy levels into literacy tuition. In phase one, their objective was to include interactive elements that would attract learners. In phase two, they were looking at what else to do to attract learners to this website and to keep them coming back.

8.4 Life-cycle Model & Development Phases

An evolutionary style model underpinned the development process, with prototypes being launched, evaluated, improved on and re-launched until the final version of the website emerged. The team decided to use this 'evolutionary prototype' model to develop the website for a number of reasons. Firstly, the end users wouldn't have been familiar with the technology, and secondly, NALA wouldn't have had the technical expertise in-house. Therefore, they believed that it was useful to present this type of website in steps, so that people were afforded an opportunity to try out interactive elements, or look at other sites in a comparative sense and voice their opinions.

8.4.1 Phases in the Development Process

The development process involved designing a prototype, investigating what was the best way of doing aspects such as accessibility, then evaluating, improving it and moving forward to the next prototype.

> ... *the first thing we would have done is to explore three prototypes, experimental prototypes, seeing what's the best way of doing... accessibility and so forth, so there was a bit of that, looking at the technical side. Then the other prototype was evaluation, kind of evolutionary prototype that we piloted so that's been really the cycle of doing something, evaluating it, moving on and really just evaluating ourselves, that's just the way it's going, we will probably spend a lot more time continually updating*
> (Team Member4, Appendix K, p.51)

Team Member3 was happy with the model chosen to develop the *LiteracyTools* website. The difficulty was in deciding what had to be included and what had to be left out – '*it was harder to leave stuff out than to put it in, like tracking users, get them to log on, for these types of users, it's really a bridge too far*' (Team Member4, Appendix K, p.54).

The design process was organic, the elements of the website evolved over the design, implementation and evaluation phases. Information came from looking at other websites and having discussions on what was needed and the information gathered in the evaluation. The design process was ongoing, and involved making changes after the evaluation. Team Member4 believed that they were successful in meeting the needs of

their client users through this process. Team Member3 (2003) believed that it would take another year or two to complete the *LiteracyTools* website.

8.4.2 Preliminary Investigations

In 2001, Team Member2 conducted a survey of the technology infrastructure, hardware and software, in place in literacy centres across Ireland to find out what technology infrastructure existed, what software was being used and how it was being used. They decided to ensure that anything included on their website would be useable on any computer across the country. This may have had implications for the integration of multimedia options, such as the integration of speech enabling software, which was reliant on the existence of a Microsoft agent. Furthermore, the design team reviewed existing online learning environments to ascertain what the main components of the *LiteracyTools* website might encompass.

A mail-out questionnaire was sent by the design team to approximately 140 centres, in order to establish the extent of computers usage. This information basically provided the Irish context of ICT. The survey showed that literacy learners weren't using the Internet or accessing websites in 2001. In addition, the technology resources at the literacy centres were limited, often consisting of a single computer with access to the Internet, rather than networks of computers – '*...they have one computer that has access to the internet so it would have been hard anyway, it's not that they had a room of computers that were networked...*' (Team Member2, Appendix K, p.60). Also technology was not being integrated as a tool in literacy tuition in the adult literacy centres; instead, it was being taught as a discrete subject, i.e. students were being taught how to use a computer. The design team realised from this survey that technology was not being integrated in a meaningful way in literacy programmes.

As this was NALA's first incursion into web development, the design team had to review a lot of websites to find out what they were looking for. They followed criteria for reviewing websites as developed by a US Literacy website. They decided to put material on the *LiteracyTools* website and review it on an ongoing basis through the development phase. Reviews of material for literacy CDs in the past were supposed to have involved both tutors and literacy learners. However, this didn't always happen and

tutors tended to review literacy materials by themselves, rather than involving literacy learners in the review process. The web developers would have been aware of other online courses and looked at the interactive elements of these online courses for inspiration. They had also created *engines* for dynamic questionnaires in the past, and would have drawn on this experience.

8.5 Phase 1: First Prototype

The priority in the design of the first prototype was to produce interactive features. The interaction could be tracked, and the users' progress tracked. The design team didn't engage in making the website accessible in phase one, as their focus was on developing the interactive elements and a content management facility.

> *In the first one we didn't really touch on the accessibility issues, from our point of view in hindsight for whatever reason, because it was a pilot we were more focused on getting the interactive functionality going, maybe a data base, easy management going.*
> (Team Member4, Appendix K, p.41)

The *LiteracyTools* prototype website was aimed at a 'website literate' user; it was not designed for people who didn't know their way around web pages. The first prototype of the *LiteracyTools* website was designed so that both tutors and learners could use it. Therefore, the target audience for *LiteracyTools* was initially mixed; this was initially a problem as the website became unfocused. The tutor aspect was subsequently shelved.

8.5.1 Format of First Prototype

Two options were presented to users in the initial manifestation of the website, *printing* and *online exercises*, as shown in Figure 8.1. The materials for the printing options were chosen by the web developers on the basis of their ease of transformation from a Word document to *Pdf* document- '*so basically the web designers, they scanned the books and they decided what went on, they were given a number of books, they said ok you look at that and then put them on, so they went on*' (Team Member1, Appendix K, p23). They also used material that had been produced in packs for the TV programme.

The materials for the interactive online exercises were selected on the basis of their relevance to the learner – '*... so they were all kind of like every day themes and so forth, ok there was hobbies and interests and various things like that which was important but there was also going to be things around health and so forth*' (ibid). The interactive exercises were divided into topics under numeracy and word, but sometimes the sub-exercises were on unrelated themes.

> *There was also in the interactive an experimenting I think really, there was a combination of what I would call topics and stills, so there was like one type called 'numeracy', there was another called 'word', and they were linked with shopping for clothes or something, so that was kind of unclear. So obviously those are the sorts of things that we've now kind of tidied up.*
> (ibid)

They didn't add any multi-media elements, such as audio, to the exercises in phase one.

Figure 8.1 Homepage of *LiteracyTools* Pilot Mode website

8.5.2 Interaction with Literacy Learners in the design process

According to Team Member5, literacy learners were not consulted in the design of the prototype, however, it was felt that the six or seven literacy learners on the NALA executive board were available to comment if needed. Team Member3 said they didn't make contact with the end-user during the design of the prototype in phase one, as they had a good idea of what the website should look like, based on their own review of materials and from feedback from tutors who evaluated CD software for them (Appendix K, p.59). Team Member2 said that they had some idea of what literacy learners wanted but decided that developing a prototype would be more useful in ascertaining their needs in an online setting (ibid).

8.5.3 Interaction of design-team members in the design process

In Phase One and Phase Two (November 2002-Summer 2003), the web developers did not engage directly with the 'literacy' subject matter experts. Instead in phase 1, the web developers viewed worksheets from workbooks and selected the ones that could easily be made interactive – '*What we would have done in phase 1 of the pilot we took worksheets...from workbooks and picked out the ones we knew we could make interactive reasonably easily*' (Team Member4, Appendix K, p.42).

8.5.4 Launch of the First Prototype

The *LiteracyTools* website was 'launched' unoffically in the Summer of 2002. The *LiteracyTools* website was promoted through mailshots to the literacy services, through announcements at the Annual General Meetings and National Literacy Day. In addition, it would have been integrated in training days for literacy practitioners, and the practitioners would have had an opportunity to comment on its effectiveness or otherwise.

The centres were made aware of the existence of the *LiteracyTools* website through the evaluation process, through a newsletter that was sent out in the Summer of 2002, through announcements at tutor forums and through training sessions that were held.

Team Member2 didn't consider that the *LiteracyTools* website had been launched at that point, what had been promoted was a pilot version of the website – '.. *we mentioned it in the newsletter, but we didn't promote it at all because we knew it was just too raw, really that it needed a lot of work..*' (Team Member2, Appendix K, p.64). Very few people accessed the website until November 2002. According to Team Member2, the low numbers accessing the *LiteracyTools* website may have been due to the fact that it was launched during the Summer 2002, when there would have been few classes running, or it could have been that the lack of information on the website initially was a turn-off for tutors, who may have preferred to wait for something more structured, more training, or it may have been outside the 'comfort' zone for tutors.

8.5.5 Evaluation of the First Prototype

The initial evaluation process took place between November 2002 and January 2003. It was conducted by Team Member1. This evaluation was the first contact by the literacy learners with the *LiteracyTools* website.

The literacy tutors who agreed to take part in the evaluation of the initial prototype were contacted in November 2002 and were given a short briefing on the form of the evaluation and the website. The briefing was intentionally short, as Team Member1 didn't want to influence the tutors in their use and subsequent feedback on the website. Their main objective was to observe learners interacting with the website. For most of the tutors that were involved, it was a once off episode in evaluating the website, for two tutors their involvement was on-going. It was envisaged that each centre would get two or three learners to interact with the website for the purpose of the evaluation. The evaluation sheets were returned in January 2003.

Literacy learners were not directly contacted; indirect feedback was obtained from literacy learners through literacy tutors. No literacy learners got in contact through the online facility for feedback (see Figure 8.2) – '... *I wouldn't have had contact with learners, I have contact with the tutors and the tutors engaged with the learners, no learners got back to me at all online*' (Team Member1, Appendix K, p.25). There was no help line for students in the initial launch of the *LiteracyTools* prototype, as the

design team felt it was better to sort out and fix the basic problems with the website before adding a help line.

Figure 8.2: LiteracyTools Pilot Mode Online

8.5.6 Main Challenges in Phase 1

Inappropriate Design 'Philosophy'

The design 'philosophy' appeared to be to design it 'on the hoof' throughout phase one. There wasn't enough ground work done for the initial prototype – '*...I think that was the nature of it, it was on the hoof, lets put it up, see how it goes and we'll work from that so basically that's what I took it as, rather than a...well researched web site*' (Team Member1, Appendix K, p.21).

The focus in the design of the initial prototype was on testing mechanisms rather than on the provision of meaningful interactive learning experiences for literacy learners. The content was used to test out mechanisms that could be added or removed from the website, rather than being examined in terms of it's learning value – '*... also the content was acknowledged that it was at its very early stage, was plucked and was in a test mode rather than a tutorial learning mode and in a way the content really was trying out I think the mechanisms, did that online mechanism work rather than the other way around, so it wasn't a learning site in that sense*' (Team Member1, Appendix K, p.24).

Minimal usage of the initial prototype in reality

The evaluation was set up on the premise that the *LiteracyTools* website was being actively used by literacy learners, and that the evaluation would consist of an investigation into how the website was being used in particular contexts. However, the reality was that the website wasn't being used at all.

> *I think...really thought that people are merrily using this, I would go out, I would record the context in which it's being used, how it's being used within the learning centre, how it's being used in conjunction with other methods and we would build up a good bit of information that way but the reality was it wasn't being used at all.*
> (Team Member1, Appendix K, p.19-20)

The evaluation was really the process that introduced literacy learners to the *LiteracyTools* website for the first time. In practice, this meant that they were writing down their opinions on the *LiteracyTools* website as they were interacting with it for the first time. Team Member1 felt that she should have contacted individuals outside the six centres that she was asked to target to properly conduct the evaluation with more 'experienced' users of the website.

Team Member1 also felt that she should have done some preliminary research to ascertain whether the website was being used, as she subsequently discovered that the website was not being used in any of the centres that had been chosen to take part in the evaluation process.

Furthermore, learners were very positive about what they saw on the website. According to Team Member1, learners who used the prototype weren't very critical about the website because they had nothing to compare it with.

Inadequate User-interaction Tracking mechanisms

Team Member1 wasn't aware of which parts of the website got the least number of hits as her understanding was that the system for tracking users didn't present that information. Another problem with the tracking mechanisms was that there was an extra layer of 'difficulty' in accessing the tracking facility or communicating with the 'outside' world via the email facility. A student would need a good degree of computer

literacy to access the password operated login facility or indeed to use the email facility to give feedback on progress. Alternatively, the student would need the help of a tutor.

Inadequate Instructional Design of Materials

There were some problems with using the material that had been designed for the TV programme. They needed specific worksheet writers. Some of the worksheets were transferred 'directly' from existing materials, without enough thought being given to setting the context for these worksheets – '*really out of ignorance I thought I could just transfer some of our existing material on to the site and some of that worked, those worksheets were going to be just printable worksheets but again when I was doing that I was thinking along the lines of a tutor using the material, ...*' (Team Member2, Appendix K, p.57).

Team Member1 felt that the *pdf* (printable exercises) could be used as a hook to entice users into using the website. However, there were too few interactive exercises presented on the website, and more exercises should have been provided on the printable aspect of the website – '*So I think we probably over estimated the amount of interactive material that was actually on it. The pdf's or the printable exercises I'd look as something very different, they're really a hook, they're a way of getting people into it, now having said that within those there were very few exercises...*' (Team Member1, Appendix K, p.26).

One of the problems with the printable exercises was that they were text based and required fairly high levels of literacy in order to be understood. In addition, they didn't have exercises to go with the reading text, which would have been useful for the tutor - '*They were incomplete from a learning point of view, only reading skills were involved*' (ibid).

Some of the printable exercises contained content that reflected bias or stereotypes; these should have been reviewed and only included as discussion points if included at all – '*even if they did have all these stereotypes and so forth, that's fine provided that's used as a discussion or learning point of something like that, or a challenging situation, they weren't great*' (ibid).

There were problems with formatting errors in the *pdf* documents that need to be addressed – *'...there were formatting errors, there was inconsistencies in font, there was inconsistencies in size of scripts, there were things that didn't transfer and in the chain of from it being in paper, to word document, to PDF format, and then put on the computer there were formatting things that were lost but at the end of the day they shouldn't have gone up without being proof read...'* (Team Member1, Appendix K, p.27).

Team Member1 felt that the obvious flaws in the prototype website should have been corrected before embarking on the initial evaluation. Spelling mistakes or ambiguities in answers should have been corrected before publishing. The prototype should have been brought to a higher level of 'sophistication'. She also felt that they should have pulled out of the initial evaluation, and instead added more interactive material, corrected mistakes and re-launched it when ready.

> *...if there's a spelling mistake... or if there's a navigation problem or if there's a page that opens in the wrong way, if the answers are wrong, if there's ambiguity in the answers, those are the things in retrospect I would have just said ok I don't know whether it's a good idea to go ahead with the evaluation at this stage, I probably would have reversed it.*
>
> (Team Member1, Appendix K, p.36)

It was initially assumed that tutors would be working with the learners, but this may not have been the case for independent learners. The independent learners would not have been able to effectively use the materials without the help of a tutor.

The feedback from the evaluation indicated that whilst a lot of the worksheets were very good, the context hadn't always been set. Learners who printed off these worksheets may not have been clear on what the context for the worksheet was – *'Now we're kind of paying the price for that because from the evaluation feedback whilst a lot of these worksheets were very good, they do kind of need a context. It's not clear...'* (Team Member2, Appendix K, p.57).

Complexity of Language used for Instructions inconsistent

Team Member1 observed that the navigation could have been improved, particularly by the removal of the inconsistencies in the complexity of English used in the instructions – '*I think there was a mixture of very good plain English at times and highly complex instructions so there was a real inconsistency in what you saw and what you read*' (Team Member1, Appendix K, p.23).

Un-reviewed External Web Links

One of the key issues from Team Member2's point of view was the lack of focus often associated with external links from the website. She hoped that this problem has been resolved by the extensive review mechanisms undertaken by NALA of each of the selected external web links.

Non-conformation to Accessibility Guidelines

The initial *LiteracyTools* protoyype did not conform to any recognised standards or guidelines, such as the Web Content Accessibility Guidelines (WCAG). One of the main concerns was the issue of accessibility. Team Member5 became aware of the importance of accessibility through her involvement as a member of the Information Society Commission (ISM), and queried whether the *LiteracyTools* website was compliant with WCAG guidelines. The design team hadn't considered accessibility in the process – '*... I think the company were aware but I don't know, certainly my first instance in conversation with Team Member1 was that they weren't and they hadn't and that they have subsequently gone back and done it, so maybe it wasn't as bad as I thought it was. But certainly that perturbed me greatly ..*' (Team Member5, Appendix K, p.9). She also felt that the design team should have taken the lead in ensuring that the *LiteracyTools* website was accessible, and compliant with accessibility guidelines.

Time wasted on tracking system

One of the challenges that emerged in the design was the difficulty of setting up a system where users would log on and have their progress tracked. It was decided that this would be too much for beginners, and if ever incorporated it would be optional.

In hindsight, Team Member3 felt that a lot of time was wasted on the tracking system. Team Member3 felt that having progress-tracking mechanisms was of value, but questioned whether the centre's staff had the necessary skills to cope with it. Team Member3 also felt that many students would not want this tracking facility (Appendix K, p.56).

Problems with analysis of evaluation data

In practice, fewer learners took part than was anticipated and some centres got their tutors to evaluate the website rather than learners. The questionnaires filled out by learners were often incomplete. This data collected was not analysed from a quantitative perspective, all information submitted was '*valued*'. Team Member1 added that *'for research purposes people might be horrified but I just thought any information I get is important, I don't really need to make statistics like 92% thought this, if there are six people it's a nonsense statistics...'* (Appendix K, p.28).

The learners also had conflicting information in their evaluation. The design of the questionnaire may have been a factor in this aspect – '*for example, people will say things like it's a really boring look, the colour was awful and then when they go to do the grid of 1 to 5, did you like the look, highly agree yes, so they don't tally with the qualitative and the quantitative necessarily and I know that all the learners did this in one go, nobody came back to it over a period of time*' (Team Member1, Appendix K, p.29).

8.5.7 Changes made to Phase 1 prototype

The plan was to consider any inputs from users on the initial prototype of the *LiteracyTools* website, and make changes if it was possible within the existing

framework. It was expected that the content would be updated and that these exercises would be added to over the Summer of 2003. Team Member2 also believed that additional training was needed for both tutors and learners in using the *LiteracyTools* website. In particular, tutors needed to embrace this mode of teaching and learning. Team Member2 intended to schedule more training sessions on the NALA training calendar for tutor training in the near future. She also felt that NALA as an organisation was more confident in giving guidance, having come through the experience of developing the *LiteracyTools* website.

8.6 Focus in Phase 2: Second Prototype

Initially in phase one, the focus was on the tracking mechanisms, but subsequently the focus changed to concentrate on whether the activity could be completed and in what way answers could be presented. The focus of the second prototype was to improve the instructional content and add some 'assistive' technologies, i.e. text reader and a 'zoom' facility. In phase two, the design team concentrated on what else to do to attract learners to this website and keep them coming back.

The website was targeted at independent learners in phase two, who may never have attended a literacy scheme but who were computer literate; therefore, it wasn't aimed at the beginner learner. The design team also believed that in practice the tutors in the literacy centres would introduce literacy learners to the phase two prototype website.

Team Member4 believed that the phase two prototype was very functional and they envisaged that it would be used by tutors in a blended learning environment. However, as the second prototype was geared for independent literacy learners, the developers couldn't assume that tutors would be present whilst learners were using the website. The navigation, instruction and direction were geared towards the independent learner, who had adequate literacy skills.

8.6.1 Framework for Second Prototype

At the time of interview in May 2003, the design team were putting final 'touches' to the framework for the second prototype of the *LiteracyTools* website. They were focused on developing the content, and investigating how people answer questions and print off documents. The structure of the content was changed from topical themes to headings such as spellings, where they could find worksheets on spelling. Their experience has shown them that the process of developing materials for use in an online context was very different to the process of developing materials for resource packs.

Team Member3 confirmed that the second prototype of the website conformed to level two guidelines for accessibility, which were aimed at ensuring websites are accessible for people with disabilities. Websites, belonging to organisations such as Teagasc and

other government agencies, also conformed to level two accessibility guidelines. However, he did think that there should be emphasis on fulfilling the literacy aspect primarily in the accessibility context.

The design team also included a text reader to read text on screen, so that the user can understand what they have to do, if their literacy level is very low. They used a Microsoft agent to provide the functionality of the screen reader.

8.6.2 Content Changes in Second Prototype

In Phase two, the design team added more question types. There were seven types of questions, with five that could be made interactive. Furthermore, an audio text reader facility, that could read text on-screen to the user, was added to the second prototype of the *LiteracyTools* website. The other multimedia element that was added was a 'zoom' facility, which allowed the text, image or screen size to be adjusted.

They ruled out having an interactive multimedia presentation showing how to use the computer on their website as, they believed that the website is geared for users who are familiar with browsing web-pages – *'so for example I know one feature that was mentioned was having an introduction to computers and the site, and we were saying really if you don't know how to get around web sites then the site is not for you, it will never be for you, I don't think you can accommodate that kind of a learner'* (Team Member 2, Appendix K, p.56).

8.6.3 Content Management System

NALA was to be given control of the content management facility in phase 2, which allowed them to create additional interactive questions and add to the database of questions that existed. The web developers believed that this feature, where the client can add to and update the content, was important in attracting and maintaining learner interest in the *LiteracyTools* website over the long term.

8.6.4 Online Support

There were some thoughts about offering support in the form of email or phone contact – '*...but that becomes an issue for everyone in terms of support then, doesn't it, because again the support you have is, we don't have a free phone number for you yet, what we have is an e-mail system...*' (ibid). The notion of offering a support facility would have involved the dual use of staff on the free-phone lines for the TV programme '*Read, Write, Now*'. However, the NALA support-staff weren't available to provide online support at the time of the first or second prototype launch.

8.6.5 Instructional Design of the Materials for Second Prototype

The design team didn't focus on any particular teaching model or learning style whilst designing the website materials. They did include variety in the type of exercises presented, and those involved in the design process would have been aware and had experience of the tenants of adult education – '*... you work on the assumption that people have a knowledge and work from the adult education sort of model but also saying, stating again people learn in different ways, your exercises must have variety in terms of whether you're asking people to repeat things constantly or whether your asking them to speak out, to solve*' (Team Member1, Appendix K, p.35).

- **Instructional Design of Printable Materials**

Two tutors, who were well known for their ability to write good worksheets, were selected as subject matter experts to develop materials for the second prototype of the *LiteracyTools* website. Team Member1, designed a number of worksheets herself as well. In addition, a Youthreach centre that had been involved in the pilot study also designed worksheets.

Team Member1 believed that people who wrote materials for the *LiteracyTools* website should have had a proven ability to teach as well as a proven ability to write worksheets. Team Member1 believed that it would be a good idea to focus on inserting all the

exercises in *pdf* form in one area of the website, under a set of themes. The themes designed were in an Irish context – '*... I thought right ok we have our themes and the themes that we were taking were very much what would have been on the site before, they were going to be information, useful information in the Irish context... going to the bank, raiding a house, whatever, practical information...*' (Team Member1, Appendix F, p.31). However, the worksheet designers disagreed with this format. They believed that it should be clear to a self-directed learner where they needed to go to get help on spelling or reading; within these areas, interactive exercises to help learners with their spelling or reading would appear.

- **Instructional Design of the Interactive Exercises**

The instructional design process for the interactive worksheets followed the same format as those designed for static worksheets i.e. there was text, and exercises to go with that. One of the features incorporated was a scrolling text bar, so that students could always read the text no matter which question they were answering.

The activities included seven different types of exercises, inspired by the American website. This included cloze tests, sequencing, true/ false and multiple-choice questions.

One of the technical limitations experienced was that 'free writing' was not considered possible. The main reason that this was excluded was that it couldn't be automatically corrected within the system. Team Member1 felt that it would have been useful to include opportunities for free writing as this would have encouraged users to express their opinions and their views. The system then could have maybe prompted the user to try to self-check his own writing. Team Member1, however, felt that if the 'free writing' system was included, that it could have provided a useful discussion point in centres if students were allowed to print off their work and discuss. However, one of the limitations of 'free writing' would be the lack of feedback provided. This could be overcome by having a 'button' beside the free writing section that would allow the user to contact a tutor for feedback.

Tutors from adult literacy centres weren't asked to develop worksheets, as they wouldn't have been able to remotely access the administrative side of the website to upload their work from their centres around the country.

- **Technical Limitations in Instructional Design of Materials**

The web developers stated that they had no technical difficulties with the design technology. However, they didn't incorporate open-ended questions in the content, as NALA couldn't provide the support needed to give feedback on open-ended questions. Automated feedback wasn't an option, as this would have introduced a degree of complexity that would have cost a considerable amount of money and man hours to implement.

- **Instructional Design Guidelines**

The instructional design guidelines for tutors developing worksheets for NALA *LiteracyTools* were being finalised as the development of the second prototype came to a close. The guidelines that have been developed for designers of worksheets, included a sample of the format of a worksheet, that incorporated text, comprehension, and scanning for meaning. Furthermore, there was guidance on the development of grammar or spelling exercises. The design of these worksheets came from Team Member1, based on her own experience of good practice – '*..so for example, lets say Nirvana for example, they're going to have loads of dates so I thought ok what you pluck out there is you pluck the different ways to write dates and that becomes that, so each learning exercise is one sort of abstract thing and then other stuff is connected to the text...*' (ibid).

8.6.6 Launch of Second Prototype

The launch date for the second version was September 2003. The second prototype of the *LiteracyTools* website was 'very basic and simple'. This was deliberate as it was a prototype model that the team planned to improve upon and add to in future manifestations. Their main concern was not to present a website that would discourage or 'damage' the learning experience for potential users with low literacy levels. An evaluation was to take place up until Christmas, and then the updated version would be publicly launched in January 2004. NALA intended to set up focus groups with the users of the online website *LiteracyTools* in this evaluation.

8.6.7 Challenges within the design and development process

- **Challenges in communication process within team**

One of the main challenges encountered by Team Member1 was the isolation factor; Team Member1 worked on her own with only occasional meetings with all the participants on the design team and NALA. She felt that she would have benefited from interacting more closely with those involved in the project, and may have learned or completed processes faster with more contact with those in the know – '*I think working in isolation from the organisation wasn't a good idea and in retrospect if I'd located myself in...that would have helped, different reasons, not least possibly even trying bouncing things off people, working in isolation here in relation to it and then keep expanding your own thoughts*' (Team Member1, Appendix K, pp.18-19).

The Web developers felt that the relationship with 'one to many' made the communication process more difficult, i.e. they had to deal with Team Member1, Team Member2 and Team Member5, amongst others, throughout the design process.

- **Challenges in understanding technical aspects**

Team Member5 found her lack of technical expertise a disadvantage in terms of not knowing whether the information communicated or presented to her could or should be

challenged – '*... you're limited in terms of how much you can question or challenge the information that you're getting, that you're paying for...*' (Team Member5, Appendix K, p.9).

Team Member1 also felt that she was at a disadvantage by not knowing what constituted good or bad work in terms of the design process or product. Also, the team were already formed before Team Member1 arrived, so even though she was given the power to make changes in personnel, this didn't happen as she wasn't confident enough to make judgements on the calibre of the individual work of team members.

- **Challenge of conforming to framework of original prototype**

One of the challenges identified by Team Member1 was that when the website was launched in a prototype form, and worked on a regular basis, there was a reluctance to veer from or get rid of the framework of the original prototype. This was limiting, especially in cases where the original framework may not have been suitable. Team Member1 hoped that the framework could and would be changed in the future, if it were evident that major re-structuring was necessary.

- **Challenge with not enough information provided initially**

The web developers felt that it would have been good to have had known more initially and to have had better clarification on what was required early on. The prototype approach did allow for changes, but more information initially would have been of benefit to them.

Team Member3 mentioned that there were delays in getting the prototypes up and running because of delays in getting feedback from users. Tutors were asked to feedback once through the online feedback mechanism. However, there are some issues around this feedback, as learners got through the limited material presented very quickly, as there wasn't much of it, and so their exposure to the website was minimal.

> *I think...thought people were going to be looking at it on a regular basis, number one that didn't happen but number two one of the reasons was there was nothing, was that there was no material on the site so learners actually got around that, maybe regardless of level, were able to get through an awful lot of these activities in*

less than an hour and I had two groups who actually got through it in about five minutes.

(Team Member1, Appendix K, p.26)

- **Challenge in understanding the needs of the participants**

It was difficult for the web developers and technical consultant to ascertain the requirements of the participants, which included, NALA, Tutors and Learners – '*...I suppose again for developers the hardest thing I think is getting the requirements from users and there are so many, there are tutors, there's NALA, there's the students, all with their own idea of what they like and what they don't like, so its trying to find a balance*' (Team Member3, Appendix K, p.52).

NALA was the main communicator to the Web developers and neither had direct contact with the end-user, which presented some challenges. The design process involved a degree of flexibility in terms of 'trial and error' of certain types of exercises or concepts. Some ideas were discounted in this way. The web developers re-iterated the challenge in ascertaining the needs of the target audience. The basic needs of users are usually met through the normal design process, but in this case, they had to work harder to get a better understanding of the requirements of the target group. The web developers would have liked to hold a workshop with the end-users.

The idea of a workshop with end-users wasn't put forward, but the web developers acknowledged a number of possible barriers to holding a workshop with end-users, namely, the issue of anonymity – end-users may not want to be identified as having low literacy levels, and secondly, end-users may not have been able to handle 'technical' questions thrown from the design team if encountering technology for the first time – '*The anonymity of the subject maybe that wasn't an option but in theory, having someone use a computer for the first time, that might not be very pleasant for them and we'd only lose track of ourselves and start throwing technical questions at them*' (Team Member4, Appendix K, p.49). They had to remind themselves of the issues for the target group, and design accordingly – '*...you have to remind yourself what the target audience is, not get over board on certain images, remember to have the text...always there, simpler images and so on...*' (Team Member4, Appendix K, p.43).

- **Challenge in translation of educational and technical requirements**

Team Member2 commented that it was sometimes difficult to explain the educational requirements to the web developers. Team Member2 thought that she could just point out websites that were good, and that the web developers would know what was required, by just looking at these websites. One of the difficulties highlighted by Team Member3, was that of trying to understand what the requirements were in terms of the content and how best to implement it. Also, there were difficulties in trying to meet the needs of end-users with literacy problems.

> *For example, even simple things such as, how you track users, how you correct, how you give feedback online to users doing interactive stuff, that has taken a bit of time, it's not technically very hard but it's just trying to understand what they want and what's the best way of doing it, what's the easiest way and presenting the content, because you're dealing with learners, you're dealing with adult learners, you're dealing with people with literacy difficulties, it's been very difficult to try and get that right.*
>
> (Team Member3, Appendix K, p.52)

Another difficulty highlighted by Team Member3, was that of trying to get the highly skilled web developers to design a simple 'educational' website. Initially, the design team attempted to add 'value' to the website by incorporating 'flashy' elements to the website. Team Member3 thought that he should have explained more clearly the boundaries within which they were operating at the outset to avoid this.

- **Challenge with development of Instructional Design Materials**

Some of the worksheets contained errors that should have been corrected. The solution may have been to include a proof-reader, who would've checked to ensure that there were no formatting errors or other omissions in the final document that was to be uploaded to the website.

There were also problems with using *pdf* files, the main one highlighted was the inability to manipulate text after it had been finalised. The *pdf* files were manufactured by an external company. The design team therefore, had a choice to publish it with the formatting errors or other inconsistencies, or else withdraw it completely. Team Member1 believed that it would have been better to use *pdf* files that were correct, and

to issue guidelines for the tutors designing the *pdf* documents to help avoid potential omissions or mistakes.

- **Challenge in the manner in which technology was integrated at literacy centres**

One of the issues that still remained was the manner in which technology was integrated at literacy centres; in particular, whether computers should be physically separated from the 'natural learning environment' or whether they should be physically located in each room.

- **Challenge in providing online support**

The 'online support' element wouldn't be available for the September 2003 launch. NALA wasn't in a position to compel literacy centres around the country to offer support for the online website, as the centres were independent. However, once the TV series ended, the support people that NALA employed to man the support lines for the TV programme, were to be re-deployed to offer online support for the *LiteracyTools* website.

> *...we were saying January*[2004] *we could use the same tutors who worked with the free phone telephone line, we could train those men and women in our web site, that would be brilliant. We have a free phone number, we might employ somebody maybe who would work two hours every day to clear the backlog of queries*' (Team Member2, Appendix K, p.65).

8.6.8 Potential Future Developments for *LiteracyTools*

Team Member1 felt that the TV programme '*Read, Write, Now*' should be harnessed to promote the *LiteracyTools* website, by including a half-hour episode on using the website. Team Member5 didn't think that the *LiteracyTools* was ready to be shown on TV in 2003, but hoped that *LiteracyTools* could be showcased on the TV programme in the next series in Autumn 2004. Their idea would be to have small themed ICT inputs into each of the TV programmes, and then in the final programme of this series show the TV viewers the *LiteracyTools* website.

Team Member5 hadn't been particularly concerned about the lack of accreditation in literacy education, primarily, because it was perceived as being a very negative barrier to learners. However, within the literacy circle and within the literacy sector generally, accreditation was very well received by learners. Team Member5 commented that:

> *...there has been a little bit of protectionism, kind of going "oh my learners wouldn't like to do a test", where in fact, lots of learners would. So I think as long as it's optional and as long as it can be creative enough that it doesn't kind of reinforce passing or failing, that it kind of gives people a sense of their strengths and they can go back and do it again maybe or they can build on their scores or whatever it is.* (Appendix K, p.16)

Team Member1 believed that it would have been good if learners got recognition for the work that they completed on the *LiteracyTools* website. It could be linked to some sort of accreditation system, so that the users could progress towards an award or certification – '*...and in a way that's maybe one of the things that would be really good, that people could actually do things online, they could do foundation courses or things like that, so that they could if they wanted have their accreditation or have that affirmation through accreditation*' (Team Member1, Appendix K, p.38).

In terms of the literacy curriculum, Team Member5 believed that there would be an interest in the establishment of a core curriculum for literacy education – '*I think that the core curriculum will work well with the qualifications framework because there will be two levels below the existing foundation level, the accreditation that we have...*' (Appendix K, p.17). The *LiteracyTools* website wasn't structured into levels of literacy ability, it was aimed at foundation literacy learners. However with an increasing number of people looking for a number of levels within the *LiteracyTools* website, the exclusion of levels needed to be reviewed. The problem with this was that literacy tuition in Ireland didn't have clearly defined levels.

At the time of interview, there was no online support facility on the *LiteracyTools* website. However, Team Member1 felt that a facility that allowed people to post queries that would be responded to in a certain period of time, would be the most viable option. The staff who supported the TV series '*Read, Write, Now*' could have been used to support the *LiteracyTools* website. However, there may have been resistance within the NALA organisation to creating these dual roles for support workers. In addition, ICT training would be required for support staff.

Team Member4 didn't think supplying the *LiteracyTools* website on CD was a viable option, however, he did think that other CD manufacturers should be consulted to see if their content could be used in the *LiteracyTools* website. NALA investigated in 2003 whether the '*Read, Write, Now*' TV programme could be linked into the *LiteracyTools* website. They had some concerns with the size of the TV programme, and that this would be problematic in terms of its linkage to the website. Team Member4 believed that the *LiteracyTools* website could be linked to an interactive TV programme, although it would have involved adding another layer of work to what had been developed solely for the website launch.

Interactive TV was another possible route for enhanced learning opportunities for adults with low literacy levels. Team Member5 thought that the learning curve for developing TV programmes for learners with low literacy levels would be very steep, and would need to be considered before embarking on developing interactive programmes for TV.

Team Member2 documented the process on how to design and implement an interactive learning website for literacy learning. Team Member2 felt that the documentation of this process was necessary for encouraging other bodies to integrate ICT in literacy tuition – '*if you're going to stand over it, if you're going to be the body that's advising groups producing literacy materials or if you're going to be a campaigning body encouraging other groups to incorporate literacy into their ICT, then you need this documented work*' (Appendix K, p.62).

In terms of the future developments, Team Member2 believed that NALA would have to think carefully about whether they want to produce their own software. She thought that their experience would be called upon by literacy schemes who were about to develop websites for their own schemes and who would need guidance on codes of practice for developing websites in the literacy context – '... *maybe being an advisory group to people out there who are producing more, where this web site I think is very useful is literacy schemes are interested in building up their own materials and I think very soon literacy schemes are going to be interested in producing their own web site and that's where they're going to come and say, "do you have a good code of practice?"* (Team Member2, Appendix K, pp. 61-62)

8.7 Summary: Development of *LiteracyTools*

The following summarises the considerations made and associated perceptions about the target audience, their context and the development process of '*LiteracyTools*'.

Life-cycle Model

In terms of the Life-cycle Model, the Evolutionary Prototype Model was chosen. The *LiteracyTools* website was developed in phases using a prototype model; in phase one, the initial prototype was developed and evaluated, in phase two, the second prototype was developed and launched. It was felt that this prototype model would allow literacy learners to examine the content at various stages and feedback on what they thought. There was a perception that literacy learners wouldn't be able to express what they wanted due to inexperience with the online medium, unless, they had a prototype of the website to comment on. Hence, it was thought that the evolutionary prototype model would be effective as a tool in ascertaining the needs of literacy learners, by giving them a chance to become familiar with the website and feedback on changes they would make to it, over a period of time. There was also a perception that the prototypes would eventually evolve into a usable learning tool for literacy learners.

Design Team

The design team comprised a project director, two project managers, two web developers, a technical consultant and two literacy tutors, who acted as instructional designers. In addition, there was intermittent involvement of a technical and literacy consultant. The two web developers and both consultants worked externally to literacy education; they were contracted or consulted as NALA didn't have in-house expertise in developing online software.

The perception of different members of the design team differed slightly in what would constitute success; Team Member5 believed that it would be successful if advanced literacy learners accessed the website to practice their literacy skills and if proven useful

for literacy learners. Team Member1 believed that it could be considered successful if people used it on an ongoing basis. Team Member4 believed it could be considered successful if adults with low literacy levels were drawn into tuition and if it attracted learners and they kept coming back.

There was a perception by the web developers that their role could be separated from that of the content developers, and so they didn't engage with the content designers on a formal footing. There was also a perception that no fixed documentation was needed to keep a record of requirements; that the *organic* design process negated the need for documentation.

Model of Implementation

The *LiteracyTools* software was web-based; one of the reasons this web-based model of tuition was chosen was so that literacy learners, who didn't want to access formal literacy programmes in adult literacy centres for fear of losing anonymity, could access literacy tuition remotely. In addition, the initial website was geared towards the independent learner, so the model of implementation was to provide an 'immersed' web-based learning environment. Technology was generally recognised by NALA and the design team as a hook, in attracting learners into literacy schemes, particularly, male learners.

E-Learning Framework

In terms of an E-Learning framework, no formal framework was undertaken or discussed. In the development of the initial prototype, there were considerations of aspects of the technological infrastructure, the pedagogical, the management of learning environment, the interface design and the evaluation elements. This expanded to include more focus on content analysis and design, and some consideration of accessibility issues, in the development of the second prototype.

- ***Technological considerations***

A technology survey was carried out by NALA in 2001 to ascertain the level of technology resources in literacy centres across the country, and to find out if and

how technology was being integrated in literacy programmes. It showed that at the time, there were limited technology resources (single computer with Internet access), that technology was mainly used for up-skilling students in basic computer literacy and that it wasn't being integrated in literacy programmes. It showed that the Internet wasn't being used in the centres. It was recognised that a training course would need to be put in place to show tutors how to effectively integrate technology in their literacy tuition.

The considerations made about the context from the technology survey was that tutor training needed to be provided and that the website could be used even with the limited technology at the centres. There was a perception that a 'generic' training course for integrating technology in literacy programmes would redress the issue of tutors not integrating technology in their literacy programmes. Furthermore, there was a perception that this analysis of the extent and usage of the technology infrastructure in centres would suffice in ascertaining the constraints or barriers of the context in which the website would eventually operate.

In addition to the technology survey, other literacy websites were reviewed by design team members to get ideas on what could be added to a website designed for a literacy audience. There was a perception that a review of other literacy websites would suffice in terms of ascertaining what the functional aspect of the website would provide.

- ***Pedagogic Considerations***

In phase one, the *LiteracyTools* website was designed so that it could be used by a target audience of both literacy learners and tutors.

A number of perceptions underpinned the considerations made about the target audience. Firstly, there was a perception that there existed a cohort of potential literacy learners who wanted to learn by themselves, and would be willing to use the Internet to do so. Secondly, there was a perception that there was a cohort of independent literacy learners who were web-literate, and who would be able to find their way around the website and interact with the material in a meaningful way.

Thirdly, there was a perception that these independent literacy learners had access to technology and the necessary infrastructure from home (and furthermore were comfortable using technology).

Printable worksheets were included for tutors and literacy learners to use in class, alongside interactive exercises that could be used by literacy learners to improve skills. There was a perception that tutors would use the website to source and print off worksheets. The additional links to external websites were also provided so that tutors could find resources on other relevant websites.

There was a perception that the teaching model or learning styles and preferences didn't need to be explicitly discussed, as it was embedded in the philosophy of the literacy experts on the design team. Similarly, because of the involvement of these literacy experts on the design team, it was also believed that the materials developed would exhibit best practice in terms of meeting learner needs and preferences.

- ***Interface Design Considerations***

In phase one, the web developers perceived that too much clutter on the graphical user interface at the outset would confuse the literacy learner, and so worked carefully to develop an 'uncluttered interface'.

- ***Accessibility Considerations***

The web developers also focused on making the prototype more accessible to literacy learners. They made the second prototype conform to level two WCAG accessibility guidelines.

In addition, they introduced some *assistive* technologies. They developed a 'Zoom' facility to help those users who may have had visual problems to re-size text, images or the screen itself. They also developed an 'audio-voice' facility so that text on screen could be read out to those who had difficulty reading.

- ***Management of the Learning Environment Considerations***

The design team prioritised the development of the tracking and content management system in the first prototype.

- ***Evaluation Considerations***

In the evaluation of the first prototype, the design team carefully designed evaluation sheets with the target audience in mind; i.e. they made sure that the evaluation sheets were readable and appropriately formatted for those with low literacy levels.

They didn't include a *help* facility on the initial prototype, as they thought it might generate too many queries. Instead, they incorporated a feedback form where the users could comment on aspects of the display or content in a structured approach. There was a perception that learner feedback from viewing the initial prototype would provide useful feedback in terms of how to progress. There was also a perception that literacy learners on the board of NALA would feed into the process, if required.

Post-evaluation, it was believed that the low uptake for the initial prototype was due to the fact that it was launched during the summer in literacy centres, when students would have been away, or possibly that the website was outside the comfort zone of tutors. There was also a perception that the lack of interest in the website may have been due to low content on the initial prototype.

There was a perception that the literacy learners should have been given another website to comment on, whilst they were using the *LiteracyTools* prototype, so that the users had something to compare it too.

There was a perception that focus groups could be used as the basis of the next evaluation.

Instructional Design Considerations

The design team didn't follow any instructional design guidelines or specific model in the adaptation of materials for use online in the first prototype. They simply transferred

existing materials that had worked in class onto an online format and uploaded them. Initially, there was a perception that materials that were effective in 'real' classrooms could be transferred into an online context without modification.

There was an initial perception that web developers could choose the 'interactive' content for the website based on the ease in which certain materials could be made interactive. There was a perception that the initial prototype shouldn't have much content on it, as it might put users off. There was a perception that there was enough content on the initial prototype for users to comment on.

There was a perception that if *'tried and tested'* literacy materials were put online as worksheets and a few interactive exercises were also supplied, that the self-directed learner would learn.

In phase two, the website was aimed at the independent literacy learner. In the development of the second prototype, the designers concentrated more on the development of appropriate material and assistance for the user of the website. In particular, they tried to include material with an Irish context. The project manager did develop and implement a set of guidelines for designing online material for the development of materials in the second prototype (See Appendix L). There was a perception that developing a set of guidelines for instructional design of materials would result in improved materials in the future.

'Free-writing' would have enabled literacy learners to enter their own text, perhaps in response to a question or to enter their opinion or attitudes to a 'discussion point'. 'Free writing' was not facilitated in the interactive elements on the *LiteracyTools* website because the developers claimed that it would add a layer of complexity, require extra man-hours and add additional cost to develop an automated feedback system to support free-writing.

Chapter Nine

Experiential Level: End-users Feedback

9.1 Introduction

This chapter presents an overview of the data gathered at the experiential level. The data was gathered from logging files on the tracking system of the *LiteracyTools* website from November 2002 to May 2004, from a survey of both the *LiteracyTools* and *BBC Skillswise* websites undertaken by a sample of literacy learners and tutors in April and May 2004 and from interviews with co-ordinators and tutors in the twelve literacy centres visited in 2004/2005.

The rationale for the analysis of data from the *LiteracyTools* tracking system was that it was hoped that this data could be used to generate information about how end-users were interacting with the website, and that this information could be combined with data from other sources to support arguments about the design of the website. The purpose of the survey of literacy learners and tutors was to elicit learner and tutor opinions of, and attitudes to, the design and use of the *LiteracyTools* website in literacy tuition, and it was hoped that this information would help illuminate current strengths and weaknesses of the website. Finally, the comments made from co-ordinators or tutors during the interview process at the contextual level were presented here so that they could be examined in light of other information gathered at the experiential level.

The discussion that follows is divided into three sections: the initial section presents an overview of the statistical information generated from the website tracking system, the middle section presents the findings from the end-user survey and the final section presents the comments from the co-ordinators of literacy centres. It concludes with a summary.

9.2 Statistics Generated from logging files on *LiteracyTools* website

The interaction on the *LiteracyTools* website from inception onwards was logged and statistics were generated over *three periods* by three different software systems designed to analyse the logging files of the website. The format of the summary reports, generated from *WebLog*, *SurfStats* and *Advanced Web Statistics* software, varied in how the information was presented, but broadly they collated the same data over three periods as discussed. In some cases, data had to be manually collated from the information presented in the third period; this was because the statistical software presented data in slightly different forms. Thus, any figure that was manually calculated by the researcher from summarised information in the third period was denoted using an asterix (*) in the presentation of the findings here.

9.2.1 Log Files Statistics

The **'number of visitors'** were calculated at the point of entry to a website. The total number of visitors included those that visited the site only once, as well as those who visited more than once.

- In the first period, the total number of visitors to the *LiteracyTools* website was 5070, with an average of 14 users accessing the website each day. In the second period, the total number of visitors was 13771, with an average of 54 visitors accessing the website each day. In the third period, the total number of visitors was 10949, with an average of 40* visitors accessing the website each day. The cumulative numbers of visitors during each period looked impressive; however, when the daily numbers of visitors were examined it showed how few visitors were accessing the website each day - increased from 14 per day in the first period to 54 per day in the second period, and then dropped to 40* per day in the third period. However, to fully understand what this meant, other information recorded had to be examined.

A **'Page-view'** was distinguished from 'ordinary' hits, as it only included those files classified as 'documents' or 'page extensions'. Therefore, graphics files and style sheet files were excluded. However, the inclusion or exclusion of the file types in 'page-

views' differed from one statistical software programme to another; hence there were difficulties in making definitive statements about findings based on 'page-views' that had been generated by different statistical software.

- In the first period, there were 34,372 total page views on the *LiteracyTools* website, with an average of 100 page views per day and 6.78 page views per visitor. In the second period, there were 127,844 total page views, with an average of 497 page views per day and 9.28 page views per visitor. In the third period, there were181,950 total page views, with an average of 661.7* page views per day and 16.61 page views per visitor.

- Therefore, in the first period, approximately seven web pages were viewed on each visit, this increased to nine pages in the second period and then roughly seventeen pages in the third period. This information on the number of web pages that were viewed by visitors on each visit to the website, was more useful to this investigation because it indicated an increase in the number of viewed web pages by visitors to the *LiteracyTools* website. Therefore, it indicated that the content of the website was of some interest to them.

The '**number of hits**' was a frequently used term, to describe the broad range of interactions that occurred when a user accessed a website. Many websites had a 'Counter' that counted the number of hits made by users of the website. Many website users mistakenly equated the number of 'hits' registered by the counter as equal to the number of people who had accessed the website. A hit was described by 'SurfStats' as:

> *A request for any object or file that is on a website. This could be an html page, a file or a graphic on a page. A request for a page can generate lots of hits depending on how many sub-elements of files the page consists of. This is an indicator of website traffic but not an indicator of how many pages were looked at.* (SurfStats, Appendix Q, p.6)

Therefore, a single page that was viewed could have generated a large number of hits, depending on the number of sub-elements on the page, and there was no correlation between the numbers of hits registered and the number of people who accessed the website. However the 'number of hits' could have been used as an indicator of website traffic; it provided an indication of how much information was being transferred and thus how much bandwidth was needed to support the interaction.

- In the first period, 176,366 hits were recorded on the *LiteracyTools* website, averaging at 515 hits per day, with 34.79 being the average of hits per visitor. In contrast for the second period, there were 434,212 hits recorded, averaging 1690 hits per day with 31.53 being the average of hits per visitor. In the third period, there were 562,666 hits, averaging at 2046* hits per day, with 51.38 being the average of hits per visitor.

- This looked very impressive; the traffic on the *LiteracyTools* website tripled from the first to the second period and then rose by about a fifth in the third period. The average-number of hits per visitor decreased from the first to second period; this may have been because there were less sub-elements on each web-page.

The **'bandwidth'** was a better measure of the traffic on the *LiteracyTools* website, and was measured in kilobytes (KB), megabytes (MB) or gigabytes (GB) of data.

- The bandwidth used in the first period was 654.97MB, with an average bandwidth of 1.92MB per day. The bandwidth used in the second period was 3688.21MB, with 14.35MB average data transferred per day. The bandwidth used in the third period was 4.2 GB, with 16.17* MB average data transferred per day.

- Therefore, the bandwidth has increased dramatically from the first to the second period, and moderately from the second to the third period. This was in line with the increase in the number of 'hits'. The dramatic increase in bandwidth from the first to the second period could have indicated that visitors were downloading more documents from the website – which was positive news in terms of the design team's choice of uploaded documents. However, it could also have been an indication of an increase in the number of graphical images within pages over that same period – which would have warranted an examination of the images, to ensure that the proper image format had been used (*Gif* image format or *Jpeg* image format), by the design team.

The **'geographical location of a visitor'** to the website is identified by the Internet Protocol (IP) address, which is recorded on entry to the website. An IP address consists of 4 sets of digits, for example 66.148.192.226 denotes a particular host network in the United States. IP addresses around the world are administered by a series of organisation, for example to locate the geographical origins of an IP address in Europe the '*Whois* facility' hosted by the RIPE organisation be used; in America the '*Who is* facility' hosted by the ARIN organisation would be used; similarly the '*Who is* facility' in the AfriNIC organisation would be used to trace IP addresses in Africa and so on.

This method of tracing IP addresses using '*Who is*' software is fine, if the IP address is only being used as a method of 'roughly' identifying the geographical location. Furthermore, even if the IP address is used as a rough indicator of the geographical location, the IP search facility only reveals the location of the address of an organisation that owns a particular block of IP addresses. It doesn't mean that the IP address traced is actually used in the same country; however, it is the norm for the IP addresses in the same block to be assigned to networks in that country. In addition, someone could have moved from one country to another and used the website there.

Two, out of the three different statistical software, packages used to generate information from the *LiteracyTools* log files, simply presented the location as an IP address, rather than presenting the country of origin. Therefore, '*Who is*' software was required to locate the geographical location of visitors from their IP address. There was no facility within the *LiteracyTools* website for the user to identify his/ her country of origin, so it would have been impossible to ascertain whether Irish people accessed the *LiteracyTools* website whilst on holiday in the United Kingdom, for example. Finally, if an Irish person in Ireland was using America Online (AOL) as their Internet Service Provider, then their IP address would have been listed geographically as the United States not Ireland.

- In the first period, the IP addresses of 48 of the top fifty 'hosts' were manually traced using the ARIN and RIPE 'Who is' facility, as the *WebLog* software presented their IP addresses only. (Two of the IP addresses couldn't be traced.) As was to be expected, the *LiteracyTools* website had a national and global audience. Visitors from three countries accessed the *LiteracyTools* website

during the first period, namely, the United States, United Kingdom and Ireland. 717 visitors accessed the *LiteracyTools* website through 36 US-based host machines, 279 visitors accessed the *LiteracyTools* website through eight Irish-based host machines and 44 visitors accessed the website via three UK-based host machines.

- In the second period, the *SurfStats* software traced the IP addresses of each host and the information was presented in terms of countries and world-wide regions that accessed the *LiteracyTools* website. It showed that the visitors to the *LiteracyTools* website came from as far away as Africa and South America, as well as the Middle East, Asia, Oceania, North America and Europe. The breakdown of countries of the visitors to the *LiteracyTools* website showed that Ireland topped the list of visits, with 3581 visits (and 80642 page views which represented 66.59% of total page views). The United States followed with 3244 visits (and 9475 page views which represented 7.82% of total page views). The United Kingdom had 963 visits, (viewing 18056 pages representing 14.91% of total page views). Australia had 337 visits (and 3311 pages viewed which represented 2.73% of total page views). Canada had 184 visits (and 2053 pages viewed which represented 1.7% of total page views). Germany had 76 visits (and 3928 pages viewed representing 3.24% of total page views). The remaining countries had made 52 or less visits and represented less than 0.5% of total pages views; these countries include New Zealand, United Arab Emirates, Spain, Netherlands, Singapore, Sweden, Belgium, China, Phillipines, Norway, Brazil, France, Romania and Japan.

- For the third period, Ireland dominated the list of the top ten countries that accessed the *LiteracyTools* website; with only one UK and US-based. There was a sharp rise in the number of visits to the site from Irish-based hosts from September through to November 2004.

- It was interesting to note that during the first period the visitors that accessed the website could be narrowed to three geographical domains, i.e. the US, UK and Ireland. Also, it was unusual that most visitors to the *LiteracyTools* website during this period came from America (717 visitors), with less than half that

number from Ireland. This anomaly may have been due to inaccurate 'geographical' pinpointing of the visitor's physical location, i.e. Irish people using proxy servers as discussed above. It could also have been because the *LiteracyTools* website wasn't promoted at a national level in Ireland at this stage, and so very few Irish people would have known of its existence. Also, one of the visitors ranked in ninth place was involved in the design of the *LiteracyTools* website, so their visits were most likely related to changes being made by the design team.

- In the second period, the number of countries that accessed the *LiteracyTools* website broadened significantly to include at least twenty countries. Ireland topped the list of visitors, with the United States in second place and the United Kingdom in third place. The fact that more Irish people accessed the website was most likely due to increased awareness of its existence through national advertising campaigns. It was also interesting to note the number of non-English speaking countries (13 approximately) that accessed the website during this period. Visitors from countries such as Germany, France, Sweden, Spain, China, Japan, United Arab Emirates, to name but a few, accessed the *LiteracyTools* website. This raised questions about the possibility of the *LiteracyTools* website being used as a primer or revision tool for those studying 'English as a Second Language' (ESOL) in these countries.

- In the third period, the sharp rise in the number of visits to the site from Irish-based hosts from September through to November 2004 may have been linked to the integration of a 'technology-related' feature in the TV literacy programme that was broadcast in Autumn of 2004.

The **'average visit length'** was used as a 'crude' indicator as to whether the website was being used for learning. The identification of the most or least **'popular time-of-day'** and the most or least **'popular day'** was useful for timetabling real-time chat sessions, for example. In the second period, the most popular day was decided by the highest number of visits to the website and the corresponding bandwidth used, and the least popular was decided by the lowest number of visits and the corresponding bandwidth used from the website. In the third period, the most popular day was decided

by the highest number of viewed pages, and the least popular was decided by the lowest number of viewed pages.

- In the first period, the most popular time of day to access the website was between 15:00 and 15:59, and the least popular time was between 05:00 and 05:59. The average visit length was 4.58 minutes, with average daily peak visit length of 25 minutes and daily lows of 1 minute.

- In the second period, 7470 visitors spent less than a minute in the *LiteracyTools* website. This represented 55.65% of the total % visitors to the *LiteracyTools* website. A further total of 1600 visitors stayed between 1 and 5 minutes on the website. A total of 848 visitors stayed between 6 and 10 minutes, and a further total of 1081 stayed between 11 and 20 minutes. Only 2308 visitors spent more than 20 minutes on the *LiteracyTools* websites, representing 17.18% of the total % number of visitors to the website. The most popular day of the week to access the website was on Tuesday and the lowest day was Saturday. The most popular time to access the website during the day was between 10am and 11am, whilst the least popular time was between 1 and 2am.

- In the third period, the most popular day was Tuesday and the least popular day was Saturday. The most popular time to access the website was between 10 and 11a.m., and the least popular time was between 2 and 3a.m.. Figure 9.1 below summarises the length of the visits for the third period. It was interesting to note that 42.2% of visits were for 30 seconds or less, 16.2% were between 5 and 15 minutes long and only 18.6% of visits were over 15 minutes long.

Figure 9.1	Third Period: Visits Duration	
Number of Visits: 10949 Average Duration: 563 sec	**Number of Visits**	**Percent**
0s-30s	**4623**	**42.2%**
30s – 2min	**1279**	**11.6%**
2min – 5min	**1210**	**11%**
5min – 15min	**1775**	**16.2%**
15min – 30min	**928**	**8.4%**
30min – 1h	**722**	**6.5%**
1h+	**412**	**3.7%**

- The huge percentage of visitors that exited the website in less than a minute in period two and three may have been indicative of a few things. It was possible that the website content may not have been appealing to them. This may have been because of a poorly designed graphical user-interface, which would be a cause of concern for the design team. Alternatively, it may have been the case that visitors were mistakenly directed to the website; this was further investigated by examining the manner in which visitors found or were referred to the *LiteracyTools* website.

- Furthermore, the low percentage of visitors that were spending more than 15 minutes on the website, during periods two and three, raised questions about the design of the content; for example, what was the 'ideal' length to make interactive activities, if the average user only spent five to ten minutes on the website, what kinds of activities were best suited for short-bursts of activity in an online context?

It was useful to know the '**most downloaded file**' as it provided an indication of where the visitor's interest lay. Visitors to the *LiteracyTools* website were given the option of downloading a number of different types of file; one type of file was known as a '**pdf**' file, which would have had worksheets or stories on it, another type of file was **'wav'**, which would have had sound on it; another type might be **'.jpg'** or **'.gif'** which were image files. There were no audio files in the version of the *LiteracyTools* website that was presented in the first section.

The information on the various images that were downloaded was ignored, as none of the images were offered as a choice of download; the images all formed a sub-element of a particular page or document on the *LiteracyTools* website and consisted of navigation buttons, icons, display graphics and logos. Therefore, it was of no benefit to discuss the implications of hits on images that were automatically downloaded with each page viewed.

- In the first period, the most downloaded files were all **pdf** files. The content of some of the **pdf** files listed was obvious from the filename – such as

'Occupations.pdf', but for the majority the filenames were listed as simply **pdf5** or **pdf8**, so the content wasn't obvious. The names of some of the more popular **pdf** files that were downloaded included: 12TipsForSelfEsteem.pdf, Occupations.pdf, Crossword.pdf, Stress.pdf, MemoriesOfSchool.pdf, MyEducation.pdf, OldIrishSayings.pdf, RoyKeane.pdf, FirstDayAtSchool.pdf, u2RocksTheWorld.pdf, OSullivanTakesSilver.pdf, IrishCottage.pdf and RiverDance.pdf

- The stories relating to the Traveller population were stored under a separate directory called Travellers; these included TravellerTellsHisStoryLevel11.pdf and PuckfairLevel8.pdf and Runawaylevel11.pdf and MozambigueMiracleBabyLevel8.pdf. Also the files stored in this section appeared to reflect different 'reading' levels, for example: MyYoungDays**Level17**Worksheet.pdf or MyYoungDays**Level17**.pdf.

- The most popular download was pdf21.pdf, which 162 visitors accessed, other popular 'unnamed' **pdf** files included pdf9.pdf which 84 visitors accessed, pdf5.pdf which 78 visitors accessed, and pdf8.pdf which 73 people accessed.

- In the second period, the top twenty (bar the first one) 'most downloaded files' were named with filenames that explained the content of the file. The most popular download (1257 visitors downloaded) was the genie.cab, which was the agent that read the text on screen to the visitor. The remainder of the downloaded files were **pdf** or **printable** documents; the most popular printable file was MemoriesOfSchool.pdf which was requested by 753 visitors; this was followed by ConfidenceSkills.pdf (requested by 688 visitors), MyYoungDays.pdf (682), Language Skills (496), PuckFair.pdf (471), LookingForAJob.pdf (454), ATravellers Story.pdf (400), Runaway.pdf (400), WhatKindOfHobbie.pdf (389), ApplicationForm (373), WritingApplicationLetter.pdf (357), WhenToCallADoctor.pdf (352) and RoyKeane.pdf (331), Occupations.pdf (324), FirstCommunion.pdf (307), u2RocksTheWorld.pdf (306), UsingARoadMap.pdf (301), FirstAid.pdf (287) and RiverDance.pdf (273).

- There was1267 hits to install an audio tool, that promoted a Microsoft agent resident on the client machine to read the text on screen in the second period.

- In the first period, many of the filenames were numerical and had no meaning, which makes it impossible to figure out what the content was, and why for example pdf21.pdf was the most popular download. It was interesting to note that the most popular 'named' download was '12TipsForSelfEsteem', which was requested by 136 visitors. Other highly placed 'named' downloads included 'occupations.pdf', which was requested by 45 visitors and 'stress.pdf', which was requested by 66 visitors. This was perhaps indicative of the need for the development of particular themes, say, '*Personal Development*', for example.

- The traveller documents were stored separately, and appeared to have been graded according to particular reading abilities. This wasn't done elsewhere on the 'download' section. Also, the worksheets were only clearly identifiable in the Traveller section, with the exception of one pdf file called 'crossword' in the main download area. This may have caused confusion to those accessing these files outside the traveller section, as they would have had to view each file separately to determine whether it was a 'text-based story' or a 'worksheet' or an 'exercise'.

- Some of the filenames raised questions about whether there was an element of cultural bias in the creation of filenames. It looked likely offence could be taken by the inclusion of inappropriately named files, such as the one named runaway.pdf in the traveller section for example. In the second period, the issue of filenames appeared to have been resolved. The Traveller Section was re-united with the main documents for download. In the third period, a list of the most popular downloads was not generated by the statistical software. However a quick review of the monthly information on downloads revealed a heavy interest in printable material, with a lot of interest in newer materials on life-coaching and hobbies that had been added.

End-users were '**directed to or accessed the *LiteracyTools* website**' in a number of ways. If the visitor was aware of the existence of the *LiteracyTools* website, then they

would have simply typed in the Uniform Resource Locator (URL) or the address of the website, which was http://www.*LiteracyTools*.ie/. However, many people who were aware of the website may not have been able to remember this address. They had a number of options to access the website. Most Irish visitors would have been aware of NALA and its connection with the website, so they may have chosen to go through the NALA website to access the *LiteracyTools* website. Alternatively, they could have used a search engine on the Internet, and by typing in keywords or key phrases, the search engine would have generated a list of possible websites. If the keywords or phrases were on the *LiteracyTools* website, then a link to the *LiteracyTools* website would have been on the list.

- In the first period, 3779 visitors accessed the *LiteracyTools* website directly, without use of a referrer, such as, NALA. 915 visitors used the NALA website to access the *LiteracyTools* website. The remainder accessed the website from a range of services, from ISP providers to the web developers. The top search engines used to search for *LiteracyTools* were Google (used for 178 searches), Yahoo (40), MSN(19), Aol Search (18), LookSmart (4), Dogpile(4), iWon(1), Altavista(1) and Lycos(1). The top search phrases used to located the *LiteracyTools* website were 'adult literacy worksheets', 'www.*LiteracyTools*.ie', 'www,lacnyc.org' and 'adult literacy exercises' to name but a few. The top keywords used were not generated from the WebLog Expert software for the first period.

- In the second period, 2325 visitors accessed the *LiteracyTools* website using its URL address, a further 2051 were referred to the website via the NALA website, and the referrers that followed, constituted search engines for the most part. Significantly, 7648 visitors were referred to the *LiteracyTools* website by an unknown referrer. The top search engines used to source the *LiteracyTools* website were Google, Yahoo, MSN, America online, AltaVista, iWon, AOL and Teoma. The top search phrases were 'www.*LiteracyTools*.ie', 'cooking words', 'literacy tools games', 'how to make fruit cake', 'printable exercises', 'adult literacy exercises' and 'nala'. The top three keywords used to source *LiteracyTools* website were, in decreasing order, 'literacy', 'adult' and 'exercises'.

- In the third period, 35.2% accessed the *LiteracyTools* website directly using the address, 13% used 'literacy' as the key word, with words as diverse as tools, games, cake and cooking also used as keywords to access the *LiteracyTools* website.

- The good news was almost half of all visitors were directly accessing the *LiteracyTools* website, which suggested that it had become more well-known and established. However, the manner in which the other half of visitors were guided to the *LiteracyTools* website was important to investigate, as it presented clues as to why so many visitors were leaving the website in less than 30 seconds. If visitors were mistakenly directed to the *LiteracyTools* website, then it most likely was connected to the keywords that they had chosen. As was discussed above, some of the top choices of keywords that directed learners to the website were 'cooking' and 'games' and 'tools' – the design team needed to look carefully at their choice of words in the main website; the use of the word 'games' on a menu obviously was going to draw in many younger learners who for example may have thought they were accessing sci-fi computer games and who had no interest in literacy.

The **'browsers'** were used to display the web pages. It was important to know what browsers were being used, as different types of browsers impacted on the way in which the information was displayed.

- In the first period, the most used browsers were Internet Explorer and Netscape. In the second period, the top three browsers used were Microsoft Internet Explorer, which was used on 8216 visits, Googlebot, which was used on 2507 visits, and Netscape (used on 1127 visits). In the third period, the most used browser by 96.5% of users was MS Internet Explorer.
- The rising number of visitors that are using the Googlebot browser would be of interest to the design team, as accessibility could become an issue if the *LiteracyTools* website doesn't display properly in this relatively new browser.

'Error messages' were generated by both client errors and by technical faults within the server. Error messages that began with the number four, usually indicated a problem on the client machine, error messages that began with the number five usually indicated a problem on the server side.

- In the first period, the most common error message was '404 - Not Found', which was experienced on 27067 hits of the website. A further 332 hits experienced a '502 Error – Bad Gateway'. Other error messages that appeared included: '400 – Bad Request', '501-Not Implemented', 500-Internal Server Error', '405-Method Not Allowed', '401-Not Authorised'. In the second period, the most common error message generated was '404 -Page or File Not Found', which was experienced on 2786 hits on website. A further 477 hits experienced the '500-Internal Server Error'. Other error messages that appeared included '403-Forbidden', '405 Method Not Allowed', '400 Bad Request' and '406 Not Acceptable'. In the third period, the most common type of error messages were '206-Partial Content' and '404-Document Not Found'.

- The huge number of 'File Not Found' error messages that were generated in the first period was most likely connected to the incomplete nature of the first prototype. There was a significant proportion of incomplete pathways, that users would have clicked on and received error messages. In the second period, there was a huge reduction in the number of error messages for 'File Not Found', which was probably connected to the launch of a better finished prototype. In the third period, the number of error messages for 'File Not Found' rose sharply again. This rise may have been in part due to the increase in the number of users in the third period, but it was still relatively high and warranted further investigation by the design team.

9.2.2 Summary of Statistical Data

The statistical software that tracked user-interaction with the *LiteracyTools* website, generated some interesting information about how end-users were interacting with the website. The number of visitors to the website increased dramatically from the first to second period, and rose more moderately between the second and third period. The number of page-views per visitor steadily increased, which suggested that visitors were browsing through more of the website. The bandwidth increased dramatically; this was most likely linked to the large number of visitors that downloaded printable material from the website.

The geographical location of visitors widened to include a global audience, with Ireland at the top. The average length of visits increased; however the number of people who left after less than one minute was huge and could have been linked to 'poorly' chosen words on the main pages of the website. Furthermore, less than one-fifth of visitors were staying longer than fifteen minutes – this had implications for the length of activities, and in particular, the design of interactive activities on the website.

The most downloaded materials tended to involve materials on *self-esteem*, *self-confidence* and more recently *life-coaching*, which suggested the need to develop *a personal development* strand to the website.

Finally, whilst the number of error messages dropped dramatically from the first to the second period, there was a noticeable increase in the number of error messages during the third period.

9.3 Survey of end-users of literacy websites

A survey was conducted in April and May 2004 to ascertain what tutors and literacy learners thought of two websites geared towards providing interactive literacy tuition and support, namely the *LiteracyTools* website and the BBC *Skillswise* website. The survey also set out to discover learner and tutor thoughts on and/ or attitudes towards the use of technology in literacy programmes.

The rationale for asking the participants to review two websites at the same time was that it was hoped that this comparative approach would help participants form opinions on what could or should form part of either literacy website.

The discussion that ensues outlines the findings from these surveys (see Appendix O).

9.3.1 Learner feedback from survey in April/ May 2004

Ten students were in the16 to 24 age group, five were in the 25 to 35 age group, three were in the 36 to 54 age group and eight students were in the 55and over age group. Two learners did not reveal their age group. Over one third of the literacy learners hadn't used the Internet in the past. Six learners used the Internet for 1-2 hours per week, a further seven learners used the Internet for 1-2 hours per month, and two learners used the Internet for 1-2 hours daily. Three other students used it every day.

Over one-third of learners accessed the Internet at an adult learning centre, with six students who accessed the Internet at home, four at work and three at other venues. Twenty four of the learners hadn't used *Skillswise* or *LiteracyTools* websites before. Of the remaining students, two said that they had used *LiteracyTools* and the remainder didn't fill this section.

In terms of websites that they had accessed and liked in the past, the Gogle search engine featured as a useful website, followed by Yhoo, childcare, travel, Irish History and wedding websites.

'Look and Feel' of Homepage

The literacy learners' feedback on the 'look and feel' of the BBC *Skillswise* homepage was positive. The majority of literacy learners agreed that the size of the font was good, thought it was easy to know where to go, liked the pictures used, agreed that the words used were easy to understand and thought that clear direction was given. The literacy learners were divided on whether there were too many choices offered on the first page. Approximately one quarter of learners didn't like the colour scheme used.

The literacy learner's feedback on the 'look and feel' of the *LiteracyTools* homepage was also positive. The majority of literacy learners agreed that the size of the font was good, thought it was easy to know where to go, liked the pictures used, liked the colour scheme used, agreed that the words used were easy to understand and thought that clear direction was given. Two-thirds of literacy learners didn't agree that there were too many choices offered on the first page.

It should be noted here that in the pilot survey that three literacy learners on average didn't fill or left gaps in the first question in BBC *Skillswise* and this increased to four literacy learners on average that didn't fill or left gaps in the first question on *LiteracyTools*.

First Click on Website

On the *Skillswise* website, the majority clicked on the 'Words' option, followed by the 'Numbers' option. Two learners clicked on the 'Your Stories' option, because they were attracted by the name or because they liked to read people's stories. One learner clicked on the 'Glossary' because '*it just caught my eye*'. Another learner clicked on the 'Tutor' section, as '*I wanted to know what training/education and newsletter they have*'. Another student clicked on '*What is Skillswise*' to find out more about the software.

On the *LiteracyTools* website, the majority clicked on 'Online Exercises' option first for a number of reasons, including that they wanted to do an exercise. Two students clicked on 'Printable Exercises'. Two other learners clicked on Games and on 'New

Users'. Finally, one student clicked on '*LiteracyTools*', as '*I wanted to know about the site and what it was to learn'*.

Favourite part of each website

On the *Skillswise* website, the favourite parts of the website covered a broad spectrum of items including the quizzes, games, glossary, learning spelling, numbers and worksheets. One learner commented that '*I like where they allow people to put in their story for people to read'*.

On the *LiteracyTools* website, the favourite part of the website also covered a broad spectrum of items from the printable exercises, online exercises, games, spelling skills, applying for a job, the 'turn-on speech' to 'a message from Mary McAleese (Irish President)'. Another student commented that '*I thought it was good that you have to check your answers and it tells you if they are correct'*. Another learners' favourite part was learning about offline exercises and online exercises.

What should be added or removed from each website?

Over one-third of the learners didn't fill or entered that they didn't know what could be added to the *Skillswise* website. The remainder requested more games, graphics, sound, puzzles, Science page and one requested an 'Irish language website'. Others wanted existing sections to be expanded. In terms of what should be removed the majority believed that nothing should be removed. A few commented that they would like 'less black/white' on homepage and in text elsewhere. One learner commented that some of the 'in the news' items were boring.

Over one-third of learners didn't fill or entered that they didn't know what could be added to the *LiteracyTools* website. The remainder requested more soaps and quizzes, more about jobs, more exercises, particularly, in computing, harder games and harder questions. Several students requested additional topics such as History, Geography, American Football or Art. One requested a typing skills exercise. In terms of what could be removed from this website, the response was divided between those who

didn't fill it in or said they didn't know, and those who said nothing should be removed. Three learners requested that the 'soaps' be removed.

What the learners would like to see more of?

On the *Skillswise* website, the learners wanted to read more stories from other literacy learners, followed by more reading and spelling exercises. One learner requested more graphics and more spelling games. In terms of what they would like to see more of, the majority of learners, on the *LiteracyTools* website, requested stories from other literacy learners.

Where the learners want to use the website?

The majority of learners wanted to use the *Skillswise* website with the help of a tutor in a learning centre, this was followed by around one-quarter of students who wanted to use the website on their own at home, and a similar amount of students who wanted to use the website with another student in a learning centre.

The majority of learners wanted to use the *LiteracyTools* website with the help of a tutor in a learning centre, this was followed by around one quarter of students who wished to use it in their home or with another student in a learning centre.

It is important to note here that some students ticked two options.

Problems experienced whilst using websites

Most learners either didn't fill this section or reported that they had experienced no problems using *Skillswise*. The problems experienced using *Skillswise* centred on lack of familiarity with the website. Some learners commented that it *'took a bit of time to get the hang of doing the exercises'* and *'just getting to know how to do the games'*.

Over one-third of learners reported they had no problems using the *LiteracyTools* website. Another one-third didn't fill this section. The problems (see Appendix O) experienced included difficulty in the online exercise on the soaps – *'I found it difficult*

to highlight and drag the words'. Another learner commented that one question didn't have any clues as to what the answer might be, '*There was a question on measurements and they didn't have any clues to what the answers might be'*.

Reasons why the website is useful according to literacy learners

The reasons why the *Skillswise* website was useful according to literacy learners included the following; helped with spelling, sentence construction and in understanding words; good worksheets in maths; the answer sheets were provided; '*can do it on your own'*; reading, spelling and writing; good choice of subjects, good layout and presentation, and easy to use; comprehensive and covers the basics well; clear instructions, easy to use and good worksheet.

The reasons why the *LiteracyTools* website was useful according to literacy learners included the following; good for reading, writing and spelling; educational; fun, learning, non-school; easy-to-use, very educational; more choice, fun - a lot of games, easy-to-use and interesting; '*because I could associate with the carictors (sic)'*; more games which are fun, easy to use and interesting; fun - not work, good learning, got results fast.

Would the learner use the website again?

The majority of learners would use the *Skillswise* website again. Only three learners said they wouldn't use it again, because it was 'hard to follow'. One student commented that he hadn't found anything he was interested in.

Only two learners said they wouldn't use the *LiteracyTools* website again, because they deemed it not useful or too slow. The majority said they would use the *LiteracyTools* website again.

9.3.2 Tutor feedback from survey in April/ May 2004

Eight tutors used the Internet for one to two hours per day, three tutors used it for one to two hours per week, one tutor used the Internet for one to two hours per month and the other tutor commented that he used to work for an Internet Service Provider (which probably means that he used it for at least eight hours each day).

Ten tutors said they accessed the Internet from home, six accessed it from the adult learning centre, five accessed it at work, and two tutors accessed the Internet in a college they were studying at. Please note that tutors ticked more than one option here.

Ten tutors had never accessed the BBC *Skillswise* website before, three tutors had accessed it before. Nine tutors had accessed the *LiteracyTools* website before, whilst four tutors had never used it before.

The majority of tutors used the Internet to source materials and to keep in touch with colleagues by email. Only one tutor used the Internet to keep in touch with students by email. Two tutors taught literacy through online programmes on the Internet. One tutor published information on web pages on the Internet. Other uses of the Internet included for shopping, to book holidays and to contact clubs.

The top barriers to using the Internet in adult literacy programmes included no Internet connection at their workplace, students not having computers at home, the number of websites on Internet being intimidating, the length of time it takes to source information and the literacy problems that the students have. The second most prioritised barriers to using the Internet in adult literacy programmes that were mentioned included the fear that older adults have towards computers, that it can be a distraction to students, that it 'wastes time' and the difficulty in finding what you're looking for. Other barriers cited included the level of literacy that the student has, the inadequate instructions given, problems with breakdown of equipment, the lack of computers available for use by students and the lack of knowledge of appropriate websites.

The tutors' comments on what should be included in an adult literacy website designed for use in the classroom included, suitable and up-to-date reading material, worksheets,

spelling, reading and maths games and material covering a wide range of hobbies and interests. They also thought that plenty of pictorial representation, less written words and fewer choices per page were important.

Most tutors used the Internet in some capacity within their programmes and advocated the continued use of it. However, some tutors had concerns about using websites with learners with low literacy levels. One tutor commented that using literacy websites could divert attention from the main literacy problems.

In terms of resources or websites on the Internet that tutors felt would be useful to their students, some tutors said they would recommend the *LiteracyTools* and *Skillswise* websites, whereas, others recommended sites included Google, One Stop English and FETAC website.

'Look and Feel' of Homepage

Almost all tutors were in agreement that the colour scheme used on the *Skillswise* homepage was good, that it was easy to know where to go, that the words used were easy to understand, that the liked the pictures used, and that clear direction was given. The majority were also in agreement that the letter size was fine. Two tutors didn't submit a response to the statements presented.

Over eleven tutors were in agreement that the colour scheme used on the *LiteracyTools* website was good, that it was easy to know where to go, that the words used were easy to understand and that clear direction was given. Overall they were happy with the letter size and with the number of choices offered on the homepage.

Integrating either website into literacy teaching

The tutor opinions varied on how the *Skillswise* website could be integrated into their literacy tuition. Some tutors saw the *Skillswise* website as a follow-up to class work, to be used after the topic or subject had been introduced. Some saw it being used as a resource for worksheets, i.e. they would print off the printable exercises. One tutor said that the website could be used by students for a short block each day as '*variation from*

other work'. Another tutor said that it would be a good tool for '*easy access to teaching materials'* but that the '*student would need tutor to explain it all'*. Another tutor said it would be useful for '*using games, use of lesson plan and printable exercises'*.

In terms of integrating the *LiteracyTools* website into literacy tuition, the tutors comments included that the worksheets could be printed off and used in class; that the online exercises could be used for grammar; that the website could be used after the student is clear on concepts and that it could be used with a class that are learning how to use the Internet and who are getting familiar with the computer.

Favourite part of either website

The favourite parts of the *Skillswise* website according to tutors were the numbers/ maths section, the quizzes and the tutor section. In particular, the lesson plans, ideas, exercises and teaching inspiration for tutors were commented upon.

The favourite parts of the *LiteracyTools* website according to tutors (see Appendix O) were the 'online exercises', the spelling area, the games, and the print exercises. One tutor commented that '*I like the NALA space girl icon'*. Another commented that '*I think the reading pieces were good and the students also liked them*'.

What the tutors would like to be added or removed from either website

In terms of what could be added to the *Skillswise* website, the recommendations included more activities using diagrams, more graphics, more worksheets, more space for all this information-'more visual cues' and better games. One tutor commented that the vocabulary section was very limited. In terms of what could be removed, the recommendations included to change the sound effect for games, the removal of the news stories as they were not recent and the removal of some of the text, as it was felt that there were too many words on screen.

In terms of what could be added to the *LiteracyTools* website, tutors requested more tutor resources, more topics, more worksheets, more options under each category, more relevant iconic images (games icon) and more visual cues. In terms of what should be

removed, four tutors said that nothing should be removed. Other tutor comments included that there should be less words on each page; that the sections that don't work should be removed, that the 'white page' at beginning should be removed and that the long learning curve should be investigated.

How would tutors prefer students to access either website?

The majority of tutors wanted to see the *Skillswise* website being used with the help of a tutor at a learning centre. Four tutors preferred to see their student use it at home, with five tutors who preferred to see their students use it with another student at the learning centre. One tutor commented that if they could use all three modes it would be good.

Ten tutors wanted to see the *LiteracyTools* website being used with the help of a tutor at a learning centre. Four tutors thought that the students could use the *LiteracyTools* website on their own at home, and six tutors wanted to see the website being used with another student in a learning centre.

It should be noted here that most tutors ticked more than one option.

Problems experienced whilst using either website

The problems experienced whilst using *Skillswise* ranged from the level of English used on the website being '*too advanced for a student with poor literacy levels*' to '*too much information*'. One tutor also commented, '*I found the exercises complicated and rather boring. In my opinion, they would not encourage students*'.

The weaknesses of the *Skillswise* website centred on three areas; the presentation, the literacy level and the lack of printable material. The presentation weaknesses included, too many words on the first page, not enough images, not enough visual cues and a bit dull in colour. The issue with the literacy level was that some of the tutors thought that it had been set too high for some literacy students and that a tutor would be needed to help the student access the website.

The problems experienced by tutors on the *LiteracyTools* website included problems using the mouse to 'drag the words' during spelling exercises, problems using the 'Back' button to go back at times, the printable exercises couldn't be printed unless the user had Adobe Acrobat, not able to access spellings in the Skills section and words in the Crosswords were too obscure.

The weaknesses of the *LiteracyTools* website centred on the lack of material presented in general, and not enough reading material, in particular. There were also comments on the lack of material for those with low literacy levels and that it took too long to learn how to use it. One tutor commented that the sound was poor and some buttons didn't work.

Would tutors recommend either website to their students

Eight tutors said that they would recommend the *Skillswise* website to their students, with just two tutors saying that they wouldn't recommend it. Those that wouldn't recommend it said that, they thought it was quite complicated and that learners would need a very good level of literacy.

Eleven tutors said that they would recommend the *LiteracyTools* website to their learners, with just two tutors saying that they wouldn't recommend it. One tutor said that the *LiteracyTools* website was an excellent resource for tutors but is too difficult for students to use on their own. The other tutor said he wouldn't recommend it without first going over the site, particularly, for a student '*new to the website and the Internet*'.

9.3.3 Summary from Tutor and Learner End-User 2004 Survey

The feedback from learners and tutors who sampled the *LiteracyTools* website and the BBC *Skillswise* website was very positive. They liked the 'look and feel' of the homepage and only a few reported problems using either website.

Most learners clicked on the 'Online Exercises' option first on the *LiteracyTools* website, rather than printable exercises, as they wanted to interact in a 'live' exercise. On the *Skillswise* website, most clicked on the 'Words' option. The favourite section of either website for learners and tutors covered a broad spectrum of categories such as, quizzes, games, printable exercises and online exercises; specific materials or activities such as, *'applying for a job'* or *'I like where they allow people to put in their story for people to read'*; or mechanisms, such as the *'turn-on speech'* or *'feedback mechanisms'*.

The learners' preferred choice was to use either website with the help of a tutor at a literacy centre; with around one quarter who said that they would also use it by themselves at home or with another student at a literacy centre. The majority of tutors also wanted to see both websites being used with their help at a literacy centre. Their preferred choice to use the website with the help of a tutor was interesting, as both websites were directed at the self-directed learner; so each website was designed so that learners could interact without the help of a tutor. This may be because those who took part in the survey were all based at learning centres, and thus an element of co-dependency may have existed. Alternatively, this may mean that both websites needed to be re-examined to investigate whether they were truly designed for use in a self-directed manner.

The majority of learners either said nothing should be removed from the websites or didn't fill in this section. A few mentioned removing items such as 'soaps' or 'in the news' items that were boring. Around one-third of learners didn't know or didn't fill in the section on what could be added to either website. The remainder requested a spectrum of items; mostly more of anything that was on either website, with a few asking for specific topics such as Art or Science. This is interesting because it possibly indicates that learners were inexperienced in using or critiquing websites, hence, they based their needs on what was presented on either website and requested more of each

item. This has implications for the life-cycle model used to implement the *LiteracyTools* website – for example, the prototype model used was probably the most appropriate in terms of allowing users to comment on what they thought at various stages, as it probably would have been impossible to get clear requirements from the literacy learners at the outset.

In contrast, tutors recommended adding more specific information, such as diagrams, worksheets or resources and improvements that could be made to the manner in which the learning content was presented, such as more 'visual cues' for learners in the activities. In terms of what could be removed, they suggested a variety of items from 'sound effects' to 'old news stories' on the *Skillswise* website, and 'less words' on page and a 'reduced learning curve' on the *LiteracyTools* website. The tutor feedback is very useful to designers as it focuses on the usefulness of the material presented in terms of its 'learning value'. This may indicate that tutors should be more closely involved in the design of an initial prototype, as they may have a clearer image of what is needed.

The websites usefulness centred on their support for reading, writing and spelling activities primarily. Furthermore, many users of the *LiteracyTools* websites mentioned the 'fun' aspect of interacting in the games, and the ease-of-use of the website. The majority of learners said that they would use both websites again, with three stating that they wouldn't use the *Skillswise* website because it was 'too hard to follow' and two stating that they wouldn't use the *LiteracyTools* website because it was deemed 'too slow' or 'not useful'. The majority of tutors said that they would recommend both websites to their learners. Many tutors commented that they would 'print-off' materials from the websites for use in classroom tuition or as a revision tool. This indicates that the use of websites could prove to be useful in literacy tuition, however, more investigation is required to examine how to further promote the use of the interactive elements.

9.4 Feedback on *LiteracyTools* from co-ordinators/ tutors

Co-ordinators or tutors in ten out of the twelve literacy centres sampled in 2004/ 2005 commented that they had recommended or noted that their tutors accessed the *LiteracyTools* website.

Some of the centres reported that the tutors had used the *LiteracyTools* website to source and print off worksheets for use in classroom literacy tuition. Other centres reported that students used the *LiteracyTools* website in their literacy tuition; *LiteracyTools* is both used live with students, and the tutors download the worksheets (Coordinator9, Appendix F, p.50).

One co-ordinator commented that a version of *LiteracyTools* on CD had just arrived and he thought that this would prove a popular resource for tutors because of support materials like lesson plans - '*...they have sent out 60 of the CDs and want to see what the uptake on it would be. This will be a big help to new tutors, as it has lesson plans and other ideas' (Coordinator11, Appendix F, p.53).*

Some of the positive comments about the *LiteracyTools* website included that it was designed with an Irish audience in mind, interactive nature of the online exercises, that it's user-friendly and simple – '*The NALA website is user-friendly, not too much reading or writing'* (Tutor1, Appendix F, p.3).

However, some of the worksheets were not considered appropriate for the Irish context. One tutor suggested that a worksheet of Irish sayings focused on sayings that were appropriate for an American audience, with *Oirish* sayings like, 'May the road rise to meet you' dominating the worksheet. She thought that the sayings selected could have been more localised - '*I would have been more inclined to include little idioms they use... if they had taken them from a specific local area... related to the locality... it would have made more sense to me'* (Coordinator5, Appendix F, p.23).

One tutor commented that students found the initial prototype of the *LiteracyTools* website difficult to navigate through – '...and I did use it with some students and

actually abandoned it, I think there was only two or three people in but they did find it hard to navigate...' (Tutors12, Appendix F, p.73).

Another tutor commented on the lack of variety with the worksheets and also the missing context for the worksheets, i.e. the stories to go with the worksheets. One co-ordinator added that the literacy level needed to be extended to Level 2 and Level 3, that the text-based nature of the website made it difficult for those students with low literacy levels and that the themes presented weren't interesting. Another tutor felt that literacy learners needed to be at Level 2 in reading ability in order to use the Internet. Another tutor felt that the level of the *LiteracyTools* was too high and she had to design her own worksheets based on the material presented.

One co-ordinator commented that the synchronised voice on the website tour should have had an Irish accent, as the voice-over on the website tour was off-putting – '*On the website tour, the synchronised voice is off-putting for adult, pity they didn't use an Irish accent...* ' (Coordinator8, Appendix F, p.37)

Some of the centres had been involved in either the initial needs analysis or the evaluation of the *LiteracyTools* website. One of the centres commented that materials that they had been developed for an internal literacy resource called 'Lifelines', were used as worksheets on the website. Another centre that had been in the evaluation of the *LiteracyTools* website commented that they felt the interactive exercises could be improved, particularly, the feedback mechanisms – '*I did an evaluation, one morning we got the group to use it and we weren't, we were kind of critical about it because you know if you have to do an exercise it doesn't tell you whether you're right or wrong, it just goes on to the next page, it's not very nice looking either but if you spell a word, you could spell the word any way you like...*' (Tutors12, Appendix F, p.57)

Furthermore, an IT tutor from this centre added that even though they had been informed of the weaknesses of the *LiteracyTools* website, that she couldn't see why anyone would use a 'substandard' website when better websites like the BBC *Skillswise* website were available, unless it was more culturally relevant. Another ICT tutor at this centre added that cultural implications wouldn't really apply when using interactive spelling facilities, such as the spelling facility on the *Skillswise* website.

In terms of what makes a website attractive to use, the tutors at DALC emphasised speedy feedback, an uncluttered interface and the inclusion of appropriate games. Another comment from the DALC tutors was that the students liked to be able to interact 'live' with materials on-screen, as well as having the option to print-off materials to do outside class.

9.5 Summary: Experiential Level

The information generated from the statistical software, the survey of end-users and the interviews with co-ordinators indicated that the *LiteracyTools* website was being used and that end-users enjoyed using it.

An interesting 'quandary' arose from the survey of end-users; literacy learners tended to be very positive about what was presented and, due to their limited exposure to online activities, suggestions made were closely tied to the existing material that was presented to them on the website. The problem with this is that it was difficult to improve a website without critical feedback from end-users; but in order to give critical feedback learners needed more experience using websites. Therefore this raised a number of questions – should we rely on tutor inputs on what is appropriate for learners when designing the initial prototype? If we are to engage learners in ascertaining design requirements for the initial prototype, in what way can the needs of learners be elicited from learners before an initial prototype is designed? Or do we wait and involve learners after the initial prototype has been implemented, so that they have a basis to constructively feedback on? What are the implications of this for the Software Life-cycle Model and Model of Implementation?

In addition, the statistical summaries indicated that the *LiteracyTools* website had a global audience; this raised issues in terms of how to identify and support the Irish literacy learner, and furthermore, how to design materials that were culturally sensitive for a diverse range of end-users. Furthermore, the length of time visitors were spending on the website needed to be examined in terms of how this impacted the degree of interaction with activities presented on the website. Also, the most downloaded materials tended to involve materials on *self-esteem*, *self-confidence* and more recently

life-coaching, which suggested the need to develop *a personal development* strand to the website.

Finally, whilst the number of error messages dropped dramatically from the first to the second period, there was a noticeable increase in the error messages during the third period. Interestingly, the literacy learners and tutors didn't report many problems using the website in the survey; although this may have been because they only spent a short time evaluating the website and may not have explored all areas. However, the increase in the number of error messages recorded needed to be further examined by the design team, to ensure that the website was functioning properly.

Chapter Ten

Research Questions

10.1 Introduction

The following sections present discourse on the gaps in the development process, how elements of the development process were prioritised, tensions that existed within and outside of the design team and finally, on identifiable elements of a workable process for developing virtual learning environments in Ireland. The questions examined included the following:

1. What considerations were missed about the target audience, their context and the development process?
2. How were considerations about the target audience, their context and the development process prioritised? How did this prioritisation impact on the implementation?
3. Did tensions exist between the priorities of instructional designers and web developers? Did tensions exist between the needs of end-users and the priorities of the design team?
4. In relation to all of the above, were there any identifiable elements of a *workable* process for developing online learning environments in literacy education in Ireland?

The following discourse presents a response to these questions, in light of the investigations undertaken at the contextual, developmental and experiential levels.

10.2 Considerations Missed

The considerations that were missed about the target audience, their context and the development process are presented in the following three sections; the first, examines the considerations missed in the development of the *LiteracyTools* website, the second, highlights the considerations missed in the development of *It Could Be You* software, and the third, highlights the considerations missed in the development of the *MICRO* website. The discourse in each section centres on gaps identified in the development process, and is structured into two main areas: Contextual and Developmental deficits. Each section ends with a short discourse on why these deficits weren't circumvented.

10.2.1 Considerations missed in the development of '*LiteracyTools*'

Contextual Deficit

The learners and their context should have been examined in more detail, so that a more appropriate focus could have been chosen for this website at the outset. Most of all, there should have been a formal analysis of all the barriers to literacy tuition and support, and an analysis of these in terms of the implementation of this online learning environment. Whilst some of this contextual knowledge resided within the NALA literacy practitioners, a formal approach to the collation and analysis of the contextual information highlighted below could have been beneficial to the overall design team.

There was a lack of consultation with literacy learners from the outset of the project. Literacy learners weren't consulted about the website in advance of the development of the initial prototype; their first involvement was in the evaluation of the initial prototype. Relationships should have been established with literacy learners, who were willing to input on their thoughts, feelings and / or attitudes to the online learning environment from the outset.

In addition, there should have been an analysis of the profile of students accessing the literacy schemes, and an examination of how this might impact on the design or content of the website. The age-profile of literacy learners could have had implications for its usage by older adult learners, for example. The nationality of the learner might have

had implications for the cultural design and the content of the website. The socio-economic background of the learner could have had implications in terms of access and usage outside the centre. The literacy level of the learner certainly had implications for the level of English used on the website and the design of the navigation for the website.

Whilst it was shown that there existed a cohort of independent literacy learners who wanted to learn without attending a literacy centre, and who were prepared to use paper-based resources and a DVD of the TV program, there was no evidence to suggest that these types of learners would be willing to learn online and no research undertaken to indicate if this was what they favoured. Most literacy learners that turned up at the twelve literacy centres sampled, did not know how to use technology, and wouldn't have used the Internet before attending the literacy centre. Whilst literacy learners may have had access to technology at home, only a few ever used it at home. In fact, as shown in the survey conducted in 2004, literacy learners' preferred choice was to use the *LiteracyTools* website with a tutor at a literacy centre.

The technology infrastructure and usage of technology at the literacy centres was only one component of the overall context that impacted on the usage of the website. There also should have been an investigation into how *computer literate* existing learners were on entry to the literacy schemes. This would have at least given an indication of what the likelihood was of an independent learner accessing the website, and the resultant implications for the focus of the website. There should also have been a detailed training needs analysis to ascertain the true extent of tutors' computer literacy, and also a survey of the tutor attitudes towards the use of technology in literacy programmes. In particular, the impact of the involvement of voluntary tutors with little or no computer literacy skills should have been investigated. There should have been consultation with the key stakeholders in the literacy schemes, particularly referral network partners. These stakeholders should have been consulted about how they perceived the notion of using the website for literacy tuition, and how the referral process could best be supported in an online context.

There should have been an analysis of the manner in which technology was introduced to learners at the centre. This would have shown a rather lengthy process from learning *mouse* and *keyboard* control, to typing in and printing off, to using Internet and so on.

This would certainly have had implications as to whether the website was to be under *mouse-control* or *keyboard control*, and what length to make the activities. Furthermore, there needed to be closer examination of how learners learn in an online context. This could be considered a catch-22, as there needed to be a website there for them to test. However, there were other interactive literacy websites (not in an Irish context) that should have been tested with literacy learners over a period of time to ascertain how they interacted with the materials, how long they spent doing activities and what potential impact this could have had on the design of '*LiteracyTools*'. Also, there needed to be closer examination on how best to support the *self-directed* learner online and what form this support might take.

In addition, there should have been an analysis of the content of the existing literacy programmes on offer at these centres: i.e. basic literacy skills programmes, literacy themed programmes and / or FETAC accredited modules, to see what the likelihood was of matching or linking the content from the websites to the existing programmes. A closer examination of the programmes may have presented opportunities for an alternate focus for the website; this may have resulted in the design of an integrated virtual literacy programme of ten or twelve tutorial hours in length rather than the 'activity' or 'exercise' based approach taken.

In particular, there needed to be closer examination of the manner in which literacy learners were assessed, and encouraged to progress, in literacy programmes, from initial contact, to 1:1 tuition, to group tuition and onwards. There should have been an examination of the innovative ways of assessing learners through learning logs, or the practice of having students print their stories in anthologies or books. This might have provided some useful information in terms of how to assess a literacy learners' level and advise them what *level* they were at on entry, and / or how to monitor and record their progress on an ongoing basis.

Development Deficit

Team Member1 summarised the underlying design philosophy, when she said that the *LiteracyTools* website was designed '*on the hoof*'. The evolutionary prototype model

used to develop the website was used as a vehicle to launch 'incomplete' prototypes from a learning point of view. There were some communications problems within the design team. Not enough contextual analysis was done in preparation for the initial prototype; the focus was on testing mechanisms initially rather than on the learning content.

The design team didn't work as effectively as possible as a unit. They only met together 'face-to-face' on a limited number of occasions. They were situated geographically far apart, and the communication was not frequent. This impacted negatively on the 'team-based' nature of the project. Team Member1 felt isolated and in hindsight, thought she should have located herself physically within the team. Whilst the design team members had a good relationship with each other and valued and respected each other's inputs, the communication channels between design team members needed to be improved and clarified. Team Member4 spoke of the difficulty of being answerable to different 'bosses'. There were difficulties with the transmission and understanding of technical and educational terminology and requirements amongst team members. There was also some difficulty in getting information about the target audience at the outset, which added to difficulties in communicating the end-user requirements to the design team. There was no contact with end-users until the evaluation process, and limited contact with select tutors.

The process of developing materials for use in an interactive online medium was different to the process of producing printed materials for a support pack. The design team had to create the setting, content, teaching strategies, assessment, user interface and feedback. The design team approached this process in a segregated manner; parts of this process were assigned to individual design team members with little interaction between them. The lack of engagement in a collaborative, dialectical process in reaching a consensus on teaching strategies, pedagogy and learner style and preferences had ramifications for the instructional design of the materials. The design team initially chose literacy materials based on their ease of transition to the online environment. The problem with this was that it didn't focus on the learner needs or the pedagogy of the learning enterprise, but instead focused on the mechanics of displaying or delivering information. Therefore, the process of developing materials should have been

conducted in a more 'inclusive' and 'dialectical' manner, with the participation of all design team members at each stage of the development of the instructional materials.

There were insecurities amongst the subject matter experts on the design team about their understanding of technological aspects. Similarly, the web developers had difficulty initially in understanding what the educational requirements were. The subject matter experts thought that they could just point out a few websites, and that the web developers would understand what was required for the prototype website from a review of these websites. This lack of understanding of the information required by various members of the team, along with the lack of contact of team members with each other over the development process, negatively impacted on the development of the initial website. It indicated a lack of awareness of the importance of the socio-cultural and collaborative aspects of teamwork.

The role, responsibilities and needs of each of the team members should have been explicitly stated at the outset of the project. Furthermore, clear and regular communication lines should have been opened, with opportunities for both face-to-face and alternate forms of communication. This information should have been documented, so that the process was clear and transparent to all who were involved, and for future design teams.

The overall impact of this was that the design was led by the technical staff, and design considerations were initially at least, focused on mechanisms that could be included on the website rather than meeting the educational or learning needs of the target audience. It really wasn't until the first prototype had been launched that the entire team realised that the focus needed to be shifted. The focus, however, still took a technical slant, i.e. the provision of *assistive* technologies, but did include a more in-depth examination of the materials presented from an instructional design perspective.

The manner in which the website was to be used was unclear initially. Some of the design team said it was geared towards self-directed learners, but in reality a tutor was needed to set the context for the learning activities. Therefore, online support was a necessity to advise self-directed learners on how best to use the materials on the

LiteracyTools website. Hence, the absence of online support would have resulted in less meaningful engagement in learning activities by the self-directed literacy learner.

The learning content on the *LiteracyTools* website was structured under two main headings; 'online exercises' and 'printable materials', with generic sub-headings to guide the learner towards activities involving reading and spelling. There was a perception that '*generic*' sub-headings, such as 'Spelling' or 'Reading', would be more attractive to users than '*thematic*' sub-headings, such as 'Art' or 'Gardening'. This debate about '*generic*' versus '*thematic*' sub-headings was difficult to resolve without some inputs from users. Therefore, research should have been conducted with learners to establish their preference in this matter.

The instructional design of the materials for the website was incomplete. The materials used from the TV programme support pack were not appropriately modified for use in an online context. The *pdf* documents could have been *used* as a hook but there were too few of them. There were also too few interactive exercises. The reading level of the *pdf* documents was too high for intended users of the website. There was no real consideration of addressing social and cultural issues in the design of materials for the *LiteracyTools* learning environment. Some of the reading exercises reflected a personal bias or stereotyping, and should have been introduced from a 'discussion' perspective rather than a 'reading' perspective. Therefore, the materials were incomplete from a learning point of view, as many activities involved only reading skills, some materials reflected stereotypes and personal bias, and a number of worksheets were missing a context.

There were formatting errors on the *pdf* documents. The transformation of 'Word' documents to '*pdf*' format resulted in the loss of images and formatting in some cases. The documents should have been proof-read, and errors removed, or else the document should have been withdrawn. Overall, the materials should have been designed with a greater level of sophistication before being launched on the website.

There were inconsistencies in the level of English used in instructions, and difficulties with navigation. Again this was indicative of two things; firstly a lack of focus on the 'base' literacy level needed to interact with materials on the website, and secondly, no

formal checking mechanisms were established to 'review' the website for internal inconsistencies.

There was less consideration of the provision of accessibility for the target audience initially, in particular, the impact of the reading level on learner engagement with the website was not considered in the first prototype. The primary accessibility considerations made were, the design of the 'uncluttered' interface and usable navigation. The issue of accessibility was raised at a post-evaluation meeting in January 2003; when the researcher suggested prioritising the reading level, in the consideration of accessibility criteria for the website. Subsequently, the design team modified the website so that it conformed to level two web content accessibility criteria (WCAG). However, more consideration was needed on the impact of the reading level on learner access, interaction, and engagement, with learning activities on the website.

A 'free-writing' facility should have been included on the basis that it afforded learners an opportunity to input their thoughts, feelings, and attitudes. It could also have formed a useful facility for collaborative work and discourse online. Alternatively, as suggested by Team Member1, the 'free writing' facility could have been used to promote discussion in a blended learning environment. The design team's argument for not including a 'free-writing' facility was that automated feedback wasn't possible in the interactive element of the website, and that there were no online support staff to 'manually' edit the students' work. However, students could have printed off their inputs from a 'free-writing' facility, and used these to promote discussion in online chat-rooms, which would have reduced the use of automated feedback or the help of a tutor.

The focus of phase two was to develop *assistive* technologies and to improve on the instructional design of the content, in the hope of motivating learners to return to the website. It was interesting to note that the 'zoom' facility was one of the two assistive technologies prioritised (the audio facility was the other). There were no records available to indicate the number of users that used the 'zoom' facility. However, a time-benefit analysis on the establishment of this zoom facility on the second prototype should have been undertaken to ascertain its usage, and thus the 'value' in prioritising its development in the second phase.

The user-interaction tracking mechanisms were very useful, but could be enhanced to provide more meaningful information on the learner interaction in the learning environment. Whilst the logging files provided information on aspects, such as; the number of hits, the most popular downloads and the length of time spent on the website, a more detailed tracking of the interaction in each activity would have given instructional designers more information on the nature and degree of engagement with the instructional content. The initial tracking system was geared towards letting learners know what they had done; this facility was subsequently shelved due to user access problems. There was a perception that the design team wasted time on the tracking system; that users didn't want it and that tutors didn't have the skills to use it. However, the tracking facility interface should have been made more accessible for end-users, and furthermore, it should have been expanded to record tracking of all types of interactions, in a format that was examinable by the design team.

NALA were given control of the content management facility, which allowed them to put up worksheets and update material on the website. Only NALA staff had permission to remotely access the server to make changes or update the material. The problem with this was that it set institutional constraints on what should have been *an inclusive* learning domain. It omitted the necessary engagement of two important end-users; firstly, the tutors in the literacy centres, who were actively engaged in literacy tuition on a daily-basis, and who could contribute to or transform materials on the website; secondly, the end-users who had a part to play in the transformation of content into a meaningful learning experience. Therefore, the learners and tutors should also have been allowed to contribute to or transform the 'content' of the website and should be facilitated in presenting perhaps 'their own materials or experiences' on this live medium.

The evaluation methodology could have been extended to include focus group meetings, as well as the survey. The literacy learners needed help to complete the evaluation sheets, even though the questions had been simplified and presented in what was considered to be a user-friendly manner. There was a perception that literacy learners would use the online feedback mechanism to record their thoughts or attitudes to various parts of the website, which never materialised. There was also a belief that

learners would be able to critically feedback on the website; the feedback gathered by the NALA evaluation was overwhelmingly positive but this may have been linked to the limited nature of the questions posed as well as limited content on interface – they had very little to comment on. There were also inconsistencies in the evaluation feedback from some learners, which raised questions about the suitability of using a survey or questionnaire with the target group of literacy learners. There was a perception that tutors would use the initial prototype with learners on an ongoing basis, that never materialised. Those involved in the evaluation of the website visited once and didn't return to use that prototype again. Therefore, the evaluation methodology wasn't as effective in identifying ways in which the *LiteracyTools* website could be improved.

The alternative to conducting a survey would have involved the use of focus groups, observation and / or interviews to gather information from literacy learners. The problem with using these tools was that they would have resulted in a loss of anonymity and confidentiality amongst participating literacy learners. However, as identified in the 2004 survey conducted by the researcher, there were one or two literacy centres who had come 'out of the closet', and whose literacy learners may have been willing to take part in focus groups and / or interviews. This highlighted the importance of doing an extensive survey of the literacy context in advance of the development of software, with a view to identifying centres where literacy tuition has been de-stigmatised.

Team Member1 believed that they should have pulled out of the evaluation of the initial prototype, added more interactive material, corrected mistakes and re-launched the prototype. The design team also needed to go back and survey their target audience and context, and re-focus the website towards a 'known' target audience. In addition, the learning 'value' of each micro-activity should have been examined in the larger context of providing a 'holistic' literacy tuition and support service.

Why weren't these deficits in the design of the *LiteracyTools* website circumvented?

Many of the initial deficits in the design of this website were circumvented through the cyclical nature of development, i.e. each prototype was an improvement on the previous

prototype. In my opinion, some of these deficits weren't identified or circumvented during the initial development primarily because the design team were hampered by an incomplete contextual analysis, and were new to the process of designing a virtual learning environment for the literacy context.

The design team thought that the needs of the literacy learner could be met by the delivery of a set of materials online that facilitated the development of a narrow set of skills (i.e. reading, writing, numeracy). Although NALA recognised that the homogenous approach in basic education programmes didn't work – *one size didn't fit all*, the resultant virtual learning environment was used to deliver a 'one-size' unit that would broadly meet the needs of tutors and learners.

The design team relied on NALA and/ or literacy practitioners (subject matter experts) to provide the context. However, NALA did not provide direct literacy tuition, they were in fact a literacy advocacy service, so they were at least one-step removed from day-to-day literacy provision and thus literacy learners. Furthermore, the subject matter experts on the design team didn't have technical expertise or experience in developing online software and because of this, the design team focused initially on responding to 'techie-led' queries in terms of what platforms would be used and technology used at the centres, rather than on the educational needs of the learners. The lack of direct access to end-users, and the corresponding lack of technical expertise, resulted in the technological context and functionality being prioritised initially, instead of prioritising the needs of the end-users.

The success of the prototype approach was dependent on designers being brave enough to make stark changes, including dumping a framework that didn't work and re-starting. The design team wasn't secure enough to do this. The design team worked in a co-operative, rather than a collaborative, manner. The materials were effectively prepared individually and assembled by the developers. The subject matter experts felt at a disadvantage in terms of the technology context, and didn't engage fully with the developers on issues of implementation of the online materials.

In the first prototype, the design team focused on using the content to test mechanisms. In the second prototype, they focused on adding *assistive* technologies, and did some

more work on the instructional design of the materials that were added. However, their focus was on the development of elements of an online environment, rather than concentrating on meeting the learning needs of the target audience. The instructional design of the content needed revision in some cases. Spelling and other grammatical mistakes in materials designed for use by literacy learners really was unacceptable. The bottom line in terms of 'priorities' for software designed for use in literacy tuition surely should have been that the spelling and grammatical content was one hundred per cent correct.

10.2.2 Considerations missed in '*It Could Be You*' software

Contextual Deficits

Literacy learners were not consulted in the design and development of the '*It Could Be You*' software. They may have been able to contribute to the interface design or to give advice on their preferred content. Also, a survey of the profile (i.e. age and / or nationality) of the literacy student in prison may have highlighted cultural issues that impacted on the design of the software for example.

The '*It Could Be You*' software was aimed at the self-directed user. However, it could also have been used in a blended learning environment, i.e. with a tutor at a centre. Therefore, there should have been a 'training needs analysis' of the tutors in prison education literacy schemes to see whether they were computer literate and what their attitudes were towards the use of this software. In addition, key stakeholders in mainstream literacy provision should have been involved or at least made aware of the design process. Literacy centres, outside the prison education context, were provided with copies of the '*It Could Be You*' software at its launch, but external literacy providers were not invited to become involved in the development of the software. Involvement in, or awareness of, the design of this software would have been very beneficial to those involved in the design of web-based software more recently.

Furthermore, there should have been some analysis done on the level of computer literacy that literacy learners in prison had, and indeed their reading level, as this may have shown that some users had advanced levels of computer and reading literacy and hence, could have coped with more advanced 'keyboard-dependent' activities. There should also have been a formal analysis of how literacy learners interacted with technology. There were few opportunities for observation of literacy learners *in action* in the mainstream literacy provision, due to issues with anonymity and confidentiality. The literacy scheme in prison offered the ideal setting for observing 'socio-technological' interaction in literacy tuition, as the learners attended literacy tuition more regularly and the prison learning-environment was easier to control. Obviously, issues such as gaining permission and non-exploitation of individuals in restricted settings could have been counter-factors, but with the culture of honesty and voluntary attendance that were embedded in prison education culture, these factors may not have been un-surmountable.

Furthermore, an analysis of the content of existing programmes on offer within prison literacy schemes should have been undertaken, to examine the linkages between the content of '*It Could Be You*' software and the content of FETAC and other accredited modules. This may have highlighted ways in which the software could be integrated in mainstream literacy programmes or ways in which the software could be used to create resources for FETAC portfolios.

Developmental Deficits

The '*It Could Be You*' software was designed in a linear manner, which negatively impacted on the opportunities for end-users to contribute to or revise aspects of its design. An iterative development process may have afforded end-users more opportunities to input on design aspects, such as the graphical user interface, on a more regular basis.

There was a perception that the order of development of the '*It Could Be You*' software was inappropriate and that this impacted negatively on the 'Look and Feel' of the graphical user interface. The design team didn't prioritise the graphical user interface. They designed the content first, then the audio and lastly the user-interface. There was

a perception that the size of the font, and the quality and size of the images, could be improved. Poor quality images, in particular, dis-empowered those literacy learners with low or basic literacy skills, who were more dependent on visual cues to help them navigate and / or interact with the content in a meaningful way.

There were problems in explaining the design requirements within the design team; the design-team members didn't understand each others' needs initially. Furthermore, there was a perception that software programmers would understand what was required from a text-based diagram. In reality, the programmers didn't understand what was required and needed several meetings, mind-map diagrams and detailed instructions before they understood the requirements. Similarly, the instructional designers didn't understand what was required by the programmers, they had difficulty in understanding the technical terminology.

There was a perception that storyboards should have been used in the development process as a means of explaining to users what the interface would look like, and elicit feedback on what would be appropriate in this context. The failure to use storyboards at the outset may have been because of a lack of awareness of their existence at that time, or a lack of understanding of their usefulness in ascertaining end-user requirements. The absence of their use may have negatively impacted on the design of the graphical user interface.

There was a perception that the instructional design of the content was too linear and there was not enough learner control. This software did offer a focused learning opportunity; learners were guided through the learning in a linear way and this was as a direct response to the prison learning context and the perceived needs of the literacy learners. The alternative would have been a hyperlinked-type enterprise where learners navigated into regions of infinite learning possibilities – possibly facilitated by linking the CD to the Internet, in learning environments outside of prison education. This could have proved useful in offering flexibility in the literacy curriculum on offer on the software. However, learners could equally have got lost in a 'sea of hyper-text' – which would have resulted in an unfocused learning opportunity.

There was a perception that users would have preferred an interface similar to Microsoft Office. Designing an interface based on familiarity may have had some benefits, for example the learning curve would have been much faster and it would most likely already have conformed to accessibility guidelines. However, the design of the interface for a literacy context stretched existing guidelines for accessibility or usability beyond their current settings, and as such required new thinking and discourse. This may not have happened if the software had been *'shoe-horned'* into an older interface format.

The level of reading on the *'It Could Be You'* software should have included a basic or lower level for the instructions, as well as a higher range of reading in some of the instructional materials. There were three reading levels on the software. However some tutors (outside prison education) thought that the lowest level wasn't low enough, and others thought that higher levels should have been introduced. As was shown by the prison education survey in 2004, the OECD tools were not sensitive enough to record the low levels of literacy in prison and new tools had to be devised. A similar survey would need to have been conducted across Ireland, to find out what the base literacy level was.

The quality of the audio could have been improved. This was important to help those literacy learners with low reading skills navigate, understand and interact with the learning content in a meaningful way; particularly, in the absence of suitable visual cues.

Why weren't the deficits in the design of *'It Could Be You'* software circumvented?

Most of the deficits were circumvented by the *It Could Be You* design team; the exception probably being the ineffective design of the graphical user interface. The design team prioritised the instructional design of the content for a target audience with different learning styles and preferences, and because of this the product was focused on meeting the learning needs of the target audience. However, this prioritisation would have impacted on the time made available for the development of aspects such as the graphical user interface. The lack of attention to the graphical user-interface was,

therefore, primarily as a result of lack of time and money, not because it wasn't recognised as needing work.

The design team communication problems were as a direct result of inexperience in designing software. However, the fact that the 'power-base' was held by the subject matter experts, who worked well both on their own in terms of instructional design and with the software developers in the implementation of the instructional design materials, helped reduce the communication difficulties.

Finally, the absence of a survey of literacy learners was due to a preconception that prison literacy tutors knew what their learners' abilities and requirements were, and a lack of awareness of the benefits of a large-scale end-user and contextual analysis.

10.2.3 Considerations missed in the 'MICRO' website

Contextual Deficits

There was no formal examination of the technological or other factors in the context of the target audience for the MICRO website. There was an unsubstantiated assumption that there were farmers in remote areas of the region that this scheme operated in, that couldn't or wouldn't access local services and would access the literacy service online.

There was no survey of technology infrastructure, it was assumed that the independent learners would have Internet access. There was no survey of the computer skills of users, or attitudes to use of technology or consideration of how the literacy learner would be supported from a distance.

Literacy learners were never consulted about the website in advance of the development of the initial prototype. There was an assumption that the needs of literacy learners were known through interaction with learners at the centres, and that the website could be developed based on prior experience and knowledge. There was also an assumption that tutors could input on the needs of the target group through their interaction with literacy learners in formal literacy programs.

Developmental Deficits

The MICRO website prototype hadn't been fully developed but there were indicators of some potential deficits in the initial development process.

Firstly, they originally intended to use the initial prototype to test a mechanism i.e. the interactive game, whilst also offering information on a range of items from staff to services at the centre. The problem with this was that the prototype would not have been able to offer learners a focused learning opportunity; and learners would have ended up testing mechanisms rather than interacting in a meaningful learning enterprise. This was subsequently reviewed, and instead the learning activities were prioritised, so that learners could interact in a meaningful way in a focused learning environment.

Secondly, whilst the communication process between the web developer and the subject matter expert was excellent in terms of explaining the ethos of the centre and issues within literacy tuition and support, there was potential tension between the theoretical discussion of aspects of the website and their implementation. However, in practice, this did not materialise as the communication process focused on consensus building using a dialectical process. The collaborative team based approach also resulted in the web developer becoming involved in the development of literacy constructs and materials, i.e. a blending of the roles.

Why weren't the deficits in the design of the 'MICRO' website circumvented?

The MICRO website design team overcame most of the deficits through their collaborative teamwork and through the engagement of a dialectical process. Where deficits arose, these resulted mainly due to an incomplete examination of the context in which the virtual learning environment was to be embedded. This was most likely due to inexperience in developing software for this market. There appeared to be an underlying assumption that the centre co-ordinators and tutors knew what their learner's wanted, and what their learners were capable of doing. Whilst they may certainly have known the capabilities of particular literacy learners attending the centre, their claim to know what learners' wanted, in the absence of a consultation process with a representative sample of learners, was misguided.

10.3 Prioritisation of Considerations

In the case of '*LiteracyTools*', the design team prioritised the technological content and functionality initially i.e. they focused on using the content to test mechanisms rather than the learning needs of the target audience. This resulted in less attention being given to the instructional design of materials, in the first prototype. In the second prototype, there was a more in-depth examination of the instructional design of the materials, and there was a larger emphasis on the design of assistive technologies to improve accessibility. Furthermore, the model of implementation for *LiteracyTools* was supposed to be an *immersed* web-based model – the intention being that the independent learner could use the resources on this website without the help of a tutor. The materials presented did not allow for immersed instruction, many of the worksheets did not have a context – therefore a tutor was needed to provide the context. Hence, the lack of appropriate prioritisation of the instructional design element resulted initially in an incomplete website from a learning point of view and, in addition, it required the use of a tutor in order for learners to be able to use it. This was subsequently rectified in later prototypes.

In terms of the '*It Could Be You*' software, the design team prioritised the instructional design of the materials and the use of multimedia elements to provide flexible learning options – they spent one year choosing and developing suitable materials for use in the software, and a further year with the web developers transforming these materials for use on the CD and tapes. Their model of implementation was an *immersed* CD-based model – the intention being that the self-directed or independent literacy learner in prison could use the CD to learn literacy without the help of a tutor. This prioritisation of the instructional design was successful, and the resultant software could be used effectively as a learning tool by literacy learners both within and outside of mainstream literacy tuition.

Finally in terms of the 'MICRO' website software, the design team prioritised the importance of adhering to the ethos of the centre and meeting the needs of literacy learners with varied learning styles and preferences. In addition, they emphasised a collaborative team-based approach, which focused on dialectical discussion and

reaching a consensus at every stage. This prioritisation of ethos, collaborative team-work and discussion was a critical factor in the success of the micro website.

However, even with good dialogue and consensus reaching, some considerations reached had the potential to create problems in the implementation of the website. For example, the model of implementation was supposed to support both the self-directed learner and learners within a blended learning environment. The MICRO prototype hadn't been launched, but it was likely that there was potential for conflict with the model of implementation chosen, i.e. it couldn't have supported self-directed learners and there also wasn't enough 'content' to provide a meaningful learning experience for literacy learners. Therefore, if self-directed or independent learners were being supported, then the design team needed to ensure that the content and online support was prioritised. From the above, it was clear that appropriate prioritisation of elements, such as instructional design or online support, was dependent on the model of implementation that had been chosen.

10.4 Tensions within and outside of the Design Team

In all cases examined, tension existed between the priorities of subject matter experts and web developers. Firstly, the subject matter experts and web developers struggled in all cases to come to terms with what was expected of them and what the requirements of the project were. Both sides needed more information about each other's requirements and better communication mechanisms were needed to help streamline this process. Secondly, there were tensions as a result of elements being prioritised differently, by the web developer or the subject matter expert. In the case where the priorities were driven by the web developer, the resultant prototype resulted in content being used to test mechanisms, which resulted in the design of an ineffective learning tool. In the case where the priorities were driven by the subject matter expert, the resultant software focused on providing a meaningful learning experience, and therefore resulted in the design of an effective learning tool for literacy tuition.

None of the design teams conducted a survey of end-users thoughts, feelings, attitudes or opinions towards the use of technology or even their use of technology at the outset of their design process. There appeared to be a common misconception that tutors knew

what literacy learners wanted or needed from an online literacy-learning environment, and that it was sufficient for learners to become involved at the evaluation stage. Whilst the priority of all design teams in theory was to meet the needs of literacy learners, only one team actively focused on revising and improving the instructional design of materials to meet learner needs. The other teams focused on testing mechanisms.

Interestingly, the feedback from learners who used the '*LiteracyTools*' website indicated that they were happy with the interface, they didn't know what should be added or removed, they liked most of what they saw and wanted to use the website primarily with a tutor at a centre. So one could reasonably assume that the design team met the needs of their target audience, despite the lack of a comprehensive contextual analysis. The data from the logging files provided an interesting aside to this: the actual numbers accessing the *LiteracyTools* website was approximately fifty four visitors a day in 2004, a large proportion of these weren't Irish, and only 17% of visitors spent from eleven to twenty minutes on the website - the majority spent less than one minute on the website. These statistics were a reminder of the need for a more detailed analysis of the usage of this website by literacy learners in Ireland, and raised the following questions:

- Why were so many users only spending less than one minute on the website; was it related to the design of the graphical user interface, the design of the learning activities, the usefulness of the website?
- The website was being accessed by large number of non-Irish nationals; this raised questions about the cultural implications of the content, whether it was being used to support ESL abroad (many of the countries accessing are non-English speaking), how nationals and non-nationals would be distinguished in the provision of online support and how the website was being promoted in Ireland?
- The bandwidth increased from the first period to the second; what did that say about the usage; were more materials being downloaded?
- The error messages were huge in the first period and considerably lower for the second period; what did that say about the functionality of the first prototype, and the second prototype – obviously there were some improvements!
- The most used browsers were Internet Explorer, Netscape and Googlebot – interesting that a third browser was gaining a foothold, what were the implications for this in terms of cross-platform compatibility.

In short, the statistical information could have been used more effectively to ascertain the 'reality' of interaction on the website, and the logging facility should have been extended to gather information that supported or dissolved existing theories of what learners wanted, and how they interacted in the online learning environment.

10.5 *Workable* process for developing online learning environments

The *'workable process'* for developing online learning environments that has emerged from this research involves sophisticated choices and decisions at four levels; this includes consideration of a Software Life-cycle Model, Model of Implementation, E-Learning Elements and/ or an Instructional Design Model.

Software Life-cycle Model

The first level of the *'workable process'* involves the design team reaching a consensus on a process to guide the design and development processes; this would be more formally known as choosing a **Software Life-cycle Model.**

Traditionally, a Software Life-cycle Model was used by software developers to guide the development of large, wieldy, time-consuming software applications. The *value* in choosing a known Software Life-cycle Model was that each model was proven to be effective in guiding the development in a particular context; furthermore, it presented clear guidelines on how to bring the software through the various stages of development and onwards to its implementation. Clients would have been notified of the Software Life-cycle Model employed at the outset of the project, so that they were aware of the various processes, and when they would be invited to review the software.

However, in the nineties, the introduction of dynamic mark-up web languages reduced the time required to program online software applications. This meant that online software could be implemented much faster, and web developers soon latched onto the idea of launching a series of prototypes for clients to review. Therefore, the 'Prototype

Software Life-cycle Model' came to the fore as the natural Software Life-cycle Model choice for online software developments.

From the investigations conducted for this research, it was evident that none of the design teams made a conscious decision to adhere to an explicit Software Life-cycle Model. However, some of the elements and processes adopted by the design teams were loosely aligned to existing Software Life-cycle Model*s* used in software development.

In the case of the online software developed, it was evident that a prototype approach (that was loosely aligned to the 'Prototype Software Life-cycle Model') was popular with the online design teams. This prototype approach was useful as it afforded literacy learners and other users an opportunity to feedback at various points in the development process, and each new prototype was implemented relatively quickly. The problem with the prototype approach adopted was when not enough planning went into the design of the initial prototype, and thus it was flawed and underdeveloped. Furthermore, even though the framework was flawed and underdeveloped, design teams can be reluctant to veer from, or to dump, it. Therefore, the design team need to carefully consider the principles underpinning the chosen 'Software Life-cycle Model'.

In the development of the *It Could Be You* software, the 'Evolutionary Dialectical Process' followed didn't mirror any known Software Life-cycle Model. A linear form of development was undertaken, that had similarities to aspects of the 'Waterfall Software Life-cycle Model'. However, it differed significantly to the 'Waterfall Software Life-cycle Model' in that it relied on a dialectical process between design-team members to highlight the degree of revision that was necessary at each stage of development. This process also involved a high degree of advance instructional design planning and preparation, before the initial framework was decided, and so was slower to implement than the prototype model. Nevertheless, the prioritisation of instructional design, in conjunction with the dialectical process, resulted in the development of a cohesive learning tool.

Therefore, in the development of online learning environments, design teams need to adopt a process that will guide them through the stages or cycles of development. In

order to do this, they need to decide on a suitable Software Life-cycle Model. The 'Prototype Software Life-cycle Model' is an obvious choice for web developers, as it facilitates user interaction with the software at various points in the development process. However, design teams need to ensure that they adhere fully to the 'tried and tested' mechanisms that this model offers in order to implement an effective learning environment. The 'Evolutionary Dialectical Process' used in the development of the *It Could Be You* software was successful, in the implementation of the CD-based learning enterprise, but the linear aspect of its development process would not be suitable for online developments, as it doesn't properly facilitate user revisions of the software. However, the **dialectical process,** that was an integral part of this model, could be very effective if used to enhance the communication process during cycles of online development in the 'Prototype Software Life-cycle Model'.

Model of Implementation

The second level of the *'workable process'* involves the design team reaching a consensus on a suitable **Model of Implementation**. A *Model of Implementation* involves decisions on what form the software will take, and thus, whether it is online or offline software. It also involves decisions on how the software designed is to be used by learners, and hence, whether it is suitable for use in an immersed learning environment or a blended learning environment.

Online and offline types of software each have particular strengths, and of course limitations, that can impact on a design teams' decision to implement either one of them. Whilst offline software generally results in less work on designing for cross platform compatibility and is cheaper to operate than online software, it is limited in terms of only being capable of supporting fixed content, which can't easily be added to or updated. Virtual learning environments offer more flexibility to learners to negotiate the curriculum on offer, and in addition, the content is relatively easy to expand or update. Furthermore, virtual online implementations can provide access to geographically disparate learners. However, poorly designed online enterprises can result in learners interacting in unfocused learning activities.

Robin Mason (1998) highlighted three models of implementation for online learning that were evident in the delivery of higher education in the United Kingdom, namely, the Content and Support Model, the Wrap-around Model and the Integrated Model. These models differed in the degree of online support provided and the manner in which the material was presented. Thus, the first two models were designed to support a blended learning environment, whereas the third model was designed to support an immersed learning environment.

In order to make a decision on a suitable *Model of Implementation,* the design team must, firstly, ascertain what type of software they intend to implement. In the case of the *LiteracyTools* and *MICRO* design teams, an online implementation of the software was chosen, as the design teams wanted to support distance learners. In the case of the *It Could Be You* design team, an offline implementation of the software was chosen, as the design team wanted to support learners in a prison setting where Internet usage was restricted. Both types of software chosen were appropriate within their respective contexts.

Secondly, the design team must decide on the manner in which the software is to be used. If the software is going to be used by self-directed or independent learners, then the 'Immersed *Model of Implementation*' would be appropriate; this would result in all the materials and support being provided within the software. If the software is to be used in a blended learning environment with the help of a tutor, then the 'Blended *Model of Implementation'* would be more appropriate; this would result in the context for the materials being set by the tutor, and integrated support would become optional.

The *LiteracyTools* website was supposed to support the self-directed learner in the 'Immersed *Model of Implementation'*; however, learners needed support in order to interact with the materials on the website and no online support was provided. Therefore, the *LiteracyTools* software was not properly designed to support the chosen 'Immersed *Model of Implementation'*, and instead supported a 'Blended *Model of Implementation'*. The *MICRO* website followed a similar *Model of Implementation* as the *LiteracyTools* website, and therefore, it was expected that they would experience similar problems to the *LiteracyTools* design team in this respect. In contrast, the *It Could Be You* software effectively supported the self-directly learner in its 'Immersed

Model of Implementation', by providing audio and visual support with the materials, so that learners could engage with the materials without the help of a tutor.

Therefore, it is important that the design team fully understand the implications of choosing a particular *Model of Implementation*, and that they carefully plan the manner in which the materials and support are provided so that the resultant software adheres to their preferred Model of Implementation. This is particularly important where the intended audience is self-directed or independent learners, as internalised support is integral to the successful utilisation of the immersed learning environment. In addition, each type of software, whether offline or online, differs in the manner in which it can support particular *Models of Implementation*. Furthermore, both offline and online software are dependent on the existence of particular technological infrastructures.

E-Learning Aspects

The third level of the '*workable process'* involves consensus on, and the appropriate prioritisation of, the **Learning or E-Learning Aspects** by the design team. The Learning Aspects comprises of those aspects that can be used to guide the development of learning environments generally. The E-Learning Aspects relates to those aspects used to guide the development of online learning environments. Therefore in practice, there is no difference between the Learning and E-Learning Aspects, other than the context in which they are embedded; thus, the term E-Learning is used in a generic sense in the discussion that ensues.

Khan (1997) presented an E-Learning Framework that consisted of eights sequenced E-Learning Aspects, namely, Pedagogical, Technological, Interface Design, Evaluation, Management, Resource Support, Ethical and Institutional Aspects. These aspects were used to guide design teams in a linear process towards the implementation of an E-Learning or online learning environment. However in terms of the software under investigation, none of the design teams used a framework to guide the development of either the online or the offline learning environments. Instead, the design teams made considerations about a number of aspects that included: Technological Aspect, Pedagogical Aspect, Interface Design Aspect, Management Aspect, Evaluation Aspect

and Institutional Aspect. These aspects were given a different priority by each design team; the prioritisation of particular aspects was controlled by certain team-members, who held the *power-base* on each team.

- The *LiteracyTools* design team were the only design team that investigated the ***Technological Aspect***. They conducted an investigation into the hardware and software infrastructure in literacy centres in Ireland, as well as ascertaining the technical support that was needed to support the software under construction. However, they did not conduct a detailed training needs analysis, or seek to elicit learner and/ or tutor attitudes to the integration of technology in their literacy programmes. The other design teams assumed that the technological infrastructure existed to support the intended learning environment, and that learners and tutors wanted to engage in technology-enabled learning environments.

- All of the design teams investigated the ***Pedagogical Aspect.*** These included an examination of the content, learning needs, learning outcomes, multimedia aspects, design approach, organisation and sequencing of material, and finally, the methods and strategies that could be used to support a self-directed or independent learner in an immersed literacy-learning environment.

- All of the design teams investigated the ***Interface Design Aspect*** to some extent. This involved discourse on how the graphical user interface looked, whether it was accessible and usable for the target audience. It involved a particular focus on the navigation facility, to ensure that it allowed the literacy learner to interact effectively and in a timely manner with the learning activity. In the case of the online enterprises, it also involved checks to ensure that the interface was supported by a variety of web browsers. Furthermore, it involved an examination of accessibility issues pertaining to the target audience, and consideration of WCAG guidelines in the development of the online software. From the literacy perspective, it involved consideration of the reading level of the learner, as well as more general accessible criteria.

- Only the design teams of the online enterprises considered the ***Management Aspect,*** as it wasn't relevant to the offline software enterprise, namely, *It Could Be You.* Therefore, the design teams of the *LiteracyTools* and *MICRO* websites thought about how the software facility was going to be managed. A content management system was integrated into the *LiteracyTools* website; however, only NALA appointed personnel were to be given access to make changes or update the content, which, in my opinion, introduced institutional constraints on what should be an inclusive virtual learning facility.

- The design teams of the online software examined the ***Evaluation Aspect***; however, this aspect wasn't prioritised by the design team of the offline software. Therefore, the *LiteracyTools* and *MICRO* design teams engaged in discussion on how the learner or end-user would give feed back on the effectiveness of the software as a learning tool. In the case of the *LiteracyTools* website, this involved the inclusion of software mechanisms that recorded end-user interactions with elements of the software, as well as formal evaluation mechanisms such as evaluation sheets. Evaluation sheets were used to get feedback on the graphical user interface, learning activities, assessments, ease-of-use of the navigation mechanisms, and on features to be added or removed.

- Only the design team of the *It Could Be You* software considered the ***Institutional Aspect***. The inclusion of multiple supports for the learner, such as the audio facility on the CD and the audiotapes for the Readers, was as a direct response to institutional constraints, such as the restricted access and support to literacy education within the prison setting.

A number of further learning aspects were either not investigated or poorly investigated by the design teams, namely, the ***Contextual Aspect*** and ***Ethical Aspect***.

The ***Contextual Aspect*** was not formally examined by any of the design teams, as there was an assumption that the contextual knowledge resided within the literacy practitioners on the design teams, and therefore, was implicitly integrated in the design of materials and other aspects of the software.

- An examination of the ***Contextual Aspect*** would involve an examination of the social and cultural factors that could impact on the design or implementation of the software. It would involve an investigation into the thoughts, feelings, attitudes and opinions of the literacy learners and literacy tutors towards the integration and usage of technology in their learning programmes. It would also involve an examination of the ethos of the literacy centres that aim to support the technology-enabled learning environment, an examination of literacy curricula on offer and a survey of the profile of the literacy learners attending the centre. In addition, it would involve dialogue with literacy referral partners and agencies to identify and reduce barriers to the implementation of the software, and to ascertain how technological developments are supported or promoted throughout partner networks, so that potential difficulties with the integration of the system could be highlighted. Furthermore, it would involve an examination of the software to ensure that it is accessible to a multi-cultural audience. This would involve careful examination of language, colour, graphics, layout and placement of elements on the screen and learning activities designed; so that they would be easily understood or recognisable by a broad range of cultures.

The ***Ethical Aspect*** was only examined to a limited extent by the online and offline design teams; they discussed learners' issues with anonymity and confidentiality, and the stigma of literacy. However, their response to these issues centred on the provision of software that would enable learners to engage in self-directed or independent learning.

- A more in-depth examination of ethical issues, that were applicable to the target audience of literacy learners, would include further discourse on the preservation of anonymity and confidentiality, legal issues and etiquette. This would involve the provision of a system that would give users the choice to remain anonymous, and also provide for the transmission of sensitive information where applicable. Furthermore, it would involve the examination of materials used, in terms of copyright and whether consent had been given for their use in an electronic context. It would also involve raising awareness of legal issues arising out of transforming existing material for use in an online context, and in allowing literacy learners publish their graphics or extracts, that were not their own. In

addition, it would involve drawing up etiquette rules for interacting in a collaborative facility, such as a chat-room, so that users wouldn't offend other participants.

Instructional Design Model

The fourth level of the workable process involves the design team reaching a consensus on the instructional design of materials. The instructional design of materials is important in terms of developing meaningful learning tools. Poor instructional design of materials can result in the development of ineffective and incomplete materials or activities from a learning point of view.

Design teams have the option of choosing an **Instructional Design Model** to guide the instructional design process. In the context of the software examined, none of the design teams adopted an Instructional Design Model. However, the design team of *It Could Be You* unknowingly followed most of the steps in the Dick & Carey Instructional Design Model in the design of their materials, with the exception of the summative evaluation step.

The initial step of most Instructional Design Models would involve an examination of the literacy learners' needs-analysis and context-analysis, so that the appropriateness of developing a technology-based enterprise to facilitate literacy learning would be determined. It may involve the adoption of an Instructional Design Model, such as the Dick and Carey Model, so that the design team would consider each aspect of the instructional design process carefully and revise these, if necessary. It definitely would involve discussion of aims and objectives of the course, pedagogy, learning styles and preferences, teaching strategies to be implemented and the manner in which the material was to be presented. It would involve close examination of Gagne's nine-step learning process, which would be critical for the progression of learners within literacy education. The higher levels of Gagne's Model in particular, which focus more on the conceptual density associated with learning, would be of importance in helping designers understand how to progress literacy learners beyond basic literacy tuition.

In terms of the material used, it would involve consideration of issues such as potential content bias, addressing a variety of learning needs and preferences, and meeting accessibility criteria for literacy learners. The materials to be transformed would be considered in terms of the time constraints of the technology medium, the target audience and/ or the context. There would also be consideration of how to assess the learning objectives, and overall how to evaluate the effectiveness of the learning activity. The process as described above would be cyclical, i.e. it would involve the on-going revision of phases or stages.

Finally, it would involve discourse on how to motivate learners in the online learning environment, with a particular focus on the provision of independent and collaborative learning opportunities within a flexible learning environment. This would hopefully motivate learners to take control of, and negotiate, their own learning, whilst actively engaging in critical thinking in a *transformative* learning environment.

10.6 Conclusions

This chapter highlighted gaps identified in the development process, how elements of the development process were prioritised, and tensions that existed within the design team. Furthermore, it presented identifiable elements of a 'workable process' for developing virtual learning environments in Ireland. This 'workable process' comprises four levels and is further discussed in the next chapter.

Chapter Eleven

Workable Process, Conclusions and Recommendations

11.1 Introduction

The central purpose of this thesis was to examine how virtual literacy-learning environments were developed in Ireland, with a view to establishing whether there were identifiable elements of a '*workable process*' that could be used to design, develop and implement online learning environments. It involved an examination of three software products, two of which were online versions, namely, the *LiteracyTools* website and the *MICRO* website, and one which was an offline version, namely, the *It Could Be You* software. The initial section of this final chapter discusses the '*workable process*' that has emerged from an examination of this software under review. This is followed by discussion of the conclusions from this research, and recommendations for the future.

11.2 *'Workable process'* for developing online learning environments

It is difficult to design technology-enabled learning environments for those who have low levels of literacy, as their low literacy competencies create challenges for the design team in terms of designing accessible interfaces, and effective learning materials and activities.

On the surface, it appears that it would be less difficult to design learning for those with a higher competency in literacy. There are a plethora of websites that can beguile both designers and learners into thinking that learning is taking place. However, if the learner fails to internalise and re-conceptualise what's provided online or elsewhere, then the 'value' of the learning enterprise is questionable. Hence, there are equivalent challenges in designing learning environments for those with a higher degree of literacy or higher competency. These challenges centre on designing sufficiently challenging materials from a learning point of view.

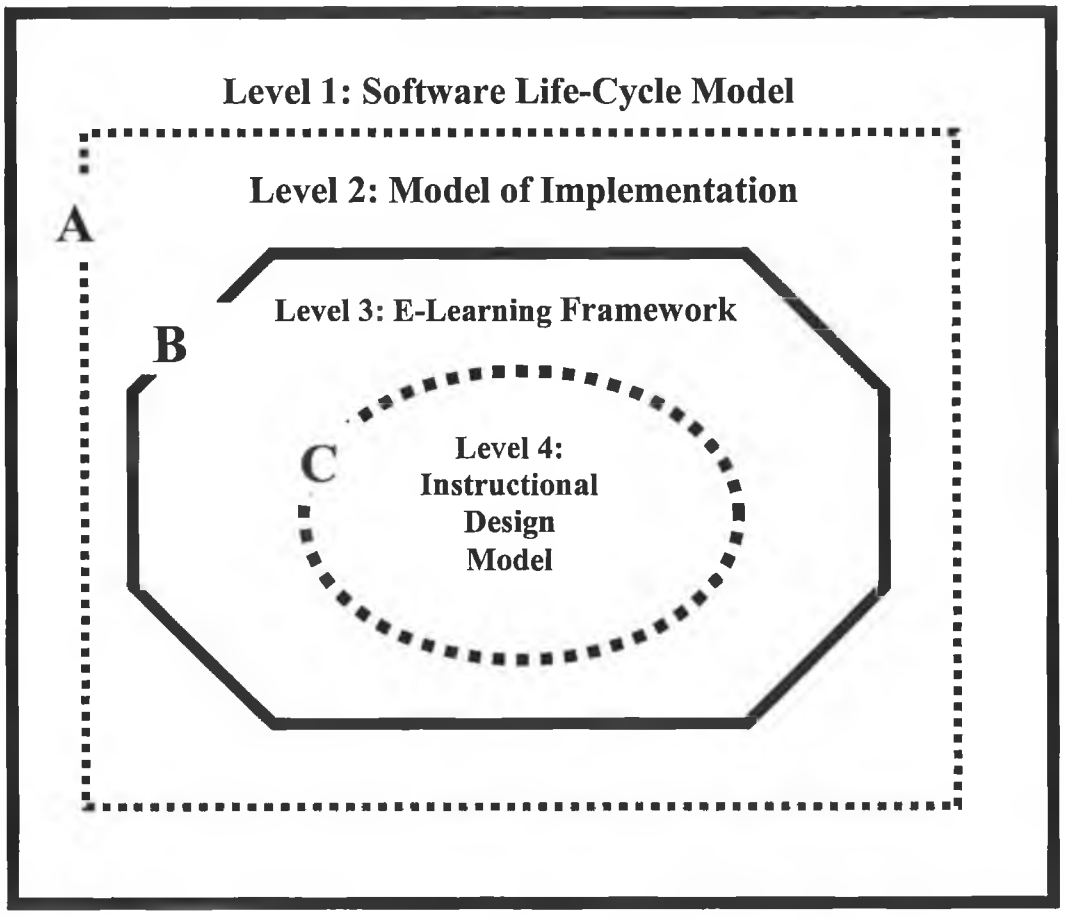
Therefore, if a software development process can be identified that successfully meets the needs of those with low competence in literacy education, then the learning from the

implementation of this software process must be applicable in other areas. It is in this context that the 'workable process' for developing online learning environments is presented here.

11.2.1 Overview of the '*Workable Process*'

When embarking on the design and development of software, the options or variables presented at each of the following four levels of the 'workable process' outlined, need to be carefully considered. The following presents an overview of the main features of the 'workable process' and examines what this new process has to offer.

Figure 11.1 *'Workable process'* for developing online learning environments



The *'workable process'* for developing online learning environments involves four levels as illustrated in Figure 11.1 above.

At the first level, the design team reach agreement on an appropriate Software Life-cycle Model. However, it was shown in this thesis that online and offline software

could be designed without adopting a Software Life-cycle Model. So, why bother using a Software Life-cycle Model? There are two reasons why a Software Life-cycle Model has been introduced into this '*workable process*'. Firstly, this type of model is useful in guiding the 'uninitiated' through the swampy lowlands of the software development process. Secondly, Software Life-cycle Models have a proven track record that supports their use in particular contexts. Therefore, it would be foolish to 'throw caution to the wind' at the outset, by following a supposedly *organic* or *intuitive* process that results in an incomplete or unusable software product.

At the second level, the design team reach agreement on a suitable *Model of Implementation*. It is unlikely that a design team would not consider the type of software that they want to implement, and, as shown in this research, the design team's choices typically consist of two options – online or offline software. However, not all design teams take the extra step of committing to the manner in which the software will be used – i.e. whether the software is to be used as part of a blended learning environment or as an immersed learning environment. It's important for the design teams to prioritise the Model of Implementation at this point, as it forces them to think about the type of learner that they want to support. The failure to identify and implement the type of learning environment that is appropriate to the target audience, will result in unfocused learning environments. This was shown in the case of one website, where there was a mismatch between the proposed target audience of independent learners and the implemented website, which only supported blended learning opportunities. Thus, the target audience of independent learners weren't properly supported.

At the third level, the design team reach agreement in a dialectical process on the E-Learning Aspects. The design teams must decide what aspects are relevant in the design of their learning environment. This may include: Contextual, Pedagogical, Technological, Interface Design, Evaluation, Management, Resource Support, Ethical and/ or Institutional Aspects. The priority that is ascribed to any of these or other aspects will determine to a large extent the quality of the resultant learning environment. This was illustrated in the case of one website in this research, where the prioritisation of the technological aspect at the early stages of development resulted in the website being less effective as a learning tool. The failure to include any of these aspects can

also negatively impact on the quality of the learning environment. The absence of a contextual analysis, for example, can contribute to reduced usage of the software in the literacy centres.

At the fourth level, the design team reach agreement in a dialectical process on the Instructional Design process. None of the design teams used an explicit instructional design model in the design of the materials for the software examined. However, the *It Could Be You* design team unknowingly followed a process that was closely aligned to the Dick & Carey Instructional Design Model. Furthermore, they prioritised the instructional design process. Both of these actions resulted in the development of an effective learning tool. One design team realised that the materials and activities designed for their first prototype were poorly designed from an instructional design perspective, and attempted to rectify this by developing instructional design guidelines 'on the fly' as they built the second prototype. This is evidence of the need to raise awareness amongst design teams of the existence of proven Instructional Design Models and processes; and thus, is the reason why the final level of the workable process is devoted to the Instructional Design process.

The boundary between the outer two levels (see figure 11.1, label A) in this '*workable process*' is permeable, the design team can move between these levels in a dialectical process until they reach agreement on a suitable Life-cycle Model and Model of Implementation. Similarly, the boundary between the inner two levels (see figure 11.1, label C) of the 'workable process' is permeable, and the design team can move backwards and forwards in a dialectical process between elements at each of the inner levels during the design and development phases. This is because the consideration of the elements of the E-Learning Framework and the Instructional Design process are inter-linked, and changes to one may have implications for the inclusion or exclusion of elements of the other. The boundary (see figure 11.1, label B) between the outer two levels, namely, the Software Life-cycle Model and the Model of Implementation, and the inner two levels, namely, E-Learning Framework and Model of Implementation, is impermeable as the outer two levels are fixed at the outset of the software development process, and should not be changed during the process. In other words, the design team need to decide on what they are going to implement and how they are they are going to develop it, before they engage in the development of a specific type of learning

environment. Furthermore, the engagement of the design team and end-users in a dialectical process is key to the success of this 'workable process'. Design team members need to use this dialectical process in consensus-building.

11.3 Potential Interest to Professionals

The '*workable process*' may be of particular interest to the following professionals:

- Designers of online learning environments or e-Learning environments. This would include instructional designers and programmers in web development companies, technology consultants and educational technologists who may be interested in the framework that has been presented.

- Educators interested in integrating online learning environments in the classroom. These may include tutors and teachers in adult and continuing education, as well as those in literacy education who may be interesting in learning how online learning environments can be integrated or blended with classroom learning.

- Researchers and practitioners interested in exploring the possibilities that new technologies offer for educational development. These may include researchers in Research & Development units in E-learning companies, private institutes, colleges and universities, who may be interested in learning about the framework presented and further exploring or testing various permutations of this framework.

- Management of Organisations or Companies. These may include co-ordinators and managers of adult education programmes or training units in industry, who may be interested in learning how to integrate, manage and evaluate online learning environments in education and or training programmes.

- Project Managers who may be interested in learning about the process of developing online learning environments.

11.4 Conclusions

When I embarked on this research, I envisaged a streamlined process where the area under investigation would be examined in a logical and sequential manner, the software development process would be investigated and a framework for developing online learning environments would emerge. The reality was different. The process that emerged was unexpected, and alien to the underlying philosophy embedded in my initial pre doctorate proposal, which reflected the positivistic investigations undertaken in my under-graduate and post-graduate education.

On reflection, this research process could be considered as 'ordered chaos'; where my initial positivistic, scientific investigation of the integration of a particular technology transcended into a more organic exploratory, naturalistic inquiry into a virtual learning environment. The key influence in this paradigm shift was my employment in the School of Education Studies in the second year of my research; where I quickly became familiar with, and could see value in, other paradigms of research outside the Positivistic one. Furthermore, I was exposed to socio-cultural and socio-technological issues in discourses with colleagues undertaking research in these areas. This period of enlightenment resulted in a corresponding shift in my perspective on the nature of the research. My ontological perspective shifted towards viewing the nature of *being* in the context of my research as the facilitation of '*socio-technologically*' enabled beings. My epistemological perspective shifted towards an acceptance that this was a *subjective* piece of research. The methodologies used included both qualitative and quantitative methods, with the former becoming the primary research methodology.

A Hybrid Design Research Model was designed to guide the research process. A useful feature of this model is the recognition of those early investigations that lead to the development of a design proposal, i.e. the inclusion of separate cycles for 'Awareness of the Problem' and 'Suggestion'. Furthermore, the addition of a 'Contextual Analysis' cycle in the initial stages is useful in terms of structuring the research process into identifiable levels, i.e. Contextual, Developmental and Experiential levels. This Hybrid Design Research Model may be of particular interest to those involved in investigating alternate research perspectives and models.

The resultant research provides a *snapshot* of the process of designing, developing and integrating technology in literacy education in Ireland.

This research highlights the importance of a contextual analysis in the process of developing software for use in literacy programmes. In particular, it raises an awareness of the potential impact of the socio-technological and cultural environment on the effectiveness of the software to be introduced. It asks that learners be consulted at the outset of any technologically developments that is to be integrated into their learning environments. It also recognises the importance of in-depth contextual analysis in the choice of content, teaching strategies and learning activities to be integrated in the technological enterprise.

The findings show that tensions can exist in conflicting priorities within the design team, and between the end-user and the design team. These tensions can occur due to a lack of communication or misunderstandings within the design team, and can result in inadequate implementation of the software requirements. Communication mechanisms need to be developed or enhanced so that the design team fully understands what is required, and to ensure that the needs of the target audience are met. In particular, communication mechanisms that help foster dialogue within the design team are of paramount importance, so that clear and transparent information is provided to members of the design team and to those commissioning the software. The dialectical process, that was an integral part of the development process of the '*It Could Be You*' software, could be very effective if used to enhance the communication process in the development of online software, and to reduce the likelihood of dissonance within design teams. Furthermore, design team members need to be made fully aware of their roles and responsibilities, and who they each report to. In particular, the design team need to understand the ethos and culture underpinning the learning context and work in a collaborative, inclusive team-based approach towards meeting the needs of the end-users and realising the 'shared vision' in the creation of the virtual learning environment.

The main factors influencing the prioritisation of the technological or pedagogical aspects in this research were primarily connected to the *power-base* on the design team, with economic and time constraints also featuring. When the 'power-base' was held by

the software developer, technical considerations were prioritised. When the power-base was held by the instructional designer, pedagogic considerations were prioritised. The term instructional designer in this instance is used to describe those who understand how to transform materials into meaningful literacy learning activities, not to be confused with literacy subject matter experts who may have specialist knowledge in the area of literacy but may not know how to transform literacy materials for use in an online context.

Finally, identifiable elements of a *'workable process'* for developing online learning environments in literacy education in Ireland have emerged from this research. This process consists of four-levels; the consideration of a Software Life-cycle Model, a Model of Implementation, E-Learning Aspects and finally an Instructional Design process. This 'workable process' is unique in that it unites four formerly distinct ways of conceptualising aspects of the software development process, in a sophisticated manner that allows design teams re-conceptualise the development process. Furthermore, it emphases the importance of a dialectical process, both within design teams and between design teams and end users/ participants, in the consideration of aspects of this workable process. In addition, the declaration of this 'workable process' provides a practical and clear guide to future literacy software developers, and literacy experts/ instructional designers, who wish to engage in the development of learning environments.

Tensions sometimes exist between the way we design virtual environments and the way people learn. The socio-technologically enabled *learner* needs to be actively involved in the transformation and construction of meaning in the learning process. This active construction of meaning is dependent on how the instructional processes align with the characteristics of the learner. In virtual learning environments, the implementation and alignment of suitable instructional processes can be severely restricted because of the use of inappropriate, under-developed or *immature* technology. The tendency is to try to gear educational transactions towards the facilitation of information exchange, skills application, knowledge construction, social interaction and self-expression in the hope of fulfilling the needs of a general audience. However, in order to achieve better alignment between the individual learner and learning environment, educational transactions may need to be re-conceptualised to include notions of *context* and

narrative (as highlighted by Dillon, Prosser and Howe, 2004, p.57). This research was conducted at a time when the online technology was evolving and, as such, opportunities for exploring the effectiveness of the instructional design processes in terms of its alignment with learner and learning environment, and the examination of *context* and *narrative*, was limited. This aspect will be examined in future research, as highlighted in the recommendations.

In conclusion, this research has captured a snapshot of rapid developments in the context of literacy education. However, this snapshot is a fragment in the mosaic of developments within the wider education arena, the quality of which is still awaiting substantive and critical evaluation. Therefore, the 'workable process' that has emerged from this research is suitably poised to provide a basis for other instructional designers, educational technologists, researchers, and project managers to critically reflect on the entire software development process, and to conduct comparative analyses of other software development enterprises. The importance of a contextual analysis, collaborative teamwork and the engagement of a dialectical process in reaching consensus is critical to the success of this 'workable process'.

11.5 Recommendations

A number of recommendations result from this investigation:

Firstly, further investigation is required to determine how literacy learners interact in a virtual learning environment. Literacy learners need to be consulted from two perspectives - their role as participant in the design process and their role as a learner. Literacy learners need to be observed whilst interacting 'live' in literacy tuition, where technology has been integrated. This should provide useful information for the design of the graphical user interface and also for decisions on content or learning activities that are to be included or excluded. The problems of identifying literacy learners due to concerns of anonymity and confidentiality can be overcome by contacting learners in centres where literacy is '*out of the closet*', hence where this issue has been minimised.

Secondly, more in-depth research is needed into the design of online tracking mechanisms that are used to record learner interactions and chart progress. These tracking facilities are currently used to collate and present very basic information on numbers accessing websites, most popular elements and information about client software; a more cohesive system could be used to provide detailed quantitative information on learner interaction that could be used in conjunction with 'observed data' to provide a holistic account of learner interaction in a virtual learning environment. This would be of interest to those wishing to investigate further how these online tracking mechanisms could be used to collate quantitative information in particular for research purposes, in a concurrent mixed methods approach.

Thirdly, an online interactive learning test-bed, in the form of an online literacy 'tuition and support' learning environment, needs to be developed that will support multi-faceted study and research into literacy education. At present, similar learning environments have been established in initiatives, such as the Dundalk Learning Network, to support investigations into primary and post-primary education. No such facility currently exists for literacy research in the South of Ireland; literacy research developments in existence are fragmented and experiences are not shared. Design teams would benefit from the shared-learning of other developers and developments in an integrated learning network.

Fourthly, there is scope for the examination of the *'workable process'* in the development of software in domains outside of literacy tuition and support. The development of learning environments, in particular online learning environments, has increased dramatically in primary and post-primary education. It would be interesting to examine the development process for software in these contexts, in light of the *'workable process'* as highlighted in this investigation, to ascertain whether it is applicable or relevant.

Also, with the rapid integration of non-nationals in mainstream literacy programmes in Ireland, further investigation is needed into ascertaining how online software, in particular, can be appropriately developed to support multicultural learning environments. Furthermore, additional research is needed to ascertain how English as a Second Language can be supported in a socio-technological context.

Finally, more research is needed into the use of this Hybrid Design Research paradigm and model in investigating design processes. Therefore, those involved in investigating or examining hybrid research models or paradigms; specifically, the Hybrid Design Research Paradigm and the corresponding Hybrid Design Research Model that were used in this research process, may be interested in conducting comparative studies into the use of this research models in other design-based scenarios.

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