Between ‘Technological Obduracy’ and ‘Academic Resistance’: Concepts of Use of Blackboard and the Experience of University Teachers.

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A thesis presented in fulfilment of the requirements for the Degree of Doctor of Philosophy

at

RMIT University

MELBOURNE

December 2013

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Candidate's Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

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Julia Mary Stewart Thornton

(20 December 2013)

Acknowledgements

A thesis should be about learning. I have learned an immense amount in pursuit of this thesis in no small degree because of the supervision of Professor Rob Watts, whose early injunction to me to 'read widely' has left me with a rich legacy far greater than is represented in the pages of this thesis. Coffee and discursive and free ranging conversation peppered with Rob's open ended questions that were an invitation to really think deeply, also played a pivotal part in my extended education. Thank you, Rob, for both the freedom to read and think, and for wielding the axe of structure when necessary.

A special thank you is also due to Professor Pavla Miller, who on more than one occasion saved me from a 'meltdown'. Her patient but persistent presence propelled me forward through the various vicissitudes of thesis completion.

I would also like to thank the School of Global, Urban and Social Studies, not only for the fruitful time I spent teaching in the school, but also because it was there I first conceived an interest in the problems of teaching with Blackboard. Colleagues in the school were hugely generous with their time in allowing me to interview them and watch them work, sometimes more than once, in order to follow this interest. It was immersion in the school and with the people in it that provided any insights that this thesis contains.

Lastly I would like to thank my wonderful family – Ken, Lynden, Talia, and also thank Colin for the sacrifices they have each made on the altar of my wish to write a thesis. They along with uncountable numbers of friends have cheered me along from the sidelines.

Copy editing was thanks to Dr Paul Jones in accordance with the Australian IPEd 'Guidelines for editing research theses'.

Publications derived from this research

Thornton, Julia. 2009. "Framing Pedagogy, Diminishing Technology: Minimum Sensemaking Conditions for Teaching Online." ***In Handbook of Research on Human Performance and Instructional Technology*****, edited by Holim Song and Terry Kidd. Houston; Texas: Texas Southern University.**

This chapter represents an early version of part of this thesis and draws on the same interview material.

Abstract

Until recently, Blackboard has been one of the most common forms of learning-management systems (LMSs) in use in Australian universities. However, it has been adopted and used by academics far less than its proponents had anticipated. The literature of academic use of learning-management systems paints a picture, either of a relatively straightforward understanding of adoption of new educational technologies as an informational problem, or alternatively, of problematic academics who 'resist' using Blackboard. Academics themselves can understand the technology of Blackboard to be obdurate, time consuming and difficult to use.

Drawing on a combination of sensemaking theory, practice theory and the socio-technical theories of social construction of technology and actor network theory, I ask how academics have set about using Blackboard. I clarify how educational technology use in the literature is constructed from diverse perspectives and how users in practice negotiate their way through Blackboard at four levels of encounter: as material infrastructure; as a process of orientation to, and reading of, navigational and interface symbolism; as an individual sensemaking project about representing education; and as an organisational representation and a technical system. Each level contains capacities for disruption and rebuilding of former habits and sense. "Rebuilding" a new interpretation and an effective use of Blackboard by any individual academic is never certain, as at each level different strategies are required, but rebuilding a notion of technologised education by creating "genres of use" explains some of the differential in approaches to Blackboard use.

At a meta level, this process of creating "use" also elucidates theories of action, practice and social change in practice theory and to a lesser extent in social construction of technology and actor network theory, by adding the insights of sensemaking theory to show how academics build their own concepts of use in an LMS, that can appear obdurate and unwieldy to users. The theoretical purpose is to offer an essay in understanding the processes of socio-technical change where change is not necessarily fostered by technological ease or user self-motivation.

INTRODUCTION

> There are these two young fish swimming along and they happen to meet an older fish swimming the other way, who nods at them and says "Morning, boys. How's the water?" And the two young fish swim on for a bit, and then eventually one of them looks over at the other and goes "What the hell is water?" (Foster Wallace 2005)

Online learning technologies now pervade higher education institutions to a greater extent than ever before (Allen & Seaman 2013). In Australia, for example we have seen "the almost universal adoption within the Australian higher education sector of just two commercial LMSs, which are now owned by the same company" (Jones & Muldoon 2007). The main factors which have promoted this change are, according to MacKeogh and Fox (2008a),

> national policies and priorities with regard to economic and social development, beliefs and expectations of the role of education in terms of supporting those priorities, and developments in educational technologies which have the potential to enable the system to achieve these objectives. (p. 136)

Accordingly, the "pressures on institutions to adopt e-learning are substantial" (p. 136). These imperatives have brought with them a requirement for academic staff to increasingly engage with new kinds of online technology. As a result, a major revision to a practice that previously was contained within well established, even traditional boundaries of comprehensibility has become necessary for most teachers in most universities. However, despite the growth of online education and the persistent pressure on academics to adopt it, the rate of adoption has consistently been lower than expected (Easton 2003; Ertmer 2005; Hixon, Buckenmeyer, Barczyk, Feldman, & Zamojski 2012; Newton 2002; Postle & Sturman 2003).

For universities, the fact of rapid technological change, and its aura of inevitability was ostensibly apparent in the rate of uptake of new technologies. One annual national survey, the "Campus Computing Project" (Green 1998) provides a useful chart on the way American universities and colleges embraced information technology. The findings approximate the Australian experience, as so much of the technology adopted on campuses worldwide, for either general use or online learning, originated in the USA [1]. Commencing in 1990, the survey initially tracked the adoption of university-based computers into higher education. By 1998, it had extended in scope to document the take up of Internet-based technologies, like email and web pages. In 1998, with respect to the development of online learning it recorded that "almost one-fourth (22.5 percent) of all college courses are using 'WWW pages for class materials and resources', compared to just 8.4 percent in 1996 and 4.0 percent in 1994" (Green 1998, p. 2). These were generic internet communication tools, not purpose-built online learning software, which at that time formed a minor percentage of the usage. However, by 2012 the survey focussed firmly on Blackboard as the standard learning-management system (LMS), could record both a high point in use (71% of campuses) and a following substantial down-turn in online learning software adoption (Green 2012). Indeed, the use of "…Blackboard including Angel and WebCT (LMSs acquired by Blackboard) as the campus standard LMS fell to 44.8 percent in fall 2012, down from 50.6 percent in 2011, 57.1 percent 2010, and 71.0 percent in fall 2006" (Green 2012, p. 2).

No less interesting for both teachers and scholars of teaching was the way the new technology was heralded as the harbinger of radical change. The rapid initial growth of educational technology was understood by many as potentially institutionally disruptive, first arising from its early dominance as the unitary, institution-dominating LMS, and later, due to its multiplicity of forms as open educational resources (OER) supported by mobile technology and social media. The question, of whether the new technology was to be threat or opportunity was raised very early in the adoption of LMSs (Burbules & Callister 2000). As Hamilton and Feenberg (2005) note, from the 1990s the possibilities of the new technology:

> became embedded in a rhetoric of reform which tended to set traditional structures and practices in fundamental opposition to the next evolutionary stage in higher education. The 'virtual university' stood as a technological destiny, the logical replacement for the

[1] Although no statistics are available for Australia in the 1990s, Bell, Bush, Nicholson, O'Brien & Tran's 2002 educational and administrative software survey results for Australian universities note that "Web CT is the most commonly used system in Australian universities at present – 29 universities, with In-house systems (20 universities) and Blackboard (17 universities) second and third respectively. In a number of cases, more than one system is in use in a particular institution" (Bell et al. 2002 p. 22). It should be noted that most other references to technology adopted by universities in this survey refer to software developed in America. (WebCT – Originally Canadian, in 1999 WebCT was acquired by a Boston USA company, ULT; Blackboard – Blackboard Inc. Washington USA; Lotus – IBM, USA; TopClass - WBT systems, Ireland and USA; Questionmark (QM) Perception – Connecticut USA; Smartforce – California USA; Flexicomm – Australia; Weblearn – RMIT Australia.)

cumbersome, rigid, and anachronistic 'traditional' institution (p. 104).

It was generally understood, in effect, to be a challenge to "the hegemony of the traditional institutions, as an industry" (Abeles 1998, p. 605 see also Marginson 2008). One perspective saw the prospective overthrow of campus-based universities as loci of hegemonic knowledge or at the least, a significant redistribution of power away from them (Selwyn 2012a); others saw universities as vulnerable and likely to be usurped in the face of a welter of uncontrollable and unvetted knowledge sources (Vaidhyanathan 2012; Walsh 2011; Watters 2011). A third standpoint imagined the university as now open to previously undreamt of flexibility and achievement in educational development (Bradwell 2009; Bristow, Dodds, Northam & Plugge 2010; Davis 2010). If some remained sanguine, other scholars were variously intrigued, (Nikolov 2009) or disturbed (Harden 2013) by the possible demise of the face-to-face university.Other commentators saw a larger problem: the challenges and likely failure – not of the university but of online learning, brought about by academics' failure to adapt (Easton 2003; Ertmer 1999, 2005; Hixon et al. 2012; Newton 2002; Postle & Sturman 2003).

However, despite the initial enthusiasm and confidence in the technology to engender change, it very soon became apparent that this was not happening. Many academics were reluctant to teach online (Allen & Seaman 2007, 2012; Maguire 2005). Moreover the uses to which academics put educational technology and LMSs in particular quickly diverged from those sanctioned by the university (Jarrahi 2009, p. 257). At the university in which I was teaching, RMIT University in Melbourne, this was patently clear within a year after introduction of online learning systems in 1998 (McNaught Kenny, Kennedy & Lord 1999). It could be said that the *post hoc* realisation that academic adaptation was very unlikely without substantial assistance to academics, spread at a comparable rate to that of the university's adoption of the software. Two hours training was definitely not enough (Kenny 2002, p. 360-361).

Scholars of education, seeking to clarify the problems for the university in the take up, focussed their attention on academic practice from the perspective of pedagogy and work. As the studies mounted, a variety of reactions to teaching with technology were identified; the one that receives the most attention is the notion that university teachers reject, "resist", or fail to adopt or use technology effectively, let alone understand its educational potential. Thus a poor (or no) uptake rate has at times been explained by reference to an interference of extrinsic factors (Abrahams 2010; Gutman 2012) or to a specific mindset and attitude of the academics concerned (MacKeogh & Fox 2008b), or to both (Bacow Bowen, Guthrie, Lack &

Long 2012; Bingimlas 2009; Hixon et al. 2012). Further, others have claimed that even when academics use online learning technology, their teaching practice remains unchanged (Blin & Munro 2008; Cuban, Kirkpatrick & Peck 2001; Laurillard 2007). The problem is practically constructed as a problem of slowness in the teachers' adoption (Burdett 2003; Jaffee 2003; Kirkwood 2009; MacKeogh & Fox 2008b). And slow adoption is the case irrespective of the ease of access to extensive technologies. High access and low use appear to be a constant, at least over the last decade (Cuban, Kirkpatrick & Peck 2001; Power & Morven-Gould 2011).

Other attributions of cause for the problem of slowness of take up were also identified, though less commonly. When failure of uptake or poor implementation results were not construed as a problem directly attributable to teachers, they were seen as a problem with the technology, arising from design problems (Beetham & Sharpe 2007) or standardisation (Cornford & Pollock 2000), or because of innately disruptive characteristics of the technology and its introduction (Conole de Laat, Dillon & Darby 2008; Flavin 2012; Sharples 2002; Simonson 2010; Williams van Rooij 2011). The poor uptake of online learning technology was also attributed to the effects of working in a university or of poor management. Factors such as: high workload; insufficient time availability; lack of support, either technological or pedagogical; overly instrumental managerial practices; or absence of the cultural norms for the spread of new technology (Coates, James & Baldwin 2005; Anderson 2008; Reid 2012) were understood as organisational failures.

In sum, the introduction of online learning technologies to universities is a site of great expectations and pressure to change practice. This pressure occurs on the part of the universities concerned and on the part of the wider society for whom it is anticipated it will bring benefits. Despite the pressure for change, adoption has been slow and fraught with problems. Whether these are a product of the academic staff or the technology or particular combinations of each remains undetermined. There is no core of consensus understanding it as a problem of the process of adoption of new practice, where "enactments" of education with technology might be modified with use. It is this very tension and practical pressure for socio-technical change that makes the adoption of online learning an ideal site to investigate the process of changing social practices through the lens of the micro-practices and experience of academics.

Research questions

Here, I take the pressure for sociotechnical change contrasted with the less than expected rates of change as a problem worthy of serious and systematic research. In this thesis my concern is that the ways academics have used a learning technology like Blackboard opens up important questions about both academic practice and the social nature and uses of technologyin an overall context of understanding the nature of social change expecially when technology intervenes. In particular I want to examine two interrelated questions: *What, if anything in academics' experience of Blackboard has sponsored changes of academic practice, and how are we to best understand the adoption and use of a new technology in educational practice which enables us to say that we see here the "use" of educational technology*. To address these two questions I frame a series of smaller questions:

- How have changes in the adoption and use of "new" technology, and educational technology been conventionally understood, and are there explanatory difficulties with these kinds of understanding?
- How has academic practice been understood?
- What is Blackboard and how and why has it been introduced?
- How has Blackboard been used by academics and has it led to interesting changes in academic practice?
- How have academics understood and constructed the "use" of technology and what does "working" mean to them?
- What if any are the theoretical implications of this study for understanding the adoption and use of new technology?

There are numerous important intellectual and practical reasons for addressing these questions, and together, the theoretical and the practice settings of the research suggest a complementary rationale for pursuing the research.

On the one hand, important traditions of thought offer highly theorised explanations of technology adoption; these are found variously in practice-theory (Bourdieu 1977; Schatzki 1996), the social construction of technology (Bijker, Hughes & Pinch 1987; Bijker 1997; Howcraft, Mitev & Wilson 2004) and actor network theory (Blok & Jensen 2011; Latour 1991, 2005, especially p. 2; Latour & Woolgar 1979; Ryder 2013; Whittle & Spicer 2008). Practice-theory, especially as an "epistemic-normative concept" brings with it the promise of "getting closer to the 'real' work in organizations" (Geiger 2009). The 'practice' under investigation here is the use made by academics of an online learning technology called Blackboard. While processes of technological adoption and their consequences have been better understood, especially since the development of the tradition of enquiry referred to as the social shaping of technology (SST) – an umbrella term, largely for actor-network theory (ANT) and social construction of technology (SCOT) – little research has been undertaken to establish how users initially comprehend the capabilities of a new technology and build an implementation plan or use for it (Griffith 1999; Vaast & Walsham 2005; Ziamou, Gould & Venkatesh 2012). This is particularly so with respect to the adoption of online learning technology (West, Waddoups & Graham 2007; Zawacki-Richter, Bäcker & Vogt 2009).

As I will argue, there are important *lacunae* in these accounts of how and why new technology does or does not change social practices like teaching. The shortcomings may be attributable to a downplaying of the role of cognition and "sensemaking" – structuring the unknown by placing events into frameworks (Weick 1995, p. 4) - in accounting for disruption to habit and *habitus*, and as a factor in structuring use of new technologies. However, I will argue that the absence of a mechanism for change and innovation can be redressed by the addition of sensemaking theory (Weick 1990, 1995, 2001a; Weick, Sutcliffe & Obstfeld 2005), which opens up new interpretative frameworks.

A second and practical rationale for addressing these questions concerns the way most literature on the adoption of learning-management systems explains the low levels of adoption of the new technology in terms either of the failure to educate and train academics appropriately or else by pointing to various kinds of resistance coming from academics fearful of, or opposed to using this technology. The first kind of explanation implies that more effort is needed so as to increase "information literacy" and by increased training to address deficient knowledge of different types of technology, (e.g., Rader 2002; Southworth, Cakici, Vovides & Zvacek 2011). The second explanation holds the academics at fault – so, better models of adoption are urged, and ones that focus on overcoming "resistance" (Lin, Singer & Ha 2010, p. 40; MacKeogh & Fox 2008b, p. 5). Notably, both accounts rely on "deficit models" of the acquisition of use of technology, accounts that describe the problem as an absence or flaw in either knowledge or character.

In the remainder of this chapter, I briefly outline the ramifications of both the theoretical and the practical contexts of the questions of interest in this research, to illustrate how the three related theoretical orientations I have chosen can serve to illuminate practical problems and how the practical setting illustrates the operation of the social routines and innovations the theories are formulated to address. The three orientations do not ascribe "causal" chains in the form of linked, discrete actions. Rather, they attempt to integrate social action with its technological products, and to explain changes in this nexus. My theoretical aim, in short, is to understand in the particular setting of academic uses of Blackboard, the extent to which each of these approaches is germane to providing an adequate account of academics' experiences of the technology and of their various moves to accommodate it. My aim in effect is to provide a theorised account of the development of technological use.

Theorising practice

The relations between people and their artefacts would, on the face of it seem to be profoundly different in different settings. The experience of a group of academics using Blackboard, largely to produce "blended" learning, where face-to-face teaching is supplemented by online support appears quite unlike, for example, Bourdieu's (1977) setting for his influential theory of practice, namely the Kabyle, a community of Berber located in the north of Algeria. Practice-theory has undergone a resurgence over the last twenty years, particularly in organization studies (Corradi, Gherardi & Verzelloni 2010; Geiger 2009), but also in theories of education (Segal 2010), and of technology, (Leonardi & Barley 2010; Schatzki 2003), though as recently as 2005, Walter Nord (2005) could still write of a notable shortfall in recognition of Bourdieu and practice-theory within management and organization studies. It is these rich intellectual traditions and the prospect of bringing them together in one study that makes the theory of practice one point of departure for this investigation. The purpose in theorising practice itself is elegantly summarised by Gross (2009):

> Practices are generally understood as forms of doing or ways of acting and interacting that appear within particular communities or groups; depend on shared presuppositions and assumptions; often have a significant corporeal or material dimension; and unfold in individuals' lives as a result of active, creative, and less than fully conscious puttings into play of those presuppositions and assumptions in the context of various and intersecting sociobiographical and interactional exigencies. (p. 365)

The underlying problem addressed by the thesis is how new practices form, especially in the context of a radical departure from the "normal" way of doing things – of a disruption to practice as usual. This entails reconsidering Bourdieu's early formulation of practice as a meaning-making process, continuous with itself in the recasting of old meaning, but continually evolving in response to contingency with unfolding events (Bourdieu 1977, p. 78). This articulation of social change, while it might account for a good deal of continuous change, pays insufficient attention to either the possibilities of a radical break or collapse of meaning, and the processes which recover it; nor does it pay sufficient attention to the emergence of novelty, perhaps more tenuously connected to old practice than Bourdieu would have us understand (Chu & Robey 2008). The possibility of collapse of meaning or the emergence of novelty also calls for a theoretical account of the re-emergence of meaning.

The place and primacy of individual agency in the formation of social practice and meaning as distinct from diffuse allocation of agency across the entire system of "sociality", or "socio-technology" is a matter of ongoing disputation especially between practice theorists, and sensemaking and SST theorists. Two principal queries emerge. While the various forms of practice-theory (here I include their socio-technical cousins) distribute the locus of sociality to different nexuses – between people and people, within communities of practice, or arising as an association of people and things – they tend to leave untouched the quality and ease of 'readability' of the social from these locations as cues to what to do next. The second question relates to the emergence of novelty. Practice-theory is centrally concerned with the reproduction of social forms: Often change can be depicted as a gradual, evolutionary process (Bourdieu 1977), or studies might show that it is discontinuous in some aspects and continuous in other aspects of the same "bundle" (Schatzki 2005, p. 475). Yet explanations derived from the broad family of practice theories struggle to account for such fundamental divergences in change mechanisms.

However, macro-level questions suggested by this disputation around what instigates a change of practice and what structuring holds a practice together are too large to be addressed directly by this thesis. Such general theoretical concerns about dissolutions and formations of practice can, however, be dealt with indirectly through comparing the various strands of practice-theory with explanations derived from the two socio-technical theories – actor network theory and social construction of technology – along with the more cognitivist approach of sensemaking theory, each of which is employed to illuminate the particular.

Theorising technology

Both the social construction of technology perspective and actor network theory specifically include the role of objects and artefacts in their accounts of social existence. The former emphasises use of a technology and how this is shaped through the ways it is collectively understood, while the latter envisages technology use as occurring in a decentred web of agentically equivalent relations between the technology and the people who use it. SCOT is ontologically constructivist, maintaining a distinction between the material and the social and attributing change to shifts in collective social construction of “stabilising” meaning about technology; ANT, in contrast, strives for anti-essentialism and thus resists privileging one part of the network over another (Whittle & Spicer 2008). Although anti-essentialism of this type can reveal important relationships between the different parts of the network, it constrains the insights within primarily descriptive accounts, leaving us largely unable to explain the origins of change to networks. Therefore, ANT cannot explain how the same technology in the same setting can be interpreted and used in different ways (Restivo & Croissant 2008; Whittle & Spicer 2008). Here, too, there is a similar tension to that occurring in the two forms of practice-theory identified by Geiger (2009) who identifies differences in practice used to describe “micro processes” and practice-theory which refers to a “social construct” that has “emerged over time, which reflects, sustains and reproduces norms, values and knowledge” (p. 133).

In the gap between the social construction of technology perspective and actor-network theory, differences emerge between collective agency and meaning ascription; on the one hand, separating the social from the material; and on the other describing the technological field as an interlocked construct of socio-technical meaning, eliding the social and the material together. In particular, they differ in the role each ascribes to cognition, with actor-network theory expressly rejecting it as “essentialist” and foundationalist.

Other literature that theoretically parallels the social construction of technology perspective and actor-network Theory provides a bridge between technology and cognition. Several of these studies adopt one or other of these approaches as the underpinning framework, but they place it alongside a complementary theory. For example, Orlikowski and Gash’s work on technological framing (Orlikowski & Gash 1994) combines an actor network based orientation with sensemaking theory; that of Collins (2001) seeks to redress what he sees as the under-theorising of the role of cognition in the two socio-technical theories of technology, especially by reintroducing an idea of expertise, adopted from Dreyfus and Dreyfus (1980) but much modified. These theorists and others like them provide a way to understand specific mechanisms of the development of use, for instance, the development of expertise or the effects of attentional framing on the origins of use.

In particular while the practice-theory of Bourdieu and the technology theories of SCOT and ANT are mainly concerned with mapping continuities, sensemaking theory provides a demonstration of, and an explanation for breaks in meaning. The SCOT perspective and ANT provide important accounts of the relationship between technology and organising, and form an intellectual substrate to most studies in the area. My intellectual starting point is to fill in the gap apparent in Bijker's (1997)implicit foundational question, "what structures technology use?".

Bijker's social construction of technology analysis of the adoption of technology assigns the decision about what constitutes technological use to "relevant social groups", and goes no further. Yet, "relevant social groups" is an amorphous concept and is questioned by many scholars. In particular, who is "in" and who is "out", of the circle of relevance is an abiding problem, as is the idea that they represent unproblematic coalitions of interests (Jasanoff 2004; Restivo & Croissant 2008). Moreover, Pinch and Bijker 's (1984) description of the process of structuring use has its critics (Jasanoff 2004; Orlikowski 2008). Furthermore, Bijker's emphasis is on explaining technological change by showing how social change concurrent with technological change shapes the development of technology. My emphasis, by contrast, is on understanding the development of social change in the context of a change of technology – what people do in a situation of enforced use and limited choice of technology, and how they accommodate it. My approach is more aligned to that of Boudreau and Robey (2005), who are interested in the role of human agency in shaping the enactments of a computer technology newly introduced into an organization. Thinking this way:

> [E]very engagement with a technology is temporally and contextually stabilized-for-now, and thus there is, in every use, always the possibility of a different structure being enacted. (Orlikowski 2008, p. 273)

Adding cognition and sensemaking back into theories of technology, in a manner consistent with Weick (Weick 1995) and Collins (Collins 2001; Collins & Evans 2009), can help to account, not only for some of the processes of building practice, but also for individually different solutions to the same problem. This helps to explain the way general use becomes the pluralised “uses”, which over time are refined and reified, evolving away from shared semblances into new and separate, socially sanctioned standards of use. As my research illuminates, individual sensemaking manifests itself in a number of different approaches to academics’ understanding of the purpose for, as well as use of Blackboard in teaching. While different, purposes and uses are not infinitely different; they are sufficiently regular to be grouped into types that I have christened “genres of use”. It is for these reasons I have turned to sensemaking theory, for Weick’s sensemaking can also be used to provide insight into the processes of crafting such genres, and may yield both a starting point and rationale for their existence.

Weick is helpful in other ways. As analogous with theories of evolution, if the practice theories of Bourdieu and Giddens and the early work of Schatzki parallel the development of meaning systems with the Darwinian idea of continuous adaptation to environmentally produced events, Weick, by contrast, presents an idea of the management of meaning analogous with “punctuated equilibrium”, the theory that bursts of disruption are followed by the reestablishment of stability and a new normalcy, as was first espoused in biology by Stephen Jay Gould (1990). Bourdieu entertains the idea of an epistemic break but it is more at the societal level of challenging the “public objectivity of an already constituted discourse” (Bourdieu 1977, p. 170), confronting an orthodoxy with a heterodoxy.

Weick, on the other hand, allows for challenges and breaks to intra-subjective meanings, but with attention to social consequences. Bijker’s “social construction of technology” approach sits somewhere in the middle. He understands technological change as something that draws forth a new meaning, followed by stabilisation of that meaning, but treats the technological change which produces it as additional novelty to life as it is, not as an event which carries with it the potential for an epistemic break. Some recent exponents of practice-theory have made more of incorporating the discontinuity of the radical break understood this way than earlier practice theorists entertained. Segal (2010), for instance, blends practice-theory with a Heideggerian idea of disruption, which he links, inter-alia, with Weick’s approach, and applies it to organizational management by documenting the case of a CEO who had an experience of surprise and derailment. Segal shows that an epistemic break also constitutes an existential break. Meyerson, his protagonist, experienced, along with the surprise, a profound sense of subjective strangeness.

> Meyerson was in the absurd. He felt like a stranger in a world that was once familiar. As he says of himself: 'You don't get it. Maybe you ought to get out of this business. You're like a highly specialized trained beast that evolved during one period and now you can't adjust to the new environment. (p. 383)

In this thesis I understand the introduction of the technology of online learning to be a radical break with the teaching practice of the past, requiring radical readjustment of ideas to accommodate it.

The third framework I use is sensemaking theory especially as it has been developed by Karl Weick (1979, 1985, 1990, 1995, 2001b; Weick & Sutcliffe 2007). It describes cognitive mechanisms used to overcome such breaks and restore the impression of a continuous and consistent stream of meaningfulness to events (Weick 1995, pp. 17–62). Sensemaking also, as Orlikowski (2008) points out, sympathetically extends the reach of practice-theory. For practice-theory, the rules constituting structure lie in abeyance until they "emerge as people interact with whatever properties of the technology are at hand, whether these were built in, added on, modified, or invented on the fly" (p. 260). This "focus on emergent rather than embodied structures … allows us to frame what users do with technologies not as appropriation but as Enactment" (p. 261). This is extremely useful as,

> [f]ocusing attention on how structures are constituted and reconstituted in action acknowledges that while users can and do use technologies as they were designed, they also can and do circumvent inscribed ways of using the technologies – either ignoring certain properties of the technology, working around them, or inventing new ones that may go beyond or even contradict designers' expectations and inscriptions. (p. 261)

In addition, Weick's approach to sensemaking allows a role for cognition in change of practice and in human relations with technology to a degree that the other theories of changed practice with technology do not.

Having described something of the theoretical framework of my research, I want now to move to the research site itself – teaching online – which I have used as the general case of changed practice, and to show some of the reasons for its significance. In the world of academia, the interrelated issues cast above as a theoretical problem of changed practice becomes recast as a problem of technological use, sometimes expressed as technological adoption.

On Method

Teaching online is a recent site of revolutionary change to the practices of teaching that have been established, mediated and conducted in more or less the same way since Socrates (Brent 2005). The pressures on universities to adopt e-learning technologies have profoundly changed both medium and method, however. Explanations of the degree of upheaval and rapidity of change often fall back on interpretations of their inevitability.

It is apparent that the requirement to adapt previous forms of teaching to new tools or media, (depending on how one thinks of online technology), began with great expectations, both negative and positive. And the new imperative to adapt was underpinned, it seems, by the willing incorporation into almost all analysis of the belief that technology was an unstoppable force (Brynjolfsson & McAfee 2011). Leonardi (2009) argues that this is based on two propositions:

> The first suggests that technological change occurs independently of human action. The second argues that organizational change is caused by the introduction of a new technology into an established social system. (p. 280)

Despite debate raging in theoretic academic literature as to the plausibility of technological determinism (Pinch & Bijker 1984; Smith 1994; Winner 1999; Woolgar & Cooper 1999), the academic questioning failed to make it over the parapets of the ivory tower and into common understanding. The adoption of change to technologised online learning systems was, therefore, understood by university administration as it was elsewhere, as inevitable, and following the logic outlined by Leonardi, above, so was also changed teaching practice. Nigel Thrift (2006) characterizes management thinking of the 1980s and 1990s, the period that produced Blackboard as an educational technology, as follows:

> Not unreasonably, it was assumed that placing people in new combinations that were simultaneously rearrangements of bodies and of environments would produce new and reproducible tacit knowledges arising out of shifts in the practical intelligence needed to be successful at practical problem-solving. (p. 286)

It was only after institutional adoption that it became apparent that this was not the case. Thus, prior to introducing online learning technology, universities had accepted both of Leonardi's *a priori* propositions, which obviated the need for them to consider beforehand either the inevitability of adoption or how use might develop separately from adoption. The question became one of not whether, but how change would occur. This question was understood to have quite different priorities, depending on whether one saw it from an institutional or from an academic perspective.

Outline of the research project

I have confined the scope of my investigation to Blackboard with some limited attention to supporting or related technology that was introduced to the university at the same time. I chose Blackboard as it remains one of the most widely used of the learning-management systems, reaching a peak circa 2008-09, though its prominence now is beginning to fade (Allen & Seaman 2013; Green 2012; Hill 2011, 2012). Blackboard is both ubiquitous and persistent, retaining a large following even in the face of major changes to educational technology. Most academics who have used learning-management systems will likely have experienced Blackboard or one of its earlier incarnations, WebCT. In this regard, an examination of Blackboard is an examination of a common site of academic change, and despite recent moves to university wide adoption of more flexible technologies (Peng, Su, Chou & Tsai 2009), it is likely to linger in legacy form for some years, given the size of investment in it. In addition, it is a relatively rigid, structured technology, unlike the more recently introduced social media for teaching and learning. This means that users are forced up against the constraints of technological structure early in their encounter with it, and must find a way to deal with this. From a research perspective, such forcing is useful because it tends to make visible that behaviour which might otherwise be difficult to detect in a form of technology which facilitated easy adoption. Thus, to take the definition of the problem as this is characterised in much of the literature, it is one of unskilled or recalcitrant academics working with a rather rigid and obdurate technology.

Limiting the focus to a single technology confers other research advantages. First, it helps to define and circumscribe the meaning of “online learning”, a notoriously difficult general proposition, given the plethora of types of technology and styles of use (Bacow et al. 2012; Gunasekaran, McNeil & Shaul 2002; Januszewski & Molenda 2008). Second, it confines the development of the use being explored to one kind of technology, thus assisting with answering that aspect of the research question concerned with why people who are using the same technology develop different interpretations and uses. The rapid early adoption of

Blackboard in particular renders it a figurehead for technological change, making it an ideal site for the examination of social change in the context of rapid technological change.

The sixteen academics I interviewed and observed were drawn from similar, non-technical disciplines within a single school within a university. Partly this occurred for reasons of ready access to the cohort, and my long standing association with the organisation, which provided me with background understanding of the specific information needed in interviews and observation, but this also meant that the cohort members themselves shared similar backgrounds and intellectual predilections, with less variation than would be found in a cross-disciplinary study. A degree of homogeneity among respondents and their engagement on very similar tasks made it easier to discern differences in work patterns and interpretations in their approach to technologizing teaching. These interviews were supplemented by interviews and personal communications with four other staff in technical support or management positions.

In the university setting I have chosen, this group of people (academics) had access to a specific technology (Blackboard) for a particular form of teaching process, which enabled certain work practices but made others difficult. Nevertheless, their access to social cues for how to use it was variable; they varied individually in the types of skills they had already mastered; and furthermore, envisaged different purposes for the technology – each of which appeared to inform the genesis of differences in practice.

The key research questions require an account of both experience and disruptions to experience but this is fraught with problems as the subjective experience of others as well as one's own are extremely difficult to observe as we are in it, functioning with it, and can only reflexively understand it. As Segal (2010) notes,

> [C]oncrete experience does not simply make itself explicit for examination. As Heidegger (1985: 36–69) maintains, everyday experience is for the most part too close to Dasein or the human being for the human being to even notice. Martin Heidegger claims that to begin with immediate experience is to be able to think in moments of disruption or disturbance of the everyday. For it is in moments of disruption of the everyday that the everyday announces itself as an explicit theme for thought. (pp. 379–380)

The reason for choosing experience as the basis of study is in accord with the emphasis on embodied experience as the basis of understanding and meaning making in practice-theory and sensemaking theory, although somewhat less so in SST theories, which tend to trace relationships. Accordingly I have used a general phenomenographic approach, both interviewing and simultaneously observing academics experience of using Blackboard, shaping my research encounters around teachers showing me their most interesting or favourite online course as they moved around it or worked at adding to it. Experiential research is supplemented by primary and secondary documentary research to trace the project of the introduction of Blackboard to the university, the reasoning behind it and expectations and discoveries along the way.

Ethical issues

The fact that I was interviewing peers and work colleagues raised ethical issues, particularly those of retaining the trust of people whose work practices were revealed to me. At a peer-to-peer level this involved paying attention to only sharing positive teaching or technical ideas should they come up in the course of the interview; retaining anonymity about who had contributed them; and non comparison of academics' work. It also entailed providing written assurance that this information would not be passed upward in any recognisable way to people who might be in management positions senior to the respondent and who have a role in the reading or production of this thesis. As interviewees were colleagues, relationships were less "disposable" than those with temporary research subjects might be, and investment in trust, greater, but pressures to retain high ethical standards were correspondingly greater.

Limits of this research

Any methodological limitations in this study arise from the ongoing debate about the role of a case study approach and the extent to which it can be expected to produce the generalisations promised by other, more broad-based research techniques. While I proceed on the basis that the specific can illuminate the general while not itself being generalisable, I recognise that this is not a position necessarily shared across the disciplines on which this thesis touches.

Limitations of method arise from the difficulty of "translating" experience, an essentially private matter, and from a limited number and range of types of academics interviewed, which was intentionally kept low and homogeneous, in part for the practical reason of controlling the vast amount of analysable information that can arise from even a single observational interview, and in part because a certain homogeneity made it easier to see small differences in approach between the "same" people using the same technology.

The structure of the thesis

In Chapter One I describe and examine the various theoretical perspectives brought to the understanding of teaching with technology by more instrumental writers, intent on solving the practical problems of non or low use of technology, and particularly online learning technology. In addition to exposing conceptualisations of use, within this discussion is a range of opinions on the place of structure and agency as well as a tendency to understand non-use as a "deficit" problem.

In Chapters Two and Three I set out the underlying assumptions of a social construction of technology perspective, actor network theory, practice-theory and sensemaking theory – the most influential bodies of literature – with a view to comparing them with practice based research which has used experiential approaches to examining the adoption of online learning technology. Along the way I aim to clarify how the problem of learning to use technology has been described by those theories and theorists. I follow this in Chapter Four with a discussion of method. In Chapter Five I turn to a history of Blackboard, to describe Blackboard and its introduction to the university, and the expectations that attended its introduction, with a view to how these helped shape organisational conceptions of use. Chapters Six, Seven and Eight concern the responses of the academics I interviewed on their working with Blackboard and associated technologies, and discuss in depth the implications with respect to disruption to current practice and how this disruption was overcome by the development of new routines and novel innovations to produce teaching and their own use of Blackboard. I conclude by discussing the particular theoretical implications of this research.

CHAPTER ONE: CONSTITUTING THE PROBLEM: "USE" AS IMPLEMENTATION.

There is a central definitional problem at the heart of the literature on educational technology use. As I shall describe further on, the metalevel theories of technology in society have engaged with the problem of how "use" of technology might be constructed as a sociological phenomenon, requiring explanation of the relationship between society and the technological artefacts it has produced, along with an account of what sorts of social practices and beliefs might build up a form of socio-technical action that becomes understood as appropriate "use". The problem as it is constituted by these literatures is to understand what technological use means, in various settings, and how it might be constituted and shaped by properties of cognition, social life, technical design and macrolevel societal and organisational pressures. It asks, "How does technological use arise"?

In contrast, the meso level theories such as those discussed below, by and large take the idea of "use" as self explanatory. Generally, for these writers, it means doing what is expected, as determined by the technology design, or by the organisation implementing it. Taking technological use as an unproblematic sociological phenomenon, not in need of explanation, what they try to explain instead, is the rate of change from non-use to use, or failing even this, simply how to make the transition from non-use to use. The difficulty with these descriptions of use is that lacking a well developed sociological theory of technological use, they rely instead on unexamined premises about the nature of technology and about human nature, and about the degree of complexity of social, technical and cognitive processes that might be engaged by working out use. They yoke these premises on to the behaviours that they variously observe and cover gaps in explanation with deficit theories. It is these qualities of this second body of literature that have led me to label it as instrumental. Embedded in these explanations are tacit theories of technology use and a variety of attributions of cause of low use. It is these implicit theories that I try to uncover in this chapter. Each type of literature renders them differently. In what follows I examine that mid range literature which describes the problem of academics' uptake of on-line learning technology, focussing on Blackboard where the literature allows.

The purpose of this approach is not simply to locate a 'gap in the literature' but to describe how the whole orientation of much of the literature is to a teleological or goal oriented approach to technology use, positioning it as normative and desirable. Ultimately I want to suggest that rather than focusing on the non attainment of normative goals, an inductive and bottom up approach to examining technology use which describes what people do, rather than assumes what they ought to do, is the better means of arriving at an understanding of how use is constituted and thus to clarify those factors which might cause difficulty in using educational technology.

Writers like Dahlberg (2004), Conole (2007), Hannon (2008), and Reid (2012) have noted three major kinds of preoccupations in the literature on online education. Firstly there is a body of work which worries about the skills and motivations of users, including teachers, to embrace the new technology. A second body of research and commentary enquires into the capacity of “the organisation” to enable the adoption of the new technology. Finally there is another body of work which stresses the determinative role played by the technology itself. I propose to discuss these three kinds of research and commentary in sequence. As I will show the proponents of each of these perspectives each look for explanations for the problem ie, less than enthusiastic adoption of the online teaching technologies, and do so in terms of deficits. These deficits can be found in the academic staff, the university as an organization, or in the technology itself.

Deficit theories are predicated on the existence of gaps. However, closer scrutiny of these three orientations reveals that to describe the gap, they focus on specific interpretations of knowledge and of the nature of agency, the latter in particular creating major divisions in approach. Moreover the problem orientation in all these orientations is to represent non-use as a deficit in some constitutive characteristic. Where deficits are presumed to be a property of academic staff, explainations of the non-use or ineffective use of online learning technologies are in terms of either a skills deficit, insufficient knowledge of correct teaching method, or are attributed to a lack of motivation. These, especially where teachers are concerned, may also attract discourses of blame. Where, deficits are understood as located in organisations they are attributed to insufficient management methods. Those who focus on the university *qua* organisation also worry about the capacity of managers and organizations to embrace the kinds of technology deemed essential and therefore allude to deficits in conditions largely beyond the control of the user. Where technology is deemed to be the source of the deficit, the location of the gap is to be found in the working of technology itself or some aspect of it, like badly designed software that lacks ease of use or usability, or as user studies also suggest, aesthetic considerations or playfulness. For these writers, design produces use. Deficit theories begin by attending to some failure in the agent under discussion and generally underplay the effect of gaps in the smooth flow of interpretable events caused by novel occurrences, in this case the degree of disruption and size of the problem presented by technological *change* itself. Deficit theories also ascribe varieties of deficits ranging from the passive to the active which can be illustrated via the various ways the teacher-as-user has been represented. The first and most obvious "gap" is understood to be a property of the individual user, or academic staff member, and is described as occuringbetween the kinds of knowledge or understanding possessed by the user and the relevant behaviour required in rising to the challenge of using a new technology

The teacher as user

Absence of skill or information is a problematisation of teaching with technology which constitutes both the problem and the solution i.e. the application of technique acquired by training. Proponents assume the problem is "not knowing enough"; the solution is "learning more". Much of the actual training associated with LMSs like Blackboard rest on this assumption. It is not necessary to attend LMS training classes to find this out. The online web-page based instruction for staff found in open access form on many university web sites treat learning to use LMSs as the application of "technique", and provide a great deal of information on categories of function of the LMS in question, based not on a workflow integrated with the purpose of use, but on an assumption, as Weick (1995) put it, that the problem is a problem of ignorance stemming from insufficient information (pp. 97–99). This methodically instrumental approach assumes that more carefully organised and hierarchically presented technical information will solve the problem. The solution involves generating what Simon (1996) has called "cookbooks", a style of solution that arises more or less by metaphor with computer instructions from the field of information science.

The cookbook perspective

So much of what is written to teach academics about online teaching technologies in all its forms, comes in the shape of normative exhortations and recipes. Herbert Simon (1996) used the idea of "cookbooks" as a critique of the way the study of design was not taken seriously by universities. For Simon, the "sciences of the artificial" was the study of matters arising from human production as opposed to the stuff of nature. He observes that:

> In terms of the prevailing norms, academic respectability calls for subject matter that is

intellectually tough, analytic, formalizable and teachable. In the past much if not most of what we knew about design and about the artificial sciences was intellectually soft, intuitive, informal and cookbooky. (p. 112)

“Cookbook” instructions on how to teach with technology describe technological interaction algorithmically, manifested in guides and lists of instructions that are short, symbolic or generic sets of instructions which incorporate an idealised work flow portrayed as a sequence of changes which are more or less linear, although some paths may be simultaneously pursued. Designed to orchestrate mastery of “the machine”, they substitute genericism over a disciplinary orientation, being produced by IT departments, technology education developers, and University staff training units and the like.

Some of these cookbooks come in relatively simple and prescriptive forms (e.g., CQUniversity Teletutorial Guide, 2010; Kahn, 2005; Herrington, Oliver & Herrington 2007 and Oliver & Herrington, 2001). The CQU Teletutorial Guide (2010)succinctly demonstrates the instrumentality of the knowledge to be conveyed:

> This Teletutorial Guide seeks to explain what should be done to prepare and deliver a teletutorial, when things need to be done, and who should do them. (p. 4)

“Cookbook” instructions often take the form of some kind of list, though lists are also frequently to be found on university websites, giving instruction on how to use online tools and on the attendant policy pertaining to its use (McIntyre & Bennet 2010).

Much of it is oriented to “how to...” without spelling out any sense of the “why...”. It is contextless in that information is typically about a step to add or correct an LMS entry, but does not describe its part in a process or point out the rationale for it. The Melbourne University video recording, *Introduction to the LMS* (University of Melbourne 2012), for instance offers entirely technical advice on how to navigate the LMS and its portal website. It almost completely avoids reference to teaching. In many of these guidebooks where instruction takes a less virtual form, the varieties of technology are the whole of the focus (Bates & Poole 2003; Dunn, Wilson & Freeman 2011; Manning & Johnson 2011). However, there are also LMS specific guides, such as Southworth, Cakici, Vovides, & Zvacek (2011).

Sometimes the guide describes specific use of a single LMS, like Blackboard e.g., Epping (2010). On occasion, the guide can be almost totally isomorphic with the technology, the structure of the course "skills" replicating the generic layout of Blackboard's information architecture e.g., Leo (2011). Other guides are quite sophisticated and complex but still qualify as a "cookbook" by virtue of concentration on technique. Some of this technique involves "learning" the various technical genres of the technology, for example, Clark and Mayer, (2011); Gosper, (2008); Iskander, (2008); Okada and Connolly, (2008); . Some can be devoted to the learning of appropriate personal techniques for interaction, for example, Anderson, (2004); Rudestam and Schoenholtz-Read, (2010).

These guidebooks and web-pages have tended to leave out pedagogy. By "pedagogy" here I mean some explicit or implicit theory of the educational action which leads students (or in this case, adult learners of a technical system, so rightfully "andragogy") to a greater understanding of the proposition or system at hand. Implicit pedagogy such as whether a teacher is "student centred" or not can usually be inferred by the way knowledge is described and by the method chosen to impart that knowledge. In the case of these sets of instructions, there is frequently no apparent theory of educational action other than that they be read and understood. Learning about online learning technology is mostly understood as an organisationally internal matter and is represented as a matter of professional development rather than as a broader academic or educational discipline. For instance Adams and Morgan, (2007) make the distinction between "first generation" technology driven approaches to e-learning and "second generation" pedagogy driven approaches. They do so using a business process re-engineering discourse, unconsciously rationalising the whole accompanying organisational change as if from the foundational metaphor of the manufacturing process line - technologising it. This is exemplified in their finding that:

> The key learning, however, is that the tighter second generation e-learning programs are integrated with daily work practice through an accountability loop strategy (i.e., making the learners accountable for demonstrating what they are learning and tracking the outcome in quantifiable job impacts), the greater the impact on job results. (p. 175)

The treatment of mastery of online teaching as a skill has been carried over from its technical origins in computer based training and also from the fact that the mastery of computers is understood as a technical skill. This has resulted in a method stressing the reproduction of online teaching as a technical skill. This tendency has been remarked upon by Brynjolfsson and McAfee, (2011). They make the point that "the computer like all general purpose technologies requires parallel innovation in business models, organizational processes, structures, institutions and skills" (p. 442), the narrow focus on technique arising from this technical orientation tends to exclude reference to the need for changes in organisational settings and to pedagogical context. They go on to say that often these intangible assets are ignored.

The orientation to social change that is implicit in "cookbooks" draws from an underlying business or manufacturing process metaphor. Change is understood as a continuous process of transformation and modification of teaching process, best achieved through "inputs" of information. These guidebooks and lists of instructions are not simply examples of short-sighted pedagogy or organisational muscle flexing, they constitute what Becker and Clark (2001) call "little tools of knowledge" capturing a particular culture of understanding the meaning of technology and technology use. Cookbook formulations of the "how to…" kind, develop and encode the ways in which a "new" academic practice is to be understood. They mirror the layout of learning-management systems in setting out "steps" and they replicate and confirm that this is a correct or at least an explicable arrangement. They act as a template for practice which reduces choice and simplifies a multitude of possible approaches down to an acceptable one which is mutually understood and, therefore, shareable. This construction of non use as a deficit understands it as the absence of knowledge, an absence which is elaborated upon by the "information literacy" approach.

Information literacy

The impetus for information literacy grew out of library science and was formulated in a somewhat *ad hoc* way into an attempt to solve the problem of library users finding materials on newly digitised systems. The first professional body to produce an agreed, albeit, minimalist definition of information literacy was The American Library Association (ALA). In 1989 it designated the information literate as a person who could, "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA Final Report, 1989, quoted in Da Costa, 2011, p. 35). Da Costa credits The Society of College, National and University Libraries (SCONUL) in the UK, with promulgating the information literacy "cause". The SCONUL Advisory Committee on Information Literacy, in 1999, distinguished between information technology skills and information handling skills. The former consist in mastering the use of computer hardware; keyboards, mouse, peripherals; and standard software and network applications. The latter is comprised of skills which more closely approximate those to do with seeking, judging and presenting information; finding information sources, and developing evaluation criteria, navigation methods, manipulation techniques, and working on presentation issues (p. 3). A series of refinements of the body of necessary knowledge required for information literacy specifically, followed. They tended to de-emphasise the acquisition of technical skills in favour of taking a more generally educationalist approach to critically seeking and using appropriate information (Bawden 2001; Marcum 2002; Webber & Johnston 2000). As Tuominen, Savolainen & Talja (2005) say, "Many, or most, texts on [information literacy] consist of normative prescriptions of information skills needed in modern society" (p. 330).

Lists of attributes of information literacy (of which there are many) focus on the processes of information collection and assessment rather than any user goals for it, but still to understand information literacy as a property of the user. Information literacy tends to focus on the quality of the user rather than on the quality of the design of the technology they are using. Indeed Webber and Johnson (2000) remark, "A distinctive feature of definitions of information literacy is the tendency to personify it as a set of personal attributes" (p. 382, see also Tuominen et al., 2005, noting information literacy "as an attribute of individuals" p. 330). Moreover differences in the work context or professional groupings of users have been diminished in favour of overarching generalist descriptions of digital and informational literacy.

So: who or what is an information literate person? In 1994, Doyle created a broad list of qualities and attributes of the information literate person; as someone
who:

- recognises that accurate and complete information is the basis for intelligent decision-making:
- Formulates questions based on information needs
- Identifies potential sources of information
- Develops successful search strategies
- Accesses sources of information including computer based and other technologies
- Evaluates information
- Organises information for practical application
- Integrates new information into an existing body of knowledge
- Uses information in critical thinking and problem solving". (Doyle 1994, p. 3)

This list points to a vision of information literacy as a "critical path" process, with sequential rational steps in the building of knowledge. Other lists are less linear and focus more on the person. For instance, Bawden and Robinson (2002) quote Bruce, also in 1994 as giving “seven ‘key characteristics’ of an information-literate person”. This is someone who:

- engages in independent, self-directed learning;
- uses information processes;
- uses a variety of information technologies and systems;
- has internalized values that promote information use;
- has a sound knowledge of the world of information;
- approaches information critically;
- has a personal information style that facilitates his or her interaction with the world of information. (Bawden & Robinson 2002, p. 298)

Rader (2005) adds a degree of contextuality to her list, while still retaining an orientation to personal attributes.

The following components define information literacy in terms of an individual’s ability to:

- determine the extent of the information needed
- to assess the needed information effectively and efficiently
- evaluate information and its resources critically
- incorporate selected information into one’s knowledge base and value system
- use information effectively to accomplish a specific purpose
- understand the economics, legal and social issues surrounding the use of information access and
- use information ethically and legally. (Rader 2005, p. 20)

There has been some criticism of this trait approach to thinking about information literacy. Webber and Johnson (2000) say that the focus on a list of skills to be mastered tends to lead to a “tick the box” approach which assumes not only that skills consist of small discrete units, but that once mastered, these skills are assimilated and do not need to be revisited. This, they argue, not only fragments the field of knowledge but

> reflects a ‘surface learning’ approach (with a short-term focus on the task in hand) rather than a ‘deep learning’ one in which the students are encouraged to reflect on and contextualise what they are learning, in a manner that enables them to use the knowledge or skill outside the task in hand. (p. 384)

Webber and Johnson also critique a lack of disciplinary context and the surface approach to “skills”. This they say, “may also reinforce academics’ preconceptions that it is not a proper

subject and that it can be picked up in a few hours" (p. 394).
Finally and centrally information literacy has also been accused of leaving out everything that is important like the social and cultural context of computer use as well as the technological context (Julien & Williamson 2011; Lloyd & Williamson 2008; Poll 2011; Tuominen, et al., 2005). Information literacy has been taken to task for conceptualising "information use" as a black box, the purposes for which only the user is privy, thereby neglecting the experiential and motivational side of information acquisition. A black box approach encourages the conceptualisation of "information" as an object to be processed, and indeed, a number of studies criticise the treatment by information literacy studies of information as a "thing" (Pawley 2003, p. 425). Critics label its conceptualisation as "information processing". Markum (2002), associated with initial development of communication as information processing, "which established the fundamentals of signals, bits, measurement of information, and the role of entropy in the information process" (p. 3). (For a history of Information theory and principles and how "information" was objectified, see Gleick, 2011). Counter to this reductionism, Tuominen et al., (2005) insist

> that literacies cannot be separated from the domain specific sociotechnical practices that give rise to them. Information literacy is embedded in the activities of particular groups and communities; that is, information skills evolve in disciplinary and other contexts, and they are practiced by communities using appropriate technologies. (p. 341)

In sum, while the various information literacy approaches to assisting people with technology use are focused on the active using agent, for example, a teacher, they lack any real appreciation of the user as a real person in a specific social and historical place.

In both the "cookbook" and the information literacy approaches, the locus of the problem is the individual user, but the attribution of cause is extrinsic. It is attributed to a lack of opportunity for, or to incorrect conditions for acquiring information. The internal condition of the user is understood as given. Agents are autonomous, as implied by the "cookbook" approach or reflexively autonomous to some degree as implied by information literacy. Neither approach attempts to describe the quality of users' interior subjective or cognitive states. Nor is there any acknowledgement of the relevant phenomenological perspectives that imply embodied knowing, the role of subjective experience or the role of social context in assimilating knowledge. As for a theory of action to account for technological use, both cookbooks and information literacy concentrate on the operationalising of use, not its foundations. There is no attempt to account for the development of technological use or to discover its origins. The same cannot be said of work that has tried to remedy some of these shortcomings.

The "novice/expert" and "digital native/immigrant" story

The use of metaphors like "novice/expert" and "digital native/immigrant" associated with Berliner (1986) and Prensky (2001) has provided a narrative frame that certainly in Prensky's case, has proved pervasively attractive. While this body of work interprets the problem as a deficit, the tendency is to treat the absence as something beyond the control of the person. Rather the emphasis is on stages of personal development or skill development with the implication that these are somewhat beyond the capacity of the user to change –at least easily. Moreover deficits are attributable to the circumstances of the user, who is not in a position to possess the correct knowledge until some form of skill or personal development takes place. Part of the appeal of these approaches is that while still "deficit", unlike help menu cookbooks and information literacy remedies, they lend a foundational theory to the absence of use. They both rest on a theory of the centrality of user "development". The key idea of novice/expert elucidations of the problem is to set out more or less explicitly a theory of educative development. Prensky on the other hand sets out a theory of demographic development. In both approaches, "stages of development" is posited by their proponents as a necessary component of the acquisition of technology use.

The "novice/expert" approach to teaching was established as a specific area of study by Berliner (1986) who, although he cites earlier practical studies of the effect, developed the seminal research on the topic. Berliner elucidated the reasons for studying teacher expertise or the lack of it, and the hurdles that might be encountered in doing so. This was a move to setting out an agenda for the professional development of teachers. Berliner's work highlights the way the idea of the expert pedagogue preceded the idea of the online expert pedagogue. The literature on teachers' professional development that used a novice/expert divide as an explanation began in the classroom. From teaching students it was adapted to teaching the teacher. The novice/expert literature has been adapted to the changed technological context.

The work of Berliner was picked up by teacher educators and applied to teacher training. For instance, Kagan (1992) describes five components to professional growth; or for our purposes, gap-bridging from novice to expert in classroom teaching;

1. An increase in metacognition: Novices become more aware of what they know and believe about pupils and classrooms and how their knowledge and beliefs are changing.
2. The acquisition of knowledge about pupils: Idealized and inaccurate images of pupils are reconstructed. Knowledge of pupils is used to modify, adapt, and reconstruct the novice's image of self as teacher.
3. A shift in attention: As the image of self as teacher is resolved, a novice's attention shifts from self to the design of instruction to pupil learning.
4. The development of standard procedures: Novices develop standardized routines that integrate instruction and management and grow increasingly automated.
5. Growth in problem solving skills: Thinking associated with classroom problem solving grows more differentiated, multidimensional, and context specific. Eventually, novices are able to determine those aspects of problem solving repertoires that can be generalized across contexts. (p. 156)

This model was adapted directly from classroom professional development to professional development of online teaching, taking silently with it the assumption that if teachers learned sufficiently about the technology and its applications, the problem of low use and “misconceptions” about it would be overcome. For instance Meskill, Mossop, DiAngelo & Pasquale (2002) adapted the novice /expert criteria first developed in classroom settings to create a model of expertise in a technological setting. The model makes some observations about the perspective of the two groups with experts better able to adapt on the fly and to put alternative plans into place if the technology or the class failed to work.

By developing the model, Meskill et al., attempted to unpack the question of what makes some technology use transformative and what reinforces the status quo. They used four criteria to derive what they call “novice expert continua” (2002, p. 3) to specify the movement from novice online teacher to expert online teacher. These criteria are *locus, focus, practice* and *emphasis*. The continua are

	Novice	Expert
Locus	machine	learner
Focus	self	student learning
Practice	managing students	empowering students

Emphasis	product	process

(Adapted from Meskill et al., 2002, p. 3)

On the first parameter, novices tended to attribute agency to the machine blaming it for going wrong and investing it with capacity to teach students on its own. On the second, novices talked in terms of what they would do with the computer during the lesson. As Meskill et al. (2002)summarised it:

> There were times when novices expressed an adversarial stance toward computers within their heavily self-referenced thinking, planning, undertaking, and reflecting. Overall the machine was seen as either thwarting personal plans and efforts … or as something offering a reprieve from the pressures of being the central focus. (p. 6)

On the third parameter, novices focused on managing student behaviour either by using the computer to manage it, or managing students' reactions to the computer so they did not treat it incorrectly. On the fourth, "For the novices, what appears to matter most when learners use computers is what gets done-some product is anticipated." (p. 8) and novice teachers tended to understand learning work by students as demonstrated by mastery of the machine.

However, despite continuing work on the expert/novice continuum in classroom teaching and teacher education, very little of this approach has been extended to teaching with technology, and still less to teaching with technology in university settings. What work there is concerning online learning technology more often than not discusses the developing expertise of the student. Recently online learning technology has been recruited into measuring the progress from novice to expert in students, via the data collection possible in LMSs. This has evolved as a small part of a much larger project of *learning-analytics* understood as a comparative performance measure. That segment of learning-analytics with a student focus is the collection and processing of large quantities of data on student interactions with LMSs in order to map student progress (See Buckingham-Shum & Deakin-Crick 2012 and some boosterism from Norris & Baer 2013).

Buckingham-Shum and Deakin-Crick (2012,) say they want to focus on "the challenge of designing learning-analytics that render visible learning dispositions and the transferable competencies associated with skilful learning in diverse contexts" (p. 1). But they point out that one limitation of learning-analytics is that they "are designed with a particular conception of 'success', thus defining the patterns deemed to be evidence of progress, and hence, the data that should be captured" (p. 1). It is this fundamental concept of spanning a gap from the

(unmentioned) absence of competence to “skilful learning” that is the justification for treating the novice/expert studies as an implicit deficit theory.
Research on the journey from novice to expert amongst academics learning to teach with technology is surprisingly sparse. This is despite some work on the relationships between technology-use and teaching ability where expertise of pre-existing teaching ability prior to the introduction of online learning technology was the main variable (Pierson 2000). This relative absence has occurred despite the existence of a very large body of research on expertise and technology as a whole (Collins & Evans 2009; Dreyfus 1984; Dreyfus, Dreyfus & Athanasiou 1986; Ericsson & Charness 1994; Ericsson, Charness, Feltovich & Hoffman 2006).

The novice/expert literature demonstrates a more sophisticated understanding of learning to use technology than do either the “cookbook” or the “information literacy” approaches. It problematises the condition of the learner in a more complex and realistic manner. However, it still fails to account for any relevant social or historical context, and surprisingly does not draw on a bank of specialist theory in the area of technology expertise. As with the other work discussed so far, it positions competence and use as a deficit problem. What literature there is on the novice/ expert use of technology amongst academic teaching staff demonstrates a concept of “use” as occurring along a developmental continuum, somewhat like Piaget’s (1928) developmental stages. Bridging the stages is bridging a gap: it is an act of completion.

Something of this approach is also evident in the discourse about “digital natives/digital immigrants”. This perspective depends on a deterministic idea of the relationship between generations of technology users, brain development and the capacity to learn. What makes it useful for my purposes is that it draws attention to the differences between student users of digital technology, including online learning technology, and the use by their teachers of the same technology.[2]

[2] It should be noted that that the concept of the ‘digital native’ and the ‘digital immigrant’ is not synonymous with ‘the digital divide’, which refers to economic or social divisions associated with (lack of) access to digital technology (e.g., see Selwyn, Gorard & Williams 2001). “Digital divide” literature is however similar to “digital native/immigrant” literature in ascribing absence of technology use as a deficit, but here it is a generalistic and unavoidable social deficit understood as stemming from class position, limited economic capacity or social exclusion - rather than a personal deficit (See also Selwyn 2003).

Prensky (2001a, 2001b) first distinguished between “digital natives” and “digital immigrants” in a pair of essays that triggered a controversy about the legitimacy of the division. The essence of Prensky’s argument is that digital technology has caused a fundamental break or discontinuity between the people who were born with it and who grew up using it (digital natives) and those who had to learn how to use it after its introduction (digital immigrants). Demonstrating the depth of the divide he posits, his opening sentence in his first paper (Prensky 2001a)on the subject is, “Our students have changed radically. Today’s students are no longer the people our educational system was designed to teach” (p. 1). This break is so significant in his estimation, that he calls it a “singularity” – an event that changes things so fundamentally that there is absolutely no going back. This so-called “singularity” is “the arrival and rapid dissemination of digital technology in the last decades of the 20th century” (p. 1). Here is a quite explicit account of a change process characterised by a radical break. The gap for practice to negotiate is so wide as to be nearly non-negotiable. This is a radical disruption theory of social change as represented by the introduction of technology.

For our purposes Prensky’s argument is critical as it centres on students, their differences from teachers and both groups’ grasp of technological use in education:

> It is now clear that as a result of this ubiquitous environment and the sheer volume of their interaction with it, today’s students think and process information fundamentally differently from their predecessors. These differences go far further and deeper than most educators suspect or realize. (p. 1)

Moreover, “it is very likely that our students’ brains have physically changed – and are different from ours – as a result of how they grew up” (p.1). This requires an alternative theory of socio-technical relations for those who did not grow up with digital technology. Prensky’s draws heavily on the immigrant metaphor:

> As Digital Immigrants learn – like all immigrants, some better than others – to adapt to their environment, they always retain, to some degree, their "accent", that is, their foot in the past. The “digital immigrant accent” can be seen in such things as turning to the Internet for information second rather than first, or in reading the manual for a program rather than assuming that the program itself will teach us to use it. Today’s older folk were "socialized" differently from their kids, and are now in the process of learning a new language. And a language learned later in life, scientists tell us, goes into a different part of the brain. (p. 1)

Much discussion followed about whether this was true or false or whether there was anything to explain at all. A sizable number of authors accept Prensky's premise (Barnes, Marateo & Ferris 2007; Kurhila 2006; McHaney 2011; Oblinger & Oblinger 2005; Oliver & Goerke 2007; Phillip 2007; Trinder et al. 2008). Authors like McHaney (2011) understand the advent of "tech savvy millennials" on campus as an "inexorable influx" of a "seismic force", which calls for a complete rethinking by academics of teaching and technology use.

Despite the attractive simplicity of Prensky's account, the pendulum of opinion appears to have largely swung against him. Many, if not most researchers agree that the reality of the distribution of technology expertise and types of technology in use is much more complex than the binary division suggested by Prensky. Many studies suggest that students in fact use a limited range of technologies for both learning and socialising. Kennedy, Krause, Maton, Bishop, Chang, Waycott, Judd, Gray, Bennett & Dalgarno (2009) for example, found that there was little evidence for the "digital native/digital immigrants" divide, and that "[t]here is great diversity in students' and staff experiences with technology, and their preferences for the use of technology in higher education" (p. 3). Ellis and Newton (2009) studied students at Southern Cross University Australia and found that students were comfortable using what they called "established technologies" such as using a computer for writing documents or for general study without accessing the Internet. Equally, fewer than one half were at home with "technologies that are not established across the student population" (pp. 5-6), like using a computer to build or maintain a Web page, or creating and editing audio and video or even using the Internet to make phone calls. Other authors have reached similar conclusions, the majority from empirical studies; (Bennett, Maton & Kervin 2008; Helsper & Eynon 2010; Jones, Ramanau, Cross & Healing 2010; Margaryan, Littlejohn & Vojt 2011). Selwyn (2009) adds an element of critical theory to otherwise empirical critique, by analysing the discourse of "digital natives" as one of moral panic over the uncontrolled access to, and use of technology by "youth".

The focus in this genre of writing is predominantly on students. Only a small number of studies have addressed the attitudes and practices of staff. Waycott , Bennett, Kennedy, Dalgarno & Gray (2010) report a qualitative study of three Australian universities in which staff and students were interviewed about "how and why they used technologies and their opinions about those technologies" (p. 1203). Both students and staff reported variable use of technology and in both groups some separated "life" technology from work technology while others blurred the boundaries (p. 1206). Both groups generally felt technologies were beneficial in higher education, with minor differences on how this manifested itself. "… staff … identified benefits relating to improving student learning, while students highlighted the convenience technologies provided." (p. 1207).

With respect to the limitations of such technology:

> [S]tudents and staff shared some concerns about the limitations of technology use in teaching and learning. Both groups mentioned usability issues, concerns about replacing face-to-face interactions, and communication issues. The different perspectives of the two groups were, however, apparent in some of the divergent limitations students and staff mentioned. Students were concerned about access to technology and learning to use technology. On the other hand, staff were concerned about increased workloads and a top-down approach to implementing new technologies in higher education. (p. 1208)

Salajan, Schönwetter & Cleghorn (2010) carried out a study at a Canadian university in the year Blackboard was introduced there. This is, to my knowledge, the single study to discuss the 'digital natives/immigrants' debate in the context of Blackboard. They found that while frequency of use was largely indistinguishable between students and faculty, the experience was a different matter:

> While both students and faculty members started with relatively high expectations of the Blackboard LMS, by the end of the year their experiences showed a significant drop in their perceptions of Blackboard as a learning and teaching tool… What is more significant at a purely observational level is that the faculty members' experience was far less satisfactory than the students' experience. The students viewed Blackboard more positively than the faculty members at the beginning of the year. While this discrepancy was preserved by the end of the academic year and both groups appear to have been dissatisfied with their Blackboard experience, the faculty members' opinions of Blackboard deteriorated to a far greater extent than that of the students. (p. 1399)

Oliver (2011) has criticised Prensky's argument as technologically determinist-and therefore flawed. He points out that Prensky wanted to explain everything from "generational changes in attention, learning, and even brain structure as a consequence of the new technology" (p. 375). Appealing to a "novice/expert" and "digital native/immigrant" distinction is deterministic in other ways as well. Postulating a digital native-immigrant distinction shifts the locus of change-by-development from an individual status (as found in novice/expert literature), to a more collective phenomenon of population demographics. However, both "novice/expert" and "digital native/immigrant" theories also rely on a naturalistic assumption of acquisition of use as a growth process that inevitably occurs over time, given the right kind of immersion in new technology. The differences between the two lie in whether this naturalistic development is understood as "nature", conceived as hard wired brains or "nurture" understood as sympathetically managed pre-service or professional development education.

Digital native/immigrant discourse draws on a much earlier division between "nature" and "nurture" (Erickson 1987) whereby "nature" was construed as hard wired, deterministic, and responsible for an array of intellectual and somatic deficits that the international eugenics movement ca 1900-1945 set out to correct. This was countered by the rise of "cultural deficit theories" of which Erickson was a proponent. Erickson traced attempts in the 1960s and 1970s to counter the determinism of nature with a more malleable nurture in the form of a socio-linguistic explanation of deficits. While modern neuroscience blurs Erickson's distinction, positing neural plasticity into adulthood, (Doidge 2007) it is retained in these two discourses. "Novice/expert" approaches conceive of learning to use technology as a matter of ongoing "nurture". Prensky's concept is a lot more hard wired; it being necessary to acquire this knowledge at a critical juncture in personal development, or go without. But both natural and cultural explanations for a deficit are still deficit theories. And deficit theories act to position the possessor of the "deficit" normatively, as less well off than those without.

All the perspectives discussed to this point have treated the way people use technology as agentially neutral or else treat agency as something shaped or controlled by irresistible natural developmental or social forces. I now turn to those theories of use which are based on an underpinning assumption that the person faced with the possible use of a new technology is capable of rational choice and action. In the following theories of use, "cause" of low use is still positioned as a deficit, but this time understood as attitudinal or motivational, essentially under the control of the user.

"Motivational disorders"

The key variation to intrinsic theories of the development of technological use which is posited in the bodies of literature grouped here is an idea that "intention" or "disposition", both understood as matters of agency and not of "nature", or circumstance, are foundational to

technological use. The act of defining “use” (or “non-use”) itself is left largely unexplained, especially how it might be socially, cognitively and/or technologically constituted.
Instead, the addition of agency acts as an explanatory device for *change* from non-use to use, or uptake of technology. From this perspective, agency in users is manifested as the taking of a “decision”. This is especially apparent in the densely interwoven theories associated with early work by Rogers (1962/2003). He understands the development of technology use less as a consequence of some learning process and more as a decision, presuming a much larger role for volition and choice. If there is a problem it is best understood as a motivational disorder in which users can either choose to embrace the technology or else “resist” its adoption. On this account technology use is a matter of judgement, depending critically on a decision that the user does, or does not make. In consequence while the explanation of low use is still represented as a deficit, it is now understood as attitudinal or motivational in character because essentially under the control of the user. Understanding it as reasoned behaviour also provides scope for apportioning blame to the user for non-use.

While user “motivation” and user “resistance” are conceptually separable in that the first does not automatically entail the second, in the literature itself they are so overlapped and interwoven that keeping this distinction analytically separate is nearly impossible. Rogers’ influential model of “diffusion of innovation has a part to play in this since for Rogers, the opposite of innovation (powered by the presence of motivation) is ultimately “resistance”. For Rogers, the problem of use (or resistance) is understood as a deficit of motivation in which the absence of motivation can quickly slide into active resistance. This perspective treats the social actor as the locus of the problem, and the problem itself as a lack of control by a rational actor over their own agency, whether too weak (unmotivated) or too strong (resistant).
Rogers’ book (Rogers 1962/2003) is hugely important both to designers of technology and to educational theorists trying to explain the adoption of technology. At the time of writing, Google Scholar had registered 47,667 citations of the book. It is widely used as the theory of choice for studies of the uptake of e-learning by academics in universities. (Giardina, 2010; Roca, Chiu & Martínez 2006). Roger’s account of the diffusion of innovation warrants examination on its own, distinct from the body of literature it has generated, since it underpins so many other discussions of technological use and non-use.

Rogers (1962) proposed a normative model of technology adoption embracing both the characteristics of the technological innovation as well as the propensity to be innovative on the part of the individual faced with a choice to adopt it or not. The third component of the model is his notion of “diffusion”. Rogers’ requirements of a technological innovation mean that both the technology and separately, its innovative properties must have particular characteristics, although in practice he often uses the terms interchangeably. Technology’s specialness does not reside in its software or hardware. Instead, he argues, it must be understood as a design. Specifically technology is “a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome” (p. 13). Technology is defined in terms of its capacity to enhance decision making. In this respect Rogers has pointed to the imbrication of a theory of “diffusion of innovation” with organisation theory as both understand decision making in terms of tight cause-effect relations reducing or eliminating uncertainty compared with more loosely structured arrangements. For Rogers (1962)any innovation itself must include characteristics like ”relative advantage” (an improvement over previous ideas), “compatibility” (that is, consistency with the needs of adopters), “degree of complexity” (simplicity of use), “trialability” (that is, it should allow for experimentation) and ”observability” (it should be readily visible to others) (pp. 16–17). Rogers also described what he calls ”reinvention” (pp. 17–18; 176–182). Rogers treats reinvention as a variation by users on a design theme introduced by the initial innovation, and not as the beginnings of a new use. He understands it as one possible permutation of otherwise general adoption by diffusion. As a result, Roger’s makes very little of the potential of reinvention to contribute to internalisation and interpretation of meaning or to the splitting off of technological capabilities into new uses, unintended by designers.

Rogers’ (1962)essentialist approach to innovation is a central quality of his thinking, evident for example, in his discussion of whether a reinvention is “bad” or ”good”. Reinvention can be “bad”, from the perspective of “developers” and “change agents”, because it alters the original idea or it can be “good” since “[f]lexibility in the process of adopting an innovation may reduce mistakes and encourage customization of the innovation to fit it more appropriately to local and/or changing conditions” (p. 179) And further;

> These differences shape the actual innovation that is implemented, even though it may still be called by the same name as the “mainline" innovation. In fact, many of the elements in the mainline innovation may be adopted by an individual, while also departing from the original model in several important respects. (p. 179)

Originators of the innovation are thus interested in an “essence” which acts as a “quality control”, whereas users can depart from that essence in usually harmless but potentially destructive ways. As the idea of “reinvention” is treated by Rogers in the book, he treats it as an interesting side issue rather than as a key aspect of understanding how users incorporate use. In contrast with Rogers’ underplaying of the role of reinvention, writers like Bijker (1993); Daft & Weick, (1984); Neff, Fiore-Silfvast & Dossick (2010) and Orlikowski & Gash (1994) offer a more fluid idea of “interpretive flexibility” such that interpretive flexibility is a process of unsettled meaning which opens possibilitites for continued evolution of use, rather than implying simple variation of use.

Rogers (1962)also describes the qualities of the technology user. These are ranged along a scale depicting the degree of ”innovativeness” of the individual (p. 22). He isolates five categories of adopter including “innovators”, “early adopters”, “early majority”, “late majority” and “laggards”. Innovators are typically high status, (pp. 277–284) especially compared to laggards who are lowly in socioeconomic terms and in other status markings (pp. 251–263). Rogers’ use of the laggards category tends to elide into “resisters”:

> Laggards tend to be frankly suspicious of innovations and change agents. Their traditional orientation slows the innovation-decision process to a crawl, with adoption lagging far behind awareness-knowledge of a new idea. While most individuals in a social system are looking to the road of change ahead, the laggard's attention is fixed on the rear-view mirror. This resistance to innovations on the part of laggards may be entirely rational from the laggards' viewpoint, as their resources are limited and so they must be relatively certain that a new idea will not fail before they can afford to adopt. (p. 250)

The actual process of diffusion is defined by Rogers as,

> [T]he process by which (1) an innovation is (2) communicated through certain channels (3) over time (4) among the members of a social system. The four main elements are innovation, communication channels, time, and the social system. (p. 11)

Diffusion occurs through the “innovation - decision process” in which a “decision” is construed as a binary choice: adoption or rejection. Central to his concept of diffusion is a “change agent” who is an “opinion leader” of “diffusion networks”. Opinion leaders are those who have the most extensive links in a network.

Rogers’ account of diffusion of innovation theory deploys instrumental rationality across all four parameters of its understanding of technology, the definition of innovation, the role of the user, and its model of diffusion. First, Rogers' understanding of technology is modelled on the physics of a machine as a rational system. Technology is an uncertainty reduction system using rational, calculative rather than heuristic modes of decision making. It is modelled on the production line in that it has inputs (innovations) and outputs (technological adoption) modified by a process (diffusion). Diffusion of innovation theory is teleological and instrumentally oriented. The goal is unequivocally technological adoption. Moