

**Integrating On-line Learning Technologies
into Higher Education:
A Case Study of Two UK Universities**

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Abstract

This dissertation presents an in-depth, qualitative case study that documents the efforts of two UK universities to integrate on-line learning technologies into their teaching practices and course design. It has been claimed that on-line learning technologies have the capacity to transform the provision of higher education. In order to address such claims, participant /observer research was conducted at two institutions, simultaneously, over a period of 18 months. Using ideas from the sociology of association, the organisational, pedagogic and technological activities surrounding the case study institutions' purchase and integration of two leading on-line learning technologies are described. Distinctions between different areas of activity both in and around the university are represented as they emerged 'in practice', allowing ostensive divisions between, for example, 'the educational', 'the technological' and 'the organisational' to be temporarily, placed to one side.

Building on these empirically grounded findings, this thesis considers the question of 'educational values'. Powerful discourses relating to knowledge, learning and the 'market for education' currently compete for primacy over pedagogic, epistemic and educational interests. By rejecting normative ascriptions of value, in either economic or moral terms, this thesis considers 'values-in-practice', or 'valence' as the enacted priorities that are set as part of organisational work. Through this analysis, values are understood as the basis upon which lines of reason or 'ways of reckoning' are constructed. This analytical approach is shown to be particularly relevant to the study of complex, integration work, where totalising or dichotomous conceptions of knowledge prove insufficient to capture or inform processes of negotiation. Together, the concepts of valence and ways of reckoning serve to support critical reflection on how educational values are constructed in the case of on-line learning. It is argued that only by understanding education as a collective endeavour, capable of promoting and supporting substantive diversity, can educational priorities be properly assessed and asserted.

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List of Acronyms

ANT	Actor-Network Theory
IS	Information Systems
ICT	Information and communication technologies
IT	Information technology
JISC	Joint Information Systems Committee
LDAP	Local Directory Authentication Protocol
LSE	London School of Economics
MLE	Managed Learning Environment
SITS	Systems InTuition
STS	Science and Technology Studies
THES	Times Higher Education Supplement
UofB	University of Brighton
VLE	Virtual Learning Environment

Chapter 1 Introduction

1. Introduction

This dissertation presents an in-depth, qualitative case study documenting the efforts of two UK universities to integrate on-line learning technologies into their teaching practice and course design. The study takes an organisation-wide view of technical and pedagogic activities surrounding the institutions' purchase, integration and dissemination of two leading on-line learning technologies. As this introductory chapter will show, the association of on-line learning technologies and higher education provision attracted the interest of governments, global conglomerates and technology entrepreneurs. The combination of these interests served to create a unique period in higher education history. As a dense site of social and political concern, education represents a special case among examples of technological reform. The aims of education and educational institutions have traditionally been associated with explicit dialogues concerning values. The example of on-line learning technology integration therefore provides an important illustration of the intricacies involved in fusing technological design with social concerns. In addressing these issues, this dissertation makes an important contribution to research into technology, education and social values.

Field work was conducted at two institutions, simultaneously, over an 18 month period from July 2001 to December 2002. During this time there was intense speculation about the role of Information and Communication Technologies (ICTs) in transforming the future of university teaching. Interest in the potential that technology, in particular the Internet had to hold for learning and teaching was not limited to students and teachers. The concept of learning via the Internet or 'on-line learning' became popular with policy makers, private sector entrepreneurs and speculative investors. This research sought to account for the competing influences that universities faced at this time by focusing on the details surrounding the integration of on-line learning technologies at two UK higher education institutions. The outcome is a vivid account

of university life and the multiple agendas that are brought to bear on educational institutions today.

The introduction to this thesis is divided into 4 sections. The first section is intended to provide the reader with a sense of the distinctive time period during which research took place. Some powerful visions of how on-line learning technologies might transform higher education provision came into circulation during this time. These created a very particular climate for integration. In order to familiarise the reader with this climate, three examples taken from the primary and secondary literature are described. Drawing on these examples, the second part of the introduction provides an overview of the research design, explaining how the case study institutions were selected and field work was carried out. It also presents the research questions and describes the theoretical foundations of data collection and analysis. In the third section, key terms that are used and developed over the course of the dissertation are explained. The final section provides the reader with a brief overview of each chapter, in order to show how prevalent themes and key terms are developed over the course of the thesis.

1.1 On-line learning and higher education

During the mid-nineties until early 2000, higher education institutions across the globe were drawn into far-ranging debates concerning the implications that Internet based technologies would hold for education provision. Discussion was initially focused around the consequences that on-line technologies would hold for distance education. The ability to present course information and provide support to students over the Internet was taken to constitute a 'new paradigm' in teaching and learning at a distance (Dutton, 1999). However, distance learning in higher education has been traditionally associated with 'scaled-down' models of education provision compared to established campus-based models. For this reason, discussion amongst educators regarding teaching and learning implications of on-line learning technologies quickly became overrun by political debate and market-based speculation. Instead of a focus on what implications the Internet held for improving opportunities for student learning, discussion became moulded around concepts of the 'virtual university' and 'global education' (Garnham,

2000; Rumble, 2001). This thesis takes a critical approach to these concepts, focusing attention on the interests and circumstances from which they arose.

One important aspect of these circumstances was the distinctive market conditions that underpinned discussion and fuelled debate. High levels of speculative investment in Internet start-up companies had brought about a steep rise in technology share prices (Financial Times, 2001). Discussions concerning the transformation of higher education became entangled in these conditions, giving rise to unprecedented levels of hype and speculation (Clegg et al., 2003). The concept of 'global education' came into circulation at this time and claims that the development of on-line learning technologies would address the education needs of countries around the world became commonplace. Uncritical attitudes towards development concerns and a focus on market-based assessments of how this potential would be realised met with mixed response. The lines between educators and those promoting private sector on-line learning endeavours were by no means clear cut. Some educators became spokespeople for global initiatives, whilst others took a defensive stance (Rosenfield, 2000; Noble, 2002).

Three aspects of the climate surrounding integration of on-line learning technologies are discussed further in the following section. Illustrative examples taken from debates concerning the 'virtual university', the market for on-line learning and global education are provided. The purpose of drawing out these themes at this stage in the thesis is to provide a context that will enable the reader to assess how these issues were accounted for in the research design which is outlined in section 1.2. The following section illustrates the concept of the 'virtual university' which achieved popularity during the time period in question.

1.1.1 The 'virtual university'

The concept of the virtual university came to represent a number of different dimensions to the possibilities presented by on-line learning. Firstly, it sought to conjure a particular experience of distance education. It suggested that students would be able to embark on distance learning courses from anywhere in the world, with all relevant teaching, learning and administrative interactions taking place via the Internet (Cornford, 2000). Secondly, it

suggested the transformation of the physical infrastructure of the university; with all interaction taking place on-line, there would be no need for classrooms and traditional teaching facilities. One outcome of discussions based around the concept of the virtual university was that it created a “resurgence of interest” in distance education debates (Dutton & Loader, 2000). The possibility of introducing further student-centred approaches to learning and the potential to increase access to education were arguments that distance educators had been asserting since the 1970s (Thorpe, 2002).

The change to infrastructural and organisational practices inferred by the virtual university were less familiar. The introduction of new technologies suggested opportunities for partnership, collaboration and a redefinition of university services (Baer, 2000). However, the prospect that responsibilities for student selection, course content development, tutorial support and library services could be divided up between different for-profit and not for-profit organisations was a thinly veiled aspect of the virtual university ideal (Harris, 2000). For critics, the disaggregation of university education inferred by this model represented a source of serious concern (Agre, 2000). The central role allocated to technology in these reforms brought with it the fear that this was ‘technology-led’ change and that educational motivations regarding new reforms were being sidelined (Rumble, 2000; Swanson, 2002). According to the rhetoric of both policy makers and commercial organisations involved in promoting on-line learning, higher education was being swept up in the same ‘inevitable tide’ of global IT-enabled change that had transformed industries and public sectors across the world (Clegg et al., 2003).

The strength of these claims was only mitigated by the difficulty of ascertaining precisely *what kind* of Internet based technologies were implicated and exactly *how* they would transform higher education provision. Lack of specificity and the absence of empirical evidence to support assertions ultimately undermined the credibility of the virtual university as a concept and a reality (Cukier et al., 2000; Barab, 2003). Garnham goes further than this, linking the virtual university concept to a suite of terms that he understands to have originated from policy rhetoric and reform based on visions of the ‘information or knowledge society’ (2000:140). He goes on to say,

...the term has become largely meaningless and the vision bears very little, if any relation to any concretely graspable reality. It therefore operates not as a useful concept for theoretical analysis but as an ideology. (2000:140)

To many authors, the extent to which on-line learning and its association with technology-led reform became the object of political attention was a matter of critical concern (Cornford, 2000; Naidoo, 2003). However, there was another significant sphere of interest exerting influence over conceptions of on-line learning at this time. The arguably unique market conditions that surrounded early on-line learning developments played an influential role in shaping perceptions of on-line learning. These conditions are explored in the following section.

1.1.2 The on-line learning market

The development and promotion of Internet based learning technologies coincided with a steep rise in the price of technology shares. The scope of claims as to what these technologies would achieve was amplified by both technology vendors and the media through 'technology hype' (Financial Times, 2000). Financed through speculative investment, numerous commercial companies were founded with the objective of developing on-line learning technologies. A number of these initiatives achieved high-profiles and involved partnerships with prestigious universities. Among these were Pensare, who developed technology for Duke University in the US; Quisic, who partnered with, among others, the London Business School; NYU online, created as a private sector arm of New York University; and Chicago University who founded a project called 'Fathom' and a global education consortium called Cardean University.

The combination of speculative investment, new technology and advantageous market conditions led to a profusion of bold statements proclaiming the inevitable transformation of higher education. A good example of these statements is cited by Ryan et al. (2000). In this example, it is the inevitability of market forces that are appealed to, but it was just as common for the lure of technology or the demands of economic development to occupy the same role.

“Market pressure is going to force educators to think about things unconventionally. [...] Every sector of business that has gone through this struggle has always said ‘we can’t do it’. That’s what healthcare said, that’s what the automobile companies said. But the markets do work, and change does come”. (Peter McPherson, President of Michigan State University in Ryan et al., 2000, p. 1)

Amidst the sweeping statements that comprise this quote, there is considerable irony in insisting that educators should think differently whilst, by the same token, compelling them to conform.

Barring those academics who became spokespeople for commercial on-line learning ventures, reactions from within the higher education sector ranged from cautious optimism, to indifference, to hostility, with the majority of institutions in the UK operating a ‘wait-and-see’ strategy for adoption (Collier, 2001). In North America, events appeared to move more quickly. The University of Phoenix established itself as a multi-million dollar on-line learning provider and the University of Chicago played a key role in establishing UNext.com, the private sector arm of the ‘Cardean university’, an on-line learning alliance of prestigious academic establishments, including the London School of Economics (LSE). However, substantial amounts of criticism were voiced by academics in North America, who forcefully condemned initiatives that they saw as transforming the university into ‘a digital diploma mill’, forming part of a general effort to fragment and marketise higher education. (Winner, 1997; Noble, 2002).

This less inspiring vision of education was reinforced by some bullish advances from North American private sector companies toward potential UK public sector partners. Sir John Daniel, Vice-Chancellor of the Open University, described one such advance in an article he wrote for the Times Higher Education Supplement. He refers to a disagreement between respective parties over whether so-called “legacy distance learning”, such as the Open University practices which makes use of a range of teaching media including the non-computer based, should be considered obsolete in the face of new technologies.

The clash of expectations reached a climax when an aggressive American dotcom, whose pressing embrace we were politely trying to resist, threatened to buy the Open University if we would not partner with them. By the middle of 2000, the

aggressive dotcom was itself put up for sale, the NASDAQ index began its slide and a more sober assessment of online learning became possible. (THES, May 24th 2001)

As Daniel points out, the courting of traditional universities by potential private sector partners died off rapidly when the prices of technology shares began to fall in April 2000, as did many of the companies who had instigated relations. With these events, the ‘great debate’ that seemed to have been started about the future of higher education appeared to dissipate overnight.

The significance of these visions and claims to discussions concerning on-line learning was such that, in this research, they were ascribed their own conceptual label: ‘claims to transformation’. The grammatically cumbersome ‘to’ is intended to draw attention to the fact that these are appeals ‘to’ an *idea* of transformation that may, or may not, take place in the future. Whilst these claims can be evocative, the scale of transformation they describe and the futuristic basis of their assumptions mean that, to all intents and purposes, they *cannot be substantiated* (Introna & Tiow, 1997). One final illustration of these types of claim is discussed below.

1.1.3 Global education

Among the claims to transformation that arose from this period came assertions that on-line learning would revolutionise access to education for people around the world. As well as some utopian visions of outcomes this would bring, there was also considerable scepticism. An emphasis on global markets and an absence of any substantial engagement with development concerns led to criticisms that education was being caught up in a general trend of globalisation (Sahay & Nicholson, 1997; Naidoo, 2003). Some typical examples of the kind of claims to which authors objected appeared in Andrew Rosenfield’s testimony before the US Web-based Education Commission in July 2000. Rosenfield is a Senior Lecturer in Law at the University of Chicago and founder of the Chicago-based UNext.com In this speech he argues for the deregulation of ‘scalable education businesses’ of which UNext.com is an example.

Internet-based learning has profound advantages for two groups. Firstly, those who, because of the happenstance of financial and geographical circumstance, never could hope to attend a physical college or university on a full-time basis, and secondly, those who already have completed their university education and seek continued lifelong learning to maintain their edge or simply to enjoy the pleasure of learning at a time, place and pace convenient to themselves. (Rosenfield, Testimony before the Web-Based Education Commission, 20.07.00)

In this address, the advantages and transformations offered by Internet-based learning would be most profoundly felt by the unfortunate and the keen. In UNext's publicity documents however, claims focus on the consequences of *not* investing in today's 'knowledge-driven society'.

The vast imbalance between the supply and demand for high-quality education has opened up an enormous, untapped global market. By all accounts, countries, companies and individuals that don't invest in knowledge are destined to fall behind. UNext, The idea, 2000.

An example of this untapped global market can be drawn from Rosenfield's aforementioned testimony to congress in which he explains:

If China were to achieve the college participation rate of the US (and it obviously lacks the resources to do so quickly, but make no mistake it will achieve this goal and likely faster than most people today think possible) it would need to build perhaps as many as 18,000 average US-sized colleges. (Testimony before the Web-Based Education Commission, 20th July 2000)

The 'market' for education is depicted as voracious, driven by the all-consuming needs of the 'happenstance' disadvantaged. In these examples, it is not merely the fate of higher education which stands to be transformed by Internet based learning but the fates of individuals, companies, countries – the whole world.

Obviously, these bold claims were and are speculative. However, as higher education institutions began to consider how they should respond to the opportunities presented by on-line learning technology, this was the decision making climate they faced. A "whirlwind" of hyperbole and rhetoric took the place of clear information (Barab, 2003).

1.2 Overview of research design

The distinctive conditions that surrounded the integration of on-line learning technologies into higher education posed some difficult challenges with respect to research design. Two characteristics in particular required attention. Firstly, the research area was subject to dynamic change. A 'snapshot' view of these events could not capture the sweeping changes taking place and the influence they had on higher education institutions. Secondly, in terms of the sector as a whole, the scope of integration activities taking place was far-ranging, from the pioneering experiments of lone academics, to institutional alliances with global private sector partners. Instead of factoring out these turbulent conditions, the aim of this research was to provide an account of integration activities that reflected the diverse and turbulent experience of higher education institutions during this time. Realising this aim involved making a number of key research design choices.

The most fundamental of these choices were that this research should be qualitative, longitudinal and empirically grounded. In this way, the day-to-day experience of higher education institutions and the decisions, choices and approaches they adopted toward on-line learning technology integration could be captured. By focusing attention on the everyday details of technology purchase and integration, the implications of contemporary debates were placed alongside everyday practices. Situating integration activities in this way created an opportunity to consider the contrasts between claims to transformation and the ways in which these claims were born out in the responses of higher education institutions. The second most important decision was that this research should take account of institution-wide issues concerning on-line learning technology integration. According to this standpoint, educational, organisational and technical priorities were treated as they appear in everyday institutional choices where each of these areas of concern can be bound to the same issue.

Conducting empirically grounded research among fast changing events required a robust theoretical framework and a focused line of questioning capable of iteratively responding to developments. The theoretical framework used for data collection was actor-network theory (ANT), also called the 'sociology of association' (Callon, 1986; Latour, 1987). It also draws heavily upon the work of authors who write about information infrastructure (Star &

Ruhleder, 1996; Ciborra, 2002). The advantage of ANT is that it is an empirically grounded theory that encourages particular theoretical sensitivity toward the study of technology. ANT also supports the study of dynamic events through the methodological technique of ‘following the actor’ (Monteiro, 2000). According to this technique, social actors are understood in terms of the associations and alliances they form. In this way, theoretical assumptions about the social domains that actors pass through are pushed to one side, in order for the agency of the actor to take precedence. This was particularly significant to the study of on-line learning technologies. As the primary actor that this research sought to follow, these technologies underwent a number of transformations on account of the alliances and associations they made. The sociology of association supported the study of these activities, allowing the character of uncertain events and multiple interests to remain intact.

While ANT equips the researcher with a sound basis upon which to conduct data collection, the theory does not offer much assistance in the task of data analysis. For this purpose, techniques were adapted from grounded theory (Glaser & Strauss, 1967). ANT and grounded theory compliment one another because of the importance both theories attach to empirical data collection. Grounded theory analyses are oriented toward the generation of theoretical concepts through a combination of both structured and intuitive involvement with the field work data (Strauss & Corbin, 1990). Two core concepts were generated from the analysis of data from this thesis, ‘valence’ and ‘ways of reckoning’. These concepts are constructed over the course of the thesis and play a key role in the analysis of field work data.

Three research questions formed the focus of research activities. The first of these acted as a basis upon which to rationalise early research activities, prior to the start of field work. The second was the core research question around which data collection activities were prioritised. The third question directed activities associated with both data collection and analysis towards a focus on ‘educational values’.

1. What are the technologies involved in on-line learning and who is developing them?

2. In the case of two contrasting UK institutions, how is the integration of on-line learning technologies taking place?
3. What are the debates, activities and concerns arising from the introduction and integration of these technologies and what do these debates suggest about educational values?

The question of educational values is used in this dissertation as a measure by which to assess the powerful claims surrounding the introduction of on-line learning technologies. The concept of values is developed both analytically and theoretically over the course of the thesis providing a very interesting contribution to questions of technology and social concern.

In order to reflect the diversity of universities' experience across the sector, a case study approach was adopted that encompassed the integration activities of two contrasting UK institutions. Three categories of activities that universities were engaged in were identified: individual departmental initiatives to use on-line learning technologies for a particular unit or programme of study; the formation of strategic partnerships with private sector companies; and the founding of university consortia for the purposes of providing on-line courses (Collier, 2001). Taking into account the scope of activities indicated, two institutions were selected: the University of Brighton and the London School of Economics and Political Science. The case study institutions were selected on the basis of the contrasts they offered, both in terms of their institutional make-up and their placement in relation to the global opportunities that were on offer. It was envisaged that the two institutions would embark on very different approaches, given early involvement with on-line learning initiatives. However, following the collapse of the technology market, both institutions adopted very similar approaches, both turned their attention inward to focus on events taking place within the institution and both purchased centralised learning technologies.

1.3 Key terms

There are a number of key terms that are central to the development of the thesis that require further qualification before proceeding. The first of these is 'integration'. The term integration is taken from the Information Systems (IS) literature on infrastructures (Ciborra, 2002; Monteiro & Hepso, 2000). It describes the processes involved in joining together complex information infrastructures. In this research, the concept of integration is extended to refer to any area of work where day-to-day practices are rearranged in order to accommodate new technologies. This includes educational practices as well as technical and organisational activities. As opposed to diffusion, which focuses on the processes underlying why one form of technology is adopted over another, integration (as it is used here) tells the story from the standpoint of the organisation 'looking outward' into the technology markets. According to this definition, alliance forming and partnership activities, as well as the details of technology purchase and involvement with technical systems are all included under the heading of integration.

The next core term which requires qualification is 'on-line learning technologies'. The absence of a clear indication as to precisely what technology or technologies would form the focal point of universities' involvement with on-line learning was a particularly challenging aspect of the research design for field work. 'Tracking down' these technologies, finding out what specific technical capabilities were being referred to and how these capabilities would serve to enhance teaching and learning activities in higher education became a significant aspect of research activity. Broadly speaking, the technologies referred to were software applications used to present course materials via the internet. The volatile market conditions surrounding the design of these technologies meant that it was only until about half way through field work that a definitive form emerged. Retaining a sense of the volatility and uncertainty of events was a defining characteristic of the research design. Therefore, various methodological techniques were used in order to preserve an empirical focus on specific technologies whilst taking into account the shifting terminology and reconceptualisations that were present in the field. Over the course of data collection, the term 'learning technologies' became institutionalised at both the case study universities. This term is therefore used interchangeably with on-line learning technologies throughout the thesis.

Two important key terms that are also central to the thesis are ‘valence’ and ‘ways of reckoning’. These concepts are theoretical contributions derived from a comprehensive analysis of the empirical data. The concept of valence aims to create an analytical basis according to which belief, priorities, personal philosophy and strong emotion can be linked to rationales concerning technology and technology design. These attributes proved to be particularly relevant to the study of technology in the context of educational design. The concept of ways of reckoning directs attention to the enactment of rationality and aims to include a spectrum of possibilities that challenge conventional conceptions. Together these concepts provide an ‘in practice’ view of priority setting that allows the significance of diverse concerns to come to light.

Finally, there are three key terms which are used throughout the case study that require qualification. The first of these is ‘the course’ where it is used to refer to an academic programme of study. There is a measure of ambiguity in the general usage of this term which has been deliberately retained. The course can refer to an individual component within a larger programme of study (referred to in some educational systems is as a module) or else, it can describe an entire programme of study in itself, such as for example, an undergraduate degree. The rigid definition of these terms is a matter of some debate within education circles and analytically, there were distinct advantages to allowing this term to ‘hover’ between two different meanings. The second term which might be open to misinterpretation is ‘administrator’. This term is one of a number that differ substantially when applied to North American institutions compared to institutions in the UK, as well as between different institutions in the UK. In the UK, an administrator is most commonly a person that deals with local organisational concerns at a departmental level. Although an administrator may have responsibility for managing other staff, in itself, administration does not denote a tier of university management as it does in the US. The other term of this nature is Faculty, which in the US refers to a member of academic staff and in the UK refers to an academic department within the university. There are other examples where educational terminology differs between the UK and the US. However, these are the three terms most likely to be a potential source of confusion.

1.4 Contribution

The introduction of on-line learning technologies into higher education is an important example of the multiple interests and concerns that come to bear on technology and education in contemporary society. It is argued that the social and technical processes associated with the integration of new technologies within this context afford important insights into the nature of technology and social values. Within the education and technology literature there is very little precedent for treating the diverse topical and theoretical issues raised by this example of technology integration within the same analytical frame. Disciplinary conventions tend to separate issues relating to organisational, educational and technical domains into different spheres of interest, making it difficult to refer to the inter-relationships that exist between them.

This thesis addresses these issues in three different ways. Firstly, these issues are addressed through research design. An 'in practice' view of integration and an empirically grounded approach to data collection and analysis, prioritise events taking place in the field sites over theoretical distinctions. Secondly, they are addressed through insightful use of actor-network theory (ANT) to draw out the implications of relationships and inter-agencies without recourse to the conventions of a particular subject discipline. Finally, the development of the two core theoretical concepts of valence and ways of reckoning form an analytical basis upon which to draw implications from areas of social study traditionally treated as distinct. Together these concepts form an important contribution to the study of technology and social values that can be extended to other areas of social practice in which these two distinctive areas of concern converge.

1.5 Structure of the thesis

In this introductory chapter the topic of on-line learning has been introduced. In so doing, some distinctive characteristics of the time period during which on-line learning technologies first emerged were illustrated. These included the concept of the virtual university, the on-line learning market and issues surrounding the concept of global education. The rhetoric and

hyperbole that characterised this time period were drawn to the foreground. Following this, a description of research design and key terms was provided.

Chapter two provides a review of academic literature relevant to the study of learning and technology. Firstly, it revisits the issue of policy rhetoric raised in the first chapter by introducing the term ‘learning discourse’. There follows a discussion of the learning literature and some important questions regarding ‘theoretical parameters’ and ‘social domains’ are raised in relation to what is considered ‘context’ in learning research. The opportunity is taken in this chapter to introduce theories of technology to issues relating to on-line learning and raise questions concerning the inclusivity of education research. Having addressed these theoretical issues, this chapter then turns directly to the on-line learning technology literature. It looks specifically at findings relating to the higher education sector and to those authors who have written about on-line learning technologies in relation to educational values.

Chapter 3 describes the important contribution that choice of methodology has made to this research in contending with a dynamic research area and an emergent technology. The current IS debate regarding ‘situated’ research is used to highlight the different ways in which empirically grounded field work can be framed. The implications of these debates are discussed in relation to the development of the research questions and the choice of case study sites. The theoretical framework for data collection is described in some detail and the distinctive approach to technology asserted by this framework discussed. This standpoint is further developed in relation to theoretical questions relating to the study of infrastructure. Following this the key theoretical concepts of ‘valence’ and ‘ways of reckoning’ are introduced. The chapter ends with a detailed explanation of data collection and analysis and a discussion of the insider / outsider status of the researcher.

Chapter 4 introduces the two case study institutions providing important background information about the constitution and organisational make-up of each. It also provides details of the basic technological infrastructure supported by both institutions. The second half of this chapter provides details of each institution’s early involvement with learning technologies. Details are provided of individual initiatives as well as LSE’s involvement in a

global education consortia and UofB's experience of purchasing an on-line learning technology, in this case Blackboard.

Chapter 5 is divided into two parts. Due to the timing of field work, the focus of integration activities at each institution differed, with UofB focusing on data integration and LSE focusing on integration with library resources. The first half of the chapter concerns UofB and provides an in-depth account of the integration issues it faced. The second half of the chapter concerns LSE and describes the ways in which academic teachers chose to integrate WebCT into their teaching practice. Of particular significance were the ways in which academic teachers chose to integrate library resources through on-line reading lists.

Chapter 6 is divided into three areas from which implications are drawn. The first area concerns the relationship between education and the market, and provides an analysis of early involvement with on-line learning technologies at both institutions. The second part is an analysis of data integration activities at UofB and the third part is an analysis of pedagogical integration activities at LSE. The theoretical concepts of ways of reckoning and valence are reintroduced in this chapter. They are both used and constructed throughout the analysis. Their relevance is described in relation to discussions of cross-sector partnerships; the character of technology and technical integration; and significance of course design as a key pedagogic practice.

Chapter 7 provides an overview of the thesis as a whole, linking research findings together with the theoretical propositions set out in the first part of the thesis and analytical implications described in chapter 6. A summary of the core contributions that this research makes to IS, education and technology literature is provided before some key areas of future research are identified. Among these is a definition of the concept of 'education infrastructure' that emerged over the course of the thesis.

In the literature review which follows, research relevant to the study of learning and technology is discussed. There is a prevailing tendency to separate technical, organisational and education domains within educational research into learning. Therefore, in order to derive a measure of inter-textual coherence, the first two parts of this review explore some of the

contextual and theoretical issues associated with learning and technology research. The final section presents findings from the on-line learning literature.

Chapter 2 Critical Literature Review

2. Introduction

In this chapter a critical review of academic literature relevant to the study of on-line learning technologies is provided. As a body of literature, research into learning technologies is extremely diverse (Conole et al., 2004; Oliver, 2002). This diversity stems from the scope of situations and environments into which technology has been introduced and the range of theory used to underpin empirical research. Understandably, the majority of literature focuses on the implications of learning technologies for learning itself, drawing upon theories of learning and knowledge to do so (Laurillard, 2002; Ryan et al., 2000; Squires et al. 2000). This overall orientation of the literature is somewhat at odds with the aims of this research, which was not specifically designed to address issues relating to student learning. The primary objective of this research was to understand the associations that learning technologies have been drawn into during the course of their integration into higher education institutions. Student learning is clearly a fundamental aspect of these associations. However, a focus on learning was deliberately resisted in this research. This resistance was a response to tendencies within the learning technology literature for concern with learning to become *exclusive* both empirically and theoretically. Exclusion on this basis conflates with one of the primary aims of this thesis, which is to establish grounds for understanding issues associated with the integration of learning technologies as *mutually constitutive*.

In order to understand how a basis for mutual concern and constitution can be achieved, it is first necessary to understand the theoretical landscape within which learning technologies sit. For this reason, relevant literature relating to learning and learning theory is addressed in the first section of this review. Part of the reason why the learning technology literature appeals to such a wide range of situations is because respectively, learning and technology have achieved such broad standing within contemporary discourse. The previous chapter provided examples

from three areas of discourse in which on-line learning technologies were implicated; 'the market', global education and policy drive. In order to consolidate these inter-related aspects of learning technology research, the concept of 'learning discourse' (Grey, 2001; Contu et al., 2003) is introduced in this chapter. By considering literature on learning as part of a 'broad ensemble', as these authors do, the complex theoretical parameters and social domains that characterise this literature begin to surface. The parameters and domains that are defined predicate to some extent 'what' can be studied in relation to 'what'. For example, this literature does not offer any theoretical approaches that allow the researcher to draw relationships between social domains such as 'the organisational', 'the educational' and 'the technical'. The reality that a learning technology in-use *simultaneously* occupies multiple social domains and is understood in relation to a range of different areas of work is therefore difficult to depict with reference to this literature.

Whilst theories of learning receive considerable attention within this literature, theory of technology is largely overlooked. Reasons for this imbalance are addressed in the second section of this chapter, where questions concerning the theorisation of technology are explored. To some extent, a synthesis of learning technology literature is impeded by an inherent imbalance between the philosophical treatment that learning and technology receive. The theoretical density of the literature is unevenly distributed, with learning receiving copious attention and technology receiving virtually none (Alavi & Leidner, 2001). Although a substantive part of the learning technology literature addresses technological concerns, for the main part these concerns are limited to the practical detail of technology design. There is a tendency for focus to rest upon design issues that relate to specific applications developed to serve a particular pedagogic end (cf. Hinostroza & Mellar, 2001; Ben-Bassett Levy et al., 2002). Without appropriate theoretical treatment it becomes difficult to draw inter-textual conclusions between specific examples of learning technology use. In addition, the implicit assumption that technology does not merit theoretical attention can lead to characterisations of technology as an intermediary (Callon, 1991) that has no bearing or influence upon a situation, or else, that technology itself enacts a determinate logic that resists intervention (Winner, 1993).

This is an area in which IS has a significant contribution to make to literature on learning technology. By enriching descriptions of the IT artefact (Orlikowski & Iacono, 2001) and by locating that artefact within its broader infrastructural (Star & Ruhleder, 1996) and institutional ecology (Star & Greisemer, 1989) it is argued that greater scope is afforded for understanding how on-line learning technologies are being integrated into higher education. Whilst on-line learning has not received extensive treatment in the IS literature, the opportunity is taken here to draw upon this literature and introduce relevant concepts regarding the theoretical treatment of technology. In this way, their significance with respect to the study of on-line learning technologies can be assessed. This section on technology ends by asserting the concept of education as a collective endeavour that extends beyond isolated learning and teaching interactions between students and teachers. It provides an example of an approach which, it is argued, has the potential to address these concerns and afford greater inclusivity to learning technology research.

With these questions in mind, the final section of this chapter turns directly to on-line learning technology literature relevant to the study of higher education. The aim of this section is to examine how learning technologies have been drawn into recent debate concerning the role of higher education. Initial conceptions of on-line learning as a purely distance learning concern shaped debate within the literature, both in terms of the implications that on-line learning held for higher education institutions, and in terms of the learning and teaching issues that were focused upon. In comparison with traditional distance learning practices, on-line learning was understood to afford greater interactivity between students and teachers. For this reason, much of the current on-line learning literature focuses on analyses of on-line discussion forums that enable asynchronous communication between participants. This section draws to a close by focusing attention upon those authors who have chosen to measure debate on on-line learning against the 'broad aims' of education, often referred to as 'educational values'.

2.1 Learning and technology

Discussion as to what learning is and how it is brought about are at the heart of educational endeavour and, as evidenced by the organisation and management studies literature, have increasingly been viewed as relevant to organisations and the workplace (Senge, 1990; Argyris,

1992; Wenger, 1998). As an artefact, technology has found its way into a similarly diffuse range of social domains, with depictions of ubiquitous computing (Weiser, 1993), the Internet explosion (Dell, 2000) and the role of IT in attaining competitive advantage (McGoey, 1998). The combination of these broad references all serve to create a sense in which learning and technology should be central preoccupations in contemporary research. However, whilst learning and technology are widely referred to, few theoretical frameworks exist that support a detailed study of both without creating two separate, unrelated worlds; that of technology and that of learning. In constructing a review of on-line learning research, the first problem is, therefore, one of *narrowing down* references to technology and learning in order to discover specific lines of enquiry. The second problem is one of retaining sufficient *details* regarding learning and technology respectively to understand what an association of the two brings. In this section, the implications of both these issues are discussed in relation to literature concerning learning, whilst the section that follows - section 2.2 - focuses on their implications with respect to technology.

In this research, the concept, 'learning discourse' is used to address learning as a phenomenon which has been implicated in a broad range of social practice (Grey, 2001). This concept offers a critique of the ways in which reference to learning has managed to achieve such broad appeal. Grey (2001) and Contu et al.. (2003) place learning within a critical frame, challenging its emergence as an unequivocally 'good thing', and questioning the breadth of status it has achieved. Within the concept of learning discourse, reference to learning is understood as part of a 'broad ensemble'. This encourages consideration of literature pertaining to learning as a 'body of work' and draws into the foreground the range of subject disciplines, theoretical models and social domains that are implicated in learning related research. It is argued that a consequence of this scope is not that it creates an open field of research with ample opportunity for drawing inter-textual conclusions, but that it creates a highly delineated one. Each theoretical model generates its own sense of social domain and embodies distinct parameters that define 'what *counts* as content' within an empirical scenario. Implications of learning discourse, and the theoretical landscape referred to within learning related research are explored in the following section.

2.1.1 Learning discourse

The topics of technology and learning bear relation to a vast array of literature. A profusion of ICT use in the past 50 years has led to depictions of technology as ubiquitous, touching and transforming every aspect of modern life. Some would argue that 'learning' has achieved a similar status. Interest in learning has been on the increase and has moved beyond the scope of psychology or educational literature, where it was once confined. This has been concurrent with policy emphasis on ideas such as 'the learning society', 'the knowledge economy' and 'lifelong learning'. There are grounds to say learning has come into fashion and some have argued that an uncritical concept of learning as 'a good thing', relevant to every aspect of an individual's life, glosses over the more antagonistic and contradictory aspects of social practice (Grey, 2001; Contu et al., 2003). These authors have opted to locate references to learning within a 'broad ensemble' which they identify as part of a wider 'learning discourse'. The case they make for critical consideration of learning discourse is timely and is explored further in this section.

Grey (2001) and Contu et al. (2003) draw on a diverse range of sources in their critique of learning discourse, citing the 'plasticity' of learning as a defining attribute. Their main argument focuses around management literature on learning, with particular attention given to 'organizational learning' (Schon, 1983) and 'the learning organization' (Senge, 1990). Grey describes an important distinction between these two in terms of 'who' or 'what' learns; in the first, it is the people in the organisation who learn; in the second it is the organisation that learns through an accumulation of codified knowledge. How this conversion occurs has become a familiar topic in the organisational literature (cf. Argyris, 1992) and has also become a topic for knowledge management theorists (cf. Nonaka, 1991). Whilst Nonaka (1991) draws on Polanyi's (1958) theory of tacit and explicit knowledge, Argyris (1992) refers to organisational learning as routine 'single-loop' learning and creative 'double-loop' learning, which Grey describes as having an 'implicitly hierarchical' relationship to one another (2001:5). According to Contu et al., the claim that authors such as Senge and Argyris make implies that:

.... organisational learning is to be conceived of as a version of anti-bureaucratic organisation. Single-loop learning is bureaucratic learning, having to do with repetition and mundanity, occurring 'within a given organisational structure, a

given set of rules' (Fiol & Lyles, 1985:807). Double-loop learning is 'post-bureaucratic' being less structured, less hierarchy-driven, more pro-active, more innovative. (Contu et al., 2003:937)

Contu et al. align debates surrounding the treatment of learning with a key debate within the management literature concerning bureaucratic and post-bureaucratic organisation. They agree with authors who suggest that conceptions of post-bureaucracy have an emancipatory agenda, and that by enlisting learning they are calling forth a humanist agenda leaving the question of whether bureaucracy itself is inherently 'bad' unaddressed. On this point, Suchman (1996) provides a cautionary note concerning the consequences of delineating knowledge and learning, where such delineations are translated into grounds on which to categorise labour.

A crucial demarcation is the distinction of 'knowledge' from 'routine', or 'mental' from 'manual' labour. This distinction enables and reproduces the differential attribution of value across the division of labour, with some workers being assigned to one category, others to the other. A corollary of this move is the ideological separation of managerial from production work. (Suchman 1996:413)

Identifying inherent hierarchies within the treatment of learning in organisations is one aspect of Grey and Contu's critique, but their overall aim is to demonstrate a convergent use of learning discourse by government, education policy makers, managers and management theorists. Their main concern is that the idea of learning as something unquestionably good sits uneasily with policy statements about economic competitiveness. These promote a reality where:

...capital is mobile, technology can migrate quickly and goods can be made in low cost countries and shipped to developed markets [...] competitive advantage must be found, not in traditional means of production but rather in knowledge, skills and creativity. (UK Competitiveness White Paper, 1998:10 in Contu et al., 2003:942).

Any humanist ideals gleaned from ideas of knowledge and creativity are overturned by the call to see them put in the service of 'developed markets'. The emergence of government rhetoric on knowledge and competition combined with a parallel rhetoric on education policy, sees education squared with economic development. The overt character of this association means that frequently, the implications of education are confined to economic analysis and never reopened to other dialectics.

The intention of Contu et al. in this piece is to disturb the trope of learning, in order to argue against political hegemony. But political analysis of learning as part of social discourse is only one approach to looking at issues concerned with learning. In responding to these concerns, other conceptions of learning are placed outside the frame. What is useful and timely about a critical concept of learning for research on education is that it situates learning within contemporary debate and affords a critical appraisal of theoretical approaches to learning. The first of these points is not simply a question of contextualisation; whilst conducting research during the time period of this thesis, the researcher experienced discourse on knowledge and learning as ‘very loud’. They appeared ‘relevant to everything’ and tended to infiltrate early research design suggesting alluring yet ultimately ill-defined approaches to empirical work. The quality of general applicability that they acquired bore similarity to the process of commodification Callon describes (1999:190) where the suggestion is one of “pure equivalence, pure disentanglement, pure circulation”.

However, these qualities are not borne out by the learning and knowledge literature. Rather than appearing as a theoretical domain which is fluid, open and free of attachment, overarching philosophies of knowledge or models of learning have a tendency to *delineate* social and theoretical landscapes. Historically, these lines represent a radical redefinition of learning theory in contrast to instructional, education specific theories which had gone before. However, they also introduce new boundaries between, for example, the abstract and the authentic; the formal and the informal; the codified and the imaginative; the organisational and the educational; the human and the technical. These distinctions create particular issues when trying to understand the work of the educational institution holistically, since, in day-to-day life, organisational, educational and technical activities can be fused together. The following section addresses some of the issues that the education literature on learning raises with respect to these concerns.

2.1.2 Domains and parameters in learning research

In turning explicitly to the educational literature on learning, further sets of parameters and social domains become apparent. As a discipline, education casts 'the educational' and 'the organisational' into separate spheres, to the extent that what takes place in the classroom, between teacher and students, is viewed entirely separately to the work that goes into making those interactions possible. In this sense, organisation represents an 'externality' with respect to education research (Callon, 1999). This is cited as a strength of the field rather than a weakness since, as the previous section showed, learning and education are readily drawn into powerful agendas that bear little resemblance to learning and teaching activities. Nevertheless, since most of the learning technologies literature stems from education research, it is worth noting that relationships between organisation and learning are rarely explored. With this aspect of the educational environment placed largely outside the frame, the extent to which learning interactions are focused upon to the exclusion of all other factors becomes a question of degree. Whether research 'focuses in' on the 'moment of learning' or whether it 'draws back' to consider aspects of the learner's situation depends upon the disciplinary and theoretical orientation of the research. In either case, a 'cognitive domain' is founded which can stretch across a spectrum of learner situations.

Whether learning takes place in the mind as mainstream cognitive psychology depicts (Anderson, 1983; Eysenck & Keane, 1995), or whether it is inextricable from the social situation in which a learner is placed (Brown & Duguid, 1989a) is disputed territory within the education literature. In mainstream cognitive psychology the learner can be placed in an experimental situation, and tests carried out on subject matter that is designed to inform the researcher, as opposed to material which has been taken from a 'real life' situation. According to 'situated theories' of learning, situations are seen to 'co-produce' knowledge, and therefore learning through 'authentic' activity is viewed as innately more valuable than knowledge of abstract concepts (Lave, 1988; Lave & Wenger, 1991). Whilst disagreement over method between different schools of research is to some extent inevitable, questions of whether authentic or abstract knowledge is more valuable have been ongoing (Laurillard, 1987a; 2002; Eysenck & Warren-Piper, 1987).

As well as drawing a distinction between abstract knowledge and situated understanding, one of the aims of the situated learning literature was to open out learning research to include

social domains other than the formal environment of the classroom. Situated learning theorists such as Brown & Duguid (1989a; 2000), Hutchins (1995), Wenger (1998) and Lave (1988) explored these new territories, where the study of cognition was not restricted to the laboratory and results were not necessarily embedded in computational models. In extending the study of cognition to include everyday situations, these authors applied a situated learning philosophy to a range of different environments and a range of different people. However, significant delineations remain.

In relation to the learning literature as a whole, cognitive streams of research place questions concerning *who* is learning and *why* they are learning to one side. Therefore, in the situated learning literature, a collection of empirical examples can be found (e.g. Brown & Duguid, 2000:131) that groups together an example involving school children attempting to learn vocabulary with the assistance of educational psychologists and an example involving phone operators using an expert system. The theoretical framework allows conclusions from the two examples to be understood in relation to one another as occasions for learning, but at the sacrifice of considering other questions. Whilst the immediate problem-solving situation is considered intimately bound to processes of learning and cognition, anything beyond what has been identified as part of that situation is considered contextual.

To counter this tendency, the implications of learning could be extended to include meaning and identity, and opened out to include all areas of work and life. Wenger's 'Communities of Practice' advocates what could be called a philosophy of learning, where learning is relevant to every aspect of life.

What if we assumed that learning is as much part of our human nature as eating or sleeping, that it is both life-sustaining and inevitable, and that - given a chance - we are quite good at it? (1998:3)

In developing this perspective, Wenger's empirical focus rests on the learning that takes place in the informal groups that are formed and disbanded in the midst of more formal affiliations. However, he makes the distinction between knowledge that is gained through negotiation and interaction, and the practice of educational institutions, where knowledge is codified and reified "in the form of a textbook or a curriculum" (1998:264). Both theoretically and empirically this stance sets up divisions, between the informal and formal; the codified and the

imaginative. Trying to understand the associations that learning technologies have formed in terms of these divisions presents difficulties. Defining institutional reification as formal and codified and other forms of interaction as informal and imaginative does not always appear instructive. In fact, in an educational setting it seems a pronounced discontinuity to exclude phenomena from analysis according to such distinctions. The implicit theoretical ordering of phenomena as externality, content and context is a significant line of enquiry with respect to learning research, and is pursued in the following section.

2.1.3 The question of context and learning research

Disciplinary and theoretical frameworks have a formative influence on the framing of research into learning technologies. To some extent, the theoretical approach applied determines what is considered ‘context’ and what is a ‘central analytical concern’. Similarly, within a research situation, theory influences what ‘counts’ as content and what is either externalised, or treated as contextual. Discipline specific theories that rely heavily on particular theoretical approaches can generate blind spots or what Laurillard (2002) refers to as a rather ‘minimal analysis’ where research is not informed by what takes place, but by what counts as content within a given theoretical framework. Laurillard attempted to address this concern, by developing an approach which places learning at the heart of educational endeavour, but also takes account of institutional organisation (2002). Her book ‘Rethinking University Teaching’ was commonly held to be a ‘beacon in the darkness’ to early learning technologists when it was first published in 1993. The very fact that the ‘conversational framework for the effective use of learning technologies’ merited a second round of publication in this fast changing arena bears testimony to the value her work is thought to hold.

Laurillard discusses a spectrum of university work within her framework, moving from a discussion of the nature of academic knowledge (2002:13), via students and what they bring to learning (2002:25), to a categorisation of learning technologies constructed from this viewpoint (2002:81). She finally offers a blueprint for organisational infrastructure designed to incorporate and support the use of learning technologies (2002:214). In order to achieve this scope, however, various complex theoretical shifts take place. Firstly Laurillard differentiates

between practice and theory, equating it with a shift from real life situations to descriptions of them (2002:19). Then there is shift between everyday knowledge and academic knowledge, described as 'abstraction' (2002:21), and finally there is a move from the educational to the organisational, where Laurillard cites Senge (1990) and Nonaka (1991) and recent trends in knowledge management to support a dialectical approach to university organisation (2002:219). The focal theoretical concept of a conversation or dialectic lends coherence to these shifts. However, when taken in its entirety, the epistemic landscape created by the framework is dense and the suggestion that different domains require distinct theoretical treatment remains.

As a model for generating teaching strategy, the conversational framework is an important contribution. It is essentially a grounded approach to teaching that emphasises the need for teachers to reflect on how and if student learning is taking place, and suggests ways in which those reflections can be shared and inculcated at an institutional level. However, Laurillard is of the situated school of learning research and therefore places certain significant aspects of the learning scenario outside the frame of analysis. For example, epistemology is pushed into the intrinsic realm of the personal and the extrinsic significance of epistemology - in the form of subject disciplines - is not addressed. The empirical examples she uses to discuss her theory of student learning are therefore drawn from a range of different subject disciplines and stages of education including children and adults alike. Her framework is *learning driven*, hence the exact character of teachers, students, subject disciplines and technologies is secondary to a reflective consideration of whether learning has taken place. By referring to both teachers and technology as 'mediators of learning', subject discipline and individual pedagogical considerations are theoretically rendered 'context'. Although Laurillard insists upon the situated character of all learning, she is forced to concede that there is a bias in the educational literature toward what she refers to as the 'content, rather than context of learning'. She describes a dearth of available research capable of exploring both.

I do not wish to suggest that with sufficient funds and enough time we could establish complete and reliable connections between learning, content and context that would enable us to define reliable prescriptions for teaching strategies. Rather, the absence of research on the context of learning gives us an over-simplified view of student learning. (2002:63)

Subject discipline and the significance of ‘the course’ within learning technology use are significant aspects that learning oriented research often contextualises. Calls for a re-positioning of learning within the learning technology literature have included the promotion of ‘pedagogically driven’ on-line learning design (Oliver, 2002; Conole, et al., 2004). From this perspective, teachers are encouraged to scrutinise theories and models of learning in order to see what they have to offer and indeed, whether the inclusion of learning technologies represents a substantive contribution at all (Clegg, et al., 2003). However, even from a pedagogical perspective, subject discipline and the nature of the course that a teacher is involved with are still left out of the frame. ‘Discipline differences’ is an area that Conole et al. (2004) mark out for further research but which has so far been left unaddressed.

A potential approach for addressing this aspect of learning technology research might be offered by the concept of ‘epistemic cultures’ (Knorr Cetina, 1999). This concept includes the notion of knowledge as it is institutionalised within an education system in the form of subject disciplines. Instead of accepting the scientific view of knowledge as universal or focusing on knowledge structure, norms and conventions, Knorr Cetina attempts to magnify ‘knowing-in-practice’ in her detailed description of work conducted in two distinctive academic fields of study. Her aim is to bring to light the “different architectures of empirical approaches, specific constructions of the referent, particular ontologies of instruments, and different social machineries” (1999:3) that exist between different subject disciplines. By identifying the collective of which a subject discipline is comprised, Knorr Cetina aims to elicit the novel and diverse ways in which knowledge is constructed. This is not to simplify or minimise questions of knowledge, on the contrary, Knorr Cetina emphasises the importance of heterogeneity, ongoing events, and recognition of the substantively different ends that knowledge serves as highly significant areas of contemporary research.

Knowledge systems, in particular, appear like density regions of the social world; if knowledge is constructed it is deeply and intricately constructed involving multiple instrumental, linguistic, theoretical, organisational, and many other frameworks. (Knorr Cetina, 1999:10)

In order to develop ideas as to how on-line learning technologies might contribute to these dense social spaces, the next section draws upon the information systems literature to explore and extend questions concerning technology.

2.2 Theorising technology

In this section it is argued that the convergence of learning and technology in a single artefact form brings to light a paradox. The paradox in question concerns the possibility of theorisation, that is to say, the potential for deep-seated enquiry that is afforded a concept or artefact. The potential that theoretical enquiry into technology has to bring to social studies is a question which is rigorously pursued by IS and Science and Technology Studies (STS) authors. As these authors discuss, there remains a tendency to exclude technology and other 'non-humans' from social analysis (Latour, 1993); to describe the minutiae of technical design without linking design to social consequence (Mackenzie & Wajcman, 1985; Bijker, Pinch & Hughes, 1987); or to focus on social consequence but refer to technology as unambiguous, undifferentiated and by omission, unworthy of theoretical attention (Orlikowski & Iacono, 2001). Within the learning technology literature, theoretical enquiry understandably centres on learning; technology, for the main part, is left outside the theoretical frame. It is argued that including a rich understanding of technology in analyses of learning technologies has the potential to open out new lines of enquiry (Alavi & Leidner 2001). Among those lines of enquiry are a detailed understanding of human-technology interactions (Suchman, 1987; Kallinikos, 1999:2002; Orlikowski, 2000); a view of technology design as informed by social and political processes (Mackenzie & Wajcman, 1985; Bijker et al. 1987, Woolgar, 1991); and analysis of technology in relation to the organisation (Ciborra, 1996; Orlikowski, 1996) and 'infrastructure' (Star & Ruhleder, 1996; Bowker & Star, 2000; Ciborra & Hanseth, 1998; Ciborra 2000).

In this area of literature, as in any other, opening up theoretical territory introduces debate. The nature of the IT artefact, and the question of whether it is comprised of a stable logic that determines the shape of the social world (Winner, 1999) or whether it is socially constructed and therefore the embodiment of social and political forces surrounding its design (Mackenzie

& Wajcman, 1985; Bijker et al. 1987) is a debate that has far reaching consequences. A stable, logical structure lends itself to scientific enquiry and laboratory study, whereas an 'unknowable', diffuse social entity lends itself to qualitative, interpretive methods (Walsham, 1993). Understanding technology as inevitable, inviolable and belonging to objective scientific study casts human agency into an opposing subjective realm, the relative status of which goes unrecognised in scientific circles (Latour, 1987). Overcoming ontological divides between the object and the subject, or rather understanding each as historically embedded social constructions (Latour, 1999) is a contribution which actor-network theory and STS authors have made to the study of technology (Latour, 1991; Star, 1991) and is discussed in the following section. The theoretical positions proposed by STS and ANT have formed the basis of concepts of infrastructure (Star & Ruhleder, 1996; Hanseth & Braa, 2000; Monteiro, 2000) and these are explored in the second sub-section. Stemming from these debates comes a proposal for understanding education as a *collective endeavour* which is founded on diversity. An example from the ANT literature provides an example of how this richness and diversity might be understood in relation to learning technologies literature.

2.2.1 The technological artefact

Alavi and Leidner (2001) argue that the IS field is uniquely positioned to contribute to the intellectual development of 'technology mediated learning'. They cite two reasons for this; the IS field's history and tradition of providing a deep understanding of the IT artefact and its application to cognitive processes; and the field's vision of organisational structures and processes (2001:2). Social Construction of Technology (SCOT) authors have contributed critical analysis of how organisational level structures and processes become embedded in technological artefacts during the design process (Bijker et al., 1987). Examining how conflict and social interests serve to shape the process through which a technology 'achieves' stabilisation during the design process, these authors depict a process of inscription, where interests become embedded within the internal structures of the technology. Once in use, users appropriate these structures and enact them in ways that are either 'faithful' or 'unfaithful' to the original design. Criticism has been levied at the SCOT authors' exclusive focus on the design phase of technological construction (Orlikowski, 2000) and their implicit

assumption that technology is only socially constructed in design and not, for example, in use (Woolgar & Grint, 1991). Kallinikos (2002) also argues that there is an issue with understanding technology in terms of 'design intention', particularly when a technology has been gradually adapted to a purpose over a long period of time, such as word processing (2002:289).

Rather than focus upon design rationale, Kallinikos focuses on human-technology interactions and what he describes as the 'cognitization of work' (1999). Following Zuboff (1988), Kallinikos argues that increasing computerisation of the workplace has fundamentally altered the nature of work, drawing people away from 'real world' engagement into an internally referential, cognitive world (1999:265). Kallinikos makes a case for constructing a richer understanding of technology and "the amazing diversity in the forms of human involvement they admit" (2002:287). The call for 'fine grain' analysis of human-technology interaction is echoed by Suchman (1987) who argues that there is a tendency to ascribe agency to a machine as a whole - to 'it' - without describing significant mechanisms of which the technology is comprised. In this way, 'intention' ('its' intention, the designers' intention) stands in place of the "burden of understanding mechanism" (1987:16). She asserts that both humans and machines make use of 'situated resources' which include plans and models, but that in both cases, pre-thought (plans and models) and afterthought (analyses) differ from the actual "business of doing" (1987:54)

The fact that we can always perform a post hoc analysis of situated action that will make it appear to have followed a plan says more about the state of our analyses than it does about our situated actions (Suchman, 1987:54)

Through her theory of 'situated action' Suchman introduces a sense in which plans, rationality and models - including those which have been inscribed into machines and technologies - are 'resources' as opposed to monolithic, uncontested forms.

Suchman is part of the 'situated' tradition of technology research which places emphasis on interactions with technology 'in situ', 'in practice', 'in the everyday'. Bowker & Star describe the situated school of thought as follows:

In brief, the research in this tradition seeks to ground activities previously seen as individual, mental and non-social as situated, collective and historically specific. (2000:288)

A current tension within situated action research lies in the contrast between researchers who use formal testing situations, and those who study 'everyday life' where 'the situation' is not configured by the researcher but taken 'as it is'. Situated action or learning authors include constructed scenarios within their repertoire of methods, where the situation is defined to some extent by the researcher. Other researchers prefer to take 'the situation' *to be* 'everyday life' and allow events to unfold. Orlikowski implicitly asserts this understanding of situatedness in the analytical standpoint she describes as the 'practice lens'. Theoretically the practice lens perspective dissolves the technological artefact, any embedded rules or structures that might lie therein, and any capacity for technology to carry out independent action. Instead, Orlikowski argues, technology should be understood in terms of how it is 'realised' in use.

technological properties may be examined to identify the typical or expected range of activities commonly associated with use of the technology. However, how these properties will actually be used in any instance is not inherent or predetermined; rather it depends on what people actually do with them in particular circumstances (2000:409).

Contrary to the SCOT authors, who take design as the process through which the technological form is stabilised, Orlikowski asserts practice, 'everyday use', as the basis upon which technological forms achieve substance. Both SCOT and the practice lens aim to create frameworks that assert the significance of human agency *over* technology.

In deconstructing technological determinism, these theories draw the possibility of agency away from technology and attribute it to designers and users. In so doing, and to varying degrees, they render technology malleable, 'open' to design and re-design by humans. This position is contested by Kallinikos (2002) and also by authors who subscribe to ANT based (Latour, 1991) conceptions of technology. Latour describes the theoretical separation of technical and human agency as an inheritance from social theory that he describes as the 'modernist settlement' (1999). He argues that the division between humans and the objective, natural world that underscores the modernist settlement creates a power dynamic where, either

humans dominate the objective world or the objective world dominates people. Latour understands this premise as an *a priori* attribution of agency (and by consequence passivity) and argues that the implicit attribution of agency to some actors and not others should be a question which is referred to empirical analysis not theoretical assumption. To illustrate his point Latour (1999:176) uses the example of a slogan used by anti-gun lobbyists, ‘Guns kill people’ compared to the slogan used by pro-gun groups ‘Guns don’t kill people, people kill people’. Latour argues that polarising debate around fixed ideas concerning the relationship of humans and objects detracts from what he sees as most important, namely, how these relationships are enacted in a given situation. In this way, agency is placed at the centre of the picture and the potential to act is opened out to human and ‘non-human’ actors. An important characteristic of agency is that it includes the capacity of actors to enrol one another in a network of relations. The concept of enrolment has been used in recent writing on infrastructure and is discussed in the following section.

2.2.2 Infrastructure

The concept of information infrastructure is addressed by both IS and STS authors (Ciborra, 2002; Hanseth & Braa, 2000; Star & Ruhleder, 1996; Bowker & Star, 2000). Whilst Ciborra theorises infrastructure from a phenomenological perspective, Star comes from a tradition of grounded theory. The emphasis of both authors is that the relations that information infrastructures enact are dense and diffuse and that knowledge of any infrastructure as a ‘totality’ is virtually impossible.

In the past one hundred years, people in all lines of work have jointly constructed an incredible, interlocking set of categories, standards, and means for interoperating infrastructural technologies. We hardly know what we have built. (Bowker & Star, 319:2000)

In this sense, infrastructure is always something that is locally achieved through the textured ‘knitting together’ of practices. Both Ciborra (2002) and Star & Ruhleder (1996) use the term ‘ecology’ with reference to infrastructure to depict the inherent heterogeneity and complex interconnectedness of information infrastructures, which tend to fade into the background

except at times of 'breakdown'. Bowker & Star (2000) suggest several techniques for overcoming this tendency and eliciting the richness of infrastructural ecology. They suggest a focus on the classifications, standards and categories upon which the interconnectivity of infrastructure depends, as well as on the spaces between categories and classifications (the unclassifiable, that which is outside categorisation) as a basis for understanding how interconnectivity is locally achieved and what the historical conditions for that interconnectivity are. They argue that standards, categories and classifications play a significant role in affording interconnectivity, but that there is a tendency to overlook them because they are frequently embedded in apparently mundane objects such as lists, programming code or document layouts and as such, are seldom understood as a basis for compelling narrative or insightful research. However, Bowker & Star argue that "standards are *material* as well as symbolic" (2000:39) and hence that, "systems of classification (and of standardization) form a juncture of social organisation, moral order, and layers of technical integration." (2000:33).

Similarly, Ciborra also sees infrastructures as both material and symbolic. He uses the term 'formative context' to describe infrastructure

not just as sets of hardware and software but as sets of the pre-existing institutional arrangements, cognitive frames, and imageries that actors bring to and routinely enact in, a situation of action. (Ciborra, 2002:70)

In this sense Ciborra sees local engagement with infrastructure as an occasion that "triggers reflexivity" and can lead to innovation. He cites the open source movement and the development of the Linux operating system as manifestations of this kind of innovation.

The complex ecological environment of infrastructure, standards and categories within which new technologies are developed and into which they are integrated is an important dimension to technology research. Although it frequently comes across as such in technology studies, no technology is designed or exists in isolation. The relationships and interdependencies it forms are both constitutive and shifting since infrastructures are constantly changing to adapt to new circumstances, new inclusions. For this reason, the term integration - a key term in this thesis - is one used by information systems authors who write about infrastructure. Its counterpart, 'implementation', no longer seems adequate to account for the textured conflicts and

reconciliations that are involved in ‘nesting’ new technologies within the complex infrastructural ecologies into which they are introduced. In ANT terms, integration concerns the alliances that a technology is capable of forming and the substantiation it achieves through the enrolment of other actors (Monteiro, 2000: Monteiro & Hanseth, 1996). Hence, authors who use ANT to describe infrastructure and the adoption of standards tend to use the technique of ‘following the actor’ (Hanseth & Braa, 2000) where the emergence, design and adoption of a technology or standard is traced through detailed empirical research. The complex character of associations formed appears as surprising and unpredictable when they are described ‘as they happen’ and not purely from the standpoint of intention or *post hoc* analysis. Another advantage of this approach is that it does not tie the researcher to a particular phase of development (i.e. either design or use) and is capable of including aspects of technology integration that are more commonly told from the standpoint of ‘technology diffusion’, such as technology purchase and integration.

2.2.3 Education as a collective endeavour

The theoretical perspectives that dominate a body of literature are important because they influence which elements of an empirical research scenario fall inside the analytical frame and which outside (Callon, 1999:188). Describing integration from the perspective of learning or, if narrowly defined, education often means leaving out significant details on the basis that they are ‘other than’, or outside, the scope of educational concerns. Theoretical separations can ‘annex’ concerns by, firstly, not permitting the researcher to describe significant activities taking place because they lie ‘outside’ the theoretical frame, and secondly, by casting issues which are *of mutual concern* into separate realms of enquiry. It is argued that in order to generate grounds for coherence in the on-line learning literature, both technology and social practice have to be understood as worthy of theorisation. In many cases this involves a significant realignment of philosophical distinctions between humans and the natural world; between subject and object. Whitley (1999) describes this as a restatement of the ‘fact / value’ distinction and depicts a ‘new collective’ in which scientific facts and human values are brought into the same theoretical framework. According to this restatement, who and what are *counted*

as part of the collective is taken as a point of departure rather than a 'given', and the question, 'how shall we live?' is offered centre stage (1999:90).

A theoretical basis for understanding mutual concern is important to establish. However, of equal significance is the empirical issue that as a significant reference discipline for on-line learning research, the education literature only accounts for a portion of university work; in general, education is rarely treated as a collective endeavour. Undoubtedly, the work of teaching, learning and research should take centre stage in accounting for the mission of higher education. However, this centrality is often achieved at the cost of excluding the work that goes into making learning and teaching possible; the contribution of administrators, librarians, estates and technology workers who *enable* the academic institution and whose work directly shapes and informs the experience of teaching staff and students. Coupled with this is the tendency to ignore the significance of the material fabric of the institution. This includes the various tools, texts, concepts, workshops, instruments and laboratories of which individual 'epistemic cultures' (Knorr Cetina, 1999) are comprised and by association, the organisational work that accompanies the upkeep and involvement of these 'epistemic actors'. An important consequence of this exclusion for on-line learning research is that, where these actors constitute an aspect of the materiality and texture with which learning technologies become involved, their significance tends to get overlooked.

Finding a framework that will allow an 'inclusive' account of education is not straightforward. Laurillard suggests phenomenography (2002:28) as a potential theoretical resource that might permit learning researchers to describe 'more' of the learner's situation. Other authors are beginning to use community-based approaches such as Wenger's 'communities of practice' to include aspects of organisational and learning experience respectively (Oliver, 2003; Lea & Nicoll, 2001). However, the problems of delineation and social domain remain, presenting issues for the development of inclusive education research. An approach that offers the potential to address some of these concerns is found in an example of qualitative education research provided by Verran (1999). In her example, Verran uses ANT as an 'interpretive frame'.

Instead of some sort of foundation (either the ‘physical entities of a natural world’ or the ‘concrete practices of the social world’) on which a knowledge-structure of symbols is built, this interpretive frame avoids any separation of the material and the symbolic (Verran, 1999:136)

Verran provides an account of a measuring and counting exercise that she was involved in with a classroom of school children in Nigeria. There is no ‘technology’ as it is commonly understood in this example but in order to conduct the exercise, some strips of cardboard cut into lengths and marked at intervals, had been made by the teachers in order to conduct the exercise because the classroom “was quite devoid of resources” (1999:137). From Verran’s understanding, the point of the exercise was to find an activity through which the children could come to terms with the abstract concept of length. In designing the activity, Verran had adopted a ‘social practice’ view of counting. She argues that both positivist and social practice accounts of measuring and counting are, in principle, foundationist (1999:145). The former is founded on an understanding of the world as possessing universal qualities of space and time which propose themselves for measurement; the latter is founded on counting as a symbolic practice of unitising the world based on methods constituted by symbols. Verran notes how adopting a foundationist social practice view, prevented her from seeing the significance of the physical aspects of counting, so that therefore she could not understand why some teachers’ measuring classes ‘worked’ and others didn’t. Eventually she realised that it was symbolically, linguistically and through *embodiment* (the children used both fingers and toes to form ‘sets’ when counting) that the Yoruba school children addressed the question of quantification. In trying to ‘mend’ the gap between ‘abstract’ and ‘real worlds’, the logics of positivist and social practice models were unable to account for the logic that the children themselves used. Realising and consequently describing how the children’s method of counting differed evaded Verran. In order to reach a different understanding she had to establish a different conceptual starting point and a painstaking account of the seemingly straightforward tasks of measurement and counting.

And when we abolish the ‘abstract domain’ and opt for worlds in which the material is already always symbolic and the symbolic already always material it becomes difficult to even describe the process of quantifying. (1999:144)

In constructing her account Verran remains highly sensitive to her depiction of power relations. At the same time however, she is unwilling to see her disconcertment and revelation subsumed by orthodox explanations of institutional or colonial power dynamics. Instead, she aims to construct a richly described, inclusive account that can address laughter and disconcertment as well as it can fingers and toes.

This is a truth that is an outcome of the collective life of Yoruba schools, and I don't just mean the collective of pupils, teacher, principal, teacher educator etc. I mean also Mr Ojo's cards and string, the scarce metre rulers, the school rooms and playgrounds [...] All are participants enacting themselves variously resisting and accommodating; all are already and always both material and symbolic; all outcomes of past collective acting; all participating in generating or regenerating Yoruba (school) life as the same and/or different outcomes in the present; all participating in an answer to the question 'How should we live?' (Verran, 1999:148)

The density of education research when taken in this light is both overwhelming and profound. Inclusivity has become an increasingly important concept in educational spheres of debate (Barton, 2003) but for different reasons from those alluded to here. Here it is used in an additional sense; to draw attention to the provision of education as a collective endeavour that includes the work of librarians, technicians, administrative support staff and institutional staff, as well as an array of technologies and a range of environments. This is not to de-emphasise the importance of the inclusivity agenda (Barton, 2003) as it exists within education research, with its focus on social justice and participation; it is an attempt to understand it better. It is argued that exclusion can be experienced with respect to many different aspects of the 'education infrastructure'; from student admissions to the restrictive designs of doorways and flights of steps; from a pedagogic failure to 'connect', to the 'meaninglessness' of a curriculum. Understanding education as a collective that involves both 'human' and 'non-human', material and symbolic constituents affords greater scope for understanding how participation and inclusion can be encouraged according to social justice agendas.

2.3 On-line learning literature

When the concept of on-line learning first became popular in the mid-nineties, the focus within both primary and secondary literature was on the implications that the Internet held for distance education (Rumble, 2001). Much of the hype and claims to transformation that were in circulation at the time were centred around distance education as a *specific conception* of on-line

learning and discussed the implications that it held for traditional, campus-based higher education as an 'either / or' proposition (Cooper & McAlister, 1999; Passerini & Granger, 2000). Whilst distance education was put in the foreground of debate, the body of educational and pedagogic thought that represents this area of education research was largely overlooked. The simultaneous 'spotlighting' and dismissal of distance education experience, pedagogic thought and research placed leading figures in this field in the position of having to re-assert the history and relevance of this substantive work (Rumble, 2001; Thorpe, 2002). Whilst other authors in areas of the on-line learning technology literature raved about the implications of 'new technology', Thorpe (2002) argues that distance educators took a more measured approach, having always been at the forefront of new technology adoption for content presentation and learner support. She suggests that recourse to the experiences, strategies and attitudes developed in distance education stand to prevent campus-based institutions interested in developing distance learning programmes from 're-inventing the wheel'.

Whilst distance educators were ready and equipped to evaluate the Internet as a pedagogical innovation, the remainder of higher education was divided. In one sense, reaction was split into two camps; the oppositionalists and the transformationalists (Boullier 2001). According to Boullier, those involved in producing case studies and providing measures for understanding pedagogical technologies were understood to be transformationalists, given that they had taken the decision to invest their time and research efforts into the development and implementation of on-line learning. Oppositionalists tended to draw upon social theory and theories of education to explicate their viewpoint, but often without having embarked on a defined empirical undertaking. The latter represents a tendency in higher education for what Barnett (1990) calls 'armchair research' whereby teachers and academics write articles based on their 'impressions of the field' rather than a specific case or empirical example.

Having said this, by far the largest body of literature available is case study based research, describing individual experiences of a particular piece of software in a particular teaching context. These studies are invaluable and provide some key observations about pedagogical and technological issues, both of which require further focus from researchers. A criticism of this body of work is that there is a tendency to be situation specific without providing sufficient theoretical context to link empirical findings to other related bodies of work (Alavi &

Leidner, 2001; Conole et al., 2004). Linking the empirical with the theoretical is an issue within this literature, but as the previous sections have shown, what is striking by omission is that technology itself is hardly theorised at all. If the character of technology is referred to, it is as a medium, a tool, a means to an end (Orlikowski & Iacono, 2001). A dichotomy therefore exists between case studies written by software developers / teachers, which tend to talk exclusively about teaching and software design issues, and articles written by educational theorists, who provide invaluable theoretical context but who tend to refer to technology in non-specific, undifferentiated terms. In this way, issues relating to design and choice of technology, as well as any contingent debates pertaining to their integration with existing systems are separated from the social, political and educational concerns of the institution. The idea that they are mutually implicated is not promoted.

Of equal importance to these concerns are those that speak directly to the status of higher education in contemporary society. Whilst authors who engage with these issues may not provide details of technologies or of learning, they provide important analyses of the policy and funding structures that underpin higher education (Barnett, 1990; 2000; Slaughter & Leslie, 1997; Naidoo, 2003). A number of authors have made the link between recent discourse on globalisation and on-line learning technologies (Sahay & Nicholson, 2001; Edwards, 2002; Clegg et al., 2003) and still more have made the connection between on-line learning and the 'marketisation' of education (Becher & Trowler, 2001; Mazzarol & Soutar, 2001; Noble, 2002). These debates are elaborated on in the following section in order to contextualise the learning technology literature. This literature is reviewed in the second section. The final section takes an overview of these issues and attempts to understand them in relation to educational concerns that have been expressed with regard to on-line learning.

2.3.1 Higher Education and on-line learning

Global trends in education policy and governance have altered the character of higher education over the past 20 years (Naidoo, 2003; Becher & Trowler, 2001). Speaking of UK and North American higher education, Becher & Trowler identify three areas in which radical transformation has taken place: the globalisation of higher education; the massification of

higher education; and a shift in the emphasis of government policy rhetoric toward the vocational functions of universities (2001:10). Whilst increases in the number of students attending higher education are tangible as both a policy directive and a lived reality, it is difficult to establish how far policy rhetoric influences social reform (Thrupp, 2002). With respect to globalisation, there is a tension within the sociology of education literature between those who, like Clegg et al. (2003) describe globalisation as a ‘myth’ and those who, like Bird & Nicholson (1997) describe it as a form of social process. However, Naidoo (2003) makes the point that, real or imagined, governments worldwide have *linked* higher education reform strategies to processes of globalisation (2003: 249).

With respect to on-line learning research, the idea of ‘time-space compression’ proposed by Giddens (1990) and the implications of a ‘global marketplace’ for education are both themes which authors have picked up on as part of the globalisation debate. Being able to access on-line courses from anywhere in the world (theoretically) and at any time of day or night is commonly cited as being a profound advantage of on-line learning (Passerini & Granger 2000). However, Clegg et al., dispute this and argue against using globalisation theory, citing a focus on time-space compression as both inadequate and totalising, affording little ‘space for resistance’ (2003:45). Armstrong (2001) argues that real competitive pressures on universities have been minimal up to now but that the sudden influx of ‘for-profit’ education providers aiming to leverage on-line learning technologies could possibly de-stabilise universities and encourage a focus on a “narrow” rather than “global good” (2001:505). Finlay & Finney (2002) argue that in the UK, since higher education funding has been tied to student numbers, students themselves have become a commodity that Further and Higher Education institutions are condemned to ‘fight over’. Naidoo also refers to a reconceptualisation of students as ‘customers’ and describes the introduction of a number of “consumerist mechanisms” such as the publication of league tables and ‘student satisfaction reports’ (252:2003). Clegg et al. (2003) and Becher & Trowler (2001) link these mechanisms with a trend towards managerialism in government education reform strategy (2001:10), and highlight issues associated with managerialist implementations of educational technologies.

Along with increased competition between education providers and the reconceptualisation of students, these authors also refer to the marketisation or commodification of knowledge

(Trowler, 1998a; Becher & Trowler, 2001; Naidoo, 2003). Each of these authors refer to the introduction of a modularised curriculum into UK higher education in relation to these arguments. Becher & Trowler argue that the treatment of knowledge as a 'thing', capable of being "bought and delivered in module-sized chunks, with learning outcomes as the unit of currency" brings with it a tendency to see academic staff as "exchangeable deliverers of learning outcomes rather than as subject specialists with unique contributions to make" (2001:10). They also cite increased concern with intellectual property rights as indicative of a 'market for knowledge'. Clegg et al. (2003) identify the question of 'who has control over curriculum and teaching methodology' as a critical issue within the higher education sector. Issues concerning modularity and intellectual property rights are clearly present within higher education research and practice and require careful scrutiny. However, there is a sense in which generalised discourse on the commodification of knowledge is too vague. The potential arises for reification and a danger that the objectification of knowledge will become a further 'irresistible myth'.

One way of countering the issue of reification is to provide careful empirical consideration of those points in time or areas of work in which universities interact with various markets or quasi-markets. Technology purchase and partnership formation are both significant in this respect. Relating events to the state of a particular market and understanding that those trying to take advantage of favourable market conditions tend to 'make a lot of noise' at particular points in time can serve to ground abstract discussions of market influence. Not conceptualising time periods in this way and prematurely conferring stability on technologies before they are proven can lead to misconception. Walker (2000) points out a tendency amongst authors who talk about technology-enabled change in higher education to insist that universities should be 'ready for change' and are simply not 'keeping up' (cf. Evans & Nation, 2000). These comments show a disregard for the 'immaturity and volatility' of new technologies and universities' need to wait for markets to 'shake out' before committing their limited public funds, as described by the Association of Learning Technologies (2003). In the same vein, Conole (2004) argues that the strong theme of politics that runs across learning technology research is due in part to the inflated expectations that surrounded the early period of on-line learning technology development.

Thrupp (2002) and Goodison (2001) both argue that there is a tendency to overlook disjuncture. Thrupp points out that although education policy can be seen to both reflect and generate social change, the processes involved are difficult to pin down (2002:321). By interviewing students and describing their sense of value regarding the institution they attend, he demonstrates that there is a limit to the extent to which students are *available* for reconceptualisation. Goodison (2001) also finishes his analysis of policy and funding reconfiguration by asserting that there is a fundamental disjuncture between the extent to which we understand ‘what it is to learn’ and current attempts to prescribe teaching methods and learning outcomes. Discussion of how the on-line learning technology literature attempts to address these particular questions is the subject of the next section.

2.3.2 On-line learning literature

A general criticism of the learning technology literature is that, on the whole, it does not offer sufficient theorisation of its subject matter (Alavi & Leidner, 2001; Conole et al., 2004). Whilst ‘how to’ guides were in some senses necessary in the first instance, the prevalence of ‘project reports’ that offer no theoretical content nor recourse to wider learning or education concerns have been a problem for the field (cf. Wilson & Whitelock, 1998; Zeynep, 1999; Ferraris et al., 2000). Conole et al. (2004) observe a pronounced tendency to embark on a project and then “fit theory to practice” instead of developing “practice underpinned by theory” (2004:18). However, having seen the theoretical complexity of the learning literature, it is hardly surprising that relating theory to practice is an issue for learning technology researchers. Most of the original interest and ‘claims to transformation’ that surrounded the introduction of on-line learning had focused upon pedagogy associated with distance education (Rumble, 2001). However, as the hype began to subside the on-line learning literature began to reflect a more balanced level of interest. In particular there was a turn (or return) to the concept of ‘blended learning’ where on-line learning technologies were understood as holding the potential to contribute to traditional face to face university courses as well as distance learning programmes (Boyle et al., 2003; Macdonald & Mcateer, 2003; Denis, 2003).

The kind of innovations taking place involved the presentation of course materials via departmental web sites or intranets (Flowers et al., 2000; McAvinia & Oliver, 2002); the use of applications to run short answer or multiple choice tests (Brown et al., 1999) and to assist in their marking and analysis (Jackson, 1996; Sosabowski et al., 2000); and the use of electronic discussion forums, 'chat rooms' or e-mail groups to facilitate interaction between teachers and students (Alavi et al. 2002; Jeffries, 2003). The latter has attracted by far the most research effort following a general trend in both distance and face to face teaching methods towards a constructivist paradigm (Goodison, 2001). This paradigm advocates a change in the role of the teacher from someone who stands at the front of the class dispensing knowledge to one who facilitates students' own acquisition of knowledge (Jonassen, et al., 1995). Constructivism stems from the tradition of education psychology which encourages self-directed learner activity based on design and discovery, and draws upon authors such as Papert (1980) and Piaget (1954). The use of technology to support student interaction also comes under the label of distributed or collaborative learning (Alavi et al., 2002) or else Asynchronous Computer Conferencing (Jeffries, 2003). Those wishing to move away from psychological explanations of learning in this area tend to use activity-based theories of learning which draw upon authors such as Vygotsky (1962), Wertsch, (1985) and Engestrom (1987). A criticism of constructivist and collaborative research is that in reconfiguring the relationship between student and teacher, it dispenses with notions of conflict and encourages an uncritical appraisal of flexibility and 'student centredness' (Clegg et al., 2003).

The generally endorsed move away from teacher-centred models to learner-centred has been followed by a further development toward community based models of on-line learning Barab (2003). Again, this development has emerged from analysis of discussion forums (Schlager & Fusco, 2003; Kling & Courtright, 2003; Barab, et al., 2003). However, these authors are critical of the concept of 'designing' or 'constructing' a community through Internet based forums. Barab (2003) argues that, at present, the word community is at risk of losing its meaning since "we have little criteria for distinguishing between a community of learners and a *group* of students learning collaboratively." (2003:197) Kling & Courtright (2003) caution against applying either aspirational or theoretical assumptions to on-line interactions linked to ideas of community. Schlager & Fusco (2003) argue in favour of locating existing functioning groups and developing design through consultation. Amidst learner and community oriented models,

pedagogically driven models of on-line learning have re-emerged (Conole et al. 2004; Clegg, et al. 2003). The emphasis here is on the critical selection of appropriate learning models and theories and *where relevant* the use of technology to support pedagogic and learning aims. From this area of research comes a call for understanding the implications of on-line learning technologies in relation to the different courses and subject disciplines in which they are used (Conole et al. 2004: 32; McAvinia & Oliver 2002). An example comes from McAvinia & Oliver (2002) whose research describes problems encountered during the design of generic intranet resources:

Because such innovations arise from outside the disciplinary context of departments, the process of embedding them into the curriculum is complex and problematic, involving staff resistance, conceptual confusion and contested terminology. (2002:219)

The nature of individual courses, the pedagogical strategies embedded in their design and their relationship to the subject discipline as an ‘epistemic culture’ is a line of enquiry that is currently not pursued by learning technology researchers. The pertinent questions arising from this branch of analysis are questions concerning the status or ‘positioning’ of technology within a particular epistemic discourse or pedagogic practice. In this vein, Barnard (1999) conducted classroom observations and interviews with a number of Further Education biology teachers in order to observe how they attempted to draw different kinds of software application into their teaching practice. She found that where the software had been designed as a pedagogical vehicle, it had to ‘fit’ with their classroom practice for teachers to understand it as valuable. However, where computer-based activity was central i.e. when it comprised the ‘point of the lesson’, teachers were prepared to alter their practice to incorporate it. Barnard’s study presents two unexplored aspects of learning technology research. The first is the value of understanding and depicting *individual* pedagogic strategies and the improvisation and innovation they exhibit. The second is to draw attention to the *various* ways in which technology has been incorporated by different subject disciplines. These include whether it is a ‘tool’ or represents a ‘material’ to work with; whether it constitutes a particular method *within* a range of methods; whether its introduction to an area of study is relatively recent or has a long history of use; whether it acts as a ‘platform’ for carrying out design or whether the subject discipline itself is founded on the study of technology.

Another way in which the theoretical and empirical base of learning technology research might be widened is to admit related institutional, organisational and infrastructural issues to the literature. For example, drawing in organisational concerns, Oliver (2003) directs research towards the newly created roles of 'learning technologists' and the sense in which people acting in these roles have fallen into an 'organisational vacuum'. Cornford & Pollock (2002) use the contrast between on-line and campus-based education to consider the university campus as 'a resource' that holds implicit implications for identity and authentication. Pollock (2000) and Scott & Wagner (2003) both describe the implementation of Enterprise Resource Systems in universities and the resulting redefinition of boundaries between academic and organisational practice. Both of these authors place these developments in the context of recent trends to 'modernise' universities through the introduction of new technologies. Another highly influential area of research which has not received adequate recognition is the implication that current transformations in library provision holds for both pedagogy and student learning. The new literacies involved in library usage are having a pronounced effect on library staff, teachers and students. Theakston (1999) argues that these implications were not taken into consideration when the emphasis of on-line learning was on distance education. He uses the example of the Open University to describe how course materials were developed in such a way that students were 'expected not to need' a library or else that they would use public libraries where the burden of training fell to local library staff. All of these concerns have a part to play in the integration of on-line learning technologies. Ultimately, however, the 'broader aims' of education are what mark out this area of research and practice as distinct from other areas of social practice. The next section provides an overview of educational concerns that have been raised with respect to the development and introduction of on-line learning technologies.

2.3.3 Concern for educational values

Explicit discourse on the values upon which educational endeavour is founded, marks education out, both as an area of social practice and an area of research. Within the learning technology literature some commentators have chosen to place emphasis on the social and

educational implications of learning via the Internet in terms of discourse on educational values. Two main themes emerge; *empowerment* and *access* to education. In common with the rest of the on-line learning literature these issues were originally cast in terms of a 'distance education versus campus-based education' discussion. The advantages and drawbacks of distance education had been debated many times before (Rumble, 2001; Thorpe, 2002). These debates were reopened with the introduction of on-line learning technologies, which were seen to offer solutions to some of the drawbacks identified, bringing forth a new paradigm in distance learning (Passerini & Granger, 2000).

Compared to traditional text based modes of distance learning, on-line learning afforded the potential for increased interactivity. This was welcomed as a means of overcoming a perceived shortfall in distance learning pedagogy (Rumble, 2001). The interaction that on-line learning facilitated corresponded with the constructivist school of learning and teaching which aimed to empower students through encouraging them to actively engage in their learning processes (Goodison, 2001). Nonetheless, a criticism of distance learning that was subsequently conferred on on-line learning was that for intellectual development to take place teachers need to have an open relationship with their students; i.e. one which is not constrained by the protocols of an overly structured curriculum or software programme. Noble (2002), Dreyfus (2001) and Cooley (1980) draw a distinction between training and education precisely on these grounds. They assert that whilst students develop competence at a specific problem-based task through on-line learning, they will never move beyond competency.

Like Rumble (2001), Sahay (2004) asserts the importance of attributing 'standpoint' within these debates. In order to critique on-line education in terms of empowerment and autonomy Sahay describes a need for critical awareness of "who is communicating with whom, how and about what" (Sahay 2004:11). Similarly, when discussing the costs and benefits of on-line distance learning Rumble cites the importance of asking, 'whose costs, whose benefits?' Barab et al. (2003) address the same issue from the point of view of supporting group and community interaction through on-line technologies, citing the inherent tension between 'I' and 'we' that underlies community. They discuss the importance of balancing and leveraging on-line interaction from the 'inside' (2003:237). In this sense, 'what is valued' is understood as a fundamental question underlying group formation and individual empowerment.

Like distance learning, on-line learning was seen as a vehicle for increasing access to education (Passerini & Granger, 2000; Rumble, 2001). However, early experiments in the area indicated that on-line learning would not be the panacea to issues of widening participation that it was initially promoted to be (Blass & Davis, 2003). 'Social inclusion' as a concept was pushed to the forefront of the New Labour political agenda in the UK along with 'lifelong learning' (Green Paper, The Learning Age, 1998). It was one of the drivers behind government policies concerning the promotion of on-line learning technologies (White Paper on Enterprise, Skills and Innovation, 2001). However, there have been concerns that whilst on-line learning may enable access to education, there are still costs involved, including owning or having access to a computer, which are largely passed onto the learner (Dutton, 1999). On this subject Rumble argues that increasing the 'richness' of on-line materials increases production costs and therefore pushes up the unit costs of courses. He also points out how many on-line distance learning initiatives (such as the UK's e-University for example) favour the disaggregation or outsourcing of existing university functions, such as library and administrative services, which students are then expected to pay for in addition to their course fees. Costs and access to technology are both significant areas of concern, but the removal of structural barriers to participation in learning is only one aspect of social inclusion. Rees et al. (2000) argue that factors such as time, place, gender, family and initial schooling all play a part in whether an individual understands 'lifelong learning' as something that is relevant to them.

Sahay (2004) discusses autonomy and empowerment from the point of view of student choice. The degree to which technology is becoming incorporated into both on-line and face-to-face teaching leaves students little choice with respect to how they *prefer* to learn. As such, feeling uncomfortable with or put off by on-line environments is a reaction that is fast becoming inconsequential to those intent on designing on-line programmes of study regardless of student preference. Sahay (2000) also considers this issue in relation to a tendency for bias within on-line learning curricula towards IT, engineering, finance and business programmes. He refers to the example of on-line learning initiatives that the World Bank has funded in developing countries, in particular Mozambique and India, where issues concerning curriculum bias have been raised. Given these conditions he asks, to what extent are students empowered *to choose* the path they wish their education to take? Self-referential curricula whose sole

purpose it is to endow students with the appropriate skills and competencies necessary for work touch on a further tension present in the education literature which is often addressed in terms of vocational and liberal education (Barnett, 1990). To what extent these two ends are prioritised within education provision is a fraught debate.

Another concern of the literature is how the idea of autonomy sits with the interests of private companies with whom universities have attempted to collaborate and form partnerships (Harris, 2000; Morrissey, 2002; Huynh & Umesh, 2003). The ends pursued by 'profit' and 'not-for-profit' organisations have consequences for negotiation and priority setting. Baer (2000) refers to these potential 'difficulties' as largely pragmatic concerns that 'expansion in demand' for on-line learning will resolve in one way or another (2000:457). Initiatives attempting to mobilise funds and investment through private sector partnership have tended to recast education as a commercial enterprise fuelled by demand (Rosenfield, 2000). The realignment of institutional policy and organisational strategies to bring about the introduction of new technologies into teaching and course design has created a fallout. This has been met with vociferous response in North America where strategies for adopting on-line learning technologies were understood to be compromised by the self-interest of university spokespeople also involved in on-line learning technology companies (Winner, 1997: 1998; Noble, 2002). The 'rush' to forge distance learning collaborations and adopt on-line learning technologies was underpinned by incentives that seemed slightly alien to distance educators, who were motivated by 'access' rather than 'demand'.

Looking back at the development of the Open University in the UK, and of similar 'open' or distance teaching universities, colleges and schools in other countries, one can discern a remarkable consistency in the values that underpinned their foundation. Almost invariably these institutions were set up to enable access to education (Rumble, 2001:227)

To some extent, access was understood to be enabled by cost. Keeping the unit costs of education down was therefore of crucial importance. In one of the rare examples where ideas of global education are linked with concern for development agendas, Rumble (2001) asks, "what the relevance of E-education is to global educational needs?" He makes the case that introducing added infrastructural and technical costs to distance learning simply pushes up overall costs thus hardening the divide between those who can afford education and those

who cannot, lending to the ever widening gap between poverty and wealth both across and between nations (2001:231).

2.4 Conclusion

In outlining the various domains and approaches that are present within the learning technology literature, the implicit aim of this review is to indicate gaps in the literature which this research stands to address. It is argued that a ‘transdisciplinary’ (Avgerou & Lebre La Rovere, 2003) approach such as IS offers scope for ‘moving between’ theoretical and empirical parameters that other subject disciplines ‘work within’. It is also argued that the IS perspective creates an opportunity to study relationships that have not as yet received adequate attention in the on-line learning literature. These include the relationship between educational institutions and the learning technology market; the organisational implications of integrating on-line learning; and the implications of integration for the information infrastructure of the university. IS also has an important contribution to make to the study of on-line learning by opening out new lines of enquiry regarding the technological artefact. By adding texture to the study of learning technologies, the freedoms and limitations that these technologies afford can be opened up to scrutiny. This has the potential to reveal a more nuanced understanding of how on-line learning technologies contribute to learning. It also has the potential add further depth to our understanding of technology.

The next chapter turns to the issue of research method and examines what kind of theoretical frameworks can be used to support an inclusive account of learning technology integration. Following the line of argument constructed in this chapter, it is argued that choices relating to theoretical frameworks for data collection and analysis can both ‘factor in’ and ‘factor out’ significant aspects of the research scenario. In the case of learning technologies, for example, a research approach that depended upon a stable technological artefact would necessarily ‘factor out’ the uncertainty and speculation that characterised the early stages of this research. Questions raised with respect to situated learning and technology research are returned to in this chapter as part of a discussion of the ‘cognitive domain’. With a few notable exceptions, research that aims to identify cognitive phenomena has a tendency to ‘focus inwards’, either

turning towards an internalised, 'mind-based' reality that is distinct from the 'real world' of people and things or else by binding cognition to the intricacies of a specific, often pre-constructed situation. When selecting a research framework that will support the study of technology 'in situ' it is therefore important to take into consideration the varying accounts of the situation that are implied. The issue of choosing a research method is addressed in relation to these and other methodological questions raised by IS researchers in the following chapter.

Chapter 3 Research Method

3. Introduction

This chapter describes the research methodology and underlying theoretical framework selected by the researcher in order to describe the integration of learning technologies into higher education. The chapter is divided into 3 sections, the first of which explores the question of research methodology choice, a central concern of IS authors. Key characteristics of this debate are considered in relation to the topic area and in relation to the methodological implications of studying the integration of new technologies. Building on these debates, the second section describes the theoretical position adopted in this research and sets out the theoretical foundations of the analytical concepts ‘valence’ and ‘ways of reckoning’. These concepts emerged from a grounded analysis of field work data and are therefore not developed in full until after the case study has been presented. The last section in this chapter provides a detailed account of how the field work data were collected and analysed.

Working within a social science discipline, the IS researcher has both qualitative and quantitative methods at their disposal. The philosophical base upon which these methods can be founded is broad (Robey, 1996). The premise that unites IS researchers from all philosophical persuasions is an engagement with the IT artefact, although the extent of that engagement has been called into question (Orlikowski and Iacono, 2001). Debates regarding appropriate treatment of the IT artefact raise inter-disciplinary issues (Avgerou & Lebre La Rovere, 2003), philosophical questions (Latour, 1999) and moral concerns (Walsham, 2001). The argument made in this section is that the choices inherent in research design and methodology are one stage in the rationalisation of these concerns.

Taking this and the status of the on-line learning literature into account, Actor-network theory (ANT), also referred to as the ‘sociology of association’, was selected as an appropriate theory

to support data collection. ANT supports the heuristic flattening of philosophical or disciplinary divides and gives precedence to the empirical over and above theoretical or social delineations. Whilst this forms an interesting basis upon which to organise and carry out data collection, the theory itself is designed to act as a 'perspective frame' that falls away once field work ends (Latour, 1999:21). Therefore, for data analysis purposes, techniques were adapted from grounded theory (Glaser & Strauss, 1967). Both ANT and grounded theory are premised on the centrality of empirical research, but whereas ANT offers a way of theoretically sensitising the researcher, the central concern of grounded theory is to generate core concepts from the data collected. The core concepts that were developed from analysis of field work data in this research were 'ways of reckoning' and 'valence'. The theoretical basis for these concepts is set out in this chapter, in preparation for their development in relation to the field work data in chapter 6.

The final section in this chapter provides a detailed account of data collection and analysis. As is typical of ANT studies, the researcher employed the technique of 'following the actor' as the basis upon which to prioritise field work activities. In this case the actor was 'on-line learning technology', therefore field work activities were organised around the relationships and associations that these technologies formed. According to this technique, the scope and pertinence of field work activities arise from the research questions and are directly bound to the relationships and associations with which the central actor becomes involved. Data collection itself incorporated a range of field work activities, from semi-structured interviews to periods of learning technology related work conducted at each field site. Documents, texts and transcripts were collected at both field sites simultaneously over an 18-month period. These documents formed the basis of data analysis, where concepts and themes were developed from the raw case study materials. Questions of research method, as they are addressed by IS researchers, informed the choice of theoretical framework to support these activities. An overview of the issues raised by IS authors regarding methodology is therefore provided in the following section.

3.1 IS and research method

Some authors have argued that the field of IS is fundamentally weakened by the breadth of theoretical diversity it supports (Benbasat and Weber, 1996). Such individuals suggest that lack of a single, unified theory to act as a foundation from which knowledge can be built is a fundamental problem for IS researchers that precludes the extension of ‘established knowledge’. The body of established knowledge referred to is that derived from research methodology commonly associated with the natural sciences. Research into technology conducted according to this tradition is often placed in opposition to what have become known as interpretive methodologies (Walsham, 1993; 1995). In some respects, the opposition between interpretive and natural science based enquiry is representative of a paradigmatic split within the social sciences between subjectivism and objectivism (Burrell and Morgan, 1979; Orlikowski, 1992).

Whether this fundamental split is a weakness or strength of the field is a question that is still debated. Robey (1996) understands diversity as a valuable attribute that “expands the foundation upon which knowledge claims in the field are based” (1996:403). He calls for a “disciplined methodological pluralism” where theories and methods are justified on pragmatic grounds as “appropriate tools for accomplishing research aims”. However, there is an underlying sense in which calls for ‘appropriacy’ and ‘pragmatism’ mask a different kind of debate. Walsham (1995) draws attention to the issue of orthodoxy and the dominance of positivist research in IS journals. He identifies the cornerstone of positivist methodology as the study of technology through structured observation that seeks to ‘discover’ cause-effect relationships. Interpretivist research challenges the determinist assumptions that underlie this kind of work not just in terms of their implications for study of the IT artefact, but in terms of all social phenomena. However, Avgerou and Lebre La Rovere (2003) also identify disciplinary emphasis as a conditioning factor that creates prevailing tendencies in technology research. They emphasise the value of ‘interdisciplinary discourse’ drawing attention to the boundaries that lie between IS, economics and organisational research as places from which new lines of enquiry into understanding ‘micro’ and ‘macro’ influences might start.

The broad base from which IS methodology can be constructed allows the researcher the opportunity to ‘step back’ and apply critical consideration to the theoretical foundations of their own and other subject disciplines. This is particularly important with respect to the study of on-line learning technologies, whose theoretical development has been informed by

concepts from a number of different disciplines. Understanding what these theoretical frameworks include and exclude is an important aspect of defining a research contribution. In the case of learning technologies there are clearly grounds for considering the infrastructural and organisational implications of integrating learning technologies alongside the pedagogical work upon which they have a bearing. There are also grounds for considering the implications of ‘claims to transformation’ and the influence that market conditions and policy debate have upon integration activity. Drawing out the relationships between activities associated with technology integration and these ‘ongoing events’ is best captured through longitudinal, qualitative research. It is argued that an empirically grounded approach that considers these activities ‘in situ’, ‘in practice’ and ‘in the everyday’ is best suited to overcoming orthodoxies relating to determinism. However, some distinctions remain to be made between the approach adopted in this research and current ‘situated’ research methods. These distinctions are set out in the following section, followed by a detailed description of preliminary research design issues.

3.1.1 ‘The situation’ and situated research

In the previous chapter, issues associated with situated studies of technology and learning were outlined. The overall emphasis of situated research is on studying phenomena ‘in situ’, ‘in practice’, ‘in the everyday’ (Suchman, 1987; Orlikowski, 2000). As discussed in the previous chapter, situated studies of technology have allowed researchers to draw a number of different aspects of technology implementation and development into the analytical frame. These include: the process of technology design (Bijker et al. 1987; MacKenzie and Wajcman, 1985); cognitive agencies associated with technology use (Suchman, 1987); and a focus on technology users and their accommodation of technologies ‘in practice’ (Orlikowski, 2000). Looking at these examples of research as potential ‘resources’ that can support the process of selecting a research methodology and designing field work raises important questions. For example, the analytical perspectives offered by Social Construction of Technology (SCOT) authors and by Orlikowski’s practice lens create a sense in which there is a *defining* situation in which to study technology which is either *in design* or *in use*. As a researcher seeking to set the scope of study, drawing on one or other of these perspectives therefore holds practical implications with

respect to the research scenarios that are sought out or constructed. Knorr Cetina refers to this as an embedded “architecture of empirical approach” (1999:10).

Recognising these architectures and understanding the bearing that they have upon research outcomes is important, especially with respect to those topic areas that have been linked to the study of cognition, such as learning and technology. Commonly, those researching situated learning or action use ‘constructed scenarios’ to conduct their investigations, inviting learners or technology users selected by the researcher into the frame (Suchman, 1987; Brown & Duguid, 1989a). The ‘emerging circumstances’ under analysis are to some extent deliberately constrained by the scenario put in place by the researcher. Although this allows for a focused study of cognitive processes, the relevance of social and political processes tends to be filtered out. For example, since research participants are pre-selected, the relevance of alliance or group formation is lost, along with the relationship of action to an unpredictable ‘flow of events’. Whilst the situated school of cognitive research has made explicit efforts to draw the social, distributed nature of learning and cognition to the foreground, there is still a tendency to understand the cognitive domain as something ‘one step removed’ from the world. Ciborra criticises situated studies for this ‘cognitivation’ of action, drawing particular attention to the absence of emotional or existential concern in situated studies. An example of a research study which has sought to address these concerns and move away from pre-formatted cognitive research scenarios is Hutchins (1995) ‘Cognition in the wild’, in which he documents the collective task of navigating a Naval ship. A further striking study is the Mann Gulch disaster (Weick, 1993), in which he describes the role of ‘panic’ in the responses of a group of fire fighters to a life threatening situation.

By understanding social phenomena as they emerge from day-to-day interaction, the researcher can dislodge orthodoxies associated with determinism, whether that determinism is attributed to a technology or any other social actor. For example, authors such as Ciborra (1993: 2002) and Mansell & Steinmueller (2000) have related questions of technological determinism to determinist conceptions of market mechanisms. They are critical of depictions where it is assumed that the combination of an ‘appropriate technology’ with competitive forces will necessarily bring about ‘the best possible outcome’ for technology diffusion (Mansell & Steinmueller 2000: 454). These authors argue that acceptance of technological and market-

based 'logic' is so unquestioned in management and policy research that accounts of technology diffusion are most commonly compiled 'after the fact' (Mansell & Steinmueller 2000: 454) and made subject to 'ex post reconstructions' (Ciborra 1996:105).

Emerging from this discussion is a sense that research design and choice of method are of crucial importance with respect to technology research. Orthodoxies have the capacity to 'factor out' significant aspects of technology related interactions. These considerations were of crucial importance when designing this research into learning technologies. A 'single technology - single learning scenario' case study would have filtered out, or rendered contextual, the sweeping developments taking place within the technology markets and the higher education sector. These developments bore implications for how on-line learning technologies would be integrated into the institutional fabric of higher education. For these reasons, this research was designed as a study of learning technologies 'in the wild' in which integration activities were unformatted, situated within a 'flow of events' and which aimed to capture, as opposed to filter out, the moods, emotions and strength of conviction that formed part of contingent debates. The research design also aimed to leave intact the various 'local logics' that emerged from patterns, routines and ways of negotiating situations, and not supplant them with either determinist presumptions or *ex post hoc* analyses. In this way, local rationales involved in integration activities were preserved and made available for analysis.

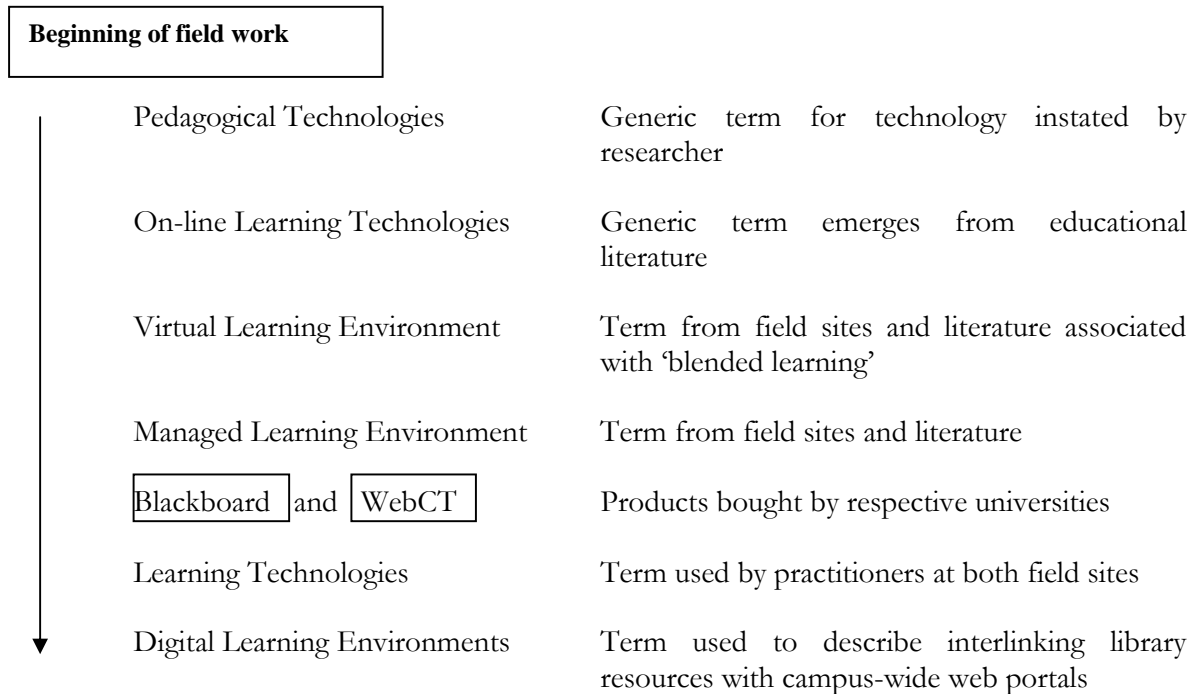
Instating these priorities had distinct implications for studying the technological artefact. Pinpointing a single learning technology and studying it 'in design' or 'in use' would not have captured the dynamic events that characterised the period of time during which research was carried out. Telling the story of integration from the viewpoint of the institution meant 'allowing' the technology in question to be unstable, elusive and difficult to pin down. This called for a distinctive methodological approach for 'tracking' technology as it passed through uncertain alliances and various conceptualisations and re-conceptualisations. The following section translates the theoretical concerns voiced in this section into the detail of practical research design. It provides an in-depth account of the development of the research questions, selection of field sites and techniques developed for contending with the shifting form of 'on-line learning technologies'.

3.1.2 Dynamic research area; emergent technology

One of the challenges of conducting research into learning technologies during the time period of this study was that for a substantial part of field work, the conditions under which on-line learning technologies would be integrated into higher education and the final form that those technologies would take were uncertain. In the light of the debates outlined in the previous section the researcher decided not to wait until these conditions had stabilised, but to place them at the core of the research design. However, studying the IT artefact in these conditions raised some distinctive considerations. For example, a substantial part of preliminary investigations included ‘tracking down’ the technologies in question; finding out the *kinds* of technologies that were implicated in debates and exactly who was responsible for developing them. Seeking out specific information about technical capabilities and how developers understood these capabilities to enhance teaching became a significant and surprisingly challenging aspect of research activity. The ‘larger scale’ developments taking place involved learning technology companies who had taken responsibility for technical design, giving universities control over academic ‘content’. Hence, for a long time it was unclear whether making contact with the technologies in question would involve conducting field work with a private sector partner or with a university. These early alliances had unknown implications for the kind of technologies that would become involved in higher education provision and the type of integration activities required.

In order to retain an empirical focus on ‘the technological artefact’, without focusing on one specific artefact, the researcher created a generic term that acted as a ‘placeholder’ until the situation began to clarify. The researcher instated the term ‘pedagogical technologies’ (Darking, 2002) in order to tie the events taking place to a notion of technical specificity and to a sense that multiple technologies and pedagogic models were at stake. Broadly speaking, ‘pedagogical technologies’ referred to software applications used to present course materials via the Internet. Over the course of field work, terminology for referring to these technologies shifted. Figure 3.1 below shows how the on-line learning nomenclature altered through the course of field work

Fig. 3.1 Shifting terminology used to refer to learning technologies during the course of field work



End of field work

Shifting learning technology nomenclature reflected the changing agendas and assumptions that accompanied integration activities. At the beginning of field work terminology used to refer to the role of technology in learning and education was extremely diverse. Alongside the emergence of the term 'on-line learning' came 'e-learning'. These two terms were used interchangeably for some time until a differentiation began to appear in the education literature between 'e-learning' as a description of work-based or corporate learning activities, and 'on-line learning' as education based learning activity. The term 'blended learning' was introduced to describe the integration of on-line and face-to-face components, in contrast to previous conceptualisations of on-line learning as solely a concern for distance educators. As the idea of 'internal', institution-wide use of learning technologies grew within the sector, the term 'learning environment' was introduced. Initially, emphasis was placed on virtuality and debates remained focused on the merits of face-to-face 'versus' on-line learning. However, the term 'virtual learning environment' (or VLE) was ultimately short-lived and was soon replaced by the concept of a 'managed learning environment' (or MLE) which included the work practices and information infrastructure of the university as a whole. This shifted the focus of attention

from learning technologies as a purely pedagogic concern to their significance within organisational spheres of interest.

Tracking on-line learning technologies over the course of these dynamic events required a commitment to longitudinal research and a capacity to take an institution-wide as opposed to purely pedagogic perspective on changes taking place. Defining the scope of empirical study in terms of UK higher education was a decisive factor that afforded a research domain; a frame, in and out of which learning technologies could be seen to pass before individual case study institutions were finally fixed on. The use of a placeholder allowed the researcher to remain flexible, following trends in learning technology activities without allying field work to a specific technological development. Through these means, dynamic aspects of the research domain and emergent trends in the conceptualisation of on-line learning technologies could be pursued. The next section describes how these trends were incorporated into an overall design for research, the development of research questions and the selection of case study institutions.

3.1.3 Development of research questions

The development of research questions was a fundamental aspect of the research design process in which the researcher aimed to both capture and reflect the emergent activities that characterised the integration of learning technologies. An iterative relationship with the primary and secondary literature in the topic area, together with preliminary research activities, highlighted the significance of claims to transformation with respect to on-line learning technology and higher education. These claims formed a significant aspect of the research climate and correspondingly played a role in shaping field work design. Given this distinctive climate, a qualitative, longitudinal, empirically grounded approach that afforded an organisation-wide as opposed to purely pedagogic perspective was selected as a basic framework for research. Taking into account current debates surrounding 'situated' studies of technology, a research focus on 'everyday' integration activities was selected as a means of capturing emergent or dynamic activity. In order to frame field work activities, a case study approach was adopted. Since the primary and secondary literature showed evidence of

potentially significant disparity across the higher education sector, the researcher decided that a cross-case comparison would afford greater generalisability of results (Lee, 2002).

A preliminary research question was formulated to guide initial research activities, which included the identification of suitable case study institutions. This question was: 'If higher education stands to be transformed by on-line learning technologies, exactly what are the technologies concerned and who is developing them?' The purpose of this question was to draw claims to transformation and empirically based descriptions of learning technologies into the same frame of analysis. In answering this question, the intention was not to create a taxonomy or list of available learning technologies. It was to draw attention to the disjuncture between claims being made and the reality that, firstly, during the period in question there were few examples of on-line learning technologies in use that were suggestive of the scale of transformation that had been mooted; and secondly, the organisational and contractual arrangements supporting the development of learning technologies were conditioned by market activity and were therefore extremely volatile and subject to overnight change.

Whilst highlighting this disjuncture, the researcher intended, nonetheless, to focus field work activities around the technological artefact. Hence, the core research question was: 'in the case of two contrasting UK institutions, how is the integration of on-line technologies taking place?' The concept of integration is developed along specific lines in this thesis, to denote the means by which a technology is brought over the organisational boundary, as well as those activities surrounding the involvement of that technology in existing systems and work practices. As opposed to 'technology diffusion', which focuses on the processes behind why particular organisations or sectors adopt one form of technology over another, 'integration' is framed from the standpoint of the organisation 'looking outward' into the technology markets. From this perspective, the idea of a technology can be circulated well before any definitive examples of that technology have been encountered by an organisation or by intended users. This perspective highlights the difficulties involved in understanding *in advance* the implications of incorporating new technologies into existing infrastructural and organisational practice. Rather than marginalise these aspects of the unknown or unsettled aspects of the research scenario, this core question sought to draw these issues into the heart of data collection and analysis.

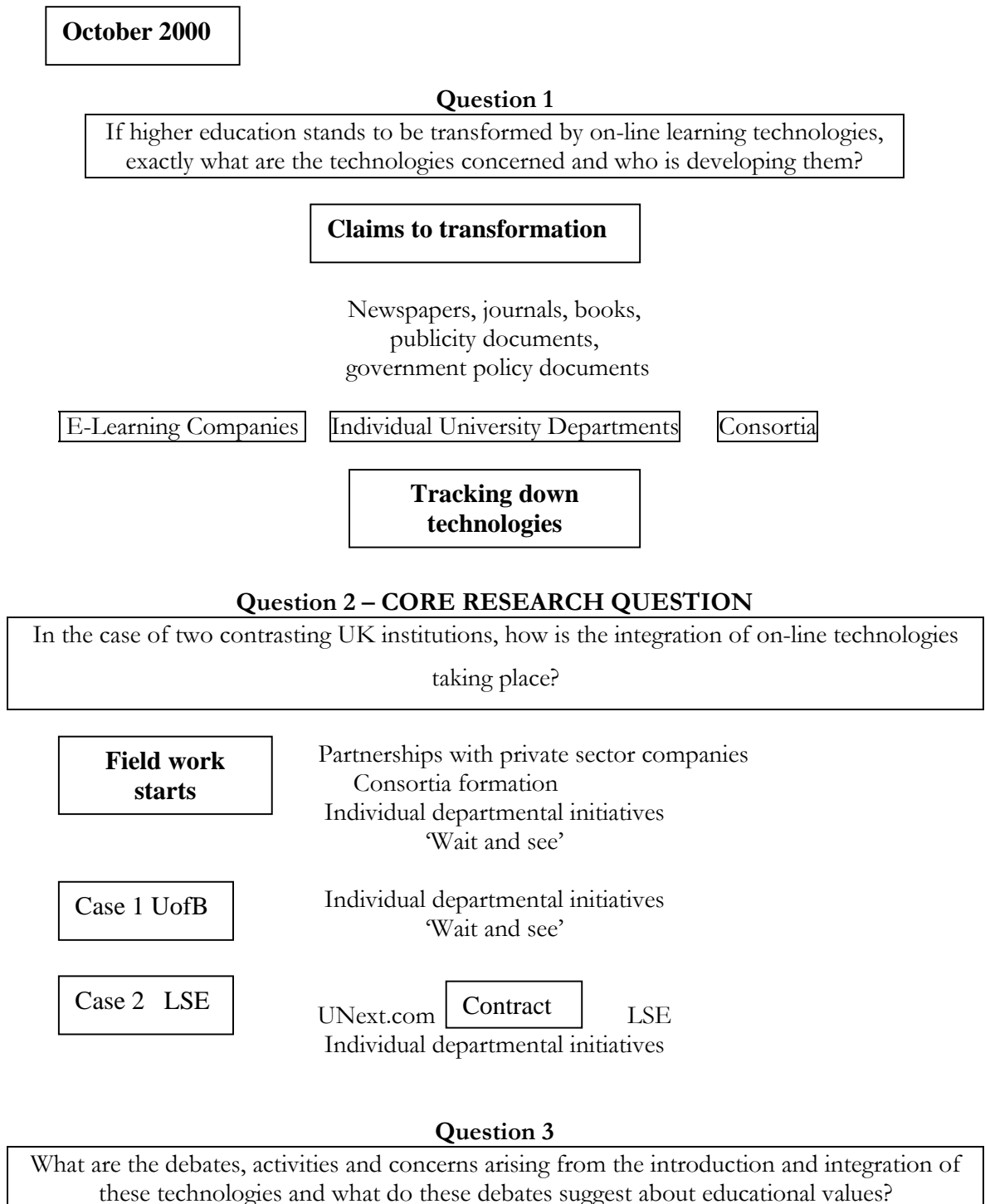
It was a significant aspect of the research design for field work that the core research question was constructed as an open question, so that it would not be rendered redundant or irrelevant by a particular turn of events. Answers to this core question were driven by events at the field sites and so it was important that the question could address emerging issues unimpeded by reference to a specific technology or a specific organisational context. On a purely practical level it was also helpful that the core question was simple so that it could be easily called to mind over the course of longitudinal research taking place across two field sites simultaneously.

The third research question was devised as a means of capturing significant events surrounding the introduction of learning technologies. Where the core research question called forth descriptions of the conditions and arrangements through which learning technologies were introduced to universities, this question asked: ‘what are the debates, activities and concerns arising from the introduction and integration of on-line learning technologies and what do these debates suggest about educational values?’ This question specifically introduced the question of ‘values’, recognising that as a social endeavour, education, like healthcare, constitutes an ethical concern. Additionally, and perhaps more importantly in terms of the analysis to come, education is *explicitly associated* with moral and ethical concerns in a way that other forms of endeavour are not. The three research questions were formulated during preliminary research and could not be settled on until it was clear what field sites would form the basis of the study and what level of access would be agreed. Case study selection therefore took place simultaneously with early research activity.

In selecting the case study institutions, trends reported in both primary and secondary literature were taken into account. Whilst the majority of institutions were already hosting isolated on-line learning initiatives embarked on by lone academic teachers, early reports of on-line learning technology adoption in UK universities identified two types of institutional response (Collier, 2001). Some universities elected to enter into alliances and form consortiums with private sector partners. However, for the main part, UK universities adopted a ‘wait and see’ approach to on-line learning technology strategy (Collier, 2001). On this basis, two case study institutions were selected: the London School of Economics and

Political Science (LSE) and the University of Brighton (UofB). Isolated learning technology use was in evidence at both field sites at the outset of research as was the use of departmental intranets. However, whereas LSE had entered into a consortia arrangement with four prestigious North American universities, UofB was representative of the ‘wait and see’ contingent and therefore, it is argued, representative of the majority of UK institutions. Figure 3.2 positions the development of research questions together with the selection of case study institutions within a timeline that includes significant field work events and influential findings from the literature.

Fig. 3.2 Timeline showing the development of research questions and the selection of case study institutions



It is worth noting that the two case study institutions had no formal connection to one another and when research began, the researcher was not aware that any significant informal connections existed either. However, during the course of field work there was a change in personnel at UofB and a person who had previously worked with LSE was made head of Information Services at UofB. By way of this association, a joint research bid concerning the use of learning technologies was made with which the researcher became involved. The bid was ultimately unsuccessful and no further inter-relations between the institutions came to the researcher's attention.

A further concern that had a bearing on the choice of field sites was the decision to adopt a research methodology that focused on 'everyday' integration activities. This decision brought with it the need to 'spend time' at each institution. With the field sites within 50 miles of one another, the researcher was able to spend some time every week at each institution. This 'simultaneity' was key since it allowed the researcher to situate analysis within a 'real-time' flow of events. If data collection had happened consecutively as opposed to concurrently, this element of comparison between the sites would have been lost.

The following section describes the theoretical framework that informed and supported data collection and analysis. Finding a framework capable of supporting the aims and priorities that have been outlined in this section was a decisive factor in understanding to what extent those priorities could be addressed. The importance of understanding the integration of learning technologies within a 'flow of events' whilst taking into account some of the criticisms of 'situated' research was a formative influence on the choice of theoretical framework

3.2 Theoretical frameworks for data collection and analysis

The selection of theoretical frameworks for data collection and analysis constituted a significant part of preliminary research activities. It was important that the theoretical framework adopted could support the depiction of dynamic events and their role in shaping the integration of on-line learning technologies. It was also important that the framework could account for the implications of an emergent technology that would be re-conceptualised,

re-named and re-constituted over the course of field work. In light of these concerns, the theoretical framework selected to support data collection was ANT (Callon, 1986; Latour, 1987). In a recent lecture series (Clarendon Lecture Series, Oxford, November 2002) Latour, who has previously written of his dislike for the name 'Actor-Network Theory' (1999), referred to this theory as the 'sociology of association'. The two titles are used interchangeably throughout this research. It was considered important to keep both in order for this research to retain a link to other ANT research. However, following Latour it is argued that the phrase 'sociology of association' reflects the basic premise of the theory better than ANT does. By placing association at the forefront of understanding, emphasis is placed on agency and 'what acts' rather than on distinctions between social or philosophical domains such as subjective / objective, structure / agency or the individual / society.

The philosophical position on which the sociology of association is founded calls for the heuristic flattening of 'great divides' (Star, 1991). This has particular consequences for the study of technology where, *theoretically*, it is argued, there is no fundamental, moral or social distinction between humans and machines or 'humans and non-humans'. Instead, technology is taken as an occasion to understand "the way understanding itself - social order, meaning, routines - is constituted" (Star, 1991:30). As such, the sociology of association places empiricism firmly at the centre of its philosophy. Properties and characteristics are understood to rest on agency and association rather than inherent distinctions. ANT authors offer the researcher some vocabulary and key terms that have emerged from other empirical investigations, but other than that, the theory is designed to dissipate once the descriptive phase of field work is over. Therefore, techniques were adapted from grounded theory in order to conduct data analysis (Glaser & Strauss, 1967). ANT and grounded theory are complementary theories, firstly because they both place empirically grounded data collection at the heart of research and secondly because they are designed to sensitise the researcher to different aspects of the field work process. Grounded theory does not offer the researcher a philosophical basis upon which to conceptualise empirical work but it does offer clear guidelines for data analysis; ANT offers no such guidelines but is well suited to the task of theoretically sensitising the researcher.

Grounded theory analysis produces concepts, inductively arrived at through creative, systematic engagement with the field work data (Strauss & Corbin, 1990). The intention is to develop core concepts that are densely integrated and offer a 'substantive fit' with the everyday reality of the field site (1990:23). Core concepts are designed to be generalisable, whilst at the same time offering conditions relating to specific circumstances. The core theoretical concepts that were generated through the analysis of field work data from this research are 'valence' and 'ways of reckoning'. These concepts are deeply informed by ANT principles, and their foundations are therefore laid out in the following section. However, they are empirically grounded, and so their explicit development in relation to field work data does not take place until chapter 6 where the data are presented. The following sub-section begins with an overview of the sociology of association, setting out some general principles of its use in relation to data collection. The second section considers the implications of some of the key philosophical ideas in more depth and relates them specifically to the study of technology. The final section shows how these ideas became interwoven in the development of the core theoretical concepts of 'valence' and 'ways of reckoning'.

3.2.1. The sociology of association

The work of the ANT and science and technology studies (STS) authors informs the field work design for this research. These authors represent an amorphous group of writers loosely bound by a common interest in the philosophy of science (Walsham, 2001). Particularly with regard to ANT, they have stated a desire to resist the creation of a canon of theoretical work from which a fixed set of principles can be derived (Law 1999). Broadly speaking, interpretive, empirically grounded qualitative research is advocated. As a touchstone of this literature, Latour and Strum's work on the 'Performative Model of Society' (1987) has provided a basis for field work design and the collection of empirical materials. The performative model is derived in part from Garfinkel's Ethnomethodology (1967). Garfinkel proposes a view of sociology in which society is achieved through interaction, rather than "it being a given, existing, structure within which interaction takes place". The performative model provides a hypothetical basis, or what Latour refers to as a perspective frame, through which activities

taking place within the field can be viewed. Activities are understood in relation to the following tenets:

- no one, including the researcher, has a privileged view of events
- actors, regardless of their size, define for themselves and for others what society is
- a variety of elements or properties can contribute to social relationships, whether they be material, symbolic or human

An extension of the premise that no actor has a privileged viewpoint is that all actors are understood as equal; as having equal access to the practical means necessary for them to achieve a definition of society and organise others around that definition. The more actors are understood to be equal *in principle*, the more apparent *practical* differences in the means available to them become (Strum & Latour, 1988). Macro and micro versions of society are not taken at face value, but are schematically levelled by understanding how relationships are enacted. For example, for a university to enter into a global consortium, a decision is taken at a particular meeting, in a particular boardroom and on the basis of this decision, a contract is drawn up. Although the consortium represents a level *above* the institution in terms of scale, it is the contractual document that binds the global alliance together and it is this that can be studied, debated and contested. This approach acknowledges that the range and extent to which practical considerations act upon a situation is partly defined by those involved, and does not rest purely on criteria pertaining to size or scale. Once issues of scale and significance are uncoupled, the *detail* of situations becomes as important as the 'larger' constituting structures; correspondingly, that which happens in 'a moment' is as significant as that which is repeated and routinised.

Along with scale, ANT does away with pre-conceived ideas of traditional 'domains' allied to what Latour describes as 'out there' theories of nature, 'in there' theories of the mind, 'up there' theories of god and 'down there' theories of the social (1999: 14). By rejecting transcendental, psychological, social or political explanations of social order *in principle*, the sociology of association draws attention to how social order is achieved '*in practice*'. Leaving this area of theoretical space open allows actors themselves to define if and how these aspects come to bear on their circumstances. If they themselves describe or rationalise their

circumstances according to these explanatory frames those descriptions are left intact, and not 're-described' in relation to one or other of these domains. In order to draw attention away from social or conceptual domains ANT authors advocate 'following the actor' as a useful basis for understanding how and why associations are (or are not) made. For these reasons, ANT lends itself to the study of unpredictable, unknown phenomena where alliance forming, group formation and the organisation of resources are emergent and dynamic.

These aspects of ANT have left it open to criticism that the theory advocates a relativist stance and as such, affords little scope for constructing moral agendas (Walsham, 1995). On this point Latour writes:

To eliminate the great divides between science/society, technology/science, macro/micro, is not to immerse ourselves in relativism and indifferentiation. Networks are not amorphous. They are highly differentiated, but their differences are fine, circumstantial and small; thus requiring new tools and concepts. Instead of 'sinking into relativism'; it is relatively easy to float upon it. (1991:130)

Latour argues that ANT is 'relationist' rather than relativist. He argues that showing the relationships between points of view held by mobilised and mobilising actors allows moral questions to become more precise as opposed to more ambiguous. However, there is a danger that in 'following the actor', descriptions centre around the powerful who are 'permitted' to act within a situation rather than those who the situation prevents from acting. Star (1991) refers to this as a tendency to construct images of the 'executive in the network' that screen out work that is delegated, which in turn becomes 'invisible' (1991:28). Star (1991) and Star & Bowker (2000) have made important methodological contributions designed to invert some of the 'taken for granted' or invisible aspects of technology studies. Among these is Star's recognition that "the voices of those suffering from the abuses of technological power are among the most powerfully analytic" (1991:28). Awareness of what is excluded as well as included in the network and how these conditions are naturalised are important sensitising considerations to hold in mind when using ANT to support data collection.

3.2.2 Key implications of ANT

The heuristic levelling of great divides brings interesting implications to the study of social phenomena. Of these implications, Latour draws particular attention to traditional divides between humans and ‘the natural world’. Latour traces the philosophical and historical origins of this divide (1999) and attributes its modern day reification to the ‘machineries’ of scientific study which aim to maintain a divide between “material infrastructure on the one hand and social superstructure on the other” (1991:129). He claims the attribution of power to one or other of these infrastructures has been a preoccupation of social theory. According to the sociology of association, understanding power in terms of ‘what acts’ and ‘what is acted upon’ is replaced by a focus on ‘the social links’ through which actors mobilise and are mobilised (1991:129). The standing of a particular link or relationship is substantiated - literally given substance - through its interconnectedness with other significant actors. Substantiation takes place through processes of alliance forming where people, resources, symbols and infrastructures are enrolled by other actors. Latour maintains that when enrolment, links, associations and agency are described *as they take place* then the separations put in place by social theory become unsupportable and the lines between ‘in there’ subjective truth and ‘out there’ objective reality blur entirely.

The notion of the actor is key to understanding how the theoretical lines put in place by traditional social theory are redrawn. An actor can be an individual, it can be a collective; it can be a human or a non-human; it can be an assembly of all of these (Callon, 1991). What are important are the associations that actors form and the networks to which these associations bind them. Whether an actor is seen as an empty vessel through which an intermediary passes, or whether it is an explicit concern in itself will vary according to standpoint. Callon uses the example of a nuclear power station. The station could be taken as a “black box” that “converts known inputs into programmed outputs”. Or else, it could be seen as an actor, as the focus of concern. In this sense, the matter is empirical rather than theoretical. Theoretically, Callon places emphasis on the actor and the possibility of agency. He maintains that every association brings with it a translation (Callon 1986), a displacement, through which actors are inevitably transformed. Of central importance to Callon is that among these translations the concept of ‘the actor’ affords an *attribution* of agency.

“Why then, do we need the notion of actor? Why should we not simply make do with that of intermediary? The answer has to do with authorship. All interactions involve a method for imputing intermediaries to authors. Indeed, authorship is often inscribed in the intermediaries themselves. Scientific articles are signed and technical objects are trademarked. Incorporated skills are attributed to the body or the subject. Thus I want to say that *an actor is an intermediary that puts other intermediaries into circulation* - that an actor is an author.” (Callon, 1991:140) [emphasis in original]

Attributing agency and understanding the status of actors and intermediaries are important ways of unsettling constructions of the world that are based on objective labelling and classification.

Star (1991) approaches these issues from another perspective, looking at networks and association from the perspective of multiple membership, multiple selves and marginality. In her analysis Star (1991:50) describes the complex yet powerful experience of marginality. Being simultaneously a part of, yet outside, communities of practice and experiencing varying levels of visibility and status are experiences Star describes as common to all.

People inhabit many different domains at once, [...], and the negotiation of identities within and across groups, is an extraordinarily complex and delicate task. It's important not to presume either unity or single membership, either in the mingling of humans and non-humans or amongst humans (Star 1991:52).

By looking at how marginalising conditions become stabilised, the power of the marginal as an analytical lens becomes apparent. Star argues that technologies and standards play a significant role in the routinised marginalisation of groups and individuals. According to her analysis, the marginal can be the majority, the few or the individual. This has interesting consequences for attributing significance to viewpoints. ‘Weight of numbers’ is not automatically understood as more significant than individual experience. In fact, Star’s analysis brings about an inversion, where the account of the marginalised individual becomes the most powerful. When subjective and objective divides are put to one side, the assumed power balance between the concerns of the one and the concerns of the many is removed. This prepares the ground for a more interesting question: when and under what circumstances does individual viewpoint count? However, Star’s analysis of multiple membership does not limit itself to exclusively human concerns. She also describes the implications of multiple membership for objects that simultaneously inhabit different domains (Star and Greisemer, 1989), such as lists and

classification systems (Bowker & Star, 2000). In the context of multiple membership, Star and Greisemer draw particular attention to ‘working arrangements’ which help to resolve the anomalies that occur when the ‘naturalised’ classifications of two or more communities of practice are required to interrelate (Bowker & Star, 2002:297).

These authors have paid particular attention to the role of technology in creating and maintaining networks. Cast in this light, society and technology are not “two ontologically distinct entities but more like phases of the same essential action” (Latour, 1991: 129). By not accepting inherent distinctions between social and technical activity ‘in principle’, the sociology of association brings to light how properties and characteristics of social or technical behaviour are enrolled in order to support and sustain arguments. The organisational demands associated with introducing a new technology and the re-arrangement of work practices that ensues provides a particularly interesting basis for considering how priorities are set according to these arguments. Listening to explanations given from within a field site with respect to why a particular course of action should be taken opens out the question of priorities to analysis. ‘Necessity’, ‘programming’, questions of ‘what is most practical’, are not taken as given or accepted as ‘reasons in themselves’ for setting priorities and as such are opened up for debate.

The table below describes how the theoretical implications of ANT have been applied methodologically to generate specific research tasks and sensitivities. The first column summarises the theoretical arguments presented in this section. The second column shows how these points of theory are translated into methodological requirements and the third column indicates the practical application of those requirements.

Fig. 3.3 Table outlining theoretical, methodological and practical application of ANT to the process of data collection

Theory	Method	Application
Sociology of association	Focus on agency and formation of social linkages	‘Following the actor’ (in this case on-line learning technologies)
Performative model of society	Links and associations take precedence over theoretical separations and ostensive	Passage and associations formed by the actor pursued regardless of social divides

	divides	
Heuristic levelling of great divides	'In principle' divides replaced by 'in practice' group formation	Sensitive to conditions of social groups and social group formation
No inherent ontological distinction between the social and the technical	Social and technical actors understood as equally capable of enacting social links	Sensitive to depictions of what is necessary, natural or logic
Actors capable of defining events, regardless of size	Macro and micro considerations placed to one side	Significance uncoupled from scale (in terms of both size and longevity)
Substantiation of social links	Material, symbolic and human actors capable of enacting social links	Sensitive to the role of both human and non-human actors in achieving social links
Marginality as analytical device	Infrastructure as simultaneously enabling and disabling	Attentive to actors who are marginalised and 'invisible voices'
Multiple membership	Actors capable of simultaneously inhabiting multiple social domains	Aware of both links between and boundaries of communities of practice
Boundary objects	Working arrangements that resolve anomalies between naturalised categories without imposing categories themselves	Attentive particular social links that facilitate communication between communities of practice

The philosophical foundation for this research was based upon the theoretical framework provided by ANT and outlined above. This framework informed the process of data collection and therefore has a bearing on research outcomes. The outcomes of this research are the analytical concepts of 'valence' and 'ways of reckoning'. In the next section, the inter-relationship between the theoretical and methodological points outlined above are discussed in relation to the development of these concepts.

3.2.3. Valence and ways of reckoning

Valence and ways of reckoning are core concepts inductively developed from an analysis of field work data. The relationship of these concepts to the field work data is fundamental, since they were derived using procedures and techniques from grounded theory. However, the analysis process is not independent from the research design. Clearly, the data available for

analysis are only those which the researcher has sought to collect. Therefore valence and ways of reckoning are as much a product of research methodology and design as of data analysis. As such, they stem from the researcher's own sense of topical relevance, refined by reviews of primary and secondary literature; they are the outcome of the process of selecting and developing a relationship with the theoretical framework for data collection; and they are the outcome of the process of developing research questions during preliminary field work activities. In effect, valence and ways of reckoning share the same theoretical foundations as the process of data collection and analysis, and so the basic premise of these concepts can be described here. This premise will be recognisable because it is formed from the tenets of the sociology of association, described in the previous two sub-sections. In accordance with those tenets, these concepts represent a 'plane of analysis' that can only be understood empirically.

The first concept, 'valence' was constructed from data that clustered around the third research question. This asked: 'what are the debates, activities and concerns arising from the introduction and integration of these technologies and what do these debates suggest about educational values?' Below is a table showing the theoretical foundations of the concept.

Fig. 3.4 Table describing theoretical foundations of the analytical concept of 'valence'

Valence
Valence is a theoretical concept that is designed for use in empirically grounded research to draw theoretical attention to the relative significance of situated priorities and concerns
Significance can be embodied or asserted by a range of different actors whether they be material, human, technical or symbolic
A priori assumptions regarding physical size or symbolic or social status are put to one side and emphasis placed on the competition between these characteristics in practice
Valence is understood as the enacted admission, enrolment or exclusion of actors and the articulated basis upon which this occurs
Valence is understood in relation to a substantiated network of associated concerns rather than in isolation
Valence accepts that actors are both historically and socially situated; that their agendas and priorities will change over time and in relation to the groups and communities of practice with which they interact.

Placing educational values in the same analytical frame as day-to-day debates, activities and concerns resulted in a focus on ‘concerns’, ‘significance’, ‘priorities’, ‘issues’ and perhaps inevitably, ‘conflict’ and ‘disagreement’. ‘Order’, ‘priority’ and ‘significance’ were understood as propositions capable of being expressed through non-human arrangements as much as through discussion and debate. Therefore, lists, technical configurations and the physical arrangement of a room were understood ‘in principle’ as capable of enacting priorities and conveying significance, in the same way as human actors. On this point, the concept of valence was used to address two issues that presented themselves during analysis. The first was that commonly, human and non-human actors are understood to occupy distinct ontological domains, whereas in practice frequently they formed areas of mutual concern. The second was that actors could simultaneously occupy multiple social domains and could therefore be of varying significance or concern to those around them. By disregarding theoretical distinctions and social domains, valence dispels tendencies to *annex concern*. In the context of complex integration work, this meant that an actor could be understood to be a source of *mutual concern* to actors from distinct social domains, who held profoundly different priorities. In both data collection and analysis this prevented the significance of certain agendas from being *automatically eclipsed* by the significance of others.

During the process of developing the concept of valence, a second concept emerged as an integral aspect of asserting priorities and concerns. ‘Ways of reckoning’ became a conceptual label for various forms of ‘reasoning’, ‘grouping’, ‘ordering’, ‘counting’ or ‘ways of seeing things’. ‘Reckoning’ seemed a particularly appropriate word to describe this activity. Collins English dictionary describes the verb ‘to reckon’ as:

1. to calculate or ascertain by calculating; compute.
 2. to include; count as part of a set or class: *I reckon her with the angels.*
 3. to consider or regard: *he is reckoned clever*
 4. to think or suppose; to be of the opinion.
 5. to settle accounts.
 6. to take into account, or fail to take into account: *the bully reckoned without John’s big brother.*
- (1994: 1295)

The significance of this concept arose from the need to refer to and more importantly *attribute* ways of reckoning to actors, regardless of whether they were an individual person, a working

group, a piece of programming or an aspect of legislation. This was found to be of enormous importance during the process of complex integration work. Understanding both current and historical reasons for why a set of relationships and conditions existed was vital to the process of understanding if and how new arrangements could be made. Below is a table outlining the theoretical foundations of the concept of ‘ways of reckoning’.

Fig. 3.5 Table describing theoretical foundations of the analytical concept ‘ways of reckoning’

Ways of Reckoning
Ways of reckoning is a theoretical concept that is designed for use in empirically grounded research to draw theoretical attention to the multiple, situated ways in which reasoning is enacted
Ways of reckoning can be enacted or embodied by a range of different actors whether they be material, human, technical or symbolic
Ways of reckoning are not bound to cognitive domains, nor are they bound to inherent concepts of logic, rationality or sense
Ways of reckoning are historically constituted; they can be elicited from existing arrangements, enacted in the present or projected into the future as organising visions
Ways of reckoning are understood in relation to a network of associated concerns rather than in isolation; they are not inferred and they do not transcend the situation.
The concept allows the texture of information infrastructures to emerge, by enriching descriptions of design issues commonly disregarded as matters of pragmatism, functionality or necessity

Valence and ways of reckoning were designed as conceptually integrated concepts. Particularly during the analysis of ‘explanations’, valence frequently came to represent ‘the reason why’ a certain set of priorities were enacted and ways of reckoning came to represent ‘how’ those priorities were achieved ‘in practice’. But this is not to suggest that explanation or an inherent relationship between ‘how’ and ‘why’ exists in either an empirical or theoretical sense. Valence and ways of reckoning simply point to depictions of how and why; they do not require or demand that the two to be linked. Where notions of how and why are linked together by an actor, it is interesting; where they are not linked - where nobody can determine or deduce ‘the

reason why' an arrangement exists or 'how' a particular set of priorities can be achieved - it is equally interesting and important.

Whilst the theoretical foundations of valence and ways of reckoning are outlined here, these concepts are empirically grounded and so they cannot be fully developed until after the field work data have been presented. Further discussion is therefore deferred until the analysis of field work data in chapter 6. The next section in this chapter describes how the theoretical framework of the sociology of association was translated into the practical task of data collection. This section also describes the techniques and procedures through which the core concepts of valence and ways of reckoning emerged.

3.3 Detailed method of data collection and analysis

The field work design and methodology selected held distinct, practical implications for data collection. For example, in order to capture a 'flow of events' data collection had to take place at both field sites simultaneously over a significant period of time. The researcher opted to take a participant observer role at both case study institutions so that she would be involved in the networks and processes through which on-line learning technologies would achieve integration. In order to capture an unformatted sense of 'dynamic events' the researcher made a point of attending various events and meetings associated with learning technologies at both institutions. She also conducted semi-structured interviews and became involved in associated learning technology work. The outcomes of many of these activities were field work texts; from the minutes of meetings to field work notes and reflections. Collecting multiple field work data types allowed the researcher to capture a variety of standpoints, which could then form part of analysis. Whilst the sociology of association was an important sensitising device during data collection, principles and procedures from grounded theory supported the process of data analysis. The generation of core concepts is a central concern within grounded theory analysis and the integrity of the concepts produced is contingent on the analysis process. Details of both data collection and analysis activities are described below.

3.3.1 Data collection

Preliminary data collection began in July 2001 with formal access granted in November 2001 and January 2002 at UofB and LSE respectively. The issue of access was influenced by the researcher's 'insider' status at each case study institution. During field work the researcher was a PhD student at the LSE in the Information Systems department. At UofB, she worked on the implementation and support of the central student information database for two years previous to beginning her PhD and retained a part-time position, working with this database whilst conducting research. Being a student at one field site and an organisational member of staff at the other had interesting implications for access, creating a dual sense of insider / outsider relations at each institution. This was manifest in the networks that the researcher had 'matter of course' access to at one institution, but she was unable to access at the other. For example, as a student at LSE, the researcher was not permitted to join certain organisational e-mail groups that she belonged to automatically as an employee at UofB. The aim was not to seek identical levels of access at each institution. On the contrary, the distinct historical relationships the researcher had with both field sites allowed dimensions to emerge from field work data that could not have been achieved otherwise. However, it was important that the theoretical framework adopted provided a solid basis according to which tensions surrounding the participant observer relationship could be explored.

Due to the dynamic nature of events, research had to be negotiated with a number of different key stakeholders, and interviews were often used as an opportunity to negotiate this kind of access. As points of interest emerged, key stakeholders were identified and semi-structured interviews were conducted. Interviewees were asked to describe their background, their current role and their involvement with learning technologies. They were also asked to provide details of any meetings or working groups in which this work involved them. Invitations to forthcoming events mentioned in the interview were sought and descriptions of and documentation pertaining to past events described as significant were requested. Where appropriate, access to meetings and involvement in correspondence were also requested, as were computer accounts to enable the researcher to interact with the technologies in question. The majority of interviews were tape recorded and transcribed by the researcher. 'Interview

maps' were created to ensure an even spread of interviews at both institutions. This did not equate to an even number of interviews; the collection of interview data was balanced against other forms of data collection taking place. The researcher's insider access at UofB meant that overall she participated in more meetings than she did at LSE. She actively compensated for this by conducting extra interviews at LSE. The extra interviews undertaken formed part of a user needs analysis study that was being undertaken at LSE as part of a JISC (Joint Information Systems Committee) funded project. The researcher was invited to be note taker for these interviews; a learning technologies librarian conducted the interviews themselves. For this reason, these interviews took a different form and emphasis to the other ones conducted. However, the researcher sought involvement in these interviews because their emphasis was indicative of a direction taken by field work events. In total 28 interviews were conducted. The interview maps, including the extra LSE interviews conducted, are provided in the appendix.

During data collection, emphasis was placed on being physically present at meetings and events and a diary of these events was maintained throughout field work. The diary formed the backbone of data collection, preserving a basic timeline of events as well as a place where the researcher could record field work notes and reflections. Additionally, it provided a means of cataloguing the various documents collected from events and meetings and of keeping track of e-mail correspondence. Collecting multiple types of field work data in this way provided a useful way of triangulating or corroborating events. Being physically present at meetings and events generated different types of documentation, each of which reflected different aspects of the events taking place. Interestingly, the technologies themselves were often left out of these accounts. In interviews or meetings, for example, the actions of technologies were represented indirectly by system or technology representatives. For this reason, the researcher sought active involvement with the technologies in question in order to develop a 'hands on' sense of their design. Where possible, relevant user manuals or system documentation were also collected to support the researcher's understanding.

Once learning technology groups had established themselves at the two institutions, a period of work was negotiated with each. The work sought was identified as something deliberately oblique in terms of the overall dissemination of learning technologies. At LSE the researcher worked on the design and maintenance of a database that held e-copyright licenses. This

involved working closely in the Centre for Learning Technology office for three days a week for a period of three months. At UofB the researcher was permitted to extend her role as a User Support Assistant of the central student database to include work on the new managed learning environment, to which she contributed periodically over the course of nine months. Her role in this work was to provide extracts of data from the central database and where called for, to act as a spokesperson for the database and its users. Both periods of work-based data collection allowed the researcher to develop an overall sense of the day-to-day working life of the respective learning technology groups. The researcher was careful to remain at the periphery of dissemination activities designed to promote or encourage the use of learning technologies. This became particularly relevant at LSE where research students began to be recruited by academic departments to create and maintain on-line course materials.

Of all the meetings and events that the researcher attended, one set of meetings warrants particular mention. These were the meetings of the Managed Environment Working Groups. At the beginning of field work it was assumed that the two case study institutions would take very different approaches to the integration of learning technologies. However, ultimately both universities took very similar approaches to the extent that both formed the same working group with the same name at around the same time. The meetings of the respective Managed Learning Environment Working Groups ran in parallel with one another for six months of the field work period and on one occasion meetings at each institution were timetabled for the same time on the same day. Told as an *ex post fact* reconstruction, this characteristic of field work events could appear inevitable; however, when arising within the flow of events the researcher considered this coincidence astonishing. The emergence of these meetings provided a serendipitous basis for analysis and comparison between the two institutions, and also served as an example of the convergence of integration choices within the higher education sector.

Learning technologies mailing lists provided one final set of data. The purpose of subscribing to mailing lists was not to make them the object of analysis but rather to capture a sense of the interconnectedness of ideas and concerns circulating at the time. Keeping apprised of debates taking place within mailing lists acted as a sensitising device and provided a means of cross-referencing data issues being raised at the case study institutions. The International

Federation for Education Technologies (IFETs) list was particularly useful in this respect as it was very much an international forum for debate, providing some interesting cross-reference between the UK experience and the experience of other countries. All the learning technology mailing lists subscribed to had an emphasis on maintaining a membership whose primary concern was education. List contributors expressed a clear and explicit determination not to let the lists become the target of commercial interests, with interventions from publishers receiving particularly harsh treatment. In the WebCT and Blackboard user group lists there was frequent reference to 'who is watching us' and a clear sense that people were taking matters outside the forum to avoid the scrutiny of Blackboard and WebCT employees. At UofB, the researcher received general e-mails sent to university staff, which again were not included in analysis but provided a distillation of wider debates taking place within the sector. University-wide e-mail debates about pay and messages from union representatives discussing strike action were common, particularly towards the end of field work when a number of groups within the UK public sector were striking with respect to pay. Towards the end of the study, e-mails concerning the long awaited White Paper on higher education began to circulate.

Data collection continued until December 2002, by which stage each of the universities in question had reached a significant juncture in their attempts to promote and integrate learning technologies. Finishing data collection was a significant act that had to be carefully planned and sensitively enacted, due to the researcher's close involvement at both field sites. From the researcher's point of view it was important to leave both field sites as far as possible. Whilst this gave the researcher an uncomfortable feeling of being 'out of the loop' it was considered necessary in order that she could begin constructing a sense of 'the field work period'. At UofB this meant leaving the employment of the university; at LSE the researcher continued as a student but stopped working for the Centre for Learning Technology.

Once the core case study chapters were available as final drafts, meetings were arranged with key participants to review the researcher's account of events. Participants were invited to comment on the presentation of case study material but they were not invited to comment on the analysis of that material. As long as there was agreement over the details of the researcher's account, responsibility for the final analysis of that account was understood to be the researcher's (as author) alone. Areas of the text that were considered to be potentially sensitive

were highlighted and discussed among the group. Neither of these meetings threw up any particular points of contention beyond corrections to dates and on occasion, job titles and departmental acronyms. With respect to UofB, one item of data was removed on the grounds that it disclosed the naming convention for servers in the machine room, which was undesirable for security reasons. Other than this, practitioners at UofB found the language and details of the account interesting and familiar. The learning technology manager remarked that it was, 'nice to have an account of their work that they actually recognised' and that it made a pleasant contrast with the majority of accounts they read in which they struggled to see themselves. At LSE there was also a good response with only minor revisions requested. In the case study material, it had been inferred that the Centre for Learning Technologies' strategy had been to dissuade teaching staff from using the new technology if their only intention was to solve an administrative issue. This inference was lessened, on the basis that learning technology staff felt that it did not accurately reflect the approach they had taken. Other than this, and an acknowledged need to clarify the number of courses that were on-line by the end of the field work period, the group was satisfied with the researcher's account.

3.3.2 Data analysis

The analysis of field work materials began before data collection ended. Eisenhardt (1989) and Glaser and Strauss (1967) argue that the overlapping of data collection and analysis is desirable, since it allows the researcher to address questions raised whilst still in the field. In most cases, the outcome of field work activities had been a text, whether it was an interview transcript, minutes of meetings, descriptions of a technology or impressions noted by the researcher. During the course of research, these texts provided a basis for thinking over activities taking place in the field and planning the next phase of involvement. The collection of multiple data types meant that the organisation and collation of field work documents presented itself as an issue early on in data collection. Initially electronic field work documents were held in e-mail and document repositories, and paper-only documents in box files. Although carefully filed, documents were essentially unordered in early phases of field work but each communication received or paper collected was referenced within the field work diary. The diary tied each piece of data to a sequence of events that was eventually translated into an index of field work

documents. The index mapped out field work events noted in the diary in temporal order, creating a fixed association between events and field work documents that facilitated the physical cataloguing and organisation of material. Latour (1999) identifies the preservation and consequent re-arrangement of temporal order as one of the key analytical acts made possible when the researcher moves from the field site into the laboratory.

Initially the field work document index combined data from both field sites, as did the field work diary. This was reflective of the author's lived experience which involved spending some time every week at each site respectively. For the purposes of analysis it became necessary to construct two separate field work tables and two separate filing systems for materials. The field work diary continued as a single document, reflecting the researcher's day-to-day experience of spending some time at each field site every week. Below is an extract from the UofB field work document index. The complete field work document indexes for both case studies are provided in appendix 1 and appendix 2.

Fig. 3.6UofB Index of Field work Documents

	Date	Event	Text
1	11/10/2001	Student database team meeting MLE first mentioned	diary entry
2	22/10/2001	Student database team meeting MLE raised at Information Strategy Committee (ISC)	diary entry
3	30/10/2001	E-mails from Learning Technology Manager (LTM) setting up 1st MLE working group meeting	e-mail
4	01/11/2002	Documents arrive from LTM	ISC minutes
5			tabled documents inc. MLE proposal
6	06/11/2002	E-mail Registrar requesting access	e-mail

Before field work documents could be submitted to the index, the researcher found that a period of stabilisation was necessary. For example, e-mail exchanges commonly centred on an

event or issue and until that event had passed or the issue resolved it proved difficult to ‘put a pin’ in the field work document and apportion an appropriate date and label to it. For this reason, the level of granularity indicated by each entry is not identical. Field work documents were classified in terms of date, field work event and the type of text collected. Sometimes this constituted an individual document but other times, where the document was part of an ongoing discussion or conversational thread, the boundary of individual documents is less discernable and therefore appears less so in the index. For an event or communication to constitute a field work event, the researcher had to be personally involved in it. By placing herself within networks that were focused on the integration of learning technologies, the researcher found that significant events would be discussed or reported on in one form or another even if first hand involvement had not been possible. The reference to the ISC in the table above is an example of this. As a top level committee, the researcher did not have access to the ISC, but the fact that mention had been made of a Managed Learning Environment was discussed at a team meeting and also in an interview at which the interviewee in question offered to forward relevant tabled documents.

The first stage of analysis took the form of ‘open coding’ (Strauss, 1987). Conceptual labels were used to pinpoint aspects of data that were understood to be significant. The theoretical framework of ANT acted as a sensitising device in this respect (Glaser & Strauss, 1967; Glaser, 1978). The organising principle against which the significance of data was measured was its relevance to the core research question. If field work data did not offer a direct contribution to this question, they were put to one side. Conceptual labels attributed to relevant areas of data were written on ‘sticky notes’ and stuck to a large wall in the researcher’s office. This provided a helpful means of surveying the data and also assisted in the process of creating categories. Linking concepts together to create categories is part of the open coding process, and moving sticky notes around the wall, grouping them according to common themes or motifs provided a useful basis for engaging with the coding process. Consistent with ANT, grounded theory places no particular emphasis on scale. In terms of analysis, this meant that ‘big’ events, moments, ‘entire infrastructures’ or single pieces of programming code could constitute a concept. Moving between data types was an important analytical act in this respect, since field work documents could include or exclude levels of detail or forms of expression, depending on their genre. The relationship of field work notes to formal

‘communication genres’ (Yates & Orlikowski, 1992) thus became important. For example, although there would be considerable overlap between the minutes of a meeting and field work notes, the minutes would not convey the same detail as that described in field work notes where moments of silence, jokes and angry outbursts were described.

Once categories for grouping together concepts had been established the process of selective coding or developing a ‘story’ and ‘story lines’ (Strauss & Corbin, 1990) began. Initially, within-case narratives were sought. Each within-case narrative was a “stand alone entity” (Eisenhardt, 1989:540). In other words, unique patterns were allowed to emerge from each case individually before there was any significant push to see patterns across cases. As discussed in section 3.1, one of the stated aims of this research was to retain a situated sense of the real-time flow of events. The field work diary and document index were fundamental to the fulfilment of this aim. However, building the narrative of the case studies through the selective coding process was also very significant in this respect.

This process revealed two kinds of document: those that signified a new phase of integration activity but which in themselves were not sufficiently complex to warrant close textual analysis; and those field work documents that were sufficiently rich as to offer opportunities for identifying new concepts. For example, document 3 in the UofB field work document index was significant in that it was indicative of the university’s first concerted effort to understand what the integration of on-line learning technologies would entail. For the purposes of analysis, both the sender and the recipients of this e-mail are significant, as is the date that the message was sent, but the message itself is a simple invitation to a meeting. By contrast the interview transcript and diary entry that arose from talking to UofB’s Learning Technology Manager (field document numbers 29 and 30) offered a very rich insight into integration activities and was therefore subjected to careful textual analysis from which particular concepts and themes emerged.

During the narrative building or selective coding process both these kinds of document were highly relevant. The time line of integration events captured by the field work documents was woven into the structure of the narratives contained within the case study chapters. Appendix 3 and appendix 4 show how key integration events are linked to specific field work documents

at each field site. The focus of the case study chapters mirrors the course of events as they were experienced by the researcher and reflected in the field work documents collected. It was the significance of events as they emerged from the selective coding process that determined which of the concepts identified during open coding took precedence and which areas of each case were given special attention.

Through the combination of identifying trends within the integration activities taking place and conceptually mining field work documents that related to those emerging trends core concepts were developed. For example, in terms of the institutional integration of on-line learning technologies, data integration emerged as a key focus of activity at UofB during the field work period. Evidence for that trend included the constitution of the MLE Working Group (field work document 3), the agendas set and discussions that took place at working group meetings (documents 9, 41, 107, 215) and the smaller meetings and discussions that took place in order to carry out the work of integration (documents 12,13,14, 73, 74, 83, 91, 98, 102, 104-106, 124, 132, 133, 141, 144, 146, 163, 170, 171, 173-180, 187, 193). Taking the MLE group as an important hub of integration activity, notes relating to these meetings were open coded. It was through this process that the concepts of 'valence' and 'ways of reckoning' were first identified. When cross case analysis began, these concepts were related to key trends and events taking place at the second field site. They were also found to hold relevance to integration activities taking place there. Subsequently they were related back to concepts generated from studying both institutions' early involvement with on-line learning technologies. In this way, valence and ways of reckoning emerged as 'core categories' around which all other categories and concepts came to be organised.

The third research question regarding educational values was especially significant to the final phases of the analysis process when cross-case analysis using core categories took place. Consistent with the aims of grounded theory, the key concern represented by this research question was to arrive at an empirically grounded basis for conceptualising educational values. Concept generation is a central concern within grounded theory analysis and the inductive generation of substantive core concepts is the intended outcome of analysis. The structure of the case study chapters is an iteration of the categories and story lines that emerged during open and selective coding. Chapter 6, however, is 'the analysis chapter'; that is, it is here that

the higher order elements of cross-case analysis are presented, and the concepts of valence and ways of reckoning described in detail. The analysis is structured around the three trends or points in time around which the core categories emerged, retaining the link between the real-time development of events at each field site and the generation of concepts and themes.

Chapter 4 Introduction to case studies

4. Introduction

The chapter provides the reader with a description of the two case study institutions. In terms of the thesis as a whole, this chapter seeks to address the second research question which asks, ‘in the case of two contrasting UK institutions, how is the integration of on-line technologies taking place?’ This question was formulated with the intention that it would ground enquiry in the empirical detail of events taking place, serving to counterbalance generalised speculation concerning the capabilities of learning technologies. Following this brief introduction there are two main sections. The first section provides an overview of the two case study institutions and their organisational arrangements for handling course and student data, prior to their involvement with on-line learning technologies. Divided into two parts, the first sub-section describes the University of Brighton (UofB) and the second sub-section looks at the London School of Economics and Political Science (LSE). Following the institutional overviews, the second section is a description of respective early involvement with on-line learning technologies. The focus of this section is on activities taking place in the period leading up to the beginning of field work, serving to situate the reader within a flow of events. In the conclusion, the situation of the case study institutions at the beginning of the field work is summarised. The conclusion ends with a figure showing the position of each institution with respect to on-line learning technologies, prior to and during the field work.

4.1 Institutional Overviews

This part of the chapter provides an overview of both case study institutions and presents an account of events that have served to characterise the ongoing work of each institution. The two institutions were selected as case studies because of the contrasts they stood to offer. Although both institutions are of a similar age, UofB was not granted university status until 1992 and is therefore considered a 'new' university. LSE is an 'old' university, originally constituted as a faculty of economics within the University of London. In terms of the curriculum they offer, LSE is a social science institution. As such, the subject disciplines and academic departments of which it is comprised act as an ongoing statement of what constitutes social science. UofB on the other hand is comprised of five separate faculties ranging from Art and Architecture to Science and Engineering, each faculty maintaining its own distinctive links to the professional bodies and cultural institutions whose work they uphold. Of the two, UofB is the 'bigger' institution in terms of both organisational constitution and student body. However, in terms of status, LSE has an international reputation in the social sciences and forms part of the elite Russell Group of universities, comprised of the UK's top 17 institutions.

In organisational terms, LSE has evolved from an over-arching constitution that has been in place since its inception. UofB on the other hand is comprised of historically separate institutions; geographically dispersed and specialist in their own subject areas. The faculty and schools of UofB had evolved their own premises, management structures and academic frameworks in line with the organisational demands of their respective subject disciplines. Unlike LSE, creating measures of equivalence and a common academic framework has been an ongoing task for UofB. Whereas these efforts have brought UofB in line with government policy that has sought to introduce standard quality measures across educational institutions, LSE and its governing body have resisted government interventions, particularly in the area of course design and curriculum philosophy. This is not to imply that LSE does not have a common academic framework. On the contrary, it has stringent requirements with respect to course design, which leave it well placed to argue the case against reform.

What is interesting is that the technological choices that the two institutions have made over the past 15 years have been very similar. In the eighties, both had administrative computing departments that were struggling to find a way of coping with student information. Whereas off-the-shelf systems for finance and personnel could be purchased with relative ease, there

were no database solutions on offer that could contend with data on student enrolment, course registration, individual assessments and final award classification. In-house solutions were developed but there was growing pressure from external funding and auditory bodies to produce institutional data according to standardised measures. As the statistics produced by institutions became increasingly bound to the allocation of government funding (upon which universities are dependent), the pressure to produce standardised statistical data grew. However much institutions may not have wanted to conform to intrusive policy and auditing demands, accurate figures had to be produced. The responsibility for this commonly rested with administrative computing departments, who increasingly saw the need for an off-the-shelf solution. When a university in Newcastle decided to develop and consequently market its student database solution, under the name Systems InTuition or SITS, it was one of the only packages available. Like many other UK institutions, both LSE and UofB purchased licenses. Although LSE and UofB took very different approaches to implementation, the SITS database would become one of the cornerstones of their information infrastructure. In the two subsections that follow, further salient details of each institution's academic constitution are described alongside ongoing issues each institution was experiencing with respect to their information needs.

4.1.1 UofB: Institutional Overview

The UofB represents a collective of historic, educational establishments. As such its buildings are dispersed across four separate sites, the furthest from Brighton being Eastbourne, which is 25 miles away. During the course of field work the university was made up of six faculties: arts and architecture, information technology, science and engineering, health, education and the business school. Following the merger of the faculty of IT and the business school, there are now five. Each faculty is made up of three or more schools, and within each school there are generally two or more departments. For example, the faculty of health includes the school of healthcare professions, which is made up of three departments; podiatry, physiotherapy and occupational health. The university has around 17,000 students, 4500 of which are postgraduate. A third of all students are non-UK and around 5500 students study part-time. Within UofB there are a number of reputed areas of educational excellence. Among those

areas is the school of arts and communication, which is oversubscribed every year and attracts the very best visual and performing arts students.

Geographical and historical factors have meant that the university has been faced with the ongoing task of building an organisational and academic framework capable of spanning its diverse curriculum and drawing together local organisational practices. In most departments, a synergy has developed over time between subject disciplines, the academic arrangements through which teaching and research are conducted and the departmental organisation and support of those arrangements. The life of each department varies considerably according to the demands of the programmes of study it offers. The physical environments that the subject areas require are a clear marker of this. Walking through the university one finds pharmacy laboratories, music rehearsal rooms, architecture studios, fashion design workshops housing looms and print machinery, computer laboratories, as well as the traditional lecture theatres and classrooms.

UofB provides specifically vocational subjects, with teacher training and nursing particularly high on its agenda. Subject areas such as these are required to be closely aligned to government policy. A shift in policy regarding school-based curriculum, for example, can have an immediate impact on course design, course delivery or student recruitment. Other subject areas do not have this kind of external directive to contend with, leaving course design and delivery as matters for the department to debate and decide upon according to institutional regulation and a jointly conceived notion of curriculum. However, achieving measures of standardisation or equivalence between diverse subject areas is not straightforward and attempts to bring about common practices and measures are often met with defiance.

The question of standardisation and equivalence was brought to the fore by a move to introduce 'modularity' as a basis for the university's curriculum design. Modularity requires that courses of study be separated into component parts or modules. For example, a typical 3-year undergraduate degree course would be divided up into 36 distinct but inter-related units of study. Each unit is designated a certain number of credits or 'CATS points'. Ordinarily, every year within a programme of study would include 12 units, each worth 10 credits. The successful completion of a year of study would see a student awarded 120 credits with an

award designated when they had reached 360 credits. The system was advocated on a number of grounds. A common course structure would allow for more flexible approaches to learning, where credits could be gained on an intermittent or part-time basis. Related 'modules' from different subject disciplines could be put together to form a programme of study selected by the student, with a clearer understanding that modules taken in different subject areas were of equivalent worth.

An additional driver was the need to introduce clearer budgeting measures across academic departments. With each department working to the same model and units of study weighted accordingly, a base-line calculation could be constructed, bringing greater transparency to the allocation of funding and resources. In terms of academic quality and standards, working to a common model for course design meant that basic module information for each course was clearly prescribed and could therefore be extracted from departmental procedure. The prescribed format involved articulating learning outcomes, assessment requirements and credit ratings for each module. Never having been held in a central repository, this information often proved difficult to elicit from departments, even though it was required for numerous aspects of university work including the production of student handbooks. Confirming the exact details of a module according to standard measures was often a task left to course administrators, and came to constitute a grey area of responsibility.

The move to modularity was reinforced by the purchase of the central student information database. The SITS database is an off-the-peg database that is divided into three parts: marketing and admissions, student enrolment and a credit accumulation and management system. The credit accumulation system records student module registrations, assessment marks and calculates final award classifications. It is possible to implement each part of the system separately and it is common for institutions to choose an implementation approach that suits their most pressing information need. UofB decided to start with the credit accumulation system because of the potential it offered to draw programmes of study across the institution further into a common framework for course structure and design. The implementation approach adopted was particularly devolved with every course administrator in the institution required to enter module and assessment data directly into the system. Where courses had not

become ‘fully modular’ this presented data entry difficulties, for which workarounds had to be found.

Although robust and secure, the database has a number of drawbacks. The user interface and navigation system are not intuitive, requiring a level of training. Whilst course administrators attend appropriate training courses and become proficient at using the system, other staff, including academics, find the system impenetrable. Since the database holds key information on students and courses, including defining records pertaining to student status and module registration, the system creates what has been described as an institutional ‘information bottleneck’. Due to these problems, the administrators responsible for maintaining the database became the system’s representatives, as only they were able to access information and interpret its requirements on behalf of others in the department. In all of this, the most controversial issue was the institutional move to use the system to produce standardised exam board reports, which academic staff have objected to since the system was introduced. Attempts to re-design the reports using an Excel overlay have seen relative success, but the integrity of data is questionable once it leaves the confines of the database and is manipulated by another application.

The SITS database reinforced UofB’s move to modularity. This occurred not only by creating a common standard for courses across academic schools, but in a day-to-day and possibly more fundamental sense, through the data structures and processes that were ‘hard wired’ into its design. Converting courses to a format that the database would accept required that academic programmes be completely overhauled and the standards suggested were often counter-intuitive to staff who knew and understood the courses they worked with. For example, the primary relationship within the SITS database is between the student and the module. Modules themselves are not linked together under a higher order data entity, such as a course or programme of study. This was a source of annoyance to users, who thought and organised their work according to programmes of study, such as a degree or masters programme. The separation of course and module is a fundamental aspect of the database design and in this sense it is completely irreversible. In this way, the database rigidly underlines the definition of modules as discrete units, something that often conflates with teachers’

understanding of the way a course is taught. Pedagogic preferences for a more holistic, linear or cyclical approach to course design were frequently at odds with database requirements.

Accordingly, problems were encountered with the implementation of SITS at UofB. After three years of effort, it was conceded that the day-to-day administration of some courses should remain outside the database. This was the compromise that had been reached at the time on-line learning technologies were beginning to be talked about within the institution. Whilst discussions surrounding a centrally purchased learning technology were focused around the idea of a virtual learning environment, there seemed little reason, at this time, to connect the issue of central student data and the teaching and learning implications of an on-line learning technology. However, as the discussion moved on to one of managed learning environments, the scenery shifted. Suddenly on-line learning was no longer a purely teaching and learning concern.

4.1.2 LSE: Institutional Overview

The buildings that LSE inhabits take up both sides of a short road in Aldwych, London, just off the Strand and only a short walk from Westminster. Although still technically a public thoroughfare, Houghton Street has been largely pedestrianised and during term time students from the LSE spill out onto it making it virtually impassable. The school, founded in 1895 is part of the University of London and was originally instituted as a faculty of economics. As such, LSE contains no faculties within itself but is comprised of 18 academic departments and five research institutes that focus solely on social science research and teaching. LSE enjoys a high profile and prides itself on being able to attract academics of world class intellectual reputation and high-achieving students. Average student entry requirements are set at a minimum of two A grades and one B grade at A level. Two distinctive characteristics of the LSE student body are that, of the 7500 students registered at the school, over half are postgraduate students and over half are non-UK students. LSE places great emphasis on research and this is reflected in the number of postgraduate and PhD students in the school.

LSE speaks in terms of governance, rather than management of the institution and clear lines have been pressed into the school's constitution separating the governance of academic frameworks and the services that support them. LSE is run by committee and the governing body responsible for all major decisions is the Council to whom all committees report. Permanent members of academic staff automatically become members of the academic board, the principle academic body to which all matters concerning the current and future academic life of the school are referred. Supporting 'services' represent all centralised aspects of non-academic organisational support and are provided by Central Administration and Services. Staff from these areas are not permitted to sit on any academic committee although they can act in an advisory capacity. As academic committees take precedence within the structure of governance, this means that Central Administration and Services are constitutionally marginalised with respect to all major decisions concerning the school. This marginalisation is by design and moves to allow senior members of Central Administration and Services to sit on academic committees have been blocked.

The Central Administration section includes Registry, Finance and Personnel divisions among others. Business Systems and Services (BSS), previously the school's administrative computing section, provide support and management of the systems run by these sections. BSS are responsible for the school's central student database, timetabling system, web services and audiovisual support. LSE also uses the SITS system as its central repository for student data. Use of the database is almost completely conducted within central administration sections, with administrators in academic departments only referring to the system on occasion to check student details. LSE opted to implement the student enrolment section of the SITS database first. As admissions and enrolment have always been conducted centrally, academic departments were largely unaffected by the move.

Apart from Central Administration and Services, LSE is organisationally de-centralised; each academic department acts as if it were an autonomous unit. However, numerous core organisational activities require a back and forth movement between departments and Central Administration. For example, when prospective students apply to study in a department their application will go to the Registry who, provided that certain mandatory criteria have been met, will pass details onto academic departments. From this point the process switches from

being an administrative concern to an academic concern, as lecturing staff assess the application materials students have submitted and indicate accordingly what offer should be made. Once departmental decisions have been finalised, recommendations are passed back to central administration and letters are sent out offering places. Whilst lines between academic and administrative work are not always so distinct, a working understanding exists with respect to the difference between academic and administrative responsibility.

A development aimed at increasing the accuracy and availability of student information was a system called 'LSE for You'. This was a web based portal development designed in-house by BSS to allow students to verify and enter personal information held on central systems. The portal design won an award for best practice from the Universities and Colleges Information Systems Association (UCISA). The recognition that the 'LSE for You' portal achieved underlined the significance that up-to-date student information holds within the higher education sector. Timely and accurate information on the status of students' enrolment, their individual course or module registrations and their contact details are key factors defining a student's logistical affiliation to an institution. It is common for this information to be interlinked with data from other systems in such a way that the record of logistical affiliation held on the central student database defines a students' ability to log onto university computing services or access the library. From a student perspective, inaccurate data can manifest as physical barriers preventing them from passing through turnstiles at the entrance to the library or accessing computing services. The same student data is used to calculate student fees and monitor the level of debt students have accrued with the university. Inaccurate billing on the basis of incorrect course registration records engenders considerable anxiety among students, whose capacity to bear the burden of debt is a question that has attracted debate at a national level.

Compared to academic undertaking or educational pursuit, logistical questions of recording student affiliation are 'taken for granted' aspects of institutional life and are often seen as a banal or purely bureaucratic area of concern. For the administrators and computing staff responsible for this work it is difficult to direct attention to the significance of these records and the complexity that surrounds them. This complexity stems from the reality that course registration records represent a point at which students' personal lives (including their physical

well-being and their ability to cope with the pressure and commitment of being on a course) intercept with an institutional need for accurate data. The only people with a day-to-day sense of these concerns are course administrators and members of teaching or technical staff who have regular contact with students. Very frequently decisions regarding student status may not be immediately resolvable, and circumstances change making immediate 'yes / no' decisions impossible to arrive at. The reason why the 'LSE for You' portal was considered so innovative was that it provided a secure environment where core affiliation data could be made visible to students and staff. The portal designers created a web page where the inter-relationship of student affiliation and other core data such as fee status was made explicit. Via this page, students could alter their own information securely and administrators could update those records for which they were responsible. This was particularly important at LSE where administrators working directly with students in the academic departments were not responsible for updating the central student database. By creating a shared repository visible to both central and departmental administrators and by allowing students to securely check and edit their own information, the opportunity to foster an increased sense of shared responsibility was opened up.

LSE's history as a single organisational entity and its focus on the social sciences has allowed a common academic framework to form the basis of its curriculum philosophy. Course design criteria are set by the academic board and are applicable to courses and programmes of study across the institution. This includes the design of assessments that fall into two categories, standard and non-standard. A standard course assessment is a three-hour exam taken at the end of the summer term and accounts for 100% of the mark a student receives for a course. If the design of a course deviates from 'the norm' a special case has to be made for a non-standard assessment. However, the only deviation allowed for non-standard assessments is generally the inclusion of coursework such as essays or dissertations. The focus of LSE's academic framework and curriculum have direct implications for the teaching resources and environments the institution provides. The mainstays of formal academic teaching are lectures, classes and seminars conducted in lecture halls or small classrooms. In some instances, teaching takes place in a computer laboratory or 'pool room' but, for the main part, the school's physical teaching environments are relatively uniform.

Although a common framework for course design has been achieved within the institution, the school has refused to act on advice from the higher education funding council and the quality assurance agency concerning the adoption of a modular academic framework and credit rating systems. The objection to modularity is that it places emphasis on the individual course taken, as opposed to a programme of study such as a degree programme. The intention underlying a modular philosophy of course design is that it lays the groundwork for a system where students select a combination of modules for themselves from a range of related disciplines. To many, this represents a 'pick and mix' philosophy of education that ignores the significance of subject disciplines and students' development in relation to them. The distinctiveness of subject disciplines, as taught by individual academic departments, is an important issue, despite the cohesive approach to teaching and course design that runs through the institution. Even though all of the subjects taught come under the banner of social science, every academic department has its own distinct relationships with professional bodies, the media, government processes and financial institutions that they draw into teaching, course design and research activities. Each subject discipline is understood to enact these relations in fundamentally different ways; a grounding in the diverse methods, practices and philosophies underlying a single approach is considered the basis of undergraduate level course design and study.

In common with all UK universities, increases in student numbers have required LSE to find organisational solutions to the demand placed on institutional resources. One approach adopted by LSE has been to structure teaching provision in such a way that research students can take responsibility for class teaching. According to this model, a typical course will be designed so that permanent academic staff will take responsibility for a core series of lectures and designated research students will take responsibility for small group teaching. Class or small group teaching is generally oriented toward the development of lecture material through group discussion. Research students are expected to attend a two-day training course before they are permitted to teach on behalf of the school and have the option of taking an Institute of Learning and Teaching qualification to assist them in developing their teaching skills. Devolving class teaching in this way provides valuable teaching experience to research students who wish to pursue a career in academia and provides a means of funding doctoral studies. Departments pay students a part-time, hourly rate; the cost cutting contribution research students make to budgets is formally structured into departmental accounting procedures.

A particularly significant aspect of LSE's organisational constitution is its relationship with the British Library of Political and Economic Science (BLPES) a specialist institution that has evolved alongside the LSE since it was first established. The library is a separate organisational entity, a charitable trust that operates as a service to the school and is directly answerable to the school's directorate. Each academic department has its own subject advisor provided by the library in order to ensure close links between the two. There is a symbiosis in this arrangement, whereby the library is made party to the very latest developments in social science research, helping it to maintain its international standing, and the university has the most up to date library resources on hand for its students and staff to use. There is a high demand for library resources, and providing students with access to recommended materials in sufficient numbers represents a logistical impasse. For example, if the reading list for an undergraduate economics course of 400 students indicates that students will need a particular book in a particular week of term, the library is unlikely to be able to meet demand in terms of books per students. Unsurprisingly, students commonly complain about the difficulties experienced in trying to locate designated readings. A key innovation has been the introduction of paper-based 'coursepacks', in which photocopies of key course readings are collated in a single pack and either sold or given to students at the beginning of a course.

Having provided a general overview of both case study institutions, the next section describes the institutions' early involvement with learning technologies. The issues and concerns described in this section were ongoing throughout field work and played a significant part in the respective approaches each institution subsequently took to the integration of on-line learning technologies. The following section begins by providing a summary overview of each institution's involvement with on-line learning. Attention is drawn to particular contrasts and similarities that emerged over the field work period. The section is divided into two parts offering a detailed description of each institution's respective experience with on-line learning.

4.2 Early Involvement with On-Line Learning

The two case study institutions were selected on the basis that they would provide contrasting examples of how on-line learning technologies were being integrated into UK higher education. On the basis of the institutions' early involvement with learning technologies this looked set to be the case. At the beginning of field work, in July 2001, LSE had entered into a consortium with four prestigious universities in the United States and a private sector partner called UNext, who described themselves as a 'global education business'. In parallel to this, LSE had also entered into a non-profit venture called 'Fathom' which aimed to provide on-line resources through linking the university with prestigious libraries, museums and educational institutions in the UK and the US. These ventures were highly publicised and were recognised as being exceptional examples of the potential on-line learning had to offer the UK higher education sector. Invitations to enter into global partnerships did not form part of UofB's early experience with on-line learning. The significance of this contrast is that UofB's position was representative of the majority of UK educational institutions, who operated what Collier (2000) described as a 'wait and see' policy toward on-line learning.

That which both institutions had in common in the period leading up to field work was a steadily growing body of student and pedagogic interest in the potential the Internet had to offer learning and teaching. This movement was reflected across the sector as a whole with networks and interest groups emerging throughout the early nineties. Individual academics continued to work on isolated learning technology projects as the market for technology grew. The intensity of speculation that surrounded their work was unlike that which any other teaching innovation had attracted. However, a distinct gap emerged between the local achievements of individuals and the level of hype that had sprung up around them. In late 1999, when the NASDAQ index crashed, the climate in which on-line learning technologies were being developed and the attention this work attracted shifted radically. Many of the private sector companies that had courted LSE were forced to cease business. As the dust settled, what remained were the isolated pedagogical initiatives that had been taking place all along. It became clear that it would be these, rather than global partnerships that would ultimately determine the course that on-line learning took.

At UofB the challenge was in drawing together isolated initiatives that were taking place in diverse areas of the university. As was the case for most higher education institutions, on-line

learning represented a completely new area of pedagogy and research. As such, no organisational mechanisms existed for acting on new initiatives and drawing together the work of learning technology pioneers. In these early stages of on-line learning development no standardised technologies were on offer; there were only individual technologies developed organically through a culture of teachers and technical staff creating solutions to local teaching and learning concerns. Their work was made possible through funding measures made available to the sector as a whole to support the use of technology in learning and teaching. As an idea of what might be achieved began to emerge, the language relating to learning technologies shifted. Instead of focusing on the use of individual technologies such as on-line discussion forums or computerised short answer tests, the idea of integrating available learning technologies into an organisation wide learning environment took hold. In the following section, early initiatives that took place at UofB are described in the context of these general trends in the development of on-line learning.

4.2.1 UofB: early involvement with on-line learning

From the early nineties onwards, individual members of teaching and technical staff working in diverse areas of UofB increasingly became interested in the use of technology in teaching. Their interests were developing at a time when national targets had been set by the Joint Information Systems Committee (JISC) to ensure the provision of student computing facilities in universities across the UK. This initiative included the development of the academic network resource JANET that gave free and continuous Internet access to all universities. Whilst computing steadily began to form the basis of work practices in many areas of the university, including administrative computing, library services and IT support for academic and student work, technology was not widely used in the work of teaching. Other than those few subjects where IT was the object of study, such as computer science or information studies, technology had yet to become an explicit part of student-teacher interactions. At UofB academic development funds were distributed to projects that focused on the use of Internet based technologies in learning and teaching and that could contribute to the development of a 'virtual learning environment' (VLE). Individual members of teaching staff began designing technologies and course materials that they could see would support students

in their particular subject areas. These developments happened in isolated pockets, and often involved the work of either an individual academic, or a small number of academic staff and a departmental computer technician. However, it became clear that those working on individual projects in different parts of the university were not in communication with one another.

In response to this lack of cross-faculty communication and the growing interest in learning technologies within the university and higher education sector as a whole, the Centre for Learning and Teaching (CLT) founded a group that would provide a common forum for those interested in learning technologies. The group began its work at around the same time that the Teaching and Learning Technologies Programme (TLTP) was established in 1991. The TLTP was a national scheme that funded the development of computer aided learning packages and made them freely available to practitioners in the higher education sector. The programme produced and distributed a brochure that featured latest software developments and reported on learning technology initiatives across the UK. However, in common with the experience of many other institutions, the learning technologies forum at UofB found that there were problems surrounding dissemination of programs and applications that the TLTP produced. For example, the technologies in this programme were frequently developed to address specific teaching issues experienced by a particular teacher in relation to the organisation of a specific course. Both pedagogically and with respect to the treatment of specific subject areas, the issues addressed by these technologies were not necessarily relevant to those working in another department, subject area or institution. There were issues with idiosyncratic programming protocols, as well as what one interviewee described as ‘not written here syndrome’. As a result, very few TLTP technologies were used beyond the institution they were developed in.

Alongside TLTP initiatives, the national Learning and Teaching Support Network (LTSN) was established to provide subject specific support and teaching resources to those wanting to use learning technologies in their teaching. In accordance with LTSN guidelines, the CLT encouraged each academic department to designate a representative to the network who could pass on ideas and resources to other teaching staff. However, the LTSN proved difficult to mobilise within universities.

the problem is that people are press ganged into it, there's no financial reward, there's no extra kudos associated with being a member of the network so there's absolutely no incentive for these people to do the extra work required...we have some that are obviously very keen and enthusiastic... [but] a lot of them don't really know that they're a member of the network. (Interview with Learning Technology Manager, 14.12.01)

UofB's learning technology forum supported LTSN activity as best they could. However, for their purposes it became more relevant to maintain a list of active and enthusiastic individuals who had direct interest in learning technologies than to draw solely on LTSN representatives.

UofB's learning technology forum oversaw the allocation of academic development funds that were distributed to projects looking at VLEs or elements of VLEs. Projects were funded in a number of schools including the business school, the faculty of IT, the school of engineering and the school of biomolecular and pharmaceutical sciences. Each of these schools began work on a student intranet, designed to provide students in their departments with a selection of centrally maintained web pages containing information about their programme of study. Typically students would follow a set of hypertext links in order to access documents such as lecture notes and reading lists or other course information. From an academic standpoint, however, use of the intranet remained restricted to a small number of individuals, with the majority of academic staff remaining largely unaware of or uninterested in what the technology had to offer. There was also disparity across faculties; where some schools were making progress, other faculties had yet to consider the need for such a resource. It became clear that those schools that were not developing student intranets might be left behind in terms of their familiarity with intranet technologies and investment in necessary hardware and human resources to support their use.

In technical terms, the student intranet was described as "fairly bare bones stuff, basically, written in-house, costing us nothing" (Interview with Learning Technologies Manager, 14.12.01). Each intranet was developed independently; correspondingly, the technical detail underlying each was slightly different. When problems began to arise with both software and hardware components, technical support workers quickly found themselves overloaded. It was becoming increasingly clear to all those concerned that a centrally supported learning technology resource could present a solution to these problems. The desire for

interoperability, increasing need for technical support as well as the absence of relations with central systems such as password authentication systems and the central student database led the CLT learning technology forum to begin discussing proposals for a centrally supported learning technology. Schools that were using intranets had seen the need for more features than the intranet could provide and began working on their own innovations. As further separate developments began to emerge, it became clear to the CLT forum that those involved were not communicating with one another. Plans were subsequently made to form a central department capable of overseeing developments across the university and ensuring the cross-fertilisation of ideas between separate developments. The Learning Technologies Group (LTG) was created in April 2001. It was headed by a former computer officer who had been a member of the CLT forum for learning technologies since its inception. The LTG manager had maintained an informal network of technicians and teaching staff involved in learning technology work and at that point in time was the common thread capable of drawing together initiatives taking place across the institution. The computer officer for the school of pharmacy (responsible for developing the pharmacy student intranet) and a media technology consultant joined him.

At about this time, universities in the UK were asked by the government body responsible for higher education funding to produce a teaching and learning strategy. By now it was widely acknowledged that Internet based learning technologies would have a significant role to play in higher education teaching and learning. Consequently universities had to provide details of how they planned to develop their use of learning technologies as part of their learning and teaching strategy. Although no new funding was associated with the production of a strategy, funds that universities would previously have been entitled to would be allocated once a satisfactory strategy document had been received. The strategy at UofB outlined a proposal for a development called the Learning Technology Support Officer (LTSO) project. The LTSO project was designed to support the use of learning technologies throughout the university in conjunction with the LTG. Around 6 members of academic staff were seconded to the project for 2 days a week to help and advise academics about the use of learning technologies.

An LTSO was allocated to each of the university's five sites with the exception of the Institute of Nursing and Midwifery, which had its own dedicated LTSO. The LTSOs and LTG were aware that learning technology support would be best given by subject specialists within a particular discipline, but funding limitations and the breadth of subjects within the university's curriculum meant that it would not have been possible to provide a support officer for each subject area. The site-specific allocation of LTSOs meant that support officers were not always familiar with the issues and requirements associated with other subject disciplines taught at that site. For this reason, interviews with LTSOs showed that they had found it particularly challenging to form associations and engage teaching staff beyond their own departments. Although introductions were made and invitations sought, there was often no response from academic departments. Though none of the LTSOs encountered outright antagonism toward their work, the 'active disinterest' shown towards them in some cases was sufficient for them to draw their own conclusions. Effectively, in this early stage they had the impression that they were largely 'preaching to the converted'. The promotion of on-line learning clearly represented a controversial issue for many in the institution.

An important aspect of the LTSO project design was that the officers would be people who were known to a network of colleagues for their interest in the use of technology in teaching and learning. One of the priorities of the group was not simply to network those people who had experience of developing courses using learning technologies, but to make in-roads with staff who were unaware of what a learning technology constituted and how it might be used. At the beginning of the project, this represented the majority of academic staff.

we had to be aware of the pioneers, you know, these people who'd done these amazing projects on their own and we did need to have some dialogue with them. In a sense, more importantly, what we needed to do was engage the majority of people in each School and that to me was quite clearly always our mission over the two years. (LTSO interview, 28.03.02)

The scope of knowledge and experience that the LTSOs had to deal with was incredibly wide, as were the issues their work raised. For those identified as pioneers, the difficulty was that their work had moved beyond support available to them from the institution.

These were pioneering people who had a strong interest in technology to use in teaching but they [...] get frustrated, because they find they're actually having to

work a lot harder, put a lot more of their own time in and there aren't necessarily the support systems initially there to help them. (LTSO interview, 28.03.02)

The widening gaps in experience that existed across the institution also meant that it was difficult for pioneers to disseminate or promote their work. Establishing a network of interest between colleagues in their own department was hard enough. To disseminate their work across the institution was a concern that lay beyond the scope of what the pioneers could hope to achieve without institutional support. Each subject discipline experienced a range of different institutional pressures and pedagogical issues. Discovering how developments in one discipline could be of relevance to another subject area was complex, requiring a level of inter-disciplinary dialogue that had not previously been present.

Another issue that the LTG and LTSOs faced was the extent of academics' familiarity with technology as part of their everyday working life. Clearly, for some subject disciplines technology was the object of study, so it could be assumed that staff had a relatively sophisticated understanding of the implications that a new technology would hold. In other disciplines, familiarity with technology could vary radically within a department. An example is architecture, where technology has been incorporated gradually as an approach for designing buildings. Hence staff's knowledge would depend on which design approaches they had chosen to specialise in. Finally, there are disciplines for which technology has remained largely redundant, such as literary subjects, fine arts, areas of humanities and social science and practice elements of non-computer based disciplines that are oriented toward professional qualification such as medicine and engineering.

The LTSOs were aware that they would encounter a range of different attitudes toward on-line learning and that the support they offered would need to vary accordingly. In their individual interviews, the LTSOs commented on the experience of academics who had been teaching for over 15 years, whose subject disciplines had not necessitated the use of technology and who had not encountered computing in their own school based nor academic education. Sensitivity to the varying experience of academics was understood as a key element of the LTSOs' work.

it's about trust and it's about personal dynamics. It's quite a big step for people to take, to contact somebody to ask them for help. They don't know what

they're going to get. They don't know who the person is that's going to turn up. They don't want to be made to feel a fool, because they can't do it. There's an awful lot of issues like that particularly with academics who've been working quite a long time, they're facing an enormous amount of change. There's a lot of people here, late 40s early 50s who you know are going to retire in the next 10, 15 years. They've had an awful lot of change. (LTSO interview, 28.03.02)

In view of these concerns, one of the first pieces of work that the LTSOs undertook was a survey of academics' IT skills. They had a very good return rate for the survey, which they attributed to the motivation that lay behind it (namely academic support), which they underlined through conversations with academic staff. As predicted, a range of experience was reported, from staff who were not familiar with using basic desktop applications to individuals who were experts in the use of technology in their own fields. It was not the intention of the LTSO project to act on this information in a direct fashion, but it did help them appreciate that as ubiquitous as technology can appear to be, there are areas of work in which it still only represents one approach.

The work conducted by the LTSOs reinforced the growing conclusion that a centrally supported on-line learning technology would assist in the development of an institution wide VLE. The manager of the LTG co-wrote a proposal for a VLE and submitted it to the directorate in March 2001. The functions and capabilities of three commercially available on-line learning technologies were cited in the proposal; WebCT, Blackboard and Lotus Domino. Lotus Domino was ultimately discounted on the grounds that it was 'prohibitively expensive' (VLE proposal, March 2001). The LTG manager received no feedback on this proposal and subsequently, a few months later, he submitted a further proposal. This time he redesigned the aims and title of the proposal to incorporate advice from JISC encouraging institutions to think in terms of managed learning environments (MLEs) as opposed to virtual ones. The difference between the two concepts was in the emphasis they placed on the integration of the learning technology with universities' existing information infrastructures. In the MLE proposal, both WebCT and Blackboard were reviewed. The LTG manager recommended WebCT for use as a VLE and recommended Blackboard as a suitable MLE. The understanding of the LTG manager was that WebCT offered more pedagogically than Blackboard. However, Blackboard had the facility to integrate administration systems already embedded within it, whilst WebCT required the purchase of an additional module. This

second proposal was also met with silence. It was not until a third proposal was written, including further financial details and information regarding implementation, that senior management responded and the proposal went forward to two high level committees. The decision was finally taken to purchase Blackboard and accordingly, the LTG manager initiated discussions with the company.

Once negotiations began with Blackboard, it was difficult to extract a full quote accounting for the cost of integration work from the company's European sales representative. At the time an initial selection had been made, Blackboard and WebCT had effectively cornered the learning technologies market. Both companies required that an annual license be bought and charged a one-off fee for installation and integration. However, in order to integrate WebCT with central systems, an additional application, WebCT Campus Profile was required, which at that time cost over £100,000. By contrast, Blackboard had been designed so that it was able to take data feeds from central systems and was in effect an 'out-of-the-box' MLE. This was a contributory aspect of UofB's decision to purchase Blackboard. However, it was assumed that initial installation and integration with existing systems would require technical support. It was important therefore that the LTG manager establish what costs the university should expect to pay on top of their annual license fee and what hardware specifications were required, given the scale of the university. This was precisely the information that proved difficult to extract from Blackboard.

Blackboard consistently avoided telling me what the consultancy fees were likely to be like even though I asked them lots of times. They knew the deadline I was working to for the proposal, which in hindsight was probably my biggest mistake, but I told them that...I did it to try to get them to give me the answer and they never did. So, I estimated what I had seen in the past which was basically 20% of the product fee to do consultancy and installation work. (Interview with Learning Technology Manager, 14.12.01)

Whilst waiting for an estimate from Blackboard, the company increased the product license fee from \$50,000 to \$55,000 a year. When an estimate of \$140,000 for integration costs was finally issued it nearly brought the project to a close. Surprised that the estimate seemed so high the LTG queried the price with Blackboard and discovered that the university was expected to pay for flights and accommodation for Blackboard engineers to be flown from the US. This was

on top of the rate that would be charged for the engineers to complete the work. During the course of these negotiations, Blackboard's annual license fee increased again from \$55,000 to \$68,000, which finally pushed the project beyond the university's means.

The LTG manager turned his attention to WebCT, whose fee had traditionally been half that of Blackboard. However, at this point in time WebCT announced that they would not release any more licenses, since they were just about to launch a new version of the product. The new version would bring with it an increase in the annual license fee from \$35,000 to \$100,000. UofB were left no choice but to get back into negotiations with Blackboard. The purchase went ahead and after the necessary hardware had been installed, the LTSOs and LTG were finally able to see the technology up and running, albeit in a stand alone sense, in April 2002.

4.2.2 LSE: early involvement with on-line learning technologies

In the summer of 1998 LSE began to receive approaches from predominantly for-profit organisations seeking some kind of collaboration or partnership for the purposes of providing web-based distance learning programmes of study. In response to this the Directors Working Group on Distance Learning (DWGDL) was formed with a membership that included among others, the pro director, the academic registrar, the chairman of Enterprise LSE and its chief executive. Enterprise LSE was the university's private sector arm. LSE itself is constituted as a charity and is therefore unable to pursue profit-making ventures. Enterprise LSE was created as the university's private sector arm in order that it could perform this role on behalf of the school. In this way, LSE could retain its organisational orientation as a not-for-profit educational establishment leaving Enterprise LSE to pursue possibilities that might be presented by potential market opportunities.

The reasons cited by the DWGDL for looking into the possibilities of distance learning were:

to protect the school's position as a leading academic institution; to develop new approaches to student learning that can be transferred into LSE's campus-based education; to establish new income streams without increasing pressure on the site and staff (Report to standing committee, May 1999).

Accordingly, Enterprise LSE took responsibility for assessing approaches from the private sector and staying in touch with developments in the on-line learning technology market, and a director of projects was appointed to take on that role.

After considering a number of arrangements, LSE took the decision in May 1999 to enter into a consortium relationship with a private sector partner called UNext.com. This relationship built on an existing alliance between New York's Columbia University and the LSE. From UNext's point of view, LSE's involvement assured a strategic gateway into the European market. From LSE's point of view, the alliance allowed them to become involved in the opportunities presented by a supposedly up and coming on-line education market without placing themselves at financial risk. The contractual relationship between UNext and LSE was constructed in such a way that there was no disruption to the internal workings of the university whatsoever. Responsibility for course development, marketing, delivery and administration was taken on by UNext; LSE was simply required to provide course content. Under this agreement lecturers would be contacted on an 'as-needs' basis to provide course content, for which they would be paid a consultancy fee. Since this arrangement resembled existing consultancy arrangements managed by Enterprise LSE, through which LSE academics provided consultancy for external organisations, it was relatively straightforward to put in place. However, as it transpired UNext's demand for consultancy was relatively low, with only three courses developed in the first three years.

In addition to developments with UNext, a project called Fathom was launched in April 2000, bringing together a diverse range of institutions associated with higher education. These included Cambridge University Press, the British Library and The Natural History Museum as well as LSE, Columbia University and the University of Chicago. A welcome outcome of this initiative was that it would build further on the school's existing relationship with Columbia University. Descriptions of Fathom provided by those involved and publicity associated with it made liberal use of the on-line catchphrases of the time. A 'centre for on-line knowledge' bringing together 'some of the world's leading universities, libraries and museums', the vision of Fathom was explained by Ann Kirschiner, Fathom's CEO in 2000.

Imagine being able to spend a day finding out about your special interest, say political history, by first visiting the British Library. There you find out a certain central character has a connection with the US so you visit the New York Public Library to find out more. But you want more details about this person, how their ideas developed, in what historical context, so you turn to Cambridge University Press for a book to read. What you would really like is an expert, a knowledgeable academic, to explain exactly what significance this person had, and why their ideas were ground-breaking. Where else would you go but LSE? (Kirschiner, LSE Magazine, Oct 2000)

The idea was that all of these resources would be made available through a single “knowledge portal”. Typically, a multimedia presentation of a lecture, exhibition or interview would be provided free of charge. Alongside the presentation would be links to recommended books, journals and on-line courses that the “knowledge seeker” could purchase in order to find out more about the topic. Collaborating institutions acted as “knowledge providers” who gave free content and designed short topic-based courses. The site was designed to provide “authenticated knowledge” acting as a breakwater between the mass of potentially spurious information on the Internet and the knowledge seeker (LSE Magazine, Oct 2000).

The UNext consortium and Fathom were both significant projects for LSE, but neither of these developments altered the day-to-day experience of teachers and students within the university. Most departments had adopted a general level of IT use in course provision. For example, it was common practice to use ‘public folders’ within the university e-mail system to post course materials. In addition, most academic departments had their own web site providing both organisational information and links to relevant resources. However, up until this point there had been no attempt to establish on-line technologies as part of the learning interactions between teachers and students.

The first concerted effort to introduce on-line technologies into course teaching and delivery was carried out in 1998 by a Senior Lecturer in the Information Systems department. Working closely with the school’s Director of Teaching and Learning, the Senior Lecturer began designing an on-line Masters programme, using funds made available to support teaching enhancement initiatives. The ‘MSc Information Systems Security’ was structured as a distance learning programme, so that course delivery would take place purely on-line, with no face-to-face contact apart from three two-day conferences to take place over the two year duration of

the course (Interview with course assistant, 14.03.02). The Senior Lecturer assembled a small team consisting of a research student, a departmental technical officer, an IT support officer and a librarian who were all seconded on a part-time basis to support the development of the course. After looking at two or three different learning environments the decision was taken to use WebCT to support the course and a single license was bought that would cover the Masters programme alone. A pilot version of one course from this MSc was run between 1998 and 1999. Additional resources were required to plan and design the full programme and so a partnership was formed with the publisher Pearson. The course went live in October 1999 and ran for two years.

The team that was assembled to work on the MSc Information Systems Security formed the blueprint for the centrally funded LTG who would eventually support the use of on-line learning technologies throughout the school. However, since this was an emergent area of technology work, there was no clear organisational structure within which to place the group. From an early stage LSE had focused on developing the teaching and learning potential of on-line learning technologies and so a close association with the Director of Teaching and Learning had developed. With no strategic aims in place detailing how on-line learning would be developed within LSE, the emergent LTG were left with key questions such as who should manage and oversee the group and which department should house it.

In March 2000 the Learning and Teaching Technology Working Group (LTTWG) was founded in order to address these issues. Whereas the DWGDL had been called together to consider developments taking place outside the university, the LTTWG was concerned with developments taking place within the boundary of the university where distance learning was not a primary concern. The terms of reference assigned to the group were,

“to propose and cost one or more options for a new LSE service to support increased use of information and communications technology in teaching delivery. The purpose of the service would be to improve the quality of the LSE student learning experience, as well as improve the efficiency of programme delivery.” (LTTWG terms of reference).

The group was comprised of two teaching staff, the Director for Teaching and Learning as well as staff from the library, IT services, management information systems and Enterprise

LSE. It was recognised that the group would address concerns that had a bearing on multiple areas of work within the university and this breadth of concern was reflected in the membership of the group

In December 2000 the LTTWG compiled a report that made four recommendations regarding the future of on-line learning technologies in the school “based on an appreciation of the LSE’s distinctive community and ethos” (LTTWG report, Dec 2000). The first was to set up a teaching initiatives fund, the second to expand the learning technologies group, the third was to create a physical and virtual space to host the school’s learning and teaching activity, and the fourth was to support the development of ‘a community interface’ through which organisational and teaching and learning resources could be accessed. This last recommendation emphasised one of the stated aims of the LTTWG’s work which saw emerging learning technology initiatives within the school as “an opportunity to ensure that the teaching arm of the School and the resources that support it (library, MIS, ITS, Services etc)” work more effectively together in the service of academic and student needs” (LTTWG report, Dec 2000).

These aims brought specific focus to the integration of learning technologies into central core infrastructures. These included student records, timetabling and fee payment as well as library services, administrative services to students delivered at course or departmental level, and wider information services “for the school community and those beyond it who look to the school” (LTTWG report, Dec 2000). The reasoning stated in the report for addressing these issues as well as teaching and learning considerations was,

A student experiences the School as a whole and learning and teaching technologies should, as noted in our terms of reference, contribute to the whole student experience providing, where possible, a common linking thread. Developments in this area must recognise the multiple functional areas that have an interest in providing learning and teaching support through technology” (LTTWG Report, Dec 2000)

This shift from a purely pedagogical to an integrated approach was reflected in the broader context of higher education. A shift in terminology from VLEs to ‘managed learning environments’ MLEs took place within higher education funding and advisory bodies such as the JISC.

The most significant recommendation that the LTTWG made was to expand the existing LTG and devise a management structure through which the group's work could be integrated with the institution. At this point in time, the LTG was made up of two full-time IT services staff employed as learning technologists and a half time library post. The report recommended that these three posts be retained on a permanent basis and that further learning technology posts be created as project numbers increased. The report also recommended that a full time librarian post be added to the existing half time post, and that a server administrator / programmer should be added to the team along with a pedagogic adviser / evaluator. Two management structures were proposed. The first was to continue with the collaborative approach that had been established where academics decided on the courses to be developed and approached the LTG accordingly. In this model an empowered steering group would oversee the work of the LTG, allocating funding to support teaching innovations and encouraging work with management information systems (MIS). The second suggested model involved the development of a Learning Technology Centre, "a more autonomous unit, with a Centre Director" (Report from LTTWG 12/00). A recommendation attached to this model was that the director would be closely related to the Teaching and Learning Development Office, a central department concerned with teaching and academic standards across the school.

Almost all of the recommendations made in the LTTWG report were taken up. Given that at the time there were no existing models for this kind of work, and that members of the working group had to speculate about the adoption of learning technologies, albeit on the basis of considerable expertise, it was remarkable that the conclusions of this report were manifested so clearly. The second model of management structure was adopted and a high level appointment was advertised in January 2002. The new Director of the Centre for Learning Technologies was appointed in March 2002. The only clear exception to the recommendations proposed by the report was the appointment of a pedagogic advisor / evaluator as part of the learning technologies group. This post had not materialised leaving pedagogic research temporarily beyond the scope of the team.

Whilst interest and organisational support for on-line learning increased internally, the momentum that inspired LSE's external partnership activities with UNext.com and the Fathom project diminished over the field work period. Both of these projects suffered from the crash in the technology market in late 1999. Like many other learning technology companies that sprung up at this time, UNext had attracted considerable speculative investment. As soon as share prices crashed, this source of income vanished and UNext was forced to make drastic cut-backs. In September 2001 UNext announced that it was making 42% of its employees redundant and that it had been forced to realign its interests significantly (THES, 21.09.01). With the exception of an MBA, traditional higher education courses were dropped from its provision and the focus fell to the development of work-related courses in partnership with specific companies. After developing only three courses with LSE, none of which actually came to be marketed, it became apparent that LSE's involvement in on-line learning was not going to be transformed by this venture.

The Fathom project also fell on hard times. Conceived around the same time as UNext.com, this collaboration was also developed at a time when aspirations concerning the future of on-line education were at their height. The project failed to sell enough courses and learning resources via its website, and folded in 2003. Reasons for its failure were clearly linked to exaggerated claims with respect to the demand for on-line learning (THES, 21.09.01). There were also claims that the Fathom web site was 'too highbrow' (THES, 21.12.01). Although static, the web site is still accessible and all free content has been distributed among the member institutions.

4.3 Conclusion

At the beginning of field work it appeared that the two case study institutions were going to take very different approaches to the integration of on-line learning technologies. However, in this chapter it has been shown how ultimately, the two institutions adopted very similar strategies: both purchased campus-wide licenses to a standardised learning technology and both established centrally funded departments to take on the role of dissemination and support. The external partnerships that LSE entered into saw on-line learning technologies

placed beyond the university boundary. Whilst this had the desired effect of causing as little disruption to the day-to-day running of the university as possible, it also meant that the precise nature of learning technologies and their implications remained elusive. Where standardised on-line learning technologies were drawn into teaching practice it was by way of isolated experiments. Still very much a minority pursuit, learning technologies were held in a kind of quarantine before interest in them finally began to grow. The focus of integration efforts at both institutions fell to establishing on-line learning technologies as tools for supporting 'blended learning' rather than distance learning.

There were methodological implications of conducting technology research in a rapidly changing environment which were discussed in the previous chapter. There were also implications for the development of the research question which took place alongside these events. Figure 4.1 provides a summary of how the research questions developed in relation to the events described in this chapter, and in chapter 1. On the left hand side is an indication of the timeframe within which events took place in order that the reader can establish a clear sense of the point at which the field work period started and ended.

Fig. 4.1 Development of Research Questions

Question 1

If higher education stands to be transformed by on-line learning technologies, exactly what are the technologies concerned and who is developing them?

Claims

Newspapers, journals, books,
publicity documents,
government policy documents

E-Learning Companies

Individual University Departments

Consortia

Tracking down technologies

Question 2 – CORE RESEARCH QUESTION

In the case of two contrasting UK institutions, how is the integration of on-line technologies taking place?

Field work starts July 2001

Partnerships with private sector companies
Consortia formation
Individual departmental initiatives
'Wait and see'

Case 1 UofB

Individual departmental initiatives
'Wait and see'

Case 2 LSE

UNext.com **contract** LSE
Individual departmental initiatives

Question 3

What are the debates, activities and concerns arising from the introduction and integration of these technologies and what do these debates suggest about educational values?

UofB
Blackboard

Virtual Learning Environment
↓
Managed Learning Environment

LSE
WebCT

Field work ends Dec 2002

Data integration

focus

Pedagogic dissemination

taken

in Chapter 5 demonstrates the significance of events as they unfolded at each institution. In particular, this focus reflects the agendas set by the MLE Working Groups that each respective institution established. As the boxes at the end of Figure 4.1 indicate, at UofB the MLE working group focused its attention on the task of integrating the new technology with existing university systems and institutional practice. At LSE, emphasis fell on the integration of on-line learning with existing academic teaching practice and electronic library resources. The reasons underlying these differences and the details of the integration work that took place are described in the next chapter.

Chapter 5 Development of case studies

5. Introduction

This chapter takes up the timeline of events at the point on-line learning technologies had crossed the institutional boundary of each institution and integration activities had begun in earnest. The logic underlying the structure of this chapter is grounded in the shape of events as they unfolded at the two field sites from this point. Two areas of activity emerged as particularly significant at UofB and LSE respectively: data integration and pedagogical integration. Data integration refers to the work involved in positioning the new technology within the work practices, existing systems and data flows that form part of day-to-day institutional life. Pedagogical integration refers to work initiated by academic teachers to integrate on-line learning technologies into their teaching and course design. In LSE's case a substantive part of this work included integrating on-line courses with electronic library resources. Both institutions elected to create a Managed Learning Environment (MLE) Working Group to account for their respective integration concerns. This was not coincidence; it was a direct response to advice from the Joint Information Systems Committee (JISC). Universities across the UK were encouraged to shift their focus from the idea of a Virtual Learning Environment (VLE) conceived solely in relation to learning and teaching considerations to an MLE where equal emphasis was attributed to the role of the learning technology within the information infrastructure of the institution.

This chapter is comprised of two main sections. In the first section, the work of integration is depicted through a description of data integration activities as they took place at UofB. The reason that data integration forms the focus of attention here is largely due to the timing of field work. Data collection was coming to a close just as academic departments at UofB began their first year of using Blackboard. Therefore although training, publicity events and in-depth discussions with academics were taking place, significant pedagogic integration of Blackboard

into teaching and course design had yet to get underway. Whilst disseminating information regarding the arrival of Blackboard to central and academic departments was a focal area of work for the Learning Technology Group (LTG), the most influential area of their work during the field work period surrounded its purchase, installation and integration. The first of these - purchase and installation - were described in the previous chapter, leaving data integration as the focus of this chapter.

At the end of the first section a brief description of data integration issues at LSE is provided, in order that they can be understood in comparison to those that UofB experienced. Following this, the second section turns to a description of pedagogical integration activities at LSE. The strategy advanced by the learning technology steering group and adopted by learning technology staff meant that use of the learning environment was primarily pedagogically driven. One of the most widely used facilities provided by the learning environment was the 'on-line reading list' which allowed course tutors to create links between digitised materials and their course. The introduction of on-line reading lists carried implications both for the organisation of library provision and for the pedagogy associated with the lists' design. Often overlooked, this subtle area came to light through the translation of reading lists into on-line form. This section ends by looking at pedagogical integration issues so far as they had emerged at UofB before providing a final overview of integration activities.

5.1 Data Integration at UofB

Whilst 'data integration' is used as a descriptive heading, this term masks the true spectrum of concern tied up in integration work. 'Data' is simply a descriptor that acts as the lowest common denominator when describing the fact that '*something*' moves between work practices and systems, allowing each to remain up-to-date and purposeful. Certain key pieces of data were the focus of concern for numerous different departments within the university, and this was reflected in the diverse membership of UofB's MLE Working Group. Some members acted as spokespersons for key systems, some acted as representatives of user groups and some offered an institutional perspective on how decisions taken within the group might come

to bear on university frameworks. The diverse standpoints from which members of the MLE Working Group viewed the work at hand became a defining characteristic of their interactions. Densely contingent and with potentially far-reaching consequences, data integration was an immensely complex area of work and this was reflected in the ways of communicating developed within the Working Group and in the manner in which the group's aims were defined.

Once the proposal to purchase a centrally supported on-line learning technology had been approved, UofB's LTG were in a position to begin planning how the new learning environment should be introduced into the working arrangements of the institution. During the course of negotiations, Blackboard had offered to install and integrate the new technology on behalf of the university. However, the fee they quoted for doing this work was considered too high. Cost aside, it was decided by senior management that attempting to deal with integration in-house would be an opportunity for the university to appraise its central processes and core data. Whilst the LTG recognised that this was a significant aim that would benefit important aspects of university work, they also knew that the learning technology could potentially become embroiled in any contentious issues surrounding core data and processes. Since this included the central database, which had proven deeply unpopular in some quarters, it was with some trepidation that they began the work of understanding to what extent integration could be achieved.

The LTG's original implementation plan was formulated around the concept of a 'pilot' that would last one year. A select number of academic departments would be invited to take part in the pilot, and on the basis of their experience use of Blackboard would be extended to further subject areas in subsequent academic years. The advantage of this model was that it afforded an exact idea of scale. The LTG would have prior knowledge of which schools they would be supporting, what modules or programmes of study would be put on-line and how many staff and students would be using the system. This model had clear advantages for data integration. If the LTG were working with specific schools or programmes of study, they had the option of organising data that needed to be integrated into 'chunks'. According to this approach, data relating to specific programmes of study could be extracted from the central database as a block and imported into the learning technology database.

One of the implications of feeding data directly from the central database into the learning environment was that data that had previously been buried in central systems would be suddenly placed on display. Senior management made the argument that by making data more visible a general level of concern for consistency would be promoted. However, there were also concerns that the close coupling required by this degree of integration could reveal potential gaps in services, leaving the university's processes exposed and open to criticism. For the LTG to come to terms with these agendas and further their plans for integration, they recognised that they would need to assemble a group of people who had detailed knowledge of university systems and who were able to appreciate the multiple agendas at stake. Therefore, in line with JISC recommendations, the LTG manager called together the MLE Working Group. The work undertaken by this group was instrumental in bringing about the integration of the new learning technology. A detailed description of this work forms the basis of the following section.

5.1.1 The MLE working group

The first meeting of the MLE working group took place in November 2001. Although Blackboard had not yet been purchased, the academic board had approved the decision to buy a centrally supported learning technology. The directorate was supportive of the move to develop an on-line learning environment, on the condition that JISC advice on integrating the learning environment with existing university systems and practices was followed. In order to achieve this end and bring about an initial meeting, the LTG manager called together a group of people who worked closely with the systems in question and understood how typical work practices across the university constituted those systems. A select number were chosen, although the LTG manager noted that the membership of the group inevitably would be shifting, since the outcomes and parameters of the work in which they were involved were largely unknown. For the first meeting he invited staff from the LTG, the group responsible for working with the central database on student information and a member of staff from the academic standards department of the registry.

The first MLE meeting set the tone of subsequent meetings and provided an initial outline of what the group sought to achieve. Part of the initial MLE proposal, written by the LTG manager, included a list of data relationships that it was hoped the MLE would uphold. The LTG manager used this list as the basis for setting the agenda of the first meeting. He admitted freely that he was using it as a diagnostic tool by which to gauge the reaction of the group, rather than as a definitive checklist. The 'wish' list of what the learning technology would ideally be able to provide is shown below in Figure 5.1:

Fig. 5.1 List of potential relations to be supported by data integration

- Authentication against the university central user directory (LDAP) to preserve the single sign on policy across information systems.
- Association of courses with enrolled students
- Automatic generation of lists of mandatory modules for each student
- Automatic generation of elective (or optional) module lists for each student
- Presentation of assessment requirements for each module
- Presentation of course specification/descriptors for each module
- Presentation of relevant resources for each module
- Listing of module leaders and other module tutors for each module
- The ability to target specific groups of students such as facilities for sending email to module groups

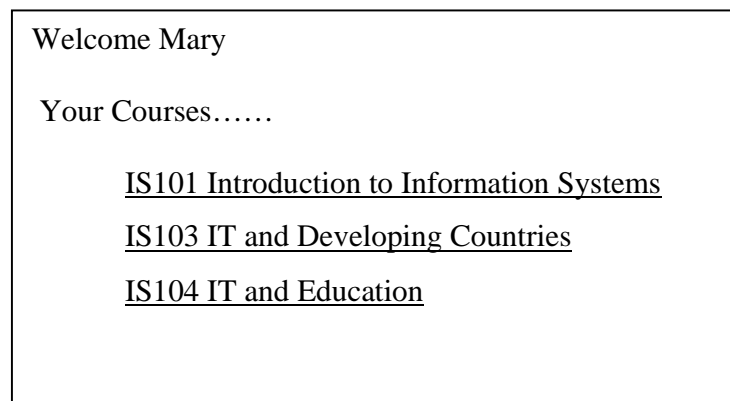
(MLE proposal 19.10.02 referred to MLE Working Group meeting 09.11.02)

It was not assumed that this list was exhaustive or that every item would be addressed before the beginning of the pilot scheduled for October the following year. However, the list provided a broad measure of potential outcomes that members of the group could counter or support as they saw fit.

The LTG manager translated this list into what he described as simple terms. He wanted to reach a position where, at the start of the pilot in October 2003, a student would be able to log onto Blackboard using the same user name and password they would use to access any university computer system. On signing in, the student would be presented with a home page

saying 'Welcome (students' name)' followed by a list of modules on which they were registered for that term. In essence, he wanted a portal view that looked like Figure 5.2 below:

Fig. 5.2 Diagram showing desired personalised student view



Having stated this aim to the group the learning technology manager asked those assembled, “I need you to tell me whether we’re looking at a straight linking of tables between the central database and the MLE and if not, why not?” (Learning Technologies Manager, MLE Working Group Meeting, Nov 2001). The answer to this question was, as the LTG manager had anticipated, a unanimous no. For the rest of this meeting and the meetings to come, the major issue was the need for members of the LTG, student information workers and registry representatives to abandon their assumptions about commonality in order to establish a shared basis for communication. Individual group members only superficially understood the frameworks and technologies for which other participants acted as spokespersons, and it was precisely this lack of shared understanding that became characteristic of the working group’s conversations. Basic assumptions, points of reference, vocabulary, descriptions and opinions were cast adrift and understanding how each system bound some relationships together and disregarded others became the order of the day.

This was not a straightforward basis upon which to initiate discussion, and frustration that not even basic assumptions held true was very much in evidence. An example was the assumption that UofB was a modular university. The implication of this was that every programme of study across the institution had been broken down into discrete modules and that each module

was designed according to standardised measures. The idea was appealing to the group because it suggested a common topography, a familiar point of access according to which the diverse organisational and pedagogic practices of the university could be understood. However, the concept of modularity did not help the group on this occasion. It was not the case that modularity had been interpreted in endlessly different ways and that the plurality of these interpretations made it impossible to generalise, or that the statement itself was wrong. It was that modularity was understood and enacted differently according to different communities of practice within the university. The fact of the matter was that, as a philosophy of course design, modularity had far-reaching implications for pedagogy, epistemology and the management of the university and academic departments had reacted to it very differently.

Understanding how philosophical objections to modularity had manifested themselves in departmental adoption of the central database represented one end of the spectrum of group discussion. At the other end was the seemingly more mundane question of course registration records. A common sense understanding of course registration would suggest that there was very little to discuss. If a student was taking an individual course either as part of a programme of study or on its own, a course or 'module registration record' should exist in the central database. However, the relationship between the course registration record and student affiliation was more complex than it first appeared. Firstly, the central database was designed to mirror a modular course philosophy, where first and foremost the student is registered on individual units of study rather than an over-arching programme of study. The way in which the database did this was by no means nominal. On the contrary, the entire architecture of relationships within the database was founded on a fundamental split between course and student data. The two sets of data were held in completely separate repositories *until* the time a course registration was formed linking the two. The fundamental nature of this division meant that all other data relationships and processes within the database hinged on the existence of a course registration record. Secondly, the course registration record was implicated in multiple systems and institutional practices. From class lists and exam board reports to finance models and auditing data, as the defining record of student affiliation, the course registration record was the focus of concern across the university. Thirdly, there was perhaps a more fundamental reason why the course registration record was a source of complexity, which was that this record stands for the relationship between a student and a programme of study. In a

sense, the record represents the point at which a student's studies intercept with their biography. For example, if a student is ill, if they decide to withdraw from a programme or change course, their registration record has to be changed. In one sense these are straightforward questions of categorisation and database maintenance, but in another, these descriptions represent the stability and well being of an individual and their ability to cope with the requirements of institutional life. As such, situations represented by the course registration record rarely invite immediate 'yes' or 'no' decisions that can be entered straight on the database. In many cases, it was only the course administrator who had a day-to-day sense of student well being across a cohort.

At certain points in the year, there would be a demand for accurate student data for either the financial model or for external auditing reports. The pressure to provide this often fell to administrators, as the only people with an understanding of both the database and individual student situations. However, academics and central departments tended to underestimate the administrative task of maintaining student information. There were two reasons why the complexity of recording core information in the central database went unrecognised. Firstly, there were residual issues that lingered from the original implementation of the central database. The approach taken to implementation at UofB meant that the database penetrated traditionally academic domains such as course structure and representation and the production of exam board reports. The degree of penetration and enforced change to academic practice had generated resentment in some quarters and a low tolerance for centralised, 'technology-led' change. Reference to the system was frequently met with impatience and disdain. Secondly, there were ongoing issues at UofB that can only be described as a lack of appreciation on the part of academics for the role that course administrators play in course provision. Obviously this did not apply to all administrators in all departments, but the problem was sufficiently endemic for the university to hold a conference for academic administrators in January 2002 on 'The Challenge of Inter-professionalism' aimed specifically at addressing concerns over the relationship between academic and administrative staff.

The LTG realised that they would need to take account of the multiple agendas associated with course registration since this record would also play a focal role within the MLE. Student and course information could be entered into the learning technology manually, but this did not

uphold the aims of the MLE. Moreover, the LTG recognised that it was in their interests to keep the maintenance overhead of the learning technology to a minimum. There was little doubt that, at least in theory, ‘chunks’ of data could be extracted from the central database and imported into the learning technology. However, moving static chunks of data between the central database and the learning technology would not capture changes that occurred to the data set in the interim. This introduced the possibility that the on-line learning environment could carry a different version of core data to the central database due to time lags between uploads. The consensus of the MLE Working Group was that this would be an undesirable outcome that would introduce an unnecessary element of confusion into day-to-day management of the learning environment and that it ran counter to the aim of increasing the consistency of key institutional data. If the learning technology could take automated feeds from the central database on a regular basis, there was a chance that this confusion might be avoided

Over the course of the year, the shifting membership of the MLE working group learnt to understand the multiple agendas and configurations that became the focus of their discussions. Through these discussions they began to develop their own way of making sense of complex agendas, by listening to the ways in which they each reasoned through the potential consequences of design choices. Eventually a method for bringing together the necessary data elements was found. It involved using a standard letter export format that called forth specific pieces of data from the central database. However, in order to begin exploring what the standard letter format had to offer, Blackboard would have to be installed; only then could experiments with data integration begin in earnest.

5.1.2 Blackboard arrives

There were a further two meetings of the MLE working group before a test version of Blackboard was finally ready for use. The LTG themselves took care of installation. Having got the relevant hardware specifications from Blackboard, two computers were purchased. These would act as servers; one to run the Blackboard application software and one to hold the Blackboard database. The two servers took their place among the others in the machine

room of the university. The LTSOs, who during this time had been working in academic departments trying to promote interest, were relieved that after what seemed like a long struggle for funds and approval, a centrally supported learning technology was finally in situ. The LTSOs together with the LTG decided to re-name the technology. Instead of using its brand name Blackboard, it was renamed 'studentcentral'. When the two servers were finally in place, the Learning Technology co-ordinator took a photo of both servers and sent it round to the LTSOs with the following message attached.

I thought it might be interesting (?) for those of you without access to the deepest, darkest parts of [the Computer Centre] to see what studentcentral (or more accurately the two servers studentcentral runs on) actually look like...so here you go! (Learning Technology Developer e-mail, 09.09.02)

The reaction of the LTSOs to the e-mail was celebratory, with joking remarks appended stating that the Learning Technology Co-ordinator should perhaps consider spending less time in the machine room. Joking aside, this response was indicative of a general trend. Those who worked primarily with the learning and teaching side of the MLE frequently saw the actual technology and its configuration as a back-office concern. On the whole the LTG found it very difficult to impress on people that the technical and organisational aspects of the way the technology was installed and configured had substantive implications for how the learning environment would appear. There seemed to be an expectation that the correct data would somehow just appear in the learning environment in an apparently effortless manner. At this stage, the members of the MLE Working Group were the only people in the university concerned with these issues and they were concerned that, whether people were aware of it or not, the choices they made would have significant ramifications for institutional practices.

Now that the learning technology was installed the LTG could begin the serious work of translating the ongoing discussions of the MLE working group into practice. For a significant period of time there was no obvious sequence in which integration activities should be approached. Whilst individual aims could be stated in isolation, their achievement was frequently contingent on the outcome of a number of other activities. For example, one of the first aims of the LTG was to ensure that the learning technology would represent a 'single sign-on' environment, whereby students and staff could access the learning environment using

the same username and password they used to log onto their computer and their e-mail. The Lightweight Directory Access Protocol or LDAP system generated these log on details. In order to create a single sign-on environment, usernames created in LDAP would need to be fed into the Blackboard database. However, in order for usernames to make any sense they would have to be associated with other aspects of staff and student information. Until a way of associating these pieces of data could be found, no progress could be made towards the single sign-on environment.

About this time a systems analyst who had been working on the question of data integration procured a 'standard letter template' from the company that produced the central database (see Appendix 5). The principle behind the template was that it could act as a bridge between the two databases. Once the systems analyst and central database staff had worked out which fields related to which, those decisions were held fast by the template allowing data to pass freely between the two repositories. Again, in principle those working with the template could see how it would work, but until an export was actually tried it was difficult to know whether data would appear in the right places.

Correspondingly, the next stage, which was to mobilise the extracted data in order that the software application could make use of it, had to be envisaged rather than tried. Blackboard provided instructions that detailed the construction of command lines and data strings that would move data from the Blackboard database into the software application. The data strings were designed to draw together specific data entities in a strict syntactical form and the command lines directed the lines of data to the appropriate part of the software application. The relationship between each element in the data string was tightly coupled to the extent that unless each piece of data in the string was present, the entire entry would not be imported.

One of the most fundamental data strings was that linking the student to the individual modules they were taking. This would be the information around which the user's portal view would be organised when they first logged onto the learning environment. The data string in question looked like this:

User name - Student number – Module code – Term - Academic year

The implications that this precise data string would hold for wider processes associated with data integration were a source of concern for some members of the MLE working group. Unless every single piece of data required by the string was present, students would not be able to 'see' the courses they were taking when they logged onto the learning environment. Each element of data required by the data string would follow its own distinct pathway through university systems and processes and would be subject to its own distinct contingencies. Academic year and term were relatively fixed; as long as this information had been entered correctly in the central database these fields were understandably straightforward. Module codes had the potential to cause issues at the beginning of term, when programmes of study had undergone changes and additional modules had been added to a programme of study but not yet set up on the central database. The student number was a key piece of data that was only allocated once a student had enrolled on a course. If there was any debate over a student's enrolment status or if they enrolled late their details would not be imported. The concern of those who worked with the central database and ordinarily provided support to course administrators was that administrators would be blamed for student details not appearing in Blackboard. It was therefore a priority of the MLE working group that data should move between systems as smoothly as possible to avoid adding this kind of pressure on administrators' workloads.

5.1.3 The 'moment' of integration

The degree of association and automation that could be achieved and the implications this would have for practice remained unknown throughout early meetings of the MLE. Numerous contingencies and agendas rested on the issue of data integration, making definitive action problematic. It was not until a spontaneous unplanned attempt to create a data feed for the first time took place in July 2002 that this situation would move forward. What follows is a description of exactly how that spontaneous attempt occurred.

Whilst a number of people had been involved in discussions surrounding data integration, responsibility for actually joining the systems fell to three people: a systems analyst (SA), the Learning Technology Developer (LTD) and a representative of the central database (CDR).

An informal meeting was called in early July 2002 to discuss exactly how to achieve template-based exports from the central database and what anomalies might be created when this data was imported into Blackboard.

After spending some time discussing issues associated with potential anomalies it was suggested that perhaps the best way of proceeding was to try an export and just see how it went. The immediacy and directness of this suggestion presented a direct contrast to the weeks of discussion that had preceded it. As such, the suggestion brought about a slightly startled reaction from all three parties in the room, including the person who had made the suggestion. Glances and half-articulated thoughts were cast about and there was a moment of silence, in which each person carefully reflected on whether the systems and applications they needed were to hand. There was a clear moment of surprise when it was discovered they were. Connections to all required systems and servers were available from the very room in which they all sat.

Without speaking and still with the same slightly stunned air of bewilderment, chairs were shuffled round whilst participants tried to work out who should sit at the computer first. The CDR made a purposeful move towards the computer, “take the chair, do your thing”, the LTD said. The CDR opened up the central database, logged on and called up an appropriate dataset; a single course with an average number of students registered on it. The CDR called up the screen from which the export would be carried out, but the menu that would allow them to call up the standard letter template was not there. The conversation that took place at this point went as follows:

CDR: Where’s the thing? It’s not there.

SA: Oh yes, we’ll have to use the test system, it’s not there

LTD: What? What’s not there? [The central database assistant and the systems analyst talk over her, continuing the same train of thought.]

CDR: ..because we haven’t upgraded the live system yet?

SA: Yes, we’ll have to get on with that

LTD: [Making sure she had their attention] What.... when will that thing that you two just talked about happen?

SA: Soon. Before the beginning of term.

LTD: Okay, so you do your thing, then the CDR can do her stuff and then I can do my thing.

(Field work diary entry, 8th July 2002)

After switching to the test system, an export was eventually created and the 'hot seat' was passed to the LTD who 'ftp'ed the file over to the Blackboard test server, which conveniently happened to be situated on the other side of the room. Once the file had been sent, all three wheeled their chairs down the other end of the room to the server. They began testing out command lines that would instruct the Blackboard database that there was some data there which its software application needed to act on.

As it transpired, the required data did not appear in Blackboard at this first attempt. However, once this attempt had taken place, the MLE Working Group had some concrete issues to work with. They could see at what stage the upload had failed by tracing the passage of data. The data had been successfully extracted and sent over to the server but it had not been 'picked up' by the data string because one of the data elements was missing. The precise conditions required by the data string meant that because a single data element was missing, none of the extracted data would appear in the Blackboard interface. The missing data element was the 'student username'. It had not appeared in the data extract because it was not held within the central database. Student usernames were generated by a separate system - the LDAP system - along with passwords and e-mail addresses at the point a student logged onto a university computer for the first time. An automatic routine already existed that took newly created student e-mail addresses from LDAP and imported them into the central database. The systems analyst suggested that if a spare field could be found on the student enrolment record in the central database, the username could be added to this automatic routine. Once the username was present in the central database the data string would pick it up, and if the rest of the data required by the string were present it would be successfully picked up by the Blackboard software application. Of course, this process was dependent on a student having logged onto a university computer in the first place, but as long as they had, a record of the modules they were registered on would automatically appear in the learning environment.

Those working on data integration began to feel confident that they would achieve an automated routine for transferring data from the central database into Blackboard. The routine would be able to transfer data not just for a single course or cohort of students, but for

all current course and student data. The halting process that the Systems Analyst, Central Database Representative and Learning Technology Co-ordinator had physically enacted would eventually take place in a matter of seconds as part of a daily automated overnight data feed. Seeing the progress that had been made with data integration contributed to the LTG's decision to re-model the design of studentcentral's pilot year. Now it had been established that data from the central database could be brought over wholesale as opposed to course by course, the LTG saw that core data would be waiting in the Blackboard database ready for use by any academic who so desired. Therefore, instead of selecting schools and faculties on the basis of interest and experience, the LTG decided to open the pilot up to anyone who wanted to use the new technology. Their argument for doing this was that a department or school-wide approach would necessarily entail the involvement of some members of teaching staff who were not as enthusiastic as others. Letting teaching staff determine for themselves whether or not they wanted to take part would cut out any 'dead wood' leaving the development of Blackboard in the hands of all those who were enthusiastic. Academics who chose to take part simply had to switch the module on by clicking the appropriate option, in order to make the online course visible to students.

5.1.4 Data integration at LSE

At LSE, early developments with learning technologies had led to a different approach to data integration. For a number of reasons, LSE had adopted an approach to data integration where only data relating to courses that had been put on-line were imported into the learning technology. Like UofB, this way of dealing with data integration emerged over time, in line with the emergence of early involvement with learning technologies. In the first instance, LSE had only one on-line course, the MSc in Information Systems Security for which a single data extract was used. The departmental IT support officer who supported the technical administration of the course requested an extract of student data from the Management Information Systems (MIS) department and imported it into the WebCT database. As there were not a large number of students on the course, maintaining student and course information manually from this point did not present any difficulties. A similar model was used for a further three courses that went on-line. However, expanded use of WebCT was

anticipated and so an automated data feed was created. The feed was only designed as an initial upload of information and did not provide regular updates. For this reason, a 'self-registration' system was created to allow students to update their own details on the system. The self-registration system acted as a bridge that meant the learning environment was not completely dependent on data from the central database.

A key reason why a bridging system was required at LSE was that use of the central database was not as devolved as it was in UofB. Student information was updated by central administration, not course administrators. Whereas at UofB course administrators had direct contact with students and could reflect their current status by changing records in the central database directly, at LSE such changes relied on central processes. This situation had significant implications in the case of optional course registration. Most programmes of study at LSE gave students a choice of courses they could take. In some cases, students would pick the courses they wanted to follow in consultation with their personal tutor; in other cases, by attending the first lecture of those courses they were interested in and deciding on that basis. Their final decision regarding optional courses had to be taken within the first few weeks of each term and their choices were communicated directly to central administration according to a set time timeframe. There was an administrative overhead associated with this process that inevitably dragged on in some cases. Once optional course registrations were submitted to central administration they were then entered onto the central database. Since this could not take place until at least half way through a term, the central database could not act as a data source for the learning technology. This was more of a problem for postgraduate courses than it was for undergraduate courses, since on postgraduate courses up to half the teaching component could be made up of options that students themselves had selected. As postgraduate study accounted for almost half the student population at LSE this presented a significant issue.

The 'LSE for You' portal developed by LSE's Business Systems and Services (BSS) was designed with this concern in mind. One of the underlying design functions of the portal was that it would allow students to enter their own optional course choices into the system; these were consequently fed directly into the central database. However, academics had consistently resisted the automating of this function. For many departments, part of the process by which

students selected their optional courses was a face-to-face discussion with their personal tutor. Academics valued this face-to-face contact as an opportunity to offer pedagogic guidance aimed at helping students orientate themselves within a given field of study, and also as a way of offering pastoral support should it be needed. At the time field work ended, preliminary trials had begun in selected areas that aimed to look in detail at the issues raised by using the 'LSE for You' portal to record optional course choices.

5.2 Pedagogical integration at LSE

The second half of this chapter describes integration activities as they took place at LSE. For the reasons described above, data integration played a secondary role within the issues surrounding the integration of WebCT at LSE. The approach to learning technologies set out by LSE's Learning and Teaching Technology Working Group and the Centre for Learning and Teaching (CLT) meant that use of WebCT had only been supported and encouraged in those areas where a clear contribution to learning and teaching was envisaged. Although learning technology staff organised workshops and dissemination activities on WebCT, the prerogative to use the learning environment rested solely with academic teaching staff. Proposals that sought to solve administrative issues or which were considered a 'bolt-on' to core learning and teaching practice were discussed but academics were encouraged to focus on pedagogic as opposed to administrative concerns. In view of the fact that academic teaching staff initiated integration activities at LSE, the heading 'pedagogical integration' is used to describe this work.

The fact that both case study institutions formed MLE Working Groups over the field work period provides an interesting source of comparison. The constitution and focus of LSE's MLE Working Group differed from that of UofB's and this difference serves to illustrate an important emphasis within integration work at LSE. Unrepresented at UofB MLE Meetings, the library occupied a central role within LSE's integration activities. As such, the primary area of concern expressed at LSE MLE Meetings did not revolve around the centralised data integration issues on which UofB meetings focused. Instead, the technical discussions at LSE meetings were associated with the integration of electronic library resources with the on-line learning environment. The reason the library featured so prominently in the business of LSE's

MLE working group was straightforward in some respects. The British Library of Political and Economic Science is a world-class specialist subject library. As a social science institution, journal articles, books, policy documents and datasets play a central role in both teaching and research activities at LSE. Hence when the CLT was first created, provision was made they provided for a library position. Furthermore, over the field work period the library hosted a number of JISC funded projects. Current and proposed JISC funding bids formed a further distinctive area of concern within LSE's MLE meetings, and the fact that many of these funding proposals also focused on the integration of library resources only served to emphasise the role of the library within discussions.

The MLE Working Group's focus on integrating electronic library resources mirrored the issue of pedagogical concern that emerged throughout the early use of WebCT. Availability of core reading materials on course reading lists was a source of ongoing concern for students, teachers and library staff alike. It seemed that the on-line learning environment might offer a solution to these issues. Interlinking reading lists with electronic library resources was by no means the only innovation taking place at LSE but on-line readings were the most common reason why academic teachers opted to use the learning environment. What was unanticipated was that the act of translating reading lists into an on-line format would reveal a distinctive area of pedagogic methodology. Also surprising was the extent to which the construction of on-line reading lists afforded specific subject areas new ways of supporting student understanding. Translating the tentative 'wish lists' of individual members of teaching staff into the functionality afforded by WebCT took a lot of effort on the part of CLT staff; the process represented a learning curve for all concerned. In the case of on-line reading lists, the on-line publication of academic reading matter incorporated the dense and complex terrain of library service providers and e-copyrights. The following section provides a detailed description of the role that reading lists played in the institution and how their digitisation altered student experience, library management and pedagogic design priorities.

5.2.1 Integrating digital library resources

One of the most popular and widely used functions offered by the WebCT portal was the capacity to compile reading lists that linked straight through to digital resources. For students, the implication of this was that instead of receiving a paper-based list of books and journal articles that they consequently would go to the library and find, students could view the same list in WebCT. In most cases the title of each document in the list was a hyperlink that, when clicked on, would take students directly to an on-line version of the document they were looking for. Obviously, the ease that on-line reading lists granted students was only matched by the effort that teaching and library staff had to put into creating them, but there were contextual and historical reasons why this effort was understood to be warranted.

A common pedagogical approach at LSE was to set weekly readings with which students were asked to familiarise themselves before their weekly classes, where the readings would form the basis of class discussion. As a social science institution, texts and data sets represented significant raw materials in both teaching and research activities. However, in logistical terms, if 450 students on a core economics course were designated the same reading for the same week, the library was placed in an impossible position. It would have been impractical for the library to purchase 400 copies of the same book that would only be needed for one week of the year. Careful loan collection management ensured that multiple copies of core course texts were made available to students, but even so, supply could not meet demand.

From a student point of view this meant intense competition for books, and the inability to access key readings was a routine source of complaint heard by Staff Student committees. In a focus group held to discuss students' experience of using on-line reading lists, the students described the pressure and anxiety associated with locating weekly readings in the library as "terrible". They spoke about strategies and tactics used to ensure that class readings were obtained.

You have to get up early in the morning so that you are one of the first ones there, or dash off straight after the seminar. It takes a lot of planning ahead. (Student Y, Student Focus Group, 26.11.02)

Some students plan weeks ahead and make arrangements between themselves so that they never come back in and you can't get hold of them. You can

spend half a day and only find one of the readings on the reading lists. (Student X, Student Focus Group, 26.11.02)

As well as these tactics, students and library staff reported other more extreme strategies, including individuals deliberately misplacing books in order that only they would know where to find them and using razor blades to remove required book chapters. Library staff reported that regular checks were made on lockers to ensure books were not being hoarded. One of the students in the focus group described the situation as follows:

All these strategies for getting hold of books! In the first year, you know, this is a really stressful thing to get used to. It's really dreadful. By the second year you're hardened to it, but it's still depressing. (Student Y, Student Focus Group, 26.11.02)

Over a period of years, course teachers and librarians at LSE developed a pragmatic approach to dealing with these concerns. The development of 'coursepacks' which contained photocopies of key course readings was a simple yet crucial innovation that eased the pressure on students and reduced the disruption to teaching that lack of access to reading materials had caused. Some departments gave coursepacks to students at the beginning of a course; some asked that they purchase the packs. Photocopying academic texts was covered by a blanket higher education copyright license but there was still a requirement to seek individual copyright permissions. When making multiple copies, charges came into place that were either costed into the price of packs or covered by academic departments.

With the introduction of WebCT came the idea to build on this existing innovation by constructing on-line coursepacks or 'E-coursepacks' as they became known. However, whilst linking to reading materials on-line afforded new possibilities it was accompanied by new constraints. A number of academic journals were freely available on-line. In these cases, a stable web site address was all that was required to link to the reading material. However, on-line access to the majority of academic journals was not free. Journals in this category charge a license fee for accessing material on-line in the same way that they would charge a subscription fee for providing a paper-based version. 'External data providers' such as INGENTA and Swetswise manage on-line access to a range of different journals and electronic resources.

Whilst their presence reduced administrative overheads associated with managing individual e-copyright licenses, there were also drawbacks to using external data providers.

Limiting access to only those users or institutions who had bought licenses meant that external data providers required authentication systems; in short, they required log on screens into which users would enter a user name and password. For librarians and academic teachers, the underlying aim to allow students direct access to on-line resources was somewhat conflated by the appearance of unfamiliar log on screens and repeated requests for usernames and passwords. This situation was mitigated to some extent by the ATHENS authentication system, which was developed with higher education needs in mind and served to reduce the number of passwords required. In addition, the ANGEL project, hosted by the LSE library, aimed to reduce still further students' experience of receiving confusing messages from external data providers during data retrieval.

Academic teachers who had attempted to include electronic journals in course-specific on-line resources also voiced concerns about the usability of such journals. There was criticism that despite the fees paid to external data providers, the archive of digital materials they offered was incomplete and therefore insufficient. A not-for-profit service called JSTOR was established to provide an archive of e-journals, but it was subject to a 'moving wall' whereby it could only provide access to journals that were between at least 3 and 5 years old. One lecturer described the overall situation with respect to e-journals as follows:

There are just enough e-journals. There is a critical mass of articles for this course. JSTOR is good but there are not enough journals available. INGENTA has no past. According to them, human knowledge has a 2 year half life. We [historians] don't subscribe to that notion. In this course there are readings from 30, 40 years ago which are absolutely crucial. We're not doing molecular biology here. (Interview with Professor in History, 19.11.02)

Access to journal articles represented a dense and complex terrain but at least in these areas systems were being developed to manage and address areas of concern. The real difficulty came with providing access to books, or more accurately book chapters and excerpts that were indicated by academics as core readings. Reproducing book excerpts in an on-line format did not come under the same blanket copyright agreement to which photocopying was subject.

Therefore, for each reading that fell into this category the owner of the electronic copyright for each item had to be tracked down and a price negotiated for the digital reproduction of each individual document. Publishers held by far the majority of copyrights, and with no standard yet established for pricing electronic copyright permissions, some of the quotes returned were simply unsupportable. A rough formula for calculating costs tended to be ‘number of students expected to access material’ x ‘number of pages’ but the presence of a stable formula did nothing to stabilise prices. A 20 page excerpt from a book requested by one tutor for a development studies course attended by 40 students was priced at £1454 whilst the same publisher quoted £7 for an excerpt of similar size requested for a course with fewer students on it.

Keeping track of all the separate prices and copyright agreements created an intolerable administrative load. Details of each piece of digitised material created and the conditions of its use had to be entered on a database. This information was required to prove that the institution was both observing and upholding copyright law, an issue on which it could be randomly audited because each digital copyright granted was only valid for one year. Information had to be retained so that it was available the following year, when every single copyright agreement had to be renewed. Furthermore, different publishers and individuals frequently owned the copyrights for pictures, photos and graphics appearing within the same text. Library staff would have to track down photographers, authors and organisations individually in order to seek permission to digitise a particular image, and a fee for e-copyright permission would have to be negotiated and paid. Needless to say, these regulatory demands had a direct bearing on the workload of the CLT librarian whose time was occupied with chasing publishers rather than helping academic teachers to develop innovative uses for on-line resources.

Publishers and academic institutions alike were only just coming to terms with electronic copyright. Publishers clearly had not developed substantive nor consistent pricing measures and in many cases academics seemed unaware that digitisation brought a different set of copyright concerns into play. When questioned about conditions they had agreed with regard to the intellectual property rights attached to individual pieces of work, many academics seemed unaware that conditions existed beyond requesting the permission of the author. One

senior academic described the suggestion that it was necessary to pay to have documents digitally reproduced as “something of a shock” (Interview with senior academic, 26.11.02). However, it was discovered that if an academic author wished to use their own work in a course they themselves were teaching, publishers were usually willing to drop e-copyright charges if the academic requested them to do so in person. Once one or two publishers had agreed to this, it was quickly adopted as a standard to which other publishers were held to account, but with no guarantee of compliance. As soon as academics became aware that this was the case, a number of course tutors made a point of phoning round their publishers to secure e-copyright for use of their work in their own teaching.

Despite this, many of the academic teachers interviewed expressed concern that in taking the decision to create on-line access to reading materials, they were forced to compromise their pedagogic rationale for suggesting particular reading materials in favour of choosing what was affordable. Ultimately the advantages offered by creating ‘E-coursepacks’ outweighed the disadvantages, and among those that had used them they were widely acknowledged as representing a significant teaching innovation. The role of WebCT in facilitating this innovation is an interesting one. The fact is that E-coursepacks could have been created just as easily using a Word document, since they basically consisted of a list of hyperlinks. The part that WebCT played was to provide a secure environment from where (theoretically) only those students registered on a course could view the digitised materials available for that course. This facility provided a basis for keeping institutions within the bounds of their electronic copyright agreements, rather than facilitating any other function.

5.2.2 Designing on-line reading lists

An unanticipated consequence of translating reading lists from their traditional paper based format to an on-line one was that it required academic teachers to articulate their pedagogical motivations for arranging lists in particular ways. For the majority of courses, the translation of reading lists into an unfamiliar technology required academic teachers to work closely with CLT staff, clearly articulating the pedagogic aims underlying their reading list design. This formed an important aspect of pedagogical integration, captured through a series of

interviews with academics and WebCT course designers. It is these motivations that are described in this section. For some subject disciplines on-line formats provided a means of extending the scope and texture of course-specific materials. A description of these innovations forms the basis of the following section.

A common goal was to design on-line reading lists in such a way that they would act as a breakwater between students and the mass of Internet-based materials available to them. In many respects the reading list was an attempt to design students' first encounters with discipline related concepts, arguments, models and tools, whilst at the same time demonstrating an approach to prioritising and classifying them. This approach was particularly true of courses that took place in the first teaching term of the year when students were new to a programme of study, whether undergraduate or postgraduate. In these cases teachers were particularly concerned that students build a gradual sense of the texts, materials and tools available to them. These concerns were translated into the organisation and arrangement of reading lists and teachers were keen to ensure that the same principles were carried through to on-line versions. Particularly with regard to on-line access, one course tutor was concerned that students would be "daunted" and "become lost" if they were pointed directly to the subject indexes and databanks held by the library (Interview with course designer, 20.11.02).

Shorter lists of resources are better, particularly for first and second years, else it's too overwhelming for them. We have links to web resources, city case studies, geography indexes but it's all very dense. It's difficult for students to find or remember their way back too. (Interview with Course Designer in Geography, 20.11.02)

Equally however, tutors expressed concern that if students were pointed directly to the academic articles and book extracts they needed to read for a course they would not learn *how to look* for resources. In some senses this was a recognition of the fact that students needed to develop library skills. However, in many respects library skills was too broad a definition to communicate the kind of understanding that teachers aimed to convey through course reading lists. Physically going to the library or searching for materials on-line both come under the heading of library skills, but the significance placed on one approach over another depended on the individual course and course teacher. In a 2nd year undergraduate history course, the

need to physically go to the library as well as use on-line resources was clearly emphasised and the message communicated to students was that they should develop a mindset where they physically 'hunted' out relevant materials.

I prefer to give students a general reading list, unclassified, and tell them to, 'Go hunt!' Find what's pertinent for yourself. There is pressure from government to design courses in this way where core readings are made explicit. There is also institutional pressure because the school has a high number of overseas students who may not be familiar with the 'go hunt' style. Students need to physically go to the library which is why it says in the course description for this course 'Go to the library' in italics, underlined. (Interview with Senior Academic in History, 19.11.02)

The physical act of going to the library was emphasised on the basis that the 'raw materials' with which historians work are frequently located in archives. Hunting through archives and discovering historical documents was a skill that students were encouraged to develop because it forms a central aspect of how historical accounts are constructed.

Several other tutors who were interviewed mentioned that physically going to the library introduced a sense of serendipity into searching for resources, which they considered highly desirable. The act of browsing for a book indicated on the reading list included the potential for a student to find interesting volumes either side of the book for which they were looking, which they might then be interested in opening up and glancing through. When direct links were created to documents on-line this element of serendipity was lost. Those tutors who saw the value of using on-line resources but who considered serendipity an important aspect of how students come to terms with a subject area sought strategies for re-introducing it.

It would be useful to have like a library armchair area for journals on-line where you could place links to the five most consistently used journals and students could just browse through them. That would re-capture the sense of serendipity that accompanies library reading. (Interview with Course Designer in Geography, 20.11.02)

Creating the right conditions for serendipity meant deliberately constructing indirect links to reading materials so that students were safeguarded from being overwhelmed, but had to apply their own judgement when looking for resources. The request for hyperlinks to direct students

to journal content pages, instead of directly to a specific article, typified the desire for a less 'seamless' environment, introducing the opportunity for students to 'stop off' and look at something on the way.

An interesting contrast emerged between occasions when tutors wanted students to 'see the seams' and occasions when it was vital that a connection appear seamless. Seeing how an association was made between different texts and tools was understood as useful when the rationale underlying the association disclosed something about the subject area. For example, showing students a journal contents page draws attention to the presence of other topics within the discipline. By contrast, tutors considered it distinctly undesirable for the seam between materials to be broken due to external influences. For example, the influence of electronic copyrights on a postgraduate geography course was that some of the photos in key course texts could not be displayed on-line because copyright for each image had to be tracked down individually and in some cases this had not been possible. This was an issue for both the course teacher and students.

Image and text can't be separated. The text is often discussing the photo. There are a lot of photos, this being urbanism, photos of buildings and places which are then discussed in the text. If you can't see the image then you can't make sense of the text. It's crucial to the students' understanding. (Interview with Course Designer in Geography, 20.11.02)

Although separate versions of photos were used in some instances, it was important to the tutor of this course that photos should be embedded within the text. In this way, he could draw students' focus to the relationship between the academic account and the photo and prevent any confusion over which photo the text referred to.

One of the benefits of creating on-line reading lists was that academic teachers found they could emphasise the role of subject specific tools and resources and their unique relationship to a subject area. Maps, photos and original documents, for example, were described as invaluable for capturing a 'graphic sense' of moment and place. Through the organisation and arrangement of links, tutors created subtle classification systems to draw attention to the role of particular texts and tools within a discipline or subject area. The classifications they created were not necessarily complex or intricate, but they communicated a set of priorities to

students. For example, materials could be grouped according to headings to create a sense of what the raw materials for a particular course were. These could include photos, historical documents, economic models, concepts or arguments and were likely to vary from course to course. Over-arching classifications or headings would have been impossible to create, and defining categories for themselves according to their own pedagogical rationale was clearly a benefit that tutors had gained from working with an on-line environment. One tutor described their approach to the classification of on-line readings as follows:

We wouldn't want a heading of e-journals. Students aren't interested in the medium. Only librarians are interested in that. It should be organised in terms of content, so students don't concern themselves with where the thing is. We want substantive categorisations not formats. My advice would be to look at how people have instinctively arranged lists. They will all have their reasons for arranging it in such a way. Articles change quicker than reports so that's a relevant division for us. But for other courses that would differ. (Interview with Lecturer in Law, 9.12.02)

The course in question was concerned with demonstrating the 'real-time' construction of the Law, which cannot be demonstrated using reading materials such as books and journal articles that can take years to be published. For this course, the key difference between reading materials lay in how current the material they presented was.

Academic teachers expressed clear frustration when rationales other than those motivated by pedagogic concern impinged on the organisation of on-line reading lists. Except in courses where students were actively directed to learn how to use the library, categorisations that reflected a library based rationale, such as format or loan collection, were seen as secondary and academic teachers tended to want them out of view. Similarly, e-copyright issues were understood as an external concern and there was considerable annoyance that they should influence pedagogic choice.

The effects of copyright charges have been that I've used papers of my own instead of using the paper I had intended simply because mine is free. We had to change our ideas about readings. Copyright is our main concern [regarding digitised reading lists] and the extent to which it shifts and restricts readings. (Interview with Senior Academic in Development, 26.11.02)

Although creating on-line versions of reading lists imposed some new restrictions that altered what academic teachers sought to achieve, it also afforded added freedom with respect to organising and classifying resources. The next section focuses on those courses where the on-line environment had allowed academic teachers to extend a distinctive aspect of pedagogy within a particular discipline and address particular organisational or subject specific concerns.

5.2.3 On-line teaching innovation

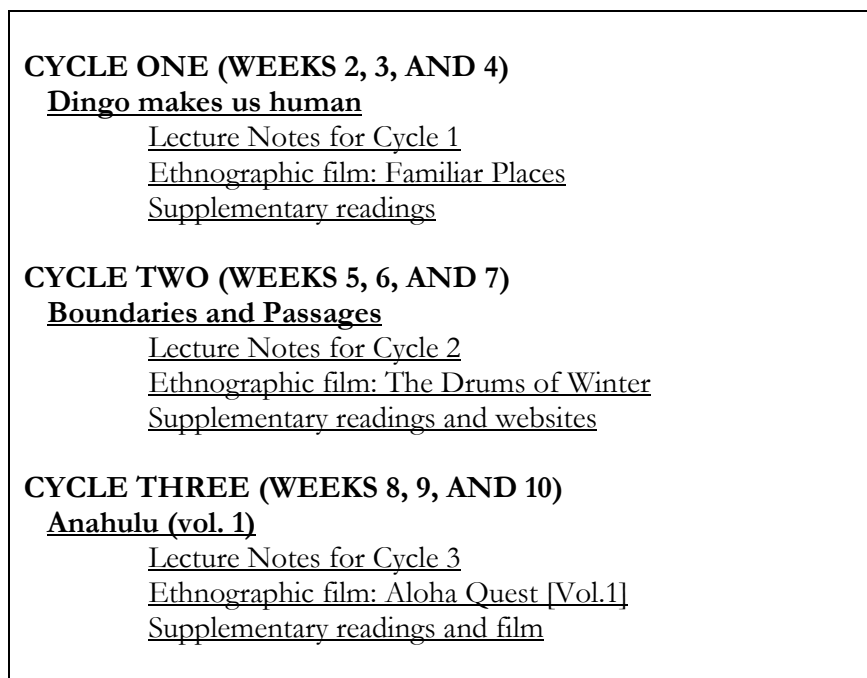
On-line reading lists represented a significant innovation at LSE. Building on the concept of the paper coursepack they helped to address a number of pedagogic and library-based concerns. However, the process of translating coursepack readings into on-line formats also provided new opportunities for teachers to develop pedagogical ideas. Whilst on-line readings lists featured prominently in these innovations, a number of other examples also emerged and are discussed in this section. One of these examples is taken from a Microeconomics course that made innovative use of the on-line quiz function in WebCT. Firstly, however, an example from an undergraduate Anthropology course is discussed, where distinctive use was made of multimedia resources and on-line readings. This course was particularly interesting because, through the on-line environment, the concept of 'the reading list' and its role within the course was extended. Instead of constructing the on-line reading list as a page *within* the on-line course, the reading list was designed as a central, organising structure that positioned materials in a very distinctive way.

In this course, students' attention was directed towards the reading materials in the on-line course, rather than toward the physical or electronic library. The intention of the tutor was to focus students' attention on the core readings and their relationship to the other materials he had positioned around them. Although the on-line course was linked to supplementary electronic readings and digitised book chapters, at the core of the course were three ethnographies. The significance of these ethnographies was of primary importance and formed the basis of the structure that the tutor developed. The tutor described his priorities as follows:

The course is based around three ethnographies which are at the heart of the course. Students are told to buy these. Supplementary readings don't have to be read for seminars. (Interview with Lecturer in Anthropology, 06.12.02)

To the tutor, the most significant facility offered by the on-line environment was the capacity for an arrangement of course materials that would complement student apprehension. In particular, it was the ability to integrate materials with one another, such as links to other web sites and multimedia video and audio clips. This integration was reflected in the structuring of the course. A common method for structuring course materials is to group them according to a linear denotation of time (i.e. Week 1, Week 2, etc.). In this course, linearity was passed over in favour of a cyclical denotation. The course outline / reading list is depicted in Figure 5.3 below. The titles of the three core ethnographic texts are shown in bold.

Fig. 5.3 Content screen of undergraduate Anthropology course



(Adapted from screen shot of course taken December 2002)

From the lecturer's point of view, the most significant aspect of the on-line course was the ability to include multi-media links alongside the core ethnographies. The underlying rationale for this reflects the way in which ethnographies themselves are constructed. Video and audio

clips serve as examples of the kinds of raw materials with which ethnographers work. According to this design, students were encouraged to move between academic accounts, video clips and sound recordings gradually developing a sense of how each related to the other. By forming the materials into three separate cycles the lecturer reinforced the iterative nature of the materials. Through this arrangement he underlined the fact that these were three separate examples which students' should not aim to synthesise or summarise. In the first instance, they are encouraged to develop an understanding of each ethnography in its own right.

As well as multi-media clips, links to web resources formed an important part of each cycle. The distinctive nature of anthropological data collection means that, unlike other social science disciplines, field work materials cannot be adequately represented solely by means of texts and datasets. Videos, photographs, audio recordings and physical artefacts form crucial aspects of anthropological investigation but are difficult to represent in simple form, frequently requiring film shows or museum exhibitions. In this course, the lecturer demonstrated this fact by placing links to academic anthropological accounts alongside links to ongoing exhibits and events in which the author of the account was involved.

They [readings and the web resources] are very closely interlinked. The author of one of the articles given here is involved with one of the museum exhibits linked to here, for example [clicks between hyperlinks in the course to demonstrate].
(Interview with Lecturer in Anthropology, 06.12.02)

Linking to ongoing events was a particular priority in those subject areas that required students to develop an awareness of the 'real time' construction of social institutions such as Media, Government and Law. In these cases, the on-line environment offered an interesting opportunity to incorporate current events into course design. This area of innovation was demonstrated in the design of a first year undergraduate Law course. In this course, both students and teachers needed to keep abreast of latest developments. The Internet provided academic researchers with new ways of staying in daily contact with significant events such as the outcome of landmark trials or parliamentary votes.

Previously, the logistical demands of trying to keep up with the information needs of time critical subject areas had placed tremendous strain on library resources. As the lecturer responsible for one course related:

Keeping up with library resources in this fast changing policy related area is an issue in this course. Library resources are limited and this is problematic, particularly for journals. The feedback I get from students is that most of the time is spent looking for articles from the library. I sit on the graduate committee and this is a constant complaint. We've had no complaints of this nature for this course [following introduction of on-line reading list] at all. (Interview with Lecturer in Law, 9.12.02)

In this case, the on-line reading list allowed this course to address an issue that was both course-specific and organisational. However, what is significant is that the Lecturer and Course Designer used the on-line environment to provide students with links to various genres of reading material. These included journal articles and newspaper articles that students had previously found difficult to obtain from the library.

This course area moves so quickly that there aren't always relevant journal articles out there. We put a lot more newspaper articles in than journal articles because they're more up to date. Journal articles are background reading because they're not recent. I go to newspapers and search for particular legal correspondents who I know are following particular events and put links to their articles in. (Interview with Course Designer in Law, 09.12.02)

The on-line list allowed resources to be grouped together around course topics or ongoing events. For example, reports provided on-line by the Lord Chancellor's office were placed together with newspaper reports of trials to capture a real time sense of the construction of Law 'in practice'. The inter-relationships of the media, legal proceedings and policy related activities were demonstrated through the use of different genres of materials. Through constant updating the course created the opportunity for students to gain an appreciation of the constitution of legal rights as ongoing. Maintaining the site required a lot of work, as events could change overnight. When questioned on this, the Lecturer and Course Designer said that the sources they used were ones they would visit on a regular basis themselves in order to keep up to date with current developments for both teaching and research purposes. Once the course design was in place and a routine had been established, channelling this information into the on-line course had not represented significant extra effort to them.

For on-line courses that encouraged real time interaction with either current events or students themselves, momentum was described as being absolutely crucial to maintaining student engagement. One tutor explained how weekly questions based on reading materials were placed on the discussion board in WebCT to encourage students to exchange ideas before they attended class. Getting questions to students at exactly the same point each week was key.

And if that momentum is lost, if questions aren't fed in at the right time, then it takes some effort to get it going again. For example, each week there are questions related to the readings. One week I didn't post questions to the discussion board prior to the seminar and then the following week there was a strike on the Thursday so the rhythm of the course was upset. It's important to strike a rhythm with the course. If the questions don't come in on cue, it can break up the rhythm of the course. (Interview with Course Designer in Geography, 20.11.02)

Maintaining momentum was a key motivation for using the quiz facility in WebCT to conduct short answer tests in a 2nd year undergraduate economics course. The quizzes were used for teaching the mathematical component of a Microeconomics course. The course tutors became concerned about how best to maintain an overview of student progress and engagement, given that there were over 450 students on the course. Responsibility for teaching was carried by two course leaders and twelve PhD students who acted as teaching assistants. Calculative principles discussed by course tutors in weekly lectures were made the subject of weekly on-line 'quizzes' that students were asked to complete before each class. By using statistical analysis tools developed by the CLT (the tools provided by WebCT were not up to the task) class teachers and course tutors could review student quiz results, isolate areas which appeared to cause problems and use this information to focus their teaching. The course tutors used the analysis of quiz scores as feedback, upon which they could base discussion in their weekly meetings with teaching assistants. Where a general issue was indicated, this could then be picked up within weekly lectures. Where quiz scores showed that individual students were falling behind, appropriate pastoral care could be offered. The issue of how to conduct teaching effectively when class or lecture sizes are increased is a concern for teachers throughout much of higher education. The significance of this innovation and the thoughtful

way in which it addressed this concern, won the tutor responsible second place in a national 'e-tutor of the year' award run by Times Higher Education Supplement.

5.2.4 Pedagogical Integration at UofB

The timing of field work was such that UofB had yet to enter into serious pedagogic use of their learning environment by the time data collection ended. Initial developments with data integration and the MLE Working Group had suggested that on-line readings would not play such a significant role within UofB on-line courses. Drawing on her experience of developing the student intranet in the Faculty of Science, the Learning Technology Developer at UofB felt the significance of on-line readings would vary from subject to subject. The scope of the curriculum at UofB meant that it was difficult to make generalisations regarding the potential relevance of on-line readings. Particularly at undergraduate level, most science subjects relied heavily on core textbooks which students were likely to buy. This situation was completely reversed for undergraduate subjects in the Faculty of Arts where undergraduate courses were designed to encourage students to develop their own ideas and approach to design. When asked to comment on the difference between arts and science library provision, an ex-Head of Learning Resources said:

Arts students are as likely to come into the library and ask, 'have you got a picture of a giraffe sitting on the end of the Palace Pier?' as 'have you got a core text book?' (Interview with ex-Head of Learning Resources, 04.12.02)

The LTG managed to create generic links between course codes and library subject indexes, but there was concern that these links might not indicate sufficient focus particularly for undergraduate students. However, at this early stage simply suggesting that links to electronic library resources were a possibility was enough. The LTG hoped that as soon as academic teachers and students became familiar with what the learning technology could do they would soon see the potential of on-line readings.

Preliminary discussions with academic departments had led to some interesting innovations with respect to on-line course presentation and design. Planning what the on-line course area for a department should look like afforded academic teachers an opportunity to re-think the ways in which a course was presented and the priorities they wanted to communicate to

students. For undergraduate architecture teachers, this represented an opportunity to reinstate a linear view of the course over and above the modular structure they had reluctantly adopted. The standpoint of teaching staff in this department was that architecture students benefited from understanding their development longitudinally. This was reflected in the portfolio-based assessment around which the course was based. Over three years of undergraduate study students would gradually contribute to and build towards a final portfolio of work, which would reflect their awareness of and proficiency in architectural design. Teaching staff felt that a modular course structure created an emphasis where elements of the course were taken at a particular point in time and then ‘finished with’. Architecture teachers were uncomfortable with this design philosophy and felt it communicated the wrong message to students. On seeing the student view that the Blackboard portal environment created in an early training session, architecture teachers saw an opportunity to reinstate a linear view of the course. Working with the LTG Manager they designed a structural model for an on-line course that students would use to navigate through course materials. The model sat ‘over the top’ of the underlying modular course structure and did not affect or conflate with the way courses were represented administratively or in the central database.

5.3 Conclusion

The course that integration activities took once on-line learning technologies had crossed over the institutional boundaries of each university differed. However, unlike the experience of many universities in the United States, integration activities at both case study institutions were non-managerialist; the decision to use the new technology rested with academics. Although it is clear that pedagogic priorities were forced to compete with other priorities in some instances, integration was driven primarily by pedagogic interest in how organisational and discipline-specific concerns could be addressed by the new technology for the benefit of student learning. Learning technologies staff elicited and enabled these interests, frequently working outside the bounds of the structured learning environment to develop workarounds and innovations.

It should be noted that during this period interest in and use of on-line learning technologies still represented a minority pursuit at both institutions. At the end of field work, LSE supported around 40 on-line courses, which represented about 10 % of the total number of academic courses. After three months use, academic teachers at UofB had 'switched on' 95 modules, which represented 3% of the total number of modules. Both learning technology groups experienced requests for further information, and the extent of attendance of dissemination events suggested clearly that usage was set to expand. However, at this stage the majority of teachers had chosen not to incorporate on-line learning into their teaching practice. The question of whether at some point in the future tutors should be *expected* to use on-line environments was a moot point. This kind of proposal would have been considered inflammatory at any point over the course of field work, but it remains to be seen whether it will emerge as a question.

In some senses, pedagogical integration and data integration can be understood as 'two sides of the same coin'. Data integration is very much the 'under side' of the on-line course. It can easily be dismissed as 'back office', 'purely practical' or 'too technical'. However, choices made relating to data integration played a significant part in the course that integration activities took. Purchasing one technology rather than another, establishing the extent it could be integrated with existing data routines and finding organisational and technical workarounds allowing teaching staff to develop course designs were important examples of this. It is easy for these activities and the work of those who bring innovative integration solutions about to be 'passed over' in favour of the 'more interesting' pedagogical issues. Course design and pedagogy act as executive narratives (Star, 1991) in this regard, taking charge as the most significant aspect of educational engagement with on-line learning technologies. However, it is argued in the next chapter that there are consequences to disregarding or rendering 'invisible' aspects of university work associated with integration.

Chapter 6 Analysis and Implications

6. Introduction

This chapter provides an analysis of the case study material presented in chapters four and five. The analysis is based on the documents in the field work document index and was conducted using techniques adapted from grounded theory. *Valence* and *ways of reckoning*, the core concepts which were generated by the analysis process, are reintroduced in this chapter. The core concepts are developed in direct relation to the field work data, drawing upon the theoretical foundations that were set out for them in chapter three. In the first part of this chapter, the case study institutions' early involvement with on-line learning technologies is analysed. This part of the analysis refers primarily to data presented in events described in chapter one and section 4.2 of the introductory case study chapter. It draws on data from both case study institutions. The second part of the chapter refers to data from UofB, providing an analysis of data integration activities that took place there, as described in section 5.1 of the case study. The third part of the chapter turns to pedagogical integration activities at LSE and provides an analysis of events described in section 5.2. Links to previous sections of the case study and field work documents are provided throughout this chapter. These links serve to reinforce the association between field work events and documents; the case study narratives (selective coding); and the concepts and implications that have been derived from these analytical processes.

In the introduction to this dissertation, some illustrative examples were provided from the distinctive time period that directly preceded the beginning of field work. The point was made that, during this time, a remarkable amount of hyperbole and rhetoric surrounded the concept of Internet based learning (see section 1.1.2). The first part of this analysis, investigates this time period in terms of the multiple agencies involved in creating this climate. It then provides a close examination of the consequences these agencies brought to bear on integration issues

at the two case study universities. It is argued that emphasising the physicality of the marketplace, instead of referring to abstract market processes, is more helpful to cross sector analyses. Conducting analysis on this premise involves examining universities' relationships with technology vendors and private sector partners, and looking at the details of contractual arrangements that were proposed. An analysis of LSE's contractual arrangement with UNext is considered in the final section, which looks specifically at arrangements pertaining to course design and provision.

The second section of this chapter is an analysis of data integration activities at UofB. The concepts of valence and ways of reckoning are used to examine the interactions of the MLE Working Group. The integration task that the MLE group faced was enormously complex. Understanding the requirements of the different systems and technologies that were implicated in integration carried implications for the way in which the group interacted. They found that it was not simply key systems and data entities with which they had to get to grips, they also had to understand the 'joining arrangements' that allowed data to move between systems. These data flows represented the means by which the information held in key systems was kept current. As such, it was important that the learning technology find its place within them. In 'the moment' in which data integration was finally achieved, lengthy discussion was put to one side as the three members of the MLE group drew data elements together in one place for the first time. The significance of this moment is discussed in terms of the striking way in which group members' physically enacted the integration process. Implications are drawn from this which add further dimensions to the concepts of valence and ways of reckoning.

In the third section, integration activities at LSE are discussed. The strategy for integration at LSE encouraged teaching staff to explore new ways of extending pedagogy through on-line learning technology use. Hence, on-line learning developments at LSE were both pedagogically driven and highly innovative. The 'reading list' featured very strongly in these innovations. However, in developing on-line reading lists, pedagogical aims had to compete with other considerations such as electronic copyrights. The concept of 'reading list methodology' is introduced in order to bring focus to some of the more subtle design issues that arose from the translation of reading lists into on-line formats. This concept is used in conjunction with the idea of 'epistemic cultures' which was introduced in chapter two.

Together these concepts help to elicit the multiple priorities and rationales that individual teachers enacted through their on-line course designs. An important aspect of course design that is drawn to the foreground of analysis are the numerous significant relationships that the course enacts. Some of these relationships act as internal feedback loops, others draw out relationships between an epistemic culture and the social institutions with which it is engaged. In the concluding part of this chapter, issues raised through the analysis of on-line course design are related back to the first two sections of the chapter, and the implications of disaggregated models of course design are discussed.

6.1 Education and the market

One of the major contributions of this research is that it offers a longitudinal perspective of the period of time during which on-line learning technologies were first introduced into UK higher education. It is argued that understanding the circumstance of the higher education sector during this time, through the experience of the case study institutions, forms an important insight into the inter-relationships that surround the emergence of new technologies. In the case of learning technologies, taking account of these inter-relations supports analysis of the case study institutions and the approaches they took toward integration. It also supports the synthesis of examples provided by the learning technology literature, by providing a basis for understanding the varied concerns expressed by learning technology researchers from a historical perspective. Using the premise of ‘the actor’ provided by actor-network theory (ANT), agencies are identified and attributed to those who author them in this analysis. This adds to a sense of the time period in question, allowing the emergence and withdrawal of significant influences to be tied to events and individual actors. Valence and ways of reckoning contribute to this analysis by allowing the multiple priorities and rationales of different actors to be held up to analytical scrutiny. The concepts draw focus to the distinctive characteristics of actors and the local logics and priorities they sought to uphold.

6.1.1 Claims to transformation

Over the course of research, the market for on-line learning emerged, peaked and crashed, along with the NASDAQ technology share index in late 1999. Many of the private sector companies that had been established to develop and sell on-line learning technologies, had to close down or significantly realign their interests as a result of this (THES, 16.05.03). During this time, emphasis had been placed on the relevance that on-line learning technologies held for advances in *distance* education and this was the conception that underpinned concepts of 'global education' (UNext brochure, 2000). Following the collapse of the technology market emphasis shifted to the relevance of on-line learning to individual academic institutions, as a means of blending face-to-face teaching with on-line support. As this shift occurred, learning technologies were brought over the university boundary and accommodated within the technological and organisational infrastructure of the university (LTTG report, December 2000).

At LSE, this shift was mirrored by the creation of two working groups. The Director's Working Group for Distance Learning, established in late 1998 assessed offers that came in via the university's private sector arm, Enterprise LSE (Council Away day Report, 31.10.00). It was this working group that oversaw the university's involvement with UNext.com. To the university, the most significant aspect of this association was that it cemented the institution's growing relationship with Columbia University in New York. So significant was Columbia's involvement in the UNext consortium that the Deputy Director described himself as waiting "pen in hand" to receive a call from them to say that they had signed the UNext contract, before he would put pen to paper (Interview with Deputy Director, 23.01.02). For the purposes of analysis it is important to note that UofB, like the majority of UK institutions, were left out of global education partnership and consortia arrangements that were common at the time. What was valued by the private sector companies who aimed to promote global distance education were worldwide reputation and a "solid brand" (Interview with Director of Projects, 20.07.01). Those universities who met these criteria were aggressively sought after and those who did not, were passed over.

The selectiveness inherent in approaches from private sector companies was based on a particular assessment of the education sector. The worth of individual institutions, according to potential partners, was based upon their viability as global brands.

[According to the UNext concept] brand was absolutely crucial in this market - that you needed to have a solid brand [...]. So their idea was, we're going to create our own courses, our own university, but we're going to work with the best people in the world [...] we're going to be associated with those people" (Interview with Director of Projects, 20.07.01)

This assessment represents a particular way of reckoning, according to the terms of this research. The markers of worth that were ascribed (i.e. reputation and brand) constitute an aspect of valence as the constitution of values-in-practice. The significance of identifying the activities of private sector partners in these terms is to underline the distinctiveness of their outlook. As a reference to organisational identity, brand is a very particular term that is tied to notions of markets and competition. Another way of reckoning might express different priorities or push other concerns to the forefront of its rationale. For example, from an educational perspective, brand would represent an uncommon term and emphasis might instead be placed on access to education. In this example, valence and ways of reckoning denote a kind of grouping, a basis for including or excluding, grounded in a particular set of priorities and based on a particular rationale. The significance of identifying values and rationale in this way becomes clear in cases where one way of reckoning or set of values begins to dominate arrangements. On these occasions, it is as if a *totalising framework* is imposed where sense making and priorities can only be explained or described according to a particular version of events. Valence and ways of reckoning provide useful critical tools for addressing this kind of framework.

In the case of learning technologies, certain versions of events were pronounced very forcefully in the early period of their development. The level of hype and speculation that began in the mid-nineties and reached fever pitch at the end of 1999, is just being problematised by the learning technology literature (Barab, 2003; Clegg et al. 2004; Conole et al., 2004). A particular difficulty with the claims to transformation that were in circulation at the time was the sense of inevitability they embodied. A good example of this was quoted in section 1.1.2 of the introduction. The quote was taken from Ryan et al. who cite Peter

McPherson the then President of Michigan State University as describing how market pressure would “force” educators to think differently (2000:1). There is a totalising aspect to this depiction in which the market embodies an inevitable logic that is undeterred by situation or circumstance. No counter concerns or opposing pressures enter the picture. There is also an implicit irony in insisting that educators should conform to market pressure whilst also saying they should ‘think differently’. In this example, it was the significance of market forces that was appealed to, but it was just as common for the lure of technology or the demands of economic development to occupy this role.

A significant implication of the rhetoric and hype that surrounded on-line learning technologies was that a palpable gap emerged between educators’ experience and claims being made. At the case study institutions, the use of on-line learning technologies in teaching was still a “minority pursuit” during the field work period (Interview with Learning Technology Specialist at LSE, 12.04.02). Learning technology staff at both institutions sought ways to bridge the gap between lone pioneers and the majority of academic staff who were completely unfamiliar with what learning technologies were. In contrast to the hype, speculation and inferences that universities were failing to ‘keep up’, some more basic realities were at stake. The market for learning technologies was extremely unpredictable. During the course of research, this market emerged, peaked and disappeared from view. The products that emerged during this period were described as “volatile and immature” (Wilson 2004). Consortia arrangements, such as the one that LSE entered into with UNext.com, kept learning technologies outside the boundary of the institution, affording academics no direct engagement with them (see fig.6.1). Within LSE, isolated initiatives were taking place, such as the MSc in Information Systems Security. However, a campus wide license for WebCT was not purchased until July 2001. At UofB, final arrangements for installing Blackboard were not in place until April 2002. Despite the intense speculation, university staff did not have access to learning technologies until long after the claims regarding their revolutionary impact on higher education had first been made. The assessment of educators was therefore largely excluded from this period of speculation.

According to the sociology of association, the standing of a particular relationship or set of values is substantiated - literally given substance - through its interconnectedness with other

significant actors. When placed under closer empirical inspection, the claims to transformation that surrounded the transformation of higher education were *unsubstantiated* (see section 3.2.2). The claims made are more aptly attributed to the status of the technology market than the assessment of educators. Correspondingly, the prevalence of claims to transformation subsided after the stock market crash in technology shares (Clegg, et al., 2004; THES 24.05.01). Depictions of the revolutionary impact of learning technologies had leaned heavily on the educational values of access and empowerment. However, given that the majority of educators in the UK had yet to even see an on-line learning technology in use, the substantive nature of these claims is called into question. Valence and ways of reckoning are tied to the concept of substantiation and to network analysis as presented by the sociology of association. Hence, a differentiation between *espoused* values and *enacted* values can be achieved. This is a dense and complex dimension to the concept of valence which is nonetheless important to instate, if a distinction between words and deeds - or in this case hype and experience - is to be achieved.

The claims and distinctive market conditions that characterised this time played a significant part in the case study universities' purchase and integration of learning technologies. The next section turns to the role of the market in the interactions between the case study universities and private sector partners. In the first instance, grounds are established for conceptualising the market before details of technology purchase and other cross-sector interactions in which the two case study institutions engaged are examined.

6.1.2 The market's place

Some sociologists of education have looked at the relationship of education to the market in terms the 'marketisation of education' (Becher & Trowler, 2001; Mazzarol & Soutar, 2001; Naidoo, 2003). According to this perspective, key educational practices such as curriculum design and student recruitment are understood to have become increasingly aligned with market-based practices. However, in this section it is argued that the concept of marketisation is unhelpful to an analysis of the interactions that took place between the case study institutions, and the learning technology companies that sought to partner with them. The implied convergence of educational and private sector practices that marketisation suggests, fails to account for the clear and fundamental differences that were in evidence between the

two. During field work, the institutional boundary of the university presented itself very clearly and differences between the institutions' priorities and rationales, compared to those seeking to partner with them, were pronounced. It was in the detail of negotiations that priorities and rationales presented themselves most clearly, rather than in the espoused views of either party. These details and their relationship to the concepts of valence and ways of reckoning are illustrated further in this sub-section.

In order to disentangle on-line learning technologies from the totalising framework of the market, this section of the analysis adopts an approach from Callon (1998). Callon suggests that emphasising the locale of the market can assist in underpinning the difference between the market as a broad area of economic analysis and the market as a network of actors, who take part in price setting and the exchange of goods. According to this approach, it is the empirical details of interactions between vendors and buyers that characterise a market, rather than generalised principles or characteristics. He likens this to the difference between 'the market' as a concept and 'the marketplace' as a physical space in which prices and contracts are agreed upon and goods are exchanged.

Whilst the market denotes the abstract mechanisms whereby supply and demand confront each other and adjust themselves in search of a compromise, the marketplace is far closer to ordinary experience and refers to the place in which exchange occurs. (Callon, 1998:1)

As well as physically locating the market, Callon also identifies markets as having distinct organisational forms constituted by a range of actors whose agency is directed towards the exchange of goods. Callon calls this form of agency 'calculative agency'. In terms of the theoretical constructs used in this analysis, calculative agencies represent particular ways of reckoning, that are associated with contracts, price and the exchange of goods.

The case study institutions' experiences of interacting with the on-line learning technology market were varied. As previously noted, LSE's brand was sought after by potential private sector partners and so the institution received a considerable amount of attention (see section 4.2.2). In fact, LSE was approached by so many different on-line learning companies between 1998 and 2000 that a new member of staff was employed simply to deal with enquiries and co-ordinate a response from the school (Interview with Director of Projects, 20.07.01). The

Director of Projects for On-line Learning was based in Enterprise LSE, the school's private sector arm. Enterprise LSE were given responsibility for assessing approaches from the private sector and keeping apprised of developments in the on-line learning market. The appointed Director of Projects kept in touch with pedagogic models and technologies on offer and choices that other academic institutions were making with respect to alliance formation and choice of technology (Interview with Director of Projects, 20.07.01).

In dealing with approaches from private sector suitors, the Director of Projects described himself as a “translator” (Interview with Director of Projects, 20.07.01). The divergent interests of the university and the companies who sought to partner with it were such that the Director had to use different terms of reference when appealing to each.

“when you speak to a client it is a matter of ‘to meet competitive advantage through the acquisition of the right knowledge’ but the aim is likely to be expressed quite differently when you speak with the academics” (Interview with Director of Projects, 20.07.01)

According to the language required when speaking to private sector partners, LSE represented a “solid brand”, robust contractual arrangements were necessary to “protect the brand of the school” but it was important for the school to be “a player in the game” (Interview with Director of Projects, 20.07.01). To further exemplify his experiences of cultural difference, the Director of Projects used the example of contractual negotiations typically handled by ELSE when a private sector company sought to have research conducted by LSE academics.

Say it's an American company who is going to do research [...] and the outcome will show that, ‘the product I am proposing is best’, so with a clear agenda. And so already at that stage we have to tell them what LSE [academics] do. What [academics] are going to tell you is that if you want to work with them, you must be willing to accept their conclusions. And the true conclusions, you might not like them. They might contradict or make you doubt your strategy. (Interview with Director of Projects, 20.07.01)

He described the difference between business and academic culture as one of “divergent interests”. Businesses wanted research that would serve specific ends, but if those ends were too narrowly prescribed, the project would be considered unsuitable to propose to academics. Directing the outcomes of research towards ends which were pre-determined would be

considered unethical in academic circles. Academic standards regarding independent research were such that a project would only be considered worthy of proposing if these standards applied, “otherwise [academics] just won’t do it”. (Interview with Director of Projects, 20.07.01).

Whereas the interests of the on-line learning companies were bound to market conditions and speculative investment, the interests of the university were bound to government policy, safeguarding public funds and maintaining standards of independent research. According to this analysis, these interests are understood as examples of enacted values or valence. They are the enacted priorities and formative relationships that each organisation sought to uphold and maintain during the course of negotiations. These values form a basis upon which contractual relations were reasoned through, or reckoned. In this example, the private sector arm of the university, for whom the Director of Projects worked, acted as a boundary infrastructure (Bowker & Star, 2000). Through this organisation, contracts were negotiated which were designed to safeguard divergent interests and support the achievement of very different ends. Although, clearly, common ground was established in both negotiating and contractual terms, as a non-profit making organisation, the ends of the university fundamentally differed to the ends of for-profit, private sector partners.

A characteristic aspect of the divergent interests at stake manifested itself in the distinctive attitudes to timescales that were in evidence. Potential private sector partners were in the position of trying to take advantage of time-critical market conditions. Their organisational orientation and calculative agencies were designed to do just this, by securing favourable contracts and competitive prices. The organisational orientation of the university is constituted to achieve very different ends, of which contract arrangements and price setting are not core activities. Hence, in a report on LSE’s distance learning strategy, it was stated that the school lacked “a clear locus or structure” for evaluating proposals “on a timescale consistent with the expectations of potential business partners” (LSE Distance Learning Strategy, Council Away day Report, 31.10.00). Whereas universities were looking for substantive evidence of how new technologies would benefit the institution, the interests of technology vendors were served by generating an ‘act now’ imperative.

In this respect, timescales associated with the negotiation of contracts and price were a pre-occupation for vendors. Those involved in negotiations at the case study universities were frustrated by the aggressive negotiating practices of potential private sector partners. In a number of instances, vendors sought to exploit critical time frames as part of their repertoire of contract and price setting tactics. At LSE the Senior Lecturer responsible for designing the university's first on-line programme of study experienced difficulties with the publisher, who had offered financial support for the project. He described delays associated with confirming contractual arrangements regarding intellectual property rights as an attempt to "bump" him into an agreement (Field work diary, 20.11.02). By this he meant that, those involved in the negotiation assumed that if the fine print of these aspects of the contract were left until the last minute, it would be less likely that he would turn his back on the project on a point of principle, after having invested so much effort. However, in this example, the publishers were proved wrong and the lecturer refused to conclude negotiations. At UofB the Learning Technology Manager felt that Blackboard 'kept him waiting' for a quotation regarding the cost of integration (Interview with Learning Technology Manager, 14.12.01). Coincidentally, when he was finally given a quote, license fees had been increased. By this point the market for on-line learning technologies had been effectively cornered by WebCT and Blackboard. Therefore, the Learning Technology Manager turned back to WebCT, only to find that their license fee had been raised by an even greater amount. For both institutions, making choices purely on the basis of a point of principle, pedagogical functionality or potential benefit to student learning was made very difficult. Instead of these, it was the reality of limited funds and the frustration of being 'played' by vendors that dominated these negotiations.

In these examples, the enacted values and rationales of negotiating parties are understood as manifest in the attitudes of the individuals involved in those negotiations; the organisational orientation of the companies and institutions involved; and the ends those organisations sought to serve. During field work, these aspects of valence and ways of reckoning were often characterised by conflict. Negotiations were often beset by 'clashes' of interest. Some of these conflicts were irresolvable. Others were worked through and resulting prices and contracts were instated. Further implications of price and contract in on-line learning technology integration are examined in the following section.

6.1.3 What is valued

From this discussion, the rather straight forward conclusion emerges that the organisation of the university is not focused on an alignment with market activity. If only in a financial sense, its well being is tied to government policy and funding more than speculative investment. Where learning technology vendors needed to generate interest and promote their products, educators wanted substantive evidence of what exactly on-line learning technologies could offer student learning. The lack of available evidence was largely due to a shortage of first (or even second) hand, experience of on-line learning technologies. The reason for this was that the claims and hype in circulation had preceded the instatement of on-line learning technologies in educational institutions. The technologies which were on offer were immature and the volatile circumstances of their suppliers posed difficulties for evaluation. Although Blackboard and WebCT ultimately cornered the market, the fact that these two technologies survived the stock market crash when so many other learning technology companies went under, was ultimately taken as a marker of their resilience. UK institutions, drastically short on funds, could not afford to make costly errors in their choice of technology. The fact that these two companies were still standing after the dot.com disaster offered a measure of reassurance, particularly to institutions such as UofB who had deliberately adopted a 'wait and see' strategy (Interview with Learning Technology Manager, 14.12.01).

Paradoxically, then, while a cornered market narrowed the institutions' choices and subjected them to unsavoury price setting tactics, it also gave them confidence to make an initial investment of resources into on-line learning. The difference between contractual arrangements proposed by companies such as Blackboard and WebCT, and the consortia arrangements that universities had entered into, was that the learning technology itself would be housed within the boundary of the university. The 'larger scale' developments taking place involved learning technology companies who had taken responsibility for technical design, giving universities control over academic content. This was the case with LSE's contract with UNext and also with the business model of the UK's e-University (PriceWaterhouseCoopers, 2000). These kinds of arrangements added to, rather than lessened, the general lack of clarity surrounding which technologies and pedagogic models were being developed. The majority of

educators still had no direct contact with learning technologies and were still unable to formulate practice based opinions of what exactly on-line learning technologies were offering.

What is frequently overlooked in the learning technology literature, however, are the implications these arrangements held for the organisational constitution of the university. Rumble relates this oversight to the literature but more importantly to estimations of cost. He discusses the example of the Open University web site which he describes as “costing many times more” than the one million dollars he cites as the cost of an average e-commerce web site (2001:229). This additional expense would be difficult for any educational institution to withstand, especially since, as Rumble points out, it is in no way clear that savings would be commensurate with costs (2001:229). The models of distance on-line learning provision represented by the e-University and by UNext aimed to address these costs by outsourcing areas that traditionally form part of university services and administration - such as examinations and awards, library services and tutor support - to commercially oriented firms. In this sense, the main thrust of these models is disaggregation.

Clearly, this is not the model reflected in the technologies and organisational responsibilities that companies such as Blackboard or WebCT propose. Other arrangements, such as LSE’s short-lived partnership with the publisher Pearson, saw that provision of technology and responsibility for course design were left to the academic. However, both the publisher and the institution laid claim to intellectual property rights over and above the course author. In the contractual arrangement between UNext and LSE, responsibilities were split, albeit somewhat unevenly, between the two organisations. The diagram below describes the distribution and breakdown of responsibilities.

Fig. 6.1 Contractual division of responsibilities for course provision in the UNext / LSE agreement

UNext		LSE
Curriculum Course structure	Student information Student support	Course content

Pedagogic model	Technical support	
Technology design	Library resources	
Marketing		
Recruitment		
Admissions		

(Derived from interview with Director of On-line Learning Projects, LSE, 20.07.01)

Activities undertaken by UNext appear on the left and those undertaken by LSE are on the right. According to this model for on-line course provision, the role of the university is to supply academics who can provide intellectual content. The underlying assumption is that this content is ‘context free’ and can be separated from the way the material is structured and way it is taught. It also assumes that the material provided will make sense without recourse to a broader curriculum.

What the university has to offer - what UNext considers to be its value according to this contract - is its ability to provide course content. From the perspective of the business model that UNext constructed, this appears to be a credible aim. However, taking a holistic view of the university and its practices, it is difficult to see what ‘academic’ or ‘course’ content in isolation actually is. According to this analysis, this is an example of how ‘what is valued’ manifests itself in the arrangements and models that underlie significant relationships. Contracts, models and working arrangements are understood to enact ways of reckoning; ways of grouping - of including and excluding - both named and unnamed actors. A way of reckoning is therefore taken as a measure of value; as ‘what is valued’ in the enactment of a particular set of relationships.

Ultimately, LSE’s relationship with UNext allowed it to have a presence in the market for on-line learning, whilst not endangering the institution either financially, academically or organisationally. In the words of the Director of On-Line Learning Projects, UNext represented “a great opportunity to be involved in the sector” allowing LSE to be “part of the game”, associated with “the right people” whilst also “limiting risk” (Interview with Director of On-line Learning Projects, 20.07.01). Although from the university’s point of view

additional income streams would have been welcome, their relationship to the UNext consortium was distinctly marginal compared to the main thrust of campus based teaching and research activities (Council Away day Report, 31.10.00; see also section 4.2.2). For the purposes of analysis, understanding the differences implied by the various models for integrating on-line learning technologies holds a number of implications. Disaggregated notions of the university and the segregation of different areas of university work from one another holds far-reaching consequences. Some of these consequences are discussed at the end of this chapter once other aspects of integration have been examined.

The next section turns to the work that accompanied the decision to house on-line learning technologies within the boundary of the university. Creating associations between the different aspects of the universities' organisational and academic practices was not straightforward, as the events described in the case study regarding data integration at UofB showed. These events form the focus of analysis in the section that follows.

6.2 Analysis of data integration at UofB

The work undertaken by the MLE Working Group offers valuable insight into the lived experience of integration work. This kind of deep systems work is now a common feature of maintaining and expanding information infrastructure (Hanseth & Braa, 2000, Star & Ruhleder, 1996). Largely, 'fine-grain' details of integration tend to go overlooked in the technology literature, perhaps due to their innate complexity. However, the choices, compromises, fixes and fudges that characterise this work have a bearing on the form that new technologies take within an organisation. In particular, they come to bear on how implementation and design choices are presented to new users. A characteristic that makes the examples of technology integration provided in the case study stand out from other examples is that both case study institutions underwent non-managerialist implementations. There were no directives issued 'from above' to say that either institution *had* to implement on-line learning technologies. Furthermore, these activities were never conceived of as a 'project' with 'milestones' or 'deliverables'. This had profound consequences for the way in which the group

interacted. It meant the actions of the group and the underlying rationales they constructed for piecing together system relations were never explained or justified in terms of ‘project requirements’ or ‘project deadlines’. In this sense, ‘the project’ was not an actor in this case study.

In order to understand exactly why activities associated with data integration were so complex, it becomes necessary ‘to set the picture in motion’. The MLE Working Group at UofB were not simply facing the task of identifying and coming to terms with individual systems and practices that the learning technology would have to draw upon. They also had to understand the means by which a *flow* of data was achieved *between* systems and work practices. The key piece of data in which the MLE Working Group was interested was the course registration record (see section 5.1.1). Although it was held within the central database, the course registration record was implicated in a range of institutional practices spanning diverse work domains - from library and academic work to management information systems and administration. The practices, mechanisms and relationships that facilitated the flow of course registration information often had ‘a logic of their own’ and establishing the design principles that lay behind their configuration was not straightforward.

The scope and complexity of the issues at hand meant that it was impossible for individual members of the MLE Working Group to sustain an overview of integration issues. Only by pooling the collective knowledge of a number of different systems spokespersons could the history and conditions attached to system relations be grasped sufficiently. Hence, it was only through the combined effort of three systems spokespersons that data integration between the learning technology and the central database was achieved for the first time. The ‘moment of integration’, when various strands from key data flows were joined together for the first time came about as an unplanned, spontaneous improvisation (see section 5.1.3). However, this improvisation was only made possible after weeks of discussion among members of the MLE working group. The members concerned had no idea how their experiment would turn out; they acted out of sheer curiosity rather than any hope of success. Once a link between systems had been achieved for the first time, the group were able to look into the implications of turning the process that had taken the group so long to achieve into an automated, ‘overnight feed’. Through an examination of the group’s activities and the technologies they worked

with, new dimensions are added to the concepts of valence and ways of reckoning and their significance to analyses of integration work is extended.

6.2.1 Integrating dialogues

In this section of the analysis, the methods of communicating that UofB's MLE Working Group developed in order to contend with the complex task of integration are analysed. The complexity the group faced was three-fold. Firstly, the technologies in question, even when considered in isolation, were enormously complex. Secondly, as in the case of the central database, it was not just familiarity with internal data definitions and constructs that was required, it was a case of understanding how these definitions and constructs formed part of institutional work practices. Thirdly, some of the structures, definitions and practices in question constituted aspects of academic practice. Therefore, in terms of ascertaining which aspects of data relations were open to reconfiguration and which were not, the group had to be highly sensitive to the variable status of the constructs and relationships they were dealing with. Emerging from these negotiations was a sense of the fundamental significance that design and design philosophy hold within the practice of education. What seems surprising is that, even in the depths of technical integration work, this significance was upheld and enacted in the choices that the group made. Understanding that certain relationships within the data constituted part of academic course design and others were of a more 'pragmatic' nature, became an important aspect of how the group navigated their way through this complex work.

The process of coming to understand the priorities and rationales that the group faced was not only complex it was also political. Identifying and accounting for different requirements and concerns was one part of the process. However, making sense of which should take precedence over which when configuring new relations and work practices was a very different part of the process. The tensions surrounding these issues are exemplified in the quotation below. In this example, a senior academic at UofB defends the methodology underlying the structure of his school's courses. The courses did not 'fit' the modular framework that was favoured by the University and that was inscribed within the central database. The conflicting structural configurations of courses and database meant that entering course details into the database was like 'banging square pegs into round holes.' The MLE Working Group intended

to draw on data from the central database in their plans for integration so this issue had a direct bearing on their work. In this example, ‘something had to give’ and the senior academic felt that, given a choice, it should not be the practice of pedagogy.

The requirements of an electronic recording system are not the best determinant of academic practice. If I read this right it is not a matter of ‘co-operation’ but of the whole structure of [our] courses – particularly (but not exclusively) the seminar input/assessment role. That is not some mere ‘practice’ – it’s fundamental to the philosophy and teaching/learning strategy of the degrees.” (E-mail, 02.09.02)

Philosophical and political dimensions added further layers of intricacy to integration work carried out by the MLE Working Group. Ultimately, the complexity the group faced was beyond the sense-making capacity of a single person. Through trial and error group members discovered that a combination of dialogical process, diverse membership and broad aims allowed them to plot a course through this dense terrain.

Within the process of the group it was not simply that each individual could offer a different way of looking at the situation. It was that, as well as their own way of looking at the situation, members could act as spokespeople for the logics and rationales of the technologies they worked with, and by proxy, they could assert viewpoints expressed by relevant user groups who worked with those technologies on a daily basis. Over time, this allowed the group to absorb the significance of the multiple concerns at stake and develop a shared understanding of how to go about their work. Two aspects of their interaction were of particular relevance to this process; broad aims and a shifting membership. Broad markers of what the group hoped to achieve were set out at the first MLE meeting (see section 5.1.1). However, for much of the group’s work, dialogue took precedence over the instatement of precise ends. Every outcome the group suggested was densely contingent, involving data and work practices from diverse areas of the university. In this sense, the *ends* to which they worked were unknown. The significance of dialogue between group members in resolving contingencies meant that *who* was included in the meeting and *which* standpoints they represented was an extremely important consideration. For this reason, the membership of the group was described as ‘inevitably shifting’ in early meetings until it became clearer whose viewpoints and expertise would need to be called upon.

In the example of the MLE Working Group, the concepts of valence and ways of reckoning are used to draw attention to the sense-making process of the group. Multiple logics and reasons were represented in these meetings. These ways of reckoning were expressed from a range of different standpoints; personal standpoints, the standpoint of user groups, the standpoint of particular technologies. Assumptions of overarching logic or straightforward rationalism were gradually placed to one side as the group moved toward a collective sense of the multiple concerns at stake. In a sense, it could be said that the group itself developed a way of reckoning that was specific to the task that faced them. The way of reckoning they developed in early discussions was ‘non-ends oriented’, in that, whilst a broadly conceived goal was in sight, desire to head straight towards precise outcomes was suspended. In the first instance, the more important task was the dialogue itself and the awareness that gradually developed of the diverse issues and concerns that were involved in integrating the new technology.

In this example, the concept of valence refers to the *multiple priorities* which the group had to account for. Each priority was accompanied by a way of reckoning; a way of representing events and relationships in such a way that selected concerns were *made* a priority. In this sense, valence affords a description of the various fundamentals that underlie complex dialogic processes. In this example, these fundamentals were often expressed in the form of explicit philosophies such as modularity or a school’s pedagogic practice. Strength of argument (way of reckoning) was important, but so was *belief* in the basis of that argument. In this way, valence and ways of reckoning draw attention to distinctions between ‘what is logical’ and ‘what is believed’ and invite the question: ‘whose logic, whose belief?’ By including philosophical dimensions, valence appeals to ‘philosophy’ with a small ‘p’ rather than ‘Philosophy’ as a disciplinary discourse. It pertains to second order definitions in which ‘philosophy’ describes, “any system of belief, values or tenets” (Collins English Dictionary). According to its origins in the sociology of association, valence sees the notion of philosophy as applicable to material arrangements and artefacts as well as groups and individuals.

In the next section, the concepts of ways of reckoning and valence are extended to the technical configurations with which the group worked. The theory of technology introduced

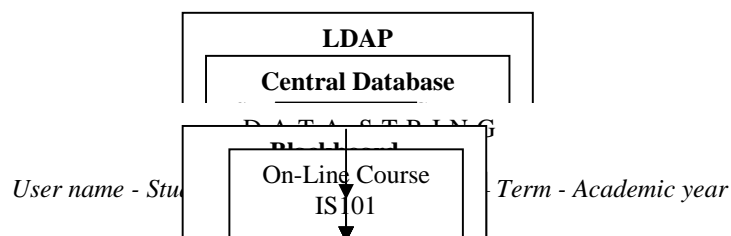
in chapter two is used to inform discussion of the varying character of the technology involved. These variations go beyond distinctions between ‘hard’ and ‘soft’ technologies and apply to technologies that link systems together to form part of an infrastructure, as well as individual systems themselves.

6.2.2 The texture of technology

In this section, the variable texture of technology and technical relations are drawn to the foreground of analysis. The concept of ways of reckoning serves to elicit this variation by describing technical artefacts and relations in terms of the logics they demonstrate ‘in practice’. This analysis goes beyond other practice-based analyses of technology, such as Orlikowski (2000), which account for technology solely in terms of how its design is appropriated by users. It also contrasts with theories of technology which, either directly or by omission, infer that technology and technical logic are homogenous or universal in character. The position taken is consistent with ANT and with authors such as Kallinikos who emphasise “the amazing diversity in the forms of human involvement” that technologies admit (2002:287). The aim of this part of the analysis is to answer calls to qualify what Bowker & Star refer to as the “texture” of technology and technological networks (2000:192), and move beyond simple distinctions between software-based artefacts and hard wired machines (cf. Orlikowski, 2000: 409).

In the case study, details of individual technologies that were significant during integration work at UofB were provided. The diagram below serves as a reminder of those technologies and the relationships that were secured between them. Key systems are depicted in bold lettering and the data entities provided by those systems are in italics. The data entities identified are those that were relevant to the first data string that members of the MLE Working Group began working on.

Fig. 6.1 Diagram showing the passage of data entities through key systems



This diagram represents a *post hoc* analysis of activities described in the case study. It shows the various relations and data entities which were drawn ‘thread-like’ through existing work practices and priorities. After months of preparation and discussion, they were finally woven together to form a stabilised routine which ‘fed’ data between systems. The notion of a ‘feed’ is important, in the sense that this diagram only makes sense when it is ‘set in motion’. A static depiction of data relations fails to account for the significance of the ‘flow’ of data and information circulating around the university. In response to the suggestion that separate lists of data entities could be created in isolation a member of the MLE Working Group insisted,

“Association is key. It’s the association that relays the dynamic aspects, the time contingent aspects of university processing.” (MLE Working Group Meeting, 09.11.04)

The momentum behind this flow is drawn from the processes, feeds and practices through which data was renewed (see section 5.2.1). For example, the learning technology relied heavily on the course (or module) registration record. This record was associated with a number of significant academic and administrative practices. When an academic administrator changed this record, it was as a situated response to these processes. In this way, an individual student's circumstances were caught up within the flow of data.

To introduce a new technology into these flows, the MLE Working Group had first to understand the practices through which key data was renewed (MLE Meeting Notes, 09.11.01). They then had to understand how key data entities *achieved passage* between diverse systems and work practices. In this respect, the mechanisms that *joined* systems to one another became as significant to the group's understanding as individual key systems. It was these joins that allowed systems, which were structured in radically different ways, to nonetheless pass data between one another. The conditions and historical circumstances that lay behind the construction of these joins meant that frequently, they enacted unique 'logics of their own'. Unpicking these logics in order to understand how data relationships could be formed with the new learning technology took up a significant amount of the MLE working group's time. In this example, valence and ways of reckoning are used to draw attention to differences that exist in both the premise and rationale underlying technical arrangements. Acknowledging these differences and working with them is an important part of infrastructural integration work and constituted a significant portion of discussions within the MLE Working group. The relationships between systems and the systems themselves enacted multiple ways of reckoning which in order to understand, the group had to trace back to various historical contingencies that had found their way into technical relationships. Bowker and Star describe this aspect of integration work as follows:

The arguments, decisions, uncertainties and processual nature of decision making are hidden away inside a piece of technology or in a complex representation. Thus, values, opinions, and rhetoric are frozen into codes, electronic thresholds and computer applications" (Bowker & Star, 2000:135)

Valence and ways of reckoning provide critical insight into the texture of technology by drawing analytical attention to the multiple rationales that are enacted by technical arrangements. They conflate ideas of universal technical rationalism, while assisting in the separation of requirements that arise as part of complex integration work.

In order to exemplify this further, attention is drawn to the two linking mechanisms that were put in place by the MLE Working Group in order to channel key data from core systems into the learning technology. The first of these was the standard letter template. The template extracted data which the learning technology needed from the central database. In so doing, the template acted as a translator, matching together data entities which each database referred to using completely different terminology (see Appendix 5). For example, the terminology used in the Blackboard database originates from the North American education system. Hence, whereas in the UK, 'Faculty' refers to an academic department, in the United States it refers to an academic member of staff. The standard letter template mapped data entities to each other, in such a way that these differences were overcome. The original interpretation and association of data entities was conducted by members of the MLE Working Group. However, once made, the standard letter template held this translation in place, allowing the two databases to interact meaningfully.

Another example of a joining arrangement was the data string. A defining characteristic of the data string was its rigidity. Unlike the standard letter template, the data string would only pass data between the Blackboard database and the Blackboard application server if every data entity it requested was present. Below is an excerpt from an e-mail exchange in which the implications of this rigidity are encountered for the first time.

-----Original Message-----
From: Central Database Representative
Sent: 18 September 2002 14:26
To: Systems Analyst
Subject: RE: SMO

Hi

Would the absence of a username on STU account for SMO records not coming through? Apart from odd glitches, that's the only common element I can see for students not appearing.

Central Database Representative

-----Original Message-----
From: Systems Analyst
Sent: 19 September 2002 08:51
To: Central Database Representative
Cc: Learning Technology Co-ordinator
Subject: RE: SMO

Hi

Yes, it certainly would. The username ("External Ref" on STU) is the student's login for StudentCentral [...]
Usernames get filled in by an overnight import from Resource, once students have self-registered for computer access. Anyone who does not self-register will not appear in our import and thus not get exported to StudentCentral. If you want me to check a few against Resource, I'm happy to do so.

This represented more than 'just' a technical, 'back office' concern. The absence of a single data entity in the data string meant that a student would not be able to access one or more of their on-line courses. The precise conditions set by the data string created a gravitational pull around which MLE Working Group members had to organise and reconfigure other processes and work practices. For example, the data routine between the LDAP system and the central database had to be altered in order that the student username be inserted into the central database. This drew the learning technology into a further set of processes, since usernames were only generated when, and if, a student logged onto a campus computer. This is then translated into a contingency that students have to take into account whereby, if a student wants to access their on-line courses, they have to log onto a campus computer at least once (even if, for main part they work at home or from a laptop).

The data string had a way of reckoning that placed great emphasis on the fulfilment of very specific requirements. The toll that these precise requirements exacted was carried by other systems, relationships, people and processes. The burden of precision and conditionality was passed on because the data string itself was not open to reconfiguration. In this example, the concept of ways of reckoning helps to elicit the varying conditions and priorities that are set by technologies. While some technical forms can support substantive diversity, others demand a measure of alignment. In the example of the data string, the concept of valence draws attention to the self-referential character of the data string, whereby, in asking the question: 'why have relationships been configured in this way?', the answer becomes, 'because the data string requires it'. No design intention or philosophy is available to broaden the basis of this answer. In this example, valence points to 'the reason why' that emerges when technical arrangements are questioned. In this case, it underlines the character of an arrangement which does not generate or appeal to any wider concerns than those that it generates itself. This state

of affairs is not given an automatically negative connotation. It is simply pointed out as one of the many textured forms that technology can take. In the next section, the concepts of valence and ways of reckoning are extended to an analysis of the ‘moment of integration’.

6.2.3 Artful integration

The MLE Working Group developed a collective process from which a general understanding of how the learning technology should be integrated into the university’s existing infrastructure emerged. The group had developed a familiarity with what could and could not be reconfigured. They had grown to recognise data structures that formed part of course design or academic practice and they had become familiar with which technologies offered some ‘room for manoeuvre’ and which did not (see section 5.1.3). Even so, the group had to take account of numerous contingencies. The consequences of interrupting data flows and disturbing joining arrangements had to be carefully thought through. In unpicking the threads by which systems had been knitted together, historical reasons for why and how an association had been achieved would begin to unfurl. Picking through the sedimented layers of prior circumstance, compromise and reconciliation, and tracing through the consequences of new compromises and reconfigurations, required the combined effort of a diverse range of people (MLE Meeting Notes, 09.11.01 and 18.02.02). It often took the collective memories of a number of people to piece together the historical situations that had led to a particular set of arrangements. Sometimes the reasons would emerge as fundamental, sometimes they were the result of a temporary “fudge” (MLE Meeting Notes, 09.11.01) that was no longer of any consequence, and sometimes it was impossible to either recall or identify the reasoning behind a particular configuration.

Two significant points emerge from this aspect of the group’s interactions. The first is that ‘technical logic’ alone was insufficient to explain why and how a particular arrangement existed. The second is that, whilst system spokespeople could make sense of the logics presented by central systems, the situated reasoning implicit in the joins *between* systems were ‘off the map’. Examining these joins in order to understand how the learning technology could be inserted into existing system arrangements required an awareness of both historical

origins and contemporary circumstance. It was the predominance of these kinds of discussions and explanations in the MLE Working Group that first suggested the relevance of valence and ways of reckoning. The group spent a significant amount of time asking ‘how’ a particular configuration worked and ‘why’ it had been designed that way. The logic they used to describe ‘how’ an arrangement worked became conceptually labelled as a way of reckoning and the ‘reason why’ that underpinned the orientation of their logic was described as valence. In this way, the concept captured the multiple ways that a rationale could be expressed and the fact that notions of universal technical logic or straightforward common sense could not necessarily help explain the detail of discussions. The second spoke to the spectrum of concern - from complete absence to fundamental - that underpinned their reasoning.

The manner in which the first elements of integration were achieved was a reflection of the interactive ‘pooling’ of knowledge and experience that typified discussions within the MLE Working Group. At the moment of integration, the various threads of understanding that had been gathered by the group were finally held in one place, albeit by three separate people (see section 5.1.3). A decisive overview of events was practically impossible at this point due to the intricacies involved. In this moment, an association between separate systems and system joins was achieved for the first time. It is literal, as opposed to figurative, to say that in order to formulate the passage of data, the path of associations that the data would make was physically enacted by the three participants (Field work diary entry, 08.07.02). The order in which each aspect of the process would take place was denoted by who was seated at the computer. When that person’s work was done, the next system representative ‘took the chair’. When the data was sent to the test server, the three literally travelled with it, wheeling their chairs across the room to begin testing out command lines on the server. Later this process would be completely automated, taking place in a matter of seconds as part of a daily, overnight data feed that would renew data held in the learning technology database.

Through intuitively acting out the extraction and consequent movement of data, lengthy explanations and attempts to achieve an overview of the process were bypassed by wordless, embodied action. Over the months of discussion that had preceded this point, the three MLE group members had absorbed the complexities at hand to the point where they could figure out these relationships by ‘doing’ better than they could explain them in words. Although

much of this happened wordlessly, there was one short, but significant, piece of dialogue. However, the words that were used at this point were notably imprecise and made little actual sense. ‘Thing’ and ‘stuff’ took the place of technical terms and lengthy explanations. Significant menu items, processes and procedures were compacted into these placeholders in order that the three could retain focus on what they were *doing*, rather than what they were *saying*. Of more significance than using precise terms was maintaining the train of thought, the threads of association they were collectively trying to draw together. Indicative of this was the point at which the Systems Analyst and the Central Database Representative briefly talked over the top of the learning technology developer, intent on continuing their conversation at all cost.

This example provides an important insight into the intricacy and innovation that is part of integration work. Firstly, it serves as a reminder that ‘taken for granted’ routines and automated procedures are actually a series of complex associations. Secondly, it shows how, in the first instance, associations between complex elements have to be *created*, and the enormous amount of preparation and work this takes to achieve. However, for the purposes of analysis, the interactions that took place in the ‘moment of integration’ are understood as a way of reckoning. As a process, the way of reckoning enacted by the group was embodied, situated and distributed. These are important references to issues that were raised in chapter two regarding theoretical parameters and social domains. The three MLE group members physically enacted the associations that needed to be formed. Deciding who would sit down first, who would ‘take the chair’ next, and physically moving across to the server took the place of complex discussion (Field work diary entry, 08.07.02). The rationale underpinning data relations was embodied, a fact that the scant use of language served to emphasise. In this case, actions really did speak louder than words. The line of reasoning that the three were trying to develop was also situated, in both time and space. The ‘moment’ came after months of discussion among MLE working group members. Although unplanned, the moment was firmly situated within this on-going process. It was also situated in a spatial sense, in the way that the three relevant group members ‘found themselves’ together, with physical access to the right systems, servers and applications. This physical co-presence was vital to the innovation they would achieve and draws out the significance of this process as a distributed one. The way of reckoning enacted was collective, involving technologies, humans and wheelie chairs. It

bore the hallmarks of what Hutchins describes as ‘distributed cognition’, a concept which he draws from an account of navigation.

...the communicative acts of the members of the navigation team are not just about the computation; they *are* the computation. When this is the case, the playing out of computational processes and the playing out of social processes are inextricably intertwined. Social moves have computational as well as social consequences. Computational moves have social as well as computational consequences. (1995:283)

According to this basis for understanding cognition, there is no *a priori* distinction between the social and the computational. Latour illuminates this point still further when he says,

Society and technology are not two ontologically distinct entities, but more like phases of the same essential action. (1999:129)

The concept of ways of reckoning is designed to assist in the description of agencies relating to ordering, grouping and sequencing that are not simply thought or language based. It aims to include the embodied, the material, the symbolic and the technical, or any other social form that shows itself to be empirically relevant in these processes. In so doing, the concept is a rejection of totalising or dichotomous theories of knowledge, cognition or learning.

The relevance of these ideas is extended to the next section of the analysis, in which the significance of design in on-line course development is discussed. It is argued that the significance and intricacy of pedagogic design is often overlooked because of the manner in which it achieves substance through structural, material or organisational arrangements. These issues are addressed in the following section.

6.3 Analysis of pedagogical integration at LSE

This part of the analysis focuses on the pedagogic integration of on-line learning technologies. Due to the timing of research, data relating to pedagogic integration was mostly concerned with events at LSE. A concept that featured prominently during analysis of LSE’s integration work was the significance of the reading list as a ‘pedagogic tool’. The underlying reasons for

this significance were both curricula and institutional. As a social science institution, unique demands are placed on library provision at LSE. Seeking ways to address these demands had been a preoccupation of academic and library staff at the school for some time. Paper-based packs of core readings were instituted as an innovative way of addressing these concerns. The introduction of on-line reading lists built upon this existing innovation and provided the institution with further means by which to address concerns over library provision. However, of more significance was the pedagogic process of translating paper based reading lists into on-line form. Emerging from an analysis of this process is the previously unexplored area of 'reading list methodology'. This term is designed to encapsulate the interesting and varied techniques that teachers used for communicating priorities to students via the reading list. In some instances, committing reading lists to the on-line environment afforded opportunities to extend aspects of pedagogy and course design. With the support of learning technology staff, teachers were able to incorporate dimensions into on-line reading lists that had been less accessible using paper formats and hard copy reading materials. These innovations were usually closely allied to teachers' conception of the course they were teaching and their desire to assist student apprehension of those specific areas of the subject discipline that the course sought to address.

Although UofB does not feature in this part of the analysis, questions concerning the cross-institutional implications of integrating learning technologies are raised by the case study. In particular, the significance of curriculum is drawn to the fore. LSE offers a curriculum focused upon the social sciences. In the case study, this was shown to hold implications for library provision, pedagogy and the physical environment of the university. The prominence of on-line reading lists within LSE's integration of learning technologies can, in some ways, be attributed to these constitutional aspects of the institution. Early pedagogic integration at UofB suggested that the significance of on-line reading lists would vary according to subject discipline, level of study and other course specific requirements (Meeting notes, 06.09.02). There are a number of important implications to be explored here. Firstly, there is the question of the synthesis between curriculum, course design and organisational requirements that exists. Secondly, there is the issue of how this synthesis is reflected in innovations arising from the pedagogical integration of learning technologies. In order to explore these issues further, the concept of epistemic cultures is reintroduced in this section of the analysis (Knorr

Cetina 1999; Becher & Trowler 2001). This concept assists in focusing attention on the significance of institutional and epistemic concerns in on-line learning technology integration. The relevance of subject discipline and course design to on-line learning innovation is overlooked by the on-line learning literature. This section of the analysis therefore constitutes a new area of on-line learning technology research and evaluation.

6.3.1 Reading lists as boundary objects

One of the benefits of using ANT is that actors which might otherwise be overlooked as mundane, bureaucratic or insignificant have the opportunity to appear in the foreground of analysis, should they emerge as empirically relevant. 'Lists' are a significant example of this form of actor. In an attempt to overcome the association of lists with mundanity, Bowker and Star cite a number of authors whose research has underlined the foundational importance of list making activity (2000:137). Such significance cannot be conferred on all lists, but in the context of this case study, it is fair to say that reading lists played an important role in LSE's integration of on-line learning technologies. Reading lists sit at the interstice of library, pedagogic and departmental concerns. In this respect, they stand as significant 'boundary objects' (Star 1989b) whose multiple membership to different work groups allows them to accommodate diverse requirements. Library staff, teachers and students each enact different priorities and apply different rationales to reading lists. A key concern of library staff in the case study was with receiving reading lists from academics in time to organise library resources (Library Staff Focus Group, 27.11.02). In this regard, the library was at the mercy of academics. If a new course was written, or alterations were made to an existing reading list, library staff needed to be informed. If the library did not receive a copy of the new list in time, they could not order new books nor organise the loan collection to meet student needs (Library Staff Focus Group, 27.11.02). From an academic standpoint, passing reading lists to the library was simply a final, bureaucratic act that came at the end of a potentially long and involved process of course design or re-design (Interview with Senior Academic in Development, 26.11.02).

Clearly, for students the reading list occupied a different role again.

If a reading is on a reading list you feel you need to get hold of it because the lecturer has picked it out. The fact that they have picked out means its important, it's significant to your understanding of the course. (Student focus group, 26.11.02)

As a communication between teacher and student, the reading list acts as a pedagogic tool that helps students to orientate themselves within a given literature. The list offers students a demonstration of how to rationalise library resources according to the epistemic priorities of a particular course or discipline. In this case it also served to sensitise students to priorities indicated by their teacher. In order to benefit from this, however, students needed to be able to enact physically the information finding process mapped out by the reading lists. Being unable to *find* reading materials indicated by their teachers was clearly a source of tremendous anxiety, which had led to students adopting extreme tactics for ensuring they could access the books and articles they needed (Student focus group, 26.11.02).

In this example, the concepts of valence and ways of reckoning allow the multiple rationales and values associated with boundary objects to come to the fore. The way in which each actor reckons the value of a particular object is left intact so that the relationship between rationale and priority remains attributable. In this way, what counts as significant to one community of practice is held within the same analytical frame as what counts to another, even if that significance goes unrecognised between the two. The situated reasoning employed to construct significance is also kept intact. In this way, no one *form* of reasoning is necessarily privileged over another. This allows the conflicts and inter-relationships between differing priorities to remain open to exploration. Library staff, teaching staff and students all bring their own distinctive agendas to bear on reading lists. From the perspective of integration, the concepts of valence and ways of reckoning afford the capacity to clearly identify the diverse concerns of relevant stakeholders. In this way, the consequences of organisation and re-organisation can be represented and understood from a variety of different standpoints. This is not only relevant to enhancing communication, it is also important in trying to evaluate whether or not new configurations of work processes are appropriate.

Translating reading lists into on-line formats did nothing to lessen their status as significant boundary objects. However, the introduction of technical and digital agendas did bring other

forces to bear on reading lists which had not previously been a concern (see section 5.2.1). The digitisation of reading lists introduced the possibility of creating a standard template that could be held centrally and updated by both library and academic staff simultaneously. One JISC funded project looked into the possibility of standardising on-line reading lists to this end. On consultation with academics, however, the generic classification of readings that were proposed proved unpopular. Denoting readings as core or secondary, or arranging them according to formats such as journal articles, books or web resources was generally considered unsatisfactory (see for example Interview with Professor in History, 19.11.01, cited in section 5.2.2). Teachers had quickly adapted to the new freedoms that the on-line environment afforded for developing course specific arrangements and classifications of readings. The possibility of creating a structure in which individual items could be grouped and positioned according to a teachers' sense of pedagogic design, added depth to the ways in which teachers were able to communicate priorities to students. The placement of one course resource next to another, or the graphic arrangement of course materials into subtle navigation systems, were all ways teachers had used to infer associations and sets of relationships within the on-line environment. Over the period of the course, it would then be up to students to intuit what kind of relationship was being implied and how exactly it was constituted.

Another agenda that was introduced with digitisation was the issue of electronic copyrights. The stipulations of electronic copyrights created problems for both library staff and academics. Chasing individual copyrights and logging copyright permissions created an added workload for librarians. For academics there was clear concern at how choice of reading materials was being influenced to some extent by the prices publishers placed on individual e-copyright permissions. There was also the issue of being unable to include images contained within texts due to the problem of locating individual copyright permissions for each image (Interview with Learning Technology Librarian, 24.04.02). These problems impinged on pedagogic design rationale and the practice of teaching. Whilst in copyright terms the images contained in texts were considered completely separate, this separation made no sense from a pedagogic point of view. In a course such as Urbanism, moving between photos of cities and buildings, and the text in which they are discussed was described as being absolutely key to student comprehension (Interview with Course Designer in Geography, 20.11.02). Image and text made no sense without one another. The Course Designer described his experience of trying

to discuss concepts and ideas with students without associated images as “breaking the seam” of student understanding (Interview with Course Designer in Geography, 20.11.02). When the image was absent, emphasis was drawn away from the rationale implicit in the association of text and image, toward the comparatively meaningless rationale pertaining to why such a key part of a text should be absent. In this way, students also became aware of copyright restrictions and expressed their frustration at the idea that academic judgement was being skewed by issues of costing and legislation (Student Focus Group, 26.11.02).

Two important points arise from this analysis. The first is that the structure of arrangements and associations can embody values and ways of reckoning. Organising and structuring course materials represented a significant pedagogic act in these examples that constituted a way of communicating with students. The grouping, positioning and association of materials were designed to demonstrate significant relationships between epistemic texts and materials. As such the classification and arrangement of reading lists was taken very seriously by academic teachers. Structural or organisational aspects of designing course materials are rarely given significant status as important aspects of pedagogic design. For this reason, it is often these aspects of pedagogy that are frequently considered open to uniform rationalisation or re-arrangement. As in the case of modularity, the structural division of course content is considered by its supporters to be something that can be determined by a centrally conceived philosophy and not as something that is implicitly tied to pedagogy and pedagogic design. The second point is that ways of reckoning from other spheres of interest can manifest themselves in arrangements, asserting priorities that conflict with original design intentions. In trying to maintain an emphasis on pedagogy and student learning, course designers found their intention had to compete with legal rationales pertaining to copyright. The competition between opposing priorities was communicated to students, whose attention was then split between two different ways of reckoning. In a situation where rationales pertaining to student learning *should* prevail, this was a source of frustration to students, teachers and library staff alike.

In the next section, pedagogic integration of on-line learning technologies is discussed in relation to the concept of epistemic culture. Through this concept the previously unexplored area of reading list methodology is investigated.

6.3.2 Reading list methodology

Pedagogic integration of on-line learning technologies was still in its infancy at the time field work was conducted at LSE. Nonetheless, some striking examples of learning technology use had already emerged. The significance of on-line reading lists and their importance as boundary objects was discussed in the previous section. However, among the competing ways of reckoning that came to bear on reading lists, it was pedagogic rationale that was encouraged by university policy and supported by learning technology staff (see section 5.2.3). Obviously the teachers involved in these early innovations were those that had an interest in seeing how learning technologies could extend teaching practice. Therefore, the examples provided in the case study are not representative of a general level of innovation achievable through on-line learning technology use. They are the outcome of a considerable amount of time, effort and imagination on the part of teachers and learning technology staff. It is worth recalling that the pedagogic tools offered by Blackboard and WebCT were somewhat limited at this time. If strict divides between the educational and the organisational were to be observed, the only specifically pedagogic tools offered were the facility to conduct short answer quizzes and the provision of on-line discussion areas. In themselves, neither of these tools suggests radical opportunities for the transformation of campus based university teaching. Providing a clear on-line identity for a course and reinforcing important associations such as those set out in the reading lists, would not commonly be recognised as significant contributions to pedagogy. However, teachers at LSE immediately saw the facility of being able to arrange, classify and position course resources within the on-line environment as an opportunity for pedagogic design (see for example Interview with Lecturer in Law, 09.12.02 in section 5.2.2). In order to understand how these came to be such important activities it is first necessary to draw out the significance of epistemic culture to these concerns.

According to the concept of epistemic culture, subject disciplines are seen as assemblies of tools, methods, materials, machineries, environments and practices. In this way, knowledge and epistemology are grounded in materiality and practice rather than in abstract, theoretical domains. In the case of social science disciplines, it is tempting to overlook the practices and raw materials from which their epistemic cultures arise. Other subject disciplines, such as the sciences and visual arts appear much more visibly engaged with materials and physical

environments. The raw materials of social science are primarily represented by field work materials, texts and datasets. According to theoretical reckonings of knowledge which focus on knowing and cognition as exclusively human activities, the significance of material artefacts such as these is left out of the frame. Correspondingly, the detailed and highly nuanced ways in which academic teachers interact with these materials is left to one side. Practices associated with the arrangement and classification of texts are generally considered the preserve of librarians. However, an unintentional outcome of translating reading lists into on-line formats was that academic concern over the ways in which associations were drawn between different course resources were brought to the fore.

The subtle pedagogic practices associated with constructing course resources are given the title of 'reading list methodology' in this analysis. Reading list methodology represents pedagogic practices associated with the translation of epistemic concerns into pedagogic concerns through the design of course content. Some key examples of these practices emerged from the case study. In the undergraduate Law course which was discussed, the reading list was designed to draw the significance of current events into the course design. In so doing, the teacher responsible for the course design wanted to draw students' attention to the ongoing construction of law as a social institution and an epistemic tradition (Interview with Lecturer in Law, 09.12.02). In order to achieve this, the teacher had to reorient the reading list away from books and journal articles toward other genres of resource such as newspaper articles and reports. Part of this reading list methodology therefore involved the constant update of course materials. In this way students were drawn into an iterative awareness of current events significant to legal practice on the one hand, and a sense of the ongoing processes through which law is constituted on the other (Interview with Lecturer in Law, 09.12.02).

In the undergraduate History course discussed in section 5.2.2, current events were not as significant as supporting student apprehension of *other* times, moments and places. Many original historical documents are now available in digital format and a senior academic in the History department had integrated links to these documents into his on-line reading list. However, he described these materials as 'not fitting' with the reading list (Interview with Professor in History, 19.11.02). To this subject discipline, original historical documents are more than just texts that students are recommended to read. The academic emphasised their

relevance in illustrating “key propositions, or moments” to students and helping them to engage with the “raw materials” from which history is derived (Interview with Professor in History, 19.11.02). It is important to note that this explication of History came in response to asking why he had grouped some readings into a separate area within his on-line reading list. Once again, the positioning, arrangement and classification of materials was considered fundamental to the pedagogic design of the course. However, there was another significant aspect of the reading list methodology employed in this example. The academic dedicated part of both paper based and on-line versions of the reading list to emphasising the need for students to develop their skills in using the physical library. Learning to seek out and hunt through historical documents and accounts represented a significant epistemic practice. In this way, the reading list imparted advice to students on *how to look* as well as a rationale for what to look for that reflected core epistemic values central to the study of History.

By way of contrast, the first year undergraduate course in Anthropology discussed, in section 5.2.3, created a different emphasis. In this example, a central focus was created on three ethnographies. Arranged into three separate cycles, multimedia resources were placed alongside the title of each core text. Rather than suggesting that students seek out new materials and explore other resources, this course encouraged students to focus on the three core texts and the multi-media resources that accompanied them. In this sense, the multi-media resources represented the raw materials of the anthropologist. Physically juxtaposing these materials with the ethnographic account relating to them was designed to encourage students to engage with issues surrounding methodology; an epistemic concern which lies at the core of Anthropology. The on-line environment facilitated this reading list methodology by allowing links to multi-media resources and readings to be integrated with one another and arranged in such a way as to suggest the epistemic and pedagogic intentions of the teacher.

From this analysis of reading list methodology emerges a sense of the diverse priorities, materials and rationales of which epistemic cultures are comprised. Here, the concepts of valence and ways of reckoning are used to draw focus to the close relationship between academic pedagogy and epistemic culture. Each epistemic culture valorises different artefacts, materials and methods. A manifestation of these values is the intimacy different subject disciplines achieve in their work with focal actors. The ways of reckoning that emerge from

this intimacy are distributed; they are innately bound to the people, concepts, raw materials and artefacts of which the subject discipline is comprised. In contrast to much of the learning technology and education literature, it is argued that these values and ways of reckoning form an important aspect of the ways in which different teachers respond to on-line learning technologies.

This is not to infer that a general taxonomy of values and ways of reckoning pertaining to each subject discipline could be arrived at and a corresponding relationship drawn to learning technology use. On the contrary, the relevance of this analytical finding is focused on the significance of course specific values as enacted through individual pedagogic design. These values are understood to be situated both *institutionally* and *epistemically*. For example, the Microeconomics course discussed in section 5.2.3 did not use an on-line reading list, but made innovative use of the on-line quiz function, allowing students to practice the use of mathematic principles relevant to the course. Within the study of Microeconomics, these principles and equations represented a core piece of epistemic machinery. However, creating the facility for students to practice mathematical exercises was not cited as the motivation for using this function. It was the capacity that weekly on-line tests (in combination with an analysis tool developed by one of the schools learning technologists) provided for establishing feedback loops between students and the teaching team. In this sense, this pedagogic innovation was inspired by both institutional concerns over increased student numbers and epistemic concern that students should develop their understanding of this key economic tool.

In the next section, the significance of authorship in course design and the importance of individual pedagogy to on-line course development are discussed. The concept of epistemic culture is expanded further to include the concept of feedback loops. It is argued that, in some cases, on-line learning technology innovations have materialised these significant relationships allowing them to be drawn to the foreground of analysis.

6.3.3 Valued relations

The concept of epistemic culture depicts a model of subject disciplines and academic knowledge that differs from models based on 'abstract' views of academic knowledge. Laurillard's conversational framework, for example, draws on a view of academic knowledge as one step removed from reality, "our experience of our experience of the world" (2002:21). In contrast to this model, Knorr Cetina materialises epistemology, drawing it out of the abstract into the social, depicting it not as abstract, but as a dense region of the social world "deeply and intricately constructed involving multiple instrumental, linguistic, theoretical, and many other frameworks" (1999:10). Abstract conceptions of knowledge often create an implicit hierarchy which, in education research, places issues pertaining to pedagogy, course design and subject discipline beyond the analytical frame. By contrast, this analysis draws upon the sociology of association and Knorr Cetina's work to reveal a view of pedagogical learning technology work that includes these material concerns and addresses them as 'knowing-in-practice'. This version of academic knowledge sees epistemic concerns as situated, embedded within the culture and practices of a particular department or institution. In this way, course design is understood as a significant epistemic practice that stands at the interstice of numerous highly significant relationships. During the creation of on-line courses, these associations were drawn to the foreground. They are explored in this section, not only as links which showed the inner workings of epistemology and pedagogic innovation, but as the means by which higher education enacts its ties to social institutions.

The most significant association that any of the design activities detailed in the case study sought to extend was the relationship between course and students. The introduction of WebCT was interpreted by many early innovators at LSE as an opportunity to add complementary dimensions to this relationship. This was the thrust behind the development of on-line feedback mechanisms for weekly on-line tests in Microeconomics (Interview with Learning Technology Specialist, 30.04.02). It was also the motivation behind the various uses that were made of the WebCT's on-line discussion forum. The key words associated with these developments were "rhythm", "momentum" "engagement" (see for example section 5.2.3 Interview with Course Designer in Urban Geography, 25.11.02). In order to be successful as ways of maintaining student engagement, these innovations required consistent involvement from the teacher. They also required structural integration with the course design. Weekly additions to the course such as questions relating to class readings, new reading materials, new

on-line tests or answers to 'frequently asked questions' had to be drawn into class teaching to create a flow of interest between both on-line and face-to-face interactions. When this momentum faltered, teachers commented that it was very difficult to re-establish. The introduction of WebCT materialised this critical area of pedagogy and student learning. Issues relating to the significance of rhythm and momentum within a prolonged course of study, are not necessarily captured through learning research focused on short, self-contained studies.

The ongoing relationship of the student to the course is complex and remaining 'in touch' with cohorts of students and their experience of the course is a vital yet challenging task, especially given increases in student numbers. The additional effort required to construct and maintain on-line feedback loops was not always justifiable. Interestingly, there were cases at UofB where on-line interaction required no pedagogical encouragement and students themselves initiated and established on-line discussion groups. This was particularly the case where an element of the course required students to work at a distance from one another. For example, as part of a degree in European nursing, students spent a year working in a hospital in another country. In this case, the on-line course acted as a tie to their home institution and provided a forum in which, students who no longer had any weekly contact with each other or their teachers, could share their experiences with one another (Meeting notes, 13.06.02).

Another example from UofB was the use of the 'student chat' facility in Blackboard. This is effectively a university-wide discussion forum, a link to which appears on students' home page. Learning Technology staff were aware of the facility, but encouraging student use of it was not something that was high on their list of priorities in the pilot stages of integration. However, within hours of Blackboard being available to students, discussion threads had been started and a high level of use was soon established. The facility allowed students studying at different sites within the university to share their views. They discussed different experiences of the institution, their teachers and the different ways in which student facilities were organised at each site such as car parking and library opening hours (Field work diary entry, 30.09.02). In examples from both field sites, on-line learning environments materialised a sense of students' ongoing engagement with their course, their institution, and with current events both local and global. In this way the learning environments added visibility to the scope of student concerns

and materialised an aspect of higher education discourse which would previously only have been known to teachers and their students.

Other significant relationships that were rendered visible through on-line learning technology innovation also made use of the ability to capture an ongoing sense of events. Rather than the inner workings of the university, these associations were concerned with external institutions and professional bodies. The epistemic culture of some subject disciplines draws them into a deep and historical relationship with particular professional bodies and social institutions. Different courses within a curriculum or programme assist students in coming to terms with different facets of these relationships. In the example taken from undergraduate Law at LSE, the course had been innovatively designed to draw students' attention to the ongoing constitution of legal rights. The reading list drew on newspaper accounts of significant trials, related reports from the Lord Chamberlain's office and documents outlining associated policy debate. In so doing, the interactions of three major social institutions were materialised and laid open to debate and scrutiny within lectures and class discussions. However, timing remained a central component;

Obviously we need resources as we're teaching – they're no good afterwards. We don't just do the reading list at the beginning of the year and that's everything covered. It needs to be looked at each term. I'll check journal articles which have been published in the interim and discuss them with [course designer]. If we can't get them into the course in time then, as a very last resort I would at least want them to go in for revision. (Interview with Lecturer in Law, 09.12.02)

When questioned about the amount effort the course took to maintain, the two staff responsible replied that the links to current events they added were ones that, as researchers, they would use themselves. In this way, another significant feedback loop is made visible; between academic teachers, the course and current research concerns. Often the reading list played a key role in the iteration of this relationship. New concepts or findings would be drawn into the course via the books, articles and web resources that were added to reading lists each year.

Those social science disciplines for whom physical co-presence with key artefacts, situations and / or people is a central concern, also found ways to develop these relationships through the on-line learning environment. Examples taken from Anthropology and Urbanism that were discussed in the case are particularly relevant in this regard. In these subject areas, it is difficult to bring students into direct contact with the buildings, communities and cultures which form the basis of epistemic concern. While there is no substitute for first-hand experience, these subject disciplines have incorporated photos, maps, video and audio resources into their epistemic culture as 'stand-ins' for direct experience. How this substitution should be addressed methodologically then becomes a key area of the subject discipline that students are encouraged to explore. The significance of these epistemic tools was underlined in the example from Urbanism where, due to electronic copyright issues, images and photos could not be included within certain texts. In these two examples, the issue of co-presence is addressed in much more depth than it is in much of the early on-line learning literature. Firstly, it is extended to include environments, artefacts and materials as well as people. Secondly, distance and co-presence are not addressed as either / or propositions. Whilst co-presence affords an undeniable spectrum of opportunities for exploring the richness and subtlety of situations, there is also a richness and subtlety to the methods used to support exploration at distance. Some pedagogies and subject areas have had reason to develop these methods more thoroughly than others. It is argued that developments in on-line learning, particularly blended on-line learning, draw these textured meanings and implications of co-presence to the fore.

In this part of the analysis, ways of reckoning and valence serve to show the diversity that exists within the knowledge and teaching practices of higher education. The texture of these practices is easier to illustrate than it is to summarise. Suffice to say that totalising or dichotomous views of knowledge or learning do not lend themselves to this kind of analysis. Valence and ways of reckoning emphasise the enactment of priorities and rationales according to different epistemic cultures. Within this enactment, course design emerges as a fundamentally important activity. The significance of course design in linking together significant social, epistemic and institutional concerns is an aspect of higher education practice that is revealed through the introduction of on-line learning technologies. The translation of these concerns into pedagogic design was undertaken by the individual teachers. The case

study evidence showed repeatedly how it was the insight, ingenuity and inspiration of individual teachers that brought about innovation. Authored course design is a very significant aspect of higher education pedagogy. It is traditional for an academic to make their mark upon a course, to develop their own material and approach to pedagogy. In this way, new concepts and associations are drawn into the curriculum and the boundaries of epistemic culture shift. Understanding developments in higher education pedagogy and curriculum in this way creates a clear sense of the historically situated character of epistemic concerns and of the significant relationship between curriculum and authored course design.

6.4 Conclusion

The three areas of activity described in this analysis are very different. The details of technology purchase and interactions with vendors, technical integration, and the pedagogic design of on-line resources would not normally be included within the same analytical frame. However, from an empirically grounded perspective, these areas of integration work are deeply inter-related. In this sense, this analysis has attempted to treat the integration of on-line learning technologies as it appeared in practice; as a socially situated, collective endeavour. A significant amount of careful theoretical work was required to enable these apparently disparate areas of integration work to appear together in the same analytical frame. Theoretical and disciplinary distinctions that create *a priori* divisions between educational, organisational and technical domains, upon which most on-line research is founded, had to be placed to one side. Distinctions between forms of knowledge and learning that create implicit hierarchies, placing creation and innovation on one side and repetition and mundanity on the other, also had to be disposed of. Through the theoretical foundation provided by the sociology of association, the focus could remain on the variety of concerns and associations expressed by actors, instead of on grouping types of knowledge together and allying them to particular social domains. Emerging from this foundation, the critical concepts of valence and ways of reckoning held this theoretical position intact during the analysis process. They afforded a constant engagement with the intricacies of knowledge as social practice, without recourse to divisive theoretical frames. This critical premise also allowed the rejection of normative or totalising frameworks for understanding either values or the rationales that underlie priority setting.

In narrative terms, the thread which ties the three parts of this chapter together is integration. It is argued that integration concerns begin as organisations look out into the technology markets and prepare themselves for new technology purchase. For the case study institutions, decisions made with respect to product selection and purchase were not straightforward and involved contending with cross-sector negotiations and a potent decision making climate. At the point at which on-line learning technologies were brought over the institutional boundary, academic teachers could begin to engage with the implications these technologies held for student learning. The non-managerialist nature of integration at both case study universities was fundamental to the types of issues and concerns that were raised. It allowed those academics who could see a potential role for on-line learning in their courses to find out more. Ultimately it would be a combination of their inspiration and innovation, and the support of learning technology staff that would give meaning to the relatively limited pedagogic tools the on-line learning technologies provided. Data integration shaped the kind of choices that academics were presented with and formed an intrinsic part of the way course design and integration took place. In this sense, the on-line course as seen by students and academic teachers acted as a veil between the outer and inner workings of course provision. Pedagogic and data integration were effectively ‘two sides of the same coin’. Both sets of concerns met at the point of what appeared on the screen and both assessed the implications of what appeared in terms of ensuring a coherent student experience. While academic teachers were able to act on epistemic, curricula and pedagogic priorities, data integration workers were able to take an institutional view, encompassing the work of administrators, librarians and technical systems.

The whole narrative of the case study and analysis has been organised around providing an answer to the core research question: ‘in the case of two contrasting UK institutions, how is the integration of on-line technologies taking place?’ The partnerships, technical integration and pedagogic design activities described will both inform future research and stand as a historical account. A more complex, theoretical response was required to the research question which asked about educational values. The entire thrust of this analysis has been to say that values are enacted. Hence, it would be counter-intuitive to provide a list of educational values that emerged over the course of field work. The case study has shown how the enactment of values occurs at every level of the university; from its constitution and

organisational orientation, to the daily constitution of priorities, spanning from students and teachers, to library services, administration and technology work. The on-line courses described within the case had technical and organisational roots that were sunk deeply into the institutional practices of each institution. Through pedagogical design, they were also shown to form deep associations with professional bodies and social institutions. This depiction stands in sharp contrast to the models of disaggregated course provision that became commonplace in early on-line learning developments. In fact, on the evidence of this research, it is difficult to see how the separations implied by these arrangements could be realistically achieved.

Chapter 7 Conclusions

7. Introduction

This concluding chapter presents an overview of core implications that have been developed in this thesis. It draws together significant aspects of the research design, case study and analysis, providing a synthesis of aims and objectives and how they have been met. The first part of the conclusion is a summary of the key issues that have been discussed. It forms a narrative of the whole thesis, incorporating ideas which have been constructed over the course of the thesis. Following this, a summary of core contributions is provided. These include contributions to theory, literature and methodology. At the end of this section is a discussion of the limitations of the research design and the implications these held for the treatment of the case study and thesis outcomes. In the final part of this chapter some selected areas for future research are examined.

In the first section of this chapter, an overview of research findings and implications is provided. The advantage of reviewing research findings at this point in the thesis is that the theoretical exposition of early chapters can be finally linked through to concerns raised in the analysis. Relating findings back to issues raised in the literature review is particularly important in this respect. The precedents that had been set in on-line learning research dealt with a number of concerns that were distinctly in and of their time. Hence, distance on-line learning featured strongly in early research and a significant amount of effort was spent confronting speculative claims about the future of the university (Passerini & Granger, 2000; Carr-Chellman et al., 2000). Whilst most of the literature chose to address these claims critically, some authors subsumed the climatic zeal into their research and used it to underpin the significance of on-line learning technologies (cf. Hamalainen et al., 1996). Taking account of the distinctive context within which early research was conducted was an important part of the process of understanding why certain issues had achieved such prominence. Authors who set

aside this context to 'focus in' on learning related concerns drew upon a dense and complex body of theoretical work. On-line learning research was drawn into ongoing debates within the educational literature regarding the cognitive, psychological and social nature of learning. Mapping out theoretical distinctions between these areas of research and forging a basis for developing grounds for inter-textual coherence was a difficult but unavoidable task. These issues had to be addressed in order that the empirically grounded findings of this thesis could be situated within the concerns of existing on-line learning studies.

The second part of this chapter moves away from overview and summary to underline the core contributions this research has made. These fall in a number of different areas. Firstly, there is the theoretical contribution of valence and ways of reckoning. Founded on the sociology of association, these concepts contribute to the terms and vocabulary of that theoretical approach. Secondly, several methodological contributions to the study of technology integration are outlined. These are attributable primarily to the theoretical approach adopted, the longitudinal design of field work and the distinctive perspective that was taken on technology integration. Thirdly, the case study itself makes a definitive contribution to the IS and on-line learning literature. In its problematisation of the time period, the details of technical and organisational integration it provides and the intricacies of on-line learning design it draws out, the case study stands as a valuable contribution to research. Finally, there are important implications for learning technology practitioners and the higher education sector to be drawn from the case study and its analysis. These implications are far-reaching and are developed further in the final section of the thesis which describes future research plans.

Numerous areas for future research are suggested by the thesis both within education research and beyond. The significance of valence and ways of reckoning to opening up further dimensions of learning technology research is an area that requires further exploration. The advantage of these theoretical concepts is that they support scrutiny of organisational and technical arrangements surrounding on-line learning developments, whilst also allowing discussion of learning and teaching implications. This is, and will continue to be, a key area of learning technology research. Beyond education research, the core analytical concepts suggest their relevance to the study of further examples of cross-sector research and also to research

into businesses oriented toward ethical or 'not-for-profit' ends. Bringing to light alternative sets of values around which organisations can be constructed is an important area of future research. In order to reinforce the link between organisational concerns and educational values, the concept of 'education infrastructure' is introduced in this section. This concept draws together curricula, organisational and technical issues whilst emphasising the material nature of education systems. Education infrastructure also lends itself to discussions surrounding on-line learning and development. The concept of 'global education' appeared to come and go with variations in the on-line learning technology market. The issues raised at that time concerning the potential of on-line learning to address international development needs deserve proper treatment. Engaging with these issues and examining the links to social institutions that are capable of being attained through situated curricula and technological developments suggest themselves as key areas for further exploration.

7.1 Overview of thesis

One of the primary aims of this thesis was to capture the distinctive conditions that surrounded the time period in question. The purpose of this was to draw out a sense of the multiple interests that came to bear on universities during this time. There were both familiar and unfamiliar aspects to the attention that universities received. Technology and learning were both topics that had achieved significant coverage in government policy documents and speeches. A generalised 'learning discourse' was identified by Contu et al. (2003), and preoccupation with knowledge, information and learning was described as bordering on ideology by Garnham (2001:458). Less familiar than policy intervention, was the attention the sector received from those concerned with the technology markets. Learning technologies became involved in what has been called a 'hype cycle' (Clegg et al., 2003), where hyperbole and rhetoric surrounding developments in Internet technologies were subsumed into debates about the transformations in education that on-line learning would bring about.

The sociology of association formed a particularly useful basis from which to view these conditions. The notion of authored agency allowed the divergent interests and priorities of those involved in creating this distinctive climate to come to the fore (Callon, 1991; 1998). It

also acted as a basis upon which to ground analytical enquiry in the empirical detail of university responses. The first observation to emerge from this was the disparity that existed between the claims to transformation being made and actual levels of involvement in university teaching that on-learning had attained. Tracking down learning technology developments that appeared capable of paralleling the levels of transformation being proposed became a task in itself. Among the boldest claims made regarding the significance of on-line learning to 'global education' were those made by Andrew Rosenfield, CEO of UNext. The relationship between LSE and UNext was cited in the press as being a paradigm example of how higher education was going to be revolutionised by on-line learning (THES, 1999) and therefore provided an interesting place for field work to begin in July 2001.

In terms of research design, the purpose of underlining these events was to emphasise the distinctive conditions that confronted the two case study institutions. UofB and LSE were selected on account of the contrasts they stood to offer with respect to the overall experience of institutions in the UK higher education sector. The eagerness of potential private sector partners to forge relationships with institutions that could offer a 'global brand' was such that LSE's private sector arm appointed a new Director of Projects simply to deal with enquiries. The private sector arm acted as a 'boundary organisation' in this respect, mediating between the diverse interests of the university and potential partners. From the perspective of the learning technology market, institutions that did not have international reputations, such as UofB, were excluded from consideration. The model of on-line course provision proposed by UNext required LSE to provide course content only. In this way the learning technologies that UNext had developed remained outside the boundary of LSE. Therefore, these relationships offered academic teachers no further insight into exactly what facilities on-line learning technologies had to offer and which models of pedagogy they supported. Interestingly, it was not LSE's relationship with UNext that would offer the most interesting examples of what on-line learning technologies could achieve. Ultimately both case study universities would take very similar approaches to integrating on-line learning technologies: both purchased very similar learning technologies; both established central units to deal with integration and dissemination issues; and both set up MLE Working Groups in order to deal with integration issues.

Capturing these sweeping changes and the various reinventions of on-line learning technologies that they brought with them required a carefully conceived research design. Only a longitudinal approach to research could take account of the unsettled character of on-line learning technologies during this time. These issues were reflected in the design of research questions, which had to be open enough to deal with fast-changing events, but specific enough to generate an empirical focus on technology. The volatile nature of learning technology markets and the emergent character of the technologies on offer meant that terminology had to be permitted to shift. Therefore, a 'placeholder' was created until terms were seen to take hold in institutional practice.

By adopting methodological techniques for allowing dynamic characteristics of the case study to emerge, important insights into the experience of technology integration became accessible. The events described in the case study reveal the situation of any organisation attempting to assess the integration implications of new technologies and make a viable purchase during volatile market conditions. For universities, the priority was to ascertain exactly what these technologies could contribute to student learning and make their selection as responsibly as possible given the limited public funds they had available. A general lack of first hand experience led to repeated calls from the literature to act on evidence based studies of learning technology use rather than speculation (Barab, 2000; Garnham, 2000; Swanson, 2002). At the same time, universities were criticised for not being ready for change or failing to 'keep up' (Evans & Nation, 2000). The hiatus that technology vendors created served the imperatives of the market well, but was unhelpful to those who had other imperatives to contend with. As the analysis of the case study showed, the orientation of universities and their private sector companies stood in stark contrast to one another.

The concepts of valence and ways of reckoning proved very useful in drawing out these contrasts. They were able to show how constitutionally and organisationally the universities and their private sector partners sought to serve different ends. This manifested itself in the details of the cross sector negotiations. Learning technology vendors had to 'act fast' in order to take advantage of potentially short-lived market conditions. Their priorities were to secure contracts and set advantageous prices. The critical time frames that they sought to impose were counter-intuitive to universities. Higher education practitioners are conditioned to

working with limited public funds and providing substantive evidence that a suggested approach to technology requirements represents the best way forward for the institution as a whole. The way in which on-line learning technology companies appeared and disappeared in the wake of the crash in technology shares was a clear manifestation of the kind of risks these companies were prepared to take. These risks were inconceivable to universities who have a social responsibility to ensure long term institutional stability. The concepts of valence and ways of reckoning were able to account for the diverse ends each organisation sought to serve and the implications this held for priority setting. They were able to highlight critical differences between the constitution of educational and private sector companies that can be overlooked when a totalising explanatory frame (such as market economics or managerialism) is imposed.

At the time the case study institutions were selected they appeared to be taking very different organisational approaches to the integration of on-line learning technologies. However, ultimately both institutions purchased very similar technologies and went about integration in very similar ways. On close examination of the two learning technologies purchased, there was not much to separate Blackboard and WebCT in either technical or pedagogic terms. Each technology offered students and teachers a personalised 'portal' view of the courses they were teaching or on which they were enrolled; each provided the facility to organise the presentation of course materials and create links to on-line resources; and each included discussion forum and on-line quiz facilities. If anything, it appeared that Blackboard offered marginally more administrative facilities for teachers using the system, such as the ability to e-mail groups of students and produce class lists of students registered on specific courses. It also provided the 'student chat' facility which proved popular at UofB. Interestingly, according to the terms of the Blackboard contract learning technology staff were prohibited from working directly within the learning technology database, whereas with WebCT this was not a condition. This effectively 'blackboxed' the learning technology database preventing learning technology staff from individualising any of its functions.

Technical integration of the learning technology was handled differently at each university although both institutions had similar issues to contend with. The configuration of the central database and the emphasis it placed on student course registration created integration concerns

at both institutions. Sensitivity to data issues which were the object of multiple concerns was also required at both. Learning to recognise these concerns and understand their relative status, particularly with respect to academic practice, was an important part of the integration process. The approach that UofB took to data integration was ambitious and served to shape the course that the pilot year would take. These ambitions were realised slowly, through discussions that were had between members of UofB's MLE working group. It took a mixture of time, dialogue, broad ends and shifting membership for the group to eventually arrive at a point where the learning technology could be positioned within existing flows and system arrangements.

The approach that the group developed for communicating was described in the analysis as a way of reckoning. This term was able to capture the way in which the group accounted for the multiple concerns at stake. It drew attention to the way in which, what is considered sensible, rationale or practical depends, to some extent on standpoint. By attributing rationale to specific actors and drawing out the different ways in which priorities can be constructed, this concept proved extremely useful to the analysis of complex integration work. In this context, the concept of valence refers to the implicit priorities that were reflected in the way of reckoning developed by the group. Their acceptance of broad aims, the absence of forced time frames and an emphasis on discussion allowed the multiple agendas of different work groups and systems to come to light. It also points to the spectrum of possibilities that the study of values can encompass. Within the arrangements and configurations under discussion, the MLE working group encountered clearly articulated philosophies, precise self-justificatory logics as well as a total absence of meaning or purpose.

An important aspect of valence and ways of reckoning is that they are applicable to both human and non-human actors. They can therefore be easily applied to physical arrangements and technical configurations just as they can to the analysis of a discussion or teaching strategy. The full implications of this came to light in the analysis of the 'moment of integration'. The description of this moment that the case study provides is a rare insight into infrastructural technology work as it is carried out 'in practice'. The richness of the account is attributable to the sensitisation toward data collection that the sociology of association engenders. Being able to take into account the spoken and the unspoken, the role of non-human actors and the

physical environment, and the significance of embodied movements are all aspects of description that the sociology of association allows to remain intact. By refusing to divide individual aspects of the description into separate social or theoretical domains, the significance of the associations and interactions that took place ‘in practice’, remain available for analysis. With respect to the study of infrastructure, this example serves as a reminder that relationships within and between technical systems have to be constructed. That in order for information to flow around an organisation in a purposeful way, someone, somewhere, at some time will have had to forge relationships between diverse work practices and technical systems. In drawing empirical and analytical attention to the work of joining systems together, further insight is gained into the distinctive priorities and rationales that technologies enact.

The practices and routines put in place by data integration activities at UofB would eventually come to bear on administrative, academic and library practices as well as student experience. These activities were the invisible ‘underside’ to the on-line course. The question of how core student data managed to ‘appear’ in the learning environment was a question that MLE group recognised as one that was of little interest or concern to anyone but themselves. The possibility that issues relating to data presented within the learning environment would be directed towards academic administrators was one of which the group were aware. There was significant concern expressed within the group that the new practices they put in place would not add to the workload of academic administrators. There was already a culture within the university whereby academic administrators felt undervalued and that the vital role they played in working with students and supporting course provision was not recognised. The MLE group were sensitive to these issues and did their best to account for them during the design process.

An interesting comparison that arose between MLE groups at each institution was the fact that at LSE the library occupied a very prominent place in MLE group meetings, whereas at UofB it was unrepresented. A number of reasons were given for this in the case study chapters. Of these, the most significant was the role of LSE as a social science institution and the implications this curricula focus brings to bear on library provision. In the analysis the concept of epistemic cultures was used to bring to light the idea of texts as the ‘raw materials’ of social science. On closer inspection, it was therefore unsurprising to discover a range of subtle and

sophisticated techniques in place for designing reading lists. The different standing that images and texts had as epistemic tools, machineries and ‘stand-ins’ across different subject disciplines was unexpectedly revealed through the process of translating reading lists into on-line format. The role that the on-line learning environment was able to play in this translation emerged from dialogues that took place between academic teachers and learning technologists who were able to investigate how specific pedagogical concerns could be addressed through the learning environment.

Integrating library and web based resources via the reading list represented a key innovation at LSE. An analysis of these activities showed how the reading list acts as a highly significant boundary object. It also revealed a previously unexplored area of pedagogy referred to in the analysis as ‘reading list methodology’. Identifying the reading list as a boundary object brought to light the ways in which the list formed the focus of diverse concerns, which included students, librarians, copyright legislation and pedagogy. Recognising the reading list as sitting at the boundary of academic pedagogy, epistemology, library provision and course design materialises the important relationships that exist between these apparently separate spheres of interest. Epistemically, the reading list allowed academic teachers to demonstrate the priorities of a course or subject area to students. It was able to show them ‘how to look’ for resources as well as ‘what to look for’. Teachers attempted to communicate the situated epistemic value of different textual genres, authors, periods in time, concepts and current events through the list making activity itself and also through the subtle arrangement, classification and positioning of resources. The list and its presentation were understood to enact ways of reckoning, designed to communicate a set of priorities and concerns, and focus students’ attentions on the significance of drawing associations between them. It is therefore easy to see why proposals for the generic classification of readings and the limitations of copyright license were sources of annoyance and frustration to academic teachers.

The pedagogic innovation underlying academic course design emerged as a highly influential activity, both with respect to on-line learning integration and to the way in which higher education curriculum is constituted. The examples of course design taken from LSE underline the fact that there is still a tradition in UK universities of authored course design. It is common (if not expected) that an academic taking over responsibility for a course, will bring

their own distinctive teaching style and epistemic awareness to course design. This awareness is shaped by ongoing institutional and departmental discourse concerning curriculum design, and by their individual work as researcher and teacher. In this way, new approaches to teaching, new relationships, new research and new theoretical sensitivities are drawn into university teaching. An interesting consequence of on-line course design was that these new associations were materialised through the links, positioning and arrangement of on-line resources. Relationships to social institutions, current events and new research were drawn into the on-line course, as were links to professional bodies and environments. Included within these links were libraries, museums, government institutions, legal bodies, newspapers, housing projects and hospitals. Seeing these relationships materialised through pedagogic practice creates a view of epistemic cultures as both historically situated and enacted. In this sense, the humble reading list enacts subtle shifts in epistemic culture, currently 'too small' to become topics in themselves, but which might one day constitute an entire degree programme. They also belie the extent to which higher education is reflexively integrated with institutions and professions, and the significant role that universities play in the well-being of society.

7.2 Core Contributions

This thesis makes a number of significant contributions to several important areas of research. The theoretical concepts of valence and ways of reckoning that have been both built and utilised over the course of the thesis are foremost among these. Developed from the theoretical foundations provided by the sociology of association and the analytical techniques of grounded theory these concepts are designed to offer theoretical density and coherence to the study of technology integration. Valence and ways of reckoning support detailed analyses of the multiple priorities and rationales that emerge when socio-technical infrastructures converge. By extending the notion of integration to include market conditions and the situated choices that organisations make during technology purchase contrasting and sometimes conflicting priorities can be accounted for. Through the notion of the actor provided by ANT, the scope of analysis includes individuals and groups as well as non-human actors. In this way, valence and ways of reckoning can also account for "the burden of describing mechanism" situating technical choices within the contexts in which they take place. By incorporating ideas

from distributed cognition, valence and ways of reckoning allow focus to rest on the task at hand, drawing out local priorities and rationales that may potentially transgress traditional organisational or disciplinary boundaries.

The relevance of this contribution, is particularly marked when considered in relation to existing on-line learning technology literature. As well as providing a historical account of a very distinctive time period in the history of higher education, this research also creates a context for the priorities that have so far been addressed by on-line learning research. The volatile and emergent character of on-line learning technologies has meant that a number of key areas in learning technology practice have not yet received attention from the literature. Included within these is the respective absence of both institution-wide and cross-institutional studies. Valence and ways of reckoning were designed to facilitate exactly this kind of research.

7.2.1 Valence and ways of reckoning

Valence and ways of reckoning represent an important theoretical contribution to a number of important areas of research. Foremost among these are the contribution they make to analyses of complex integration scenarios involving multiple sociotechnical infrastructures. As well as extending the concept of technology integration to include these interactions, this research also engages with core concerns within the IS literature regarding the IT artefact and infrastructure. The example of higher education was taken as an opportunity to draw technology research into an area of social practice that includes philosophy, beliefs and strong emotion. Traditionally associated with purely structured, rational traits, this example of technology integration was recognised by the researcher as an opportunity to contribute to both technology and education research. It is argued that the example of the higher education experience during this time period is an important contribution to the IS literature on infrastructure and integration. Issues concerning market conditions and technology hype were at the forefront of the case study institutions' early experiences. The notion of 'claims to transformation' was proposed as a means of marking out this kind of speculation. This term is relevant to both this and other instances of technology purchase and integration. With respect

to this case study, further dimensions to these claims were identified as emerging from policy rhetoric and the management literature surrounding learning, which Contu et al. described as learning discourse (2003). With respect to integration, the implications of these conditions were related to technology purchase and the experience of universities looking outward upon dynamic market conditions. In the analysis, these implications were linked to issues concerning partnership and consortia formation, volatile technologies, critical time frames and contrasting priorities.

The research design allowed highly detailed aspects of technology work to be brought to the foreground of analysis. On account of the rich description provided, new dimensions are added to conceptions of technology infrastructure. The diverse rationales that technologies enacted, the significance of joining arrangements and the complexity of integration work are brought to the foreground, as are the choices inherent in infrastructure design. Issues regarding 'what is logical', practical and necessary are cast to one side in favour of questions concerning the prioritisation of diverse concerns. Emerging from the details of integration comes the description of the 'moment of integration' which the analysis referred to as an example of distributed cognition. From this analysis, the implications of group work; the fine-grain analysis of interactions with technical and material artefacts; and the implications of environment, embodiment and co-presence in technology work, all offer important insights for IS literature concerned with infrastructure and the IT artefact.

Valence and ways of reckoning are conceptually integrated, but do not have to be used in conjunction with one another. When used together in the context of empirical work, ways of reckoning tends to draw the focus to actors' explanations of 'how' a situation has come about. Valence compliments this by highlighting either the absence or articulation of reasons 'why' a situation has come about. Empirical instances where there is a tightly coupled relationship between 'how' and 'why' can often act as potent political forms by forming influential explanations or justifications. Valence and ways of reckoning provide a basis for critically deconstructing explanations. In so doing, the *kind* of logic being used and the *sort* of philosophy being enacted can be opened up to examination and contrasted with alternatives. In this way, methods of constructing and denoting worth can be compared to one another, even when fundamental differences are apparent. This is particularly useful when conducting

cross-sector analyses where, economic measures of priorities and social concerns may conflict. Ways of reckoning and valence take into account methods of both denoting and constructing worth. In this way, they invite analysis of ‘what counts and is counted by a community of practice’ (where ‘what counts’ refers to both ‘what is counted’ and ‘what carries out the counting’).

The two core concepts also make a contribution to ANT research and are designed to form part of the vocabulary that researchers in this area have developed. The concept of valence is an especially important addition to this body of work because it addresses a criticism which has been levelled at ANT research. The heuristic flattening of theoretical differences between humans and non-humans that ANT advocates has been associated with relativism, which has left the theory open to charges of amorality (Latour, 1991; 1999). The concept of valence is designed to draw specific attention to questions concerning values. Used in conjunction with ways of reckoning it is intended to open up dimensions of empirical research pertaining to ethics, beliefs, morals, priorities and concerns to inspection. Within the construction of valence, emphasis lies on enactment. As such, it points to a spectrum of possibility rather than fixed ascriptions. In this respect, valence can point to an absence of moral issues as well as it can to a clearly articulated system of beliefs. This makes the concept an important addition to the study of technology where questions of practicality, inevitability, logic and irreversibility tend to dominate debate whilst questions of social purpose become marginalised.

7.2.2 Contribution to IS and on-line learning literature

An important aim of this study was to highlight the contribution that IS is in a position to make to education studies which have until now remained largely at the margins of the IS canon (Alavi & Leidner, 2001). This research has shown that the interdisciplinary nature of IS places it in an excellent position to contribute to analyses of the complex inter-relationships formed by on-line learning technologies. In turn, the study of technologies in education has much to offer the IS canon in terms of deepening theoretical understandings of infrastructure and the technological artefact. It also provides a basis for considering the implications of developing technologies for non-commercial environments. In this respect, the example of

higher education during this time period is an important contribution to the IS literature. Issues concerning market conditions and technology hype are brought to the fore. The notion of 'claims to transformation' was proposed as a means of marking out this kind of speculation. A further dimension to these claims was identified as emerging from policy rhetoric and the management literature surrounding learning, which Contu et al. described as learning discourse (2003). The implications of these conditions with respect to technology purchase and the experience of universities looking out upon dynamic market conditions were drawn out. These implications were linked to issues concerning partnership and consortia formation, volatile technologies, critical time frames and contrasting priorities.

As well as extending the concept of technology integration to include these interactions, this research also engages with core concerns within the IS literature regarding the IT artefact and infrastructure. The research design allowed highly detailed aspects of technology work to be brought to the foreground of analysis. On account of this rich description, new dimensions are added to conceptions of technology infrastructure. The diverse rationales that technologies enacted, the significance of joining arrangements and the complexity of integration work are brought to the foreground, as are the choices inherent in infrastructure design. Issues regarding 'what is logical', practical and necessary are cast to one side in favour of questions concerning the prioritisation of diverse concerns. Emerging from the details of integration comes the description of the 'moment of integration' which the analysis referred to as an example of distributed cognition. From this analysis, the implications of group work; the fine-grain analysis of interactions with technical and material artefacts; and the implications of environment, embodiment and co-presence in technology work, all offer important insights for IS literature concerned with infrastructure and the IT artefact.

The significance of distributed cognition is also implicitly suggested in the discussion of epistemic culture that appears in the analysis. The importance of this cross-over is that it challenges theoretical parameters instated by the learning and education literature between the formal and the informal; the mundane and the creative; the codified and the imaginative. These implicit hierarchies are present in the culture of higher education and can lead to dismissive attitudes towards certain areas of work and the people who work in them. A contribution this research sought to make to the education literature was to extend the concept

of 'the higher education practitioner' to include administrators, technology workers and librarians. The notion of education as a collective endeavour was proposed in order to show how both human and non-human actors contribute to the character of practice within and educational institution. In this way, it was intended that scrutiny of education values should be applied to organisational arrangements, partnerships and technical systems as much as it should academic practice.

Through its association with distributed cognition, the concept of ways of reckoning was deliberately designed in order to be able to traverse traditionally distinct social and theoretical domains. In this way, the significance of distributed cognition is drawn out in relation to epistemic culture and the distinctive rationales for working with people, environments and materials that subject disciplines enact. A contribution of this research to the on-line learning literature is that it draws attention to the question of what is contextualised in education research. Social aspects of the educational establishment and cognitive / psychological analyses of learning are unerringly treated as separate in education research. Issues relating to subject discipline and course design also tend to be left out of the empirical architecture of research. In the analysis of on-line learning provided by this thesis, epistemic, pedagogic and institutional concerns were all found to contribute important dimensions to understanding learning technology innovations. Taking into account situated concerns and accounting for their significance in on-line innovation is therefore seen to hold implications for both learning technology research and practice.

With particular reference to education research, the two core concepts were designed to enable reference to the range of actors who contribute to higher education provision and to the integration of learning technologies. In so doing, the intention was to show how 'in practice' the constitution of learning technologies is not subject to the same social and theoretical divisions that appear in the literature. As such, the two theoretical concepts have proved themselves highly relevant to processes of technology integration where the reconfiguration of technical arrangements is the site of multiple concerns. Valence and ways of reckoning are theoretically compatible with the concept of epistemic cultures. They contribute to this concept by facilitating reference to the varying character of epistemic values; the diverse methods through which subject disciplines construct rationality; and the range of people, raw

materials and physical environments of which disciplines are comprised. Valence and ways of reckoning are also compatible with the concept of distributed cognition (Hutchins, 1995). This theory of cognition does not draw distinctions between ‘internal’ mental activity and ‘external’ interaction allowing the significance of arrangement, positioning and association to emerge. By breaking down ideas of inner and outer, both distributed cognition and the two core concepts place concerns over subjectivity and objectivity to one side, prioritising empiricism over theoretical preconception.

The empirical evidence that this research offers represents an important contribution to learning technology literature. As a cross-institutional, institution-wide study spanning a variety of subject disciplines, this study stands out from the majority of on-line learning studies. The longitudinal aspect of the case study is important both as an account of contemporary developments in higher education technology use and as a historical account capable of generating inter-relationships between diverse areas of the literature. Learning technologies in their current form as commercially produced, generic software applications offering a combination of standardised tools have yet to be taken account of in the on-line learning literature. The focus of research efforts has remained on individual functionalities such as the role of on-line discussion forums. This research turns this empirical perspective around so that the assembly of standardised tools offered by the learning technology become a lens through which to view the richness and diversity of epistemic and pedagogic practice.

The integration of digital library resources is another key area that this research draws attention to which has not yet been sufficiently addressed by the on-line learning literature. Part of the reason for this is the separation of library based and pedagogic concerns into two separate bodies of research. The underlying nature of this separation is confronted by this research. Through its emphasis on empiricism and its analysis of the reading list as a boundary object, the cross over between pedagogic and library practice is opened up as an important areas of analysis. Finally, through its focus on blended learning this research moves beyond distinctions between distance and on-line learning as ‘either / or’ propositions. In so doing it draws out the significance of co-presence in education and the situated texture of learning activities.

7.2.3 Limitations of the thesis

Choices that were made during the course of designing this research brought with them limitations as well as opportunities. One of the most striking omissions from the case study is the absence of evidence concerning the student experience of using on-line learning technologies. Ultimately, research activities were forced to stop short of directly engaging with student attitudes and opinions. Having traced the integration learning technologies through private sector arrangements and purchase, to its integration with technical systems and teaching practice, it was not feasible to extend the design to include comprehensive evidence of student engagement. It was hoped that a number of student focus groups would take place. However, despite e-mailing 250 students and offering book tokens as incentives, only 3 students were able to attend. The group that met discussed one particular course where the innovation had been in the provision of an on-line reading list. Whether the discussion was relevant to understanding how students learn is an interesting point. According to the theoretical parameters set out by the education literature it was not. However, a viewpoint oriented towards distributed cognition might contradict this. With respect to understanding student concerns, there is also a tendency to underestimate the situated viewpoint of course teachers and the extent to which they are engaged, on a daily basis, with students' learning experience. The iterative nature of this relationship and the constant feedback that teachers received was apparent in interviews and in the subtle yet emphatic design principles teachers sought to instate. Nonetheless, it cannot be assumed that enthusiastic pedagogic intentions or well-intentioned designs automatically constitute positive student learning experiences. Evaluative statements about the role of learning technologies in improving or inhibiting student learning were therefore avoided.

A flaw which runs through most on-line learning studies which is further compounded by the use of ANT is that, only positive examples of integration and pedagogic use of on-line learning technologies are described. In tracing the associations that on-line learning technologies made, issues surrounding non-association are marginalised. The critical concepts of ways of reckoning and valence were designed to address this shortfall, to some extent, by drawing attention to the exclusion and marginalisation that form an implicit part of priority setting activities. However, the case study is still open to the criticism that it only tells 'the stories of the converted'. It would have been just as relevant to conduct a study of academic teachers

who were not interested in using on-line learning technologies as it was to study early pioneers. The range of reasons derived from this line of questioning would provide as much insight into the inner workings of the university as this study has. There is also the charge that by focusing on innovation, this thesis focuses on positive examples of higher education practice and does not engage with negative examples.

Whilst it was an explicit concern within the research design to avoid the creation of 'executive narratives' (Star, 1991) it still proved difficult to draw certain influential aspects of university practice into the case study. In particular, the 'rough treatment' of academic administrators was an issue that deserved further attention. There were numerous undignified examples where, the extent to which a task was considered 'mundane' formed the basis upon which it was considered less significant and therefore an administrative rather than academic concern. This distinct cultural barrier was in evidence at both institutions and with respect to integration activities, led to gross oversights with respect to understanding the institutional significance of core practices and events. There was also inescapable evidence that there were gender issues at play between academics (who were predominantly male) and administrators (who were predominantly female) within this cultural barrier. Male academics would frequently not refer to administrators by their proper titles, preferring to call them 'secretaries'. There were examples of academic behaviour where any engagement with technology and organisational affairs was considered unseemly. In these cases, academic administrators were expected to 'take dictation', or asked to print out e-mails, take down responses and type replies. With respect to learning technology integration, it was therefore often assumed that it would be administrators who would be carrying out the majority of the work involved. This formula contrasts with examples from the case where pedagogical innovation was only achieved through focused, hands-on academic engagement with the tools and functionalities of the learning technology. It was not possible to address these issues in sufficient analytical depth within the thesis and so they were not given detailed treatment in the case study. However, there was a clear sense in which these kinds of attitudes were reflected in the models of disaggregated course provision popular in early on-line learning developments. These limitations will be taken into account in future research, some examples of which are provided in the next section.

7.3 Future Research

In this section, ideas for research which have suggested themselves over the course of this study are described. It has not been possible to include all the issues that presented themselves, but a selection of inter-related areas for future research are included. The conceptual theme of 'education infrastructure' is introduced in this section and used to create a sense of how these ideas might cohere to form an integrated plan for future research.

7.3.1 Curriculum

The basis for conducting research that is established in this thesis is one which has the potential to produce an ongoing contribution to education studies. Within this field a number of areas for future research suggest themselves. At the point that field work ended at UofB and LSE, some particularly interesting comparisons were beginning to emerge from on-line learning technology developments across the diverse subject disciplines that formed part of each institution's curriculum. It is argued that the generic nature of on-line learning technologies provides a useful basis for understanding diversity in pedagogic and epistemic practice. Investigating why the tools offered are useless to one subject area but significant in another has the potential to offer a very rich and textured account of university curriculum. In particular, it has the capacity to draw out further implications concerning nuances involved with co-presence, embodiment and focused engagement with materials and physical environments. In this respect, understanding if and how epistemic cultures have already developed relationships with technology and how those technologies are positioned within the discipline, also forms an interesting area of study. The diverse relationships that subject disciplines have traditionally fostered with libraries and the new possibilities that on-line resources afford is another highly interesting area that merits further attention.

Through the view of diverse subject disciplines that centralised learning technologies afford, an opportunity to understand university curriculum as socially and historically situated is presented. According to this view, the ways of reckoning employed by disciplines can be

understood as socially instituted 'ways of knowing'. By taking this approach the relative social status of university subject disciplines is opened up to analysis. For example, divisions conceived on the basis of creativity and pragmatism, liberal education and vocationalism, education and training and hierarchical relationships between subjective and objective knowledge can be held up to inspection.

In the case study and within the education literature, this question appeared particularly relevant to the relative status of arts disciplines compared to other university disciplines. It is rare for either the learning or education literature to draw on empirical examples taken from arts based subjects and as such their significance in revealing different ways of learning is missed. The role of enactment and embodied movement, visual imagery, music, fiction and imagination are all significant aspects of knowledge and learning. Even putting these aspects to one side, arts disciplines are the bedrock of cultural industry and enact close associations to numerous professional bodies and cultural institutions such as libraries, museums and galleries. The introduction of institution wide learning technologies provides an unexpected opportunity to take a holistic view of the university curriculum and consider constructions based on the relative status of subject disciplines.

7.3.2 Technical Infrastructure

Another set of issues raised by this thesis concerns the significance of technology infrastructure to the provision of higher education. In the case study, there were examples where aspects of educational design were challenged or stunted by the configuration of particular technical arrangements. The fixity of the central database was a case in point as were the barriers to library resources presented by external data providers. These two examples point to issues which would benefit from further investigation.

The first example pertains to the question of standardisation in higher education. The role of course design emerged from the case study as a pivotal pedagogic activity. The arrangement and construction of course materials was shown to enact important ways of reckoning that formed part of student / teacher communications. The implications of centrally imposed philosophies of course design and their enactment through database design have the potential

to limit pedagogic course design in ways which were not intended. This is a particular area of concern where the philosophy of course design asserted is also tied to government initiatives to bring about standardisation, such as modularity and also the 'Bologna agreement' which seeks to rationalise the design of university courses throughout Europe. These are both areas that require further scrutiny. However, of greater concern is the introduction of Enterprise Resource Planning technologies into higher education (Cornford, 2000; Wagner, 2003b). Classifications and structural configurations that these technologies impose may obscure the subtle practices and organisational arrangements through which individual epistemic cultures achieve form. The significance of material aspects of education design can be put under pressure to re-rationalise their practices according to the priorities of the ERP system. It is likely that these priorities will not serve the epistemic ends around which subject disciplines have traditionally organised themselves. The foundational attributes of diversity and innovation in higher education could be seriously undermined by these kind of initiatives.

The second example of infrastructural issues relates to developments in the provision of on-line resources. Barriers to on-line materials created by external data providers are an example of the issues that disaggregation of university services to commercial providers can create. The service that external data providers offer is not oriented toward academic or educational priorities and creates discontinuities that cause issues for students and researchers alike. Such is the extent of these difficulties that considerable public funds, channelled through major JISC projects, have been spent on the development of technologies capable of over-coming the disjuncture caused by external data providers. The technologies that JISC have funded, such as ATHENS and ANGEL, are designed specifically for the education sector. They are developed under an open copyright license that allows the technology to be freely used by anyone. This copyright arrangement is indicative of the culture of 'shared knowledge for the public good' that is still in evidence in higher education provision. The ability to embed these kind of values in technical and organisational arrangements is an area of concern for higher education. The development of open source learning technology software and VLEs represent an important area of future research that has the potential to release universities from aggressive negotiating tactics of for-profit providers. An open copyright version of such a software would represent a significant contribution to the sector.

An area of research which is suggested by, but which lies outside education research, is the significance that analyses of non-profit, or 'alternative', organisational forms have to offer current technology, management and organisational literature. Conventional business models tend to level out or ignore the significance of the diverse ends that organisations can seek to serve and the potential this creates for innovation and inter-organisational learning. With respect to organisational practices, the learning curve between business and education is always assumed to be one way, where universities are the ones who would benefit from adopting business practices. However, businesses are being forced to consider the implications of ethical choices and reorient their practices in order not to alienate their customer bases. Educational institutions are powerful examples of organisations that are oriented toward non-profit ends. However, there are also an increasing number of businesses and social organisations that choose to develop ethical or non-profit business models. These organisations may have much to teach commercial organisations with regard to the enactment of ethical and socially motivated ends. The concept of valence presents an opportunity to consider the 'ethical scope' of decision making and priority setting. It raises the issues of whether individuals are able to recognise or connect with the values that an organisation enacts.

7.3.3 Education infrastructure

A concept which suggested itself over the course of research was that of 'education infrastructure'. This concept draws on the theoretical basis of ANT and the work of infrastructure authors discussed in chapter two. The concept of infrastructure encourages critical consideration of the reach and scope of education infrastructure, both in terms of who is served by it and who is not, and in terms of the limits of what can be termed education. It suggests a way of drawing together issues relating to curriculum, technology infrastructure and library provision creating a focus on the university as a whole. In this way it affords a greater scrutiny of relationships with private sector partners that imply a disaggregation of services. However, the theoretical basis proposed allows the theorisation of infrastructure as both material and symbolic. In this way, it admits two important dimensions of education

provision. The first dimension is that of material resources and organisation; the second dimension relates to philosophical, epistemic and pedagogical concerns represented in the design of university curriculum. By implication, the concept of education infrastructure creates a focus on holistic conceptions of education systems - including school based, further and higher education - and the longitudinal considerations associated with the ability of people to move between each stage. Higher education in particular feeds into school based and further education. Shifts in pedagogic practice and epistemic cultures at this level are reflected in curricula design at other levels. This fact adds further emphasis to the significance of authored course design and curriculum development in universities. Higher education acts as a 'frontier' in this respect. Education infrastructure serves to emphasise the links that bind together and create coherence within the education systems of a particularly country.

According to this standpoint, on-line learning technologies are understood as one aspect of education infrastructure. They represent a particular pedagogic genre that may or may not prove suitable to use in a given teaching scenario. In this way, the importance of non-managerialist implementations of on-line learning technologies and the encouragement of critical pedagogy (Clegg et al., 2003) are underlined. Associated with the importance of critical pedagogy is the issue of intellectual property rights and on-line course design. In most universities, the introduction of on-line learning technologies has brought with it a break in tradition. The authored nature of higher education course design has meant that historically, intellectual ownership of course designs have remained with the academic. At many universities, including LSE, intellectual ownership of courses now remains with the institution. This was a profound source of contention in early on-line initiatives at LSE. The implications of institutional ownership of on-line courses have yet to be fully addressed by the sector but have the potential to cause upheaval as use of on-line learning technology becomes more widespread.

Finally, the concept of education infrastructure offers the potential to look into questions concerning development issues associated with education and technology. On-line learning was associated with the term 'global education' in the late nineties. The mixed intentions underlying discussions concerning the role of Internet technologies in extending the scope of education generated a rather empty debate. The education needs of developing countries and

the potential of on-line learning technologies to address them were portrayed in a bland, uncritical way. The concept of education infrastructure has the potential to enrich these discussions by drawing attention to the situated education needs of individual countries. It creates critical awareness of the unfamiliar relationships and associations that the introduction of new technologies bring. It also serves to highlight issues involved in integrating new technologies with larger infrastructural initiatives and the complications that relationships with private sector partners can bring to projects oriented towards social concerns. Emphasis on education infrastructure encourages analyses of national education systems as distinct, reflecting diverse political, historical and social attitudes towards education. Lastly, it supports an awareness of the links that higher education institutions are capable of enacting with social institutions which bring important levels of engagement and visibility to social processes.

Appendix 1

UofB Index of Field Work Documents

	Date	Event	Text
1	11/10/2001	Student database team meeting MLE first mentioned	diary entry
2	22/10/2001	Student database team meeting MLE raised at Information Strategy Committee (ISC)	diary entry
3	30/10/2001	E-mails from Learning Technology Manager (LTM) setting up 1st MLE working group meeting	e-mail
4	01/11/2002	Documents arrive from LTM	ISC minutes
5			tabled documents inc. MLE proposal
6	06/11/2002	E-mail Registrar requesting access	e-mail
7	08/11/2002	Student database team meeting	diary entry
8	09/11/2001	MLE pre-meeting and meeting	pre-meeting notes
9			meeting notes
10		E-mail from LTC providing links to intranet sites and Blackboard demo and link to learning and teaching doc	e-mail
11		E-mail from TO with academic framework	e-mail
12	15/11/2001	LTM e-mails summary of meeting	e-mail
13		DN replies concerning timetabling and SI	e-mail
14		Series of e-mails concerning pilot and timetabling	e-mail
15	21/11/2001	Registrar confirms access	access e-mail
16	23/11/2001	E-mail to LTM requesting permission to do case study	e-mail
17	25/11/2001	E-mail Head of Computer Centre to try and get interview before he leaves to work for UKERNA - too busy	e-mail
18			e-mail
19	29/11/2001	Student database manager e-mails to say 'e-vision' demo has been arranged	e-mail
20	30/11/2001	E-mail Student Database Manager to say have got access	
21		Computer Centre manager leaving to UKERNA e-mail before leaves to work for UKERNA - too busy	e-mail
22			diary entry
23	07/12/2001	Hear of admin conference	diary entry
24		e-mail TM about admin conference	e-mail
25		e-mail LTM requesting interview	e-mail

26	13/12/2001	Visit to Grand Parade to see TM given conf docs	conference program
27		Invitation to attend admin conference	letter
28	14/12/2001	Interview LTM – see diary entry for notes and impressions	questions and cover doc
29			transcript
30			diary entry
31			VLE/MLE proposals
32	03/01/2002	Admin conference	notes
33			conference materials
34	04/01/2002	E-Vision demo moved	e-mail
35	11/01/2002	E-vision demo confirmed for 28 th Jan	e-mail
36	22/01/2002	Release of StaffCentral	e-mail
37	04/02/2002	diary entry giving feedback from e-vision demo – copy of slides to come	diary entry
38			e-vision documentation
39	14/02/2002	Student database team meeting – talked about e-vision	diary entry
40	15/02/2002	Student database manager mails copy of e-vision slides	e-mail
			E-vision slides
41	18/02/2002	MLE meeting	notes
42	20/02/2002	Mail from LTSOs re. workshops	e-mail
43	21/02/2002	Student database team meeting – e-Vision, Registry day, LT workshop	diary entry
44	22/02/2002	Diary entry	diary entry
45	04/03/2002	Interview with Learning Technology Co-ordinator (LTC)	Transcript LTC
46			notes
47			diary entry
48	08/03/2002	Thanks to LTC and arrange LTSO meeting	e-mail
49	11/03/2002	Computer support for learning technologies	e-mail
50		Advert for ‘Getting Started’	e-mail
51	13/03/2002	Announcement that Blackboard contract is signed	e-mail
52		Confirmation of LTSO meeting attendance	e-mail
53		Congratulations to LTM	e-mail
54	14/03/2002	LTSO Meeting	notes of meeting
55			diary entry

56	15/03/2002	Notes from talking to BM and about Registry day	diary entry
57	18/03/2002	E-mails to set up LTSO interviews - ongoing	e-mails
58	19/03/2002	E-mail advertising Getting started	e-mail
59	26/03/2002	LTM e-mail to Blackboard user group	e-mail
60		Registry day programme	e-mail
61			programme
62	27/03/2002	Interview LTSO	transcript
63	28/03/2002	Interview LTSO	transcript
64		Interview LTSO	transcript
65			notes
66	11/04/2002	Getting started day and Registry day	notes
67	15/04/2002	Blackboard made available for experimentation	e-mail
68	17/04/2002	Interview LTSO	transcript
69			notes
70	18/04/2002	Request to attend LTSO meeting and reply	e-mail
71		LTSO meeting	notes
72		Student database user group meeting – MLE item	minutes
73		Admin element of consultation / forms	e-mails
74	19/04/2002	Continuation of admin element mails with LTM	e-mails
75			Admin and MLE doc
76		Ask LTC for MLE pilot application form	e-mail
77	22/04/2002	Application form and roadshow schedule from LTC	e-mail
78			form
79	25/04/2002	LTSO response to 1st roadshow	e-mail
80	26/04/2002	LTM answer to LTSO feedback	e-mail
81	02/05/2002	Interview LTSO	transcript
82		Interview LTSO	transcript
83	09/05/2002	Blackboard data integration meeting	e-mail
84			integration doc
85		Conversation with Student database manager drawing in LSE work	diary entry
86	15/05/2002	Registry management discusses e-Vision	minutes
87	16/05/2002	More info to Student database manager	e-mail
88		Architecture roadshow	notes

89			diary entry
90			MLE Roadshow doc
91	17/05/200 2	Admin integration meeting request from LTM	e-mail
92		Arts roadshow	notes
93	18/05/200 2		diary entry
94	23/05/200 2	Architecture situation over timing of admin	diary entry
95	24/05/200 2	IT Roadshow	notes
96	06/06/200 2	E-mail with e-learning manifesto docs	e-mail with links
97	10/06/200 2	UofB lecturer article in THES about modularity	newspaper article
98	11/06/200 2	Data schema and MLE working group pre-meeting exchange with System analyst and Student Database Manager	e-mails
			diary entry
99	12/06/200 2	Notes on architecture situation	diary entry
100	13/06/200 2	Student database team meeting and meeting with LTC	diary entry
101		Log on to BB test system	e-mail
102		Subject code and other related mails	e-mails
103		Renault Clio e-mails – general uni discussion	e-mails
104	14/06/200 2	Systems analyst work on Blackboard data format	e-mail
105			data format files
106	17/06/200 2	Systems analyst over for data format meeting	diary entry
107	18/06/200 2	MLE meeting	notes
108			diary entry
109		JISCwatch, e-vision site e-mails	e-mails
110	19/06/200 2	Agenda from MLE meeting	agenda
111	20/06/200 2	Student database team meeting	diary entry
112	26/06/200 2	E-mails about JISC	diary entry
113			e-mails
114	27/06/200 2	E-mail from new head of IT	e-mails
115			diary entry
116	28/06/200 2	More JISC e-mails	e-mails
117			e-mails
118	01/07/200 2		diary entry
119	02/07/200	Architecture 'tails wagging dogs'	paper e-mail

	2		
120		Meeting with Head of IT re. JISC bid	e-mails
121			diary entry
122	04/07/2002	JISC e-mails	diary entry
123			e-mails
124	08/07/2002	Blackboard integration meeting	diary entry
125			e-mails
126	11/07/2002	Shared work with LTC. 'not my job!' and SHACS	diary entry
127		Student database team meeting	diary entry
128		Education Roadshow	Education Roadshow
129		Final JISC draft	JISC final draft
130			e-mails
131	12/07/2002	Learning and Teaching conference	L&T programme
132		E-mails about integration issues and my availability established inclusion in planning meetings	e-mails
133	15/07/2002	E-mails about LDAP stu. Non look up, planning meetings, HESA codes	e-mails
134			LTC's questionnaire
135	17/07/2002	E-mails about environment meeting. One to EQ. SHACS e-mails to TM.	e-mails
136			SOTE application form
137	18/07/2002	Reply EQ. LTC on my research. Arts meeting TM. Environment planning meeting.	e-mails
138			MLE entry
139			Application form
140			Arts report
141	19/07/2002	E-mail to LTC about subject code deadlines. LDAP, SITS, SC meeting confirmed. Conversation with TG and AL relayed to LTM and LTC and forwarded to Student database manager	e-mails
142			SOTE 'mindmap' document
143	22/07/2002	Student database manager work on module browser	e-mail
144	23/07/2002	LTM Response. Notes from LDAP CAMS meeting	e-mail
145	24/07/2002	Chelsea planning meeting attendance request. Planning meeting e-mails from LTM to Chelsea, Social science, Languages (separate proposals), Architecture, INAM. SOTE de-brief (didn't attend).	e-mail
146	25/07/2002	E-mail from Systems Analyst about external ref key	e-mail
147	26/07/2002	Chelsea module list.	e-mails

148	29/07/2002	SOTE mind map update. Chelsea module list. Phase 1 participant database. Planning meeting LTM to ?	e-mails
149			Updated mindmap
150	31/07/2002	Notification of training workshops. SALTM planning meeting date	e-mails
151	01/08/2002	LTM Pharmacy planning meeting e-mail. LTC e-mail to BB usergroup.	e-mails
152	05/08/2002	ANGEL notification at UofB from NH. Systems Analyst upgrade notification.	e-mails
153	06/08/2002	LTM Languages advice.	e-mail
154	13/08/2002	Planning meeting confirmations for Eng, CMIS and PG cultural heritage	e-mails
155	19/08/2002	PG cultural heritage meeting non-attendance, module ownership and split modules question	e-mail
156	20/08/2002	PG Cert cultural heritage planning meeting - didn't attend	diary entry
157	23/08/2002	LTC Latest discussion with Systems Analyst on XML. SOE planning meeting notification.	e-mails
158		CMIS planning meeting.	notes
159	27/08/2002	Eng planning meeting non-attendance. LTMM planning meeting notification	e-mail
160	02/09/2002	Update on data integration work with LTC e-mails and date for SOE planning meeting. CMIS demo e-mail. Pharmacy planning meeting request. Arranging catch up meeting.	e-mails
161			diary entry
162	03/09/2002	Education planning meeting.	e-mails
			notes of meeting
163	05/09/2002	Integration meeting didn't attend. Chelsea school planning meeting confirmation. Notes from integration meeting LTC. TG feedback on notes. PRS table change TG message to admin. LTMM meeting confirmation.	e-mails
164	09/09/2002	2pm LTC meeting. Completing grads incrementing levels mail. Languages planning meeting conf. CM interview request. LTC – LTM e-mail to administrators. 'What studentcentral looks like' photo	e-mails
165			diary entry
166			notes
167	10/09/2002	JISC bid inquiry. LTC admin contact list.	e-mails
168			diary entry
169	11/09/2002	CMIS scheduling co-ordination. IQ getting codes.	e-mails
170	12/09/2002	SH scheduling and BB.	e-mails
171		Meeting LTC 3pm. LTC access to CAMS	notes
172		LTC photo BB	photo

173	13/09/2002	Systems Analyst XML glitches	e-mail
174	16/09/2002	SOE and co-ordinating scheduling. SALT domain codes in CAMS. Pharmacy scheduling. LTC SOE DP e-mail. LTMM CAMS scheduling. Pharmacy domain codes. Admin contact CMIS.	e-mails
175			diary entry
176	17/09/2002	LTC domain codes. LTC SMOs datafeed. SOE domain codes. SMO check. More on SMOs. Pharmacy option co-ordination. JISC bid. SALT admin contact check. Options check. Systems Analyst SMO.	e-mails
177			diary entry
178		Admin position of schools report.	report
179	18/09/2002	Systems Analyst test data.	e-mails
180			diary entry
181		Chelsea planning meeting – attended.	notes
182	19/09/2002	Systems Analyst SMO.	e-mails
183			diary entry
184	20/09/2002	Who's using SC? Link to monitoring screen.	e-mail
185	24/09/2002	LTMM planning meeting confirm.	e-mail
186	27/09/2002	Pharmacy planning meeting suggested dates.	e-mails
187	30/09/2002	Studentcentral catch up. Meeting LTC 2.30. Architecture training invitation. DC e-mail. External users e-mail. INAM no module codes. Batch uploads.	e-mail
188			notes
189			diary entry
190	01/10/2002	Student database manager evaluation and praise. External ref report BM. INAM module codes e-mails.	e-mails
191			external ref report
192			diary entry
193	02/10/2002	IT311 mod reg. SHM planning meeting suggested dates. Architecture training and planning.	e-mails
194			diary entry
195			notes
196	03/10/2002	DC CAMS and BB. pdf files of Arch programmes. CAMS and SHACS.	e-mails
197			pdf files
198	04/10/2002	Arch meeting to sort exam board dates.	e-mails
199		IT311 self-reg.	
200	09/10/2002	Confirmation of interview with registrar	e-mail
201	11/10/2002	Student database scheduling update	e-mail
202		Interview with Registrar	transcript
203	14/10/2002	SHP planning meeting confirmation	e-mail

	2		
204	16/10/2002	Architecture planning meeting	e-mail
205	24/10/2002	SI User group meeting – attended by LTC	notes
206	25/10/2002	Feedback from SI user group	diary entry
207	27/10/2002	MLE meeting request and LTM thanks	e-mail
208	29/10/2002	MLE admin integration request	e-mail
209	15/11/2002	Xmas and leaving do	e-mail
210	21/11/2002	LTC catch up	e-mail
211	22/11/2002	Catch up with LTC - studentcentral chat.	notes
212		Admin student complaints e-mail over registration delay	e-mail
213	28/11/2002	Systems Analyst research interview request	e-mail
214	29/11/2002	Arrange arts meeting MS and HS	e-mail
215	02/12/2002	MLE Working Group Report and analysis of ext refs. Blank user name report.	e-mails
216			meeting notes
217	05/12/2002	Meeting with LTSOs for Art	notes
218	06/12/2002	Confirm Systems Analyst research interview	e-mail
219	08/01/2003	Interview with Systems Analyst	transcript
220	20/01/2003	E-mail with stats on courses run by UofB	e-mail
221			report

Appendix 2			
LSE Index of Field Work Documents			
	Date	Field work event	Field work text
1	20/11/2000	Meeting with BC prior to leaving LSE for UNext.	UNext brochure
2			Rosenfield address
3		BC suggests contacting Director of Projects (PT)	notes
4	05/07/2001	E-mail PT requesting interview	e-mail
5	20/07/2001	Notes from talking to PT and interview transcript	transcript
			notes
6	24/09/2001	E-mail PT copy of transcript for checking	e-mail
7	02/10/2001	E-mail PT set up date for meeting 9 th Oct	e-mail
8	04/10/2001	BC leaves UNext. Phone in Chicago before departure.	notes
9	05/10/2001	E-mail BC thanking her for help	e-mail
10	07/10/2001	BC e-mails back with new address	e-mail
11	09/10/2001	Meeting with PT see notes	notes
12	06/11/2001	E-mail PT requesting access as agreed at meeting	access e-mail
13	12/11/2001	Acknowledgement e-mail from PT	e-mail
14	06/12/2001	E-mail chasing PT	e-mail
15	07/12/2001	PT e-mails to say request has gone to Director's Working Group on Distance Education	e-mail
16	11/12/2001	E-mail from PA to Deputy Director requesting meeting.	e-mail
		Thank you e-mail to PT.	e-mail
17	16/12/2001	E-mail back from PT saying keep in touch	e-mail
18	15/01/2002	E-mail via TT about Learning Technologies workshop	e-mail
19	18/01/2002	LSE Learning Technologies workshop	notes
20	23/01/2002	Meeting Deputy Director	notes of meeting
21		Documents provided by Deputy Director	Reports
22			diary entry
23	23/01/2002	E-mail from member of Learning and Teaching Technologies Working Group (LTTWG)	e-mail
24		LTTWG terms of reference attached	terms of ref
25		PA to Deputy Director forwards advertisement for CLT manager	advertisement
26	12/02/2002	E-mail with LTTWG report attached	e-mail
27			LTTWG report
28	25/02/2002	Request interview with Director of Learning and Teaching	e-mail
29	04/03/2002	Request access to minutes from Director's Working Group	e-mail

30	06/03/2002	Answer from Deputy Director's PA - no minutes available	e-mail
31		Ask SD for copy of LSE organisational chart, refers me to HN	e-mail
32	11/03/2002	HN reply	e-mail
33	13/03/2002	Cisco presentation	notes
34	14/03/2002	Interview with MSc Information Systems Security course assistant	transcript
35		Director Learning and Teaching Interview – directs me to Learning Technology Manager - now in post	transcript
36			diary entry
37	18/03/2002	Learning Technology Manager request for interview	e-mail
38	27/03/2002	Learning Technology Manager interview	transcript
39		Negotiate permission to contact Centre for Learning Technology (CLT) staff	notes
40		LSE organisational documents from HN	e-mail
41			council structure
42			committee structure
43			structure of governance
44		Learning Technology Manager e-mails with links to documents	e-mail
45	08/04/2002	E-mail CLT staff requesting permission to carry out research	e-mail
46		Positive response from all sent via QX	e-mail
47		E-mail Director BSS (BSS) requesting interview	e-mail
48	09/04/2002	Reply Director BSS	e-mail
49	24/04/2002	Director BSS interview	transcript
50		Learning Technologist Interview	transcript
51		Learning Technologist Systems Administrator Interview	transcript
52	30/04/2002	E-mail from Director BSS giving details of 'LSE for You' and responds to access request re. MLE working group	e-mail
53			link to LSE for you materials
54		E-mail from Learning Technology Manager about attendance of MLE meetings and book references	MLE working group papers
55		Learning Technologist Interviews	transcript
56			transcript
57	09/05/2002	E-mail from Learning Technology Manager saying access to MLE Meetings should be requested of the group at first MLE meeting	e-mail
58	13/05/2002	<i>1st MLE Working Group meeting – access still being negotiated</i>	
59	17/05/2002	Director BSS e-mail concerning articles on LSE for you	e-mail

60			articles
61	28/05/2002	Notification of next MLE meeting 18/06/02	e-mail
62	18/06/2002	E-mail with TS overview of JISC projects on MLEs	e-mail
63			'JISC descriptions'.doc
64	18/06/2002	MLE Working Group Meeting	notes of meeting
65		E-mail to Director BSS about 'E-vision'.	e-mail
66	20/06/2002	Notes from MLE working group from TX	e-mail
67			formal notes of meeting
68	24/06/2002	KT e-mail with links to library projects	
69	25/06/2002	Library newsletter to IS	e-mail
70			web page
71	26/06/2000	Learning Technology Manager e-mail concerning JISC bids	e-mails
72		Learning Technology Manager notifies MLE meeting attendees of JISC bid	e-mail
73	22/07/2002	E-mail to arrange catch up with CLT staff	e-mails
74	23/07/2002	Catch up meeting cancelled by me	e-mail
75	28/08/2002	Interview arranged with two department administrators	e-mails
76	11/09/2002	Notification of next MLE meeting and agenda	e-mail
77			MLE agenda
78		Success of DELIVER funding bid.	e-mail
79		<i>Meeting with supervisor. Field work imbalance identified</i>	<i>notes</i>
80	17/09/2002	Notification of MLE meeting on 6th December	e-mail
81	20/09/2002	Meeting with Learning Technology Manager to arrange part-time work	notes
82		MLE meeting	notes
83		Chat with CLT staff to negotiate access and hands on work	diary entry
84	23/09/2002	Portals evaluation project details from Director BSS sent to MLE meeting attendees	e-mail
85			document
86		MLE Working Group Meeting	e-mail
87			formal notes of meeting
88	24/09/2002	E-mails with Learning Technology Manager negotiating hands on work and access to CLT	e-mail
89		Link to DELIVER project outline	document
90	25/09/2002	E-mails with Learning Technology Manager negotiating hands on work and access to CLT	e-mails
91		Link to joint LSE Columbia / LSE digital libraries bid	document
92	27/09/2002	Advances in admin integration e-mail, timetabling from BSS	e-mail
93	30/09/2002	Work arrangements made with learning technologists, negotiating start date	e-mail

94	02/10/2002	Server overload on LSE for you	e-mail
95	03/10/2002	Start work at CLT	diary entry
96	08/10/2002	Working on copyright license database in CLT	diary entry
97			list of database fields
98	15/10/2003	WebCT registration e-mail for WebCT training	e-mail
99		Working on copyright license database in CLT	diary entry
100	16/10/2003	Working on copyright license database in CLT	e-mail
101			document
102			diary entry
103	17/10/2002	Working on copyright license database in CLT	diary entry
104	21/10/2002	Working on copyright license database in CLT	diary entry
105	23/10/2002	Notification of MLE meeting on 6 th December	e-mail
106		Field work notes for 22.10.02	e-mail
107	08/11/2002	Permission to quote LB 'ANGELS and Titans'	e-mail
108	12/11/2002	Working on copyright license database in CLT	e-mail
109	18/11/2002	Note of working hours for KT	e-mail
110	19/11/2002	Working on copyright license database in CLT	diary entry
111		Invite to Pearson meeting	e-mail
112			notes
113			diary entry
114		DELIVER Interview Professor of History	transcript
115	20/11/2002	Working on copyright license database in CLT	diary entry
116		Draft e-mail to TC	e-mail
117		Brief meeting with KB	diary entry
118		Interview request Course Designer in International Relations	e-mail
119		Interview request Professor of Development Studies	e-mail
120		DELIVER interview Course Designer in Geography	transcript
121	21/11/2002	Interview request Lecturer in Law	e-mail
122		Interview request Lecturer in Anthropology	e-mail
123	22/11/2002	Links to learning technology mailing lists from Learning Technologist	e-mail
124		Updated interview guide from K	e-mail
125			interview guide
126	25/11/2002	DELIVER interview Course Designer in International Relations	transcript
127			e-mail
128		Interview arrangements	e-mail
129		Working on copyright license database in CLT	diary entry
130		Interview arrangements	e-mail
131		Interview arrangements	e-mail
132		DELIVER interview Course Designer in International Relations	transcript
133	26/11/2002	DELIVER Interview Professor of Development Studies	transcript

134		DELIVER Student focus group	notes
135	27/11/2002	e-sources day' e-mail	e-mail
136		DELIVER Library focus group	notes
137	03/12/2002	Time negotiations with CLT staff	e-mail
138	04/12/2002	DELIVER Interview lecturer in Geography	transcript
139	06/12/2002	MLE Working Group meeting	notes
140		DELIVER Interview lecturer and course designer in Anthropology	transcript
141	09/12/2002	User needs analysis document	e-mail
142			document
143		DELIVER Interview lecturer and course designer in Law	transcript
144		DELIVER Student focus group	e-mail
145			transcript
146	17/12/2002	MLE working group URLs	e-mail
147	07/01/2002	Learning technologies open house e-mail	e-mail
148	14/01/2003	London weighting strike action	e-mail
149	20/01/2003	MLE meeting minutes and action points	e-mail
150			formal notes of meeting
151	05/02/2003	Meeting with Learning Technology Manager	meeting
152		Chat with CLT staff	notes
153	07/02/2003	WebCT work begins!	e-mail

Appendix 3

High level time line of integration events extracted from UofB field work document index

Field work doc index	Date	Integration event
3	30/10/2001	Announcement of first MLE Working Group meeting
41	18/02/2002	2nd MLE Working Group meeting
54	14/03/2002	Blackboard purchased
66	11/04/2002	UofB Blackboard launch day
79	25/04/2002	First departmental 'roadshow'
101	13/06/2002	Test system made available for general use
107	18/06/2002	3rd MLE Working Group meeting
124	08/07/2002	Data integration achieved for first time
137	18/07/2002	School planning meetings begin
164	09/09/2002	Servers installed and data integration dry runs begin
184	20/09/2002	Academic staff begin using learning technology
213	02/12/2002	4th MLE Working Group meeting

Appendix 4

High level time line of integration events extracted from LSE field work document index

Field work doc index	Date	Integration event
5	20/07/01	UNext related events
25	23/01/2002	LSE advertise for Centre for Learning Technology Manager
58	13/05/2002	1st MLE Working Group meeting
64	18/06/2002	2nd MLE Working Group Meeting
71	26/06/2002	Learning Technology Manager e-mail concerning current JISC bids
78	11/09/2002	Success of joint Columbia and DELIVER funding bids
86	23/09/2002	3rd MLE Working Group Meeting
114	19/11/2002	DELIVER user needs analysis begins
139	06/12/2002	4th MLE Working Group Meeting
144	09/12/02	DELIVER user needs analysis ends

Appendix 5

Discussion document and example of standard letter text from UofB

Blackboard/CAMS integration

A discussion document

This document describes the XML (eXtensible Markup Language) download produced by SITS for exporting module registrations to Blackboard. The download is produced by a standard letter in the MAV group called BLACKBOARD.

It appears from the Blackboard Integration Guide (BIG) (actually Blackboard 5: Learning System Advanced Integration and Data Management Manual), that XML files are always processed as snapshots. That is:

- If a record is in the XML file but not in BB, it is created in BB.
- If a record is in BB but not in the XML file, it is disabled in BB.
- If a record is in both the XML file and in BB, it is updated in BB with the data from the XML file.

In other words, BB will always make its own database reflect what is in the import file. This is different from some flat-file loads where separate files of deletions, new students and updates can be supplied.

In the tables below I have attempted to map the BIG data feed elements onto the XML objects produced by the letter, and hence find which SITS:Vision fields are used to populate the information. Without a definitive guide to how Blackboard have implemented the IMS XML definition this is not always easy, though in most cases the match is quite apparent. Over and above this inherent uncertainty, where I am particularly puzzled I have put a question mark after the appropriate value in the table. Blank entries represent unused fields or a total inability to match up the descriptions. I can't help feeling that there must be a guide produced by Blackboard on this topic.

Entries are not necessarily in the same order as in the BIG. For example I've grouped related information such as names, addresses etc, together whereas they are scattered in the BIG list. Essentially the data model consists of three elements: people (students or staff), courses (modules), and memberships to link the two (i.e. to assign a tutor "person" to a module, or enrol one or more student "persons" on it). SITS' XML letter describes all of these for a given set of modules selected on the MAV screen.

If we intend to use the XML import, this document might prove a starting point for how to proceed. Grateful thanks are due to SITS for providing the SRL. For those familiar with XML or SITS:Vision standard letters, I've attached the letter text at the end of the document.

Systems Analyst,

UofB 14-Jun-02

Course (module)

BB ELEMENT	SITS:Vision Field	XML OBJECT
EXTERNAL_COURSE_KEY	MOD_CODE.MAV	SOURCEDID.ID

BB ELEMENT	SITS:Vision Field	XML OBJECT
	MAV_OCCUR.MAV AYR_CODE.MAV PSL_CODE.MAV?	
NEW-EXTERNAL_COURSE_KEY		
COURSE_ID	MOD_SNAM.MOD?	DESCRIPTION.SHORT
COURSE_NAME	MOD_NAME.MOD	DESCRIPTION.LONG
DESCRIPTION	MOD_DESC.MDS (LIST)	DESCRIPTION.FULL
END_DATE	MAV_ENDD.MAVT (LIST)	TIMEFRAME.END
START_DATE	MAV_BEGD.MAVT (LIST)	TIMEFRAME.BEGIN
NEW_DATA_SOURCE_KEY		
ROW_STATUS	transaction?	
ALLOW_ENROLL	1 (=self/instructor)?	ENROLLCONTROL.ENROLLACC EPT
ALLOW_ENROLL_EXISTING_AC COUNT		
AVAILABLE_IND		
CATALOG		
DESC_PAGE		
ENROLL_EMAIL_INST		
LOCKOUT_IND		
PACE		
ABS_LIMIT		
SOFT_LIMIT		
UPLOAD_LIMIT		
ENROLL_START		
ENROLL_END		
DAYS_OF_USE		
DURATION		
INSTITUTION_NAME		
CLASSIFICATION_KEY		
TEMPLATE_COURSE_KEY		
	DOM_NAME.DOM	ORG.ORGNAM
	DOM_NAME.DOM	ORG.ORGUNIT
	“Academic”	ORG.TYPE
	0 = course	GROUPTYPE.TYPEVALUE
	0 = course	EXTENSION.X_BB_GROUP_TYP E

Appendix 6

University of Brighton Interview Map

- Registrar (ex-Head of Learning Resources)

Learning Technologies Group

- Manager
- Learning Technology Co-ordinator
- Learning Technology Specialist (Media)

Learning Technologies Support Officers

- Moulsecoomb site (east)
 - Moulsecoomb site (west)
 - Grand Parade site
 - Falmer site
 - Institute Nursing and Midwifery
 - Eastbourne site
-
- Senior Programmer Analyst

Appendix 7

London School of Economics Interview Map

<p>Enterprise LSE</p> <ul style="list-style-type: none">• Director of Projects <p>Student Focus Group (3 students)</p> <p>Library Library Focus Group (5 members of staff)</p> <ul style="list-style-type: none">• Deputy Director• Teaching and Learning Director• Director Business Systems and Services <p>Centre for Learning Technologies</p> <ul style="list-style-type: none">• Director of Centre for Learning Technologies• Learning Technology Specialist• Learning Technology Specialist• Learning Technology Librarian• Learning Technology Systems Administrator <p>Department of Information Systems</p> <ul style="list-style-type: none">• Co-ordinator CSRC• Research Co-ordinator• Course Support Administrator	<p>JISC funded project interviewees</p> <p>Department of International History</p> <ul style="list-style-type: none">• Professor <p>Department of International Relations</p> <ul style="list-style-type: none">• Tutorial Fellow <p>Department of Development Studies</p> <ul style="list-style-type: none">• Professor <p>Department of Geography</p> <ul style="list-style-type: none">• Lecturer• Course Designer <p>Department of Anthropology</p> <ul style="list-style-type: none">• Lecturer• Course Designer <p>Department of Law</p> <ul style="list-style-type: none">• Lecturer• Course Designer
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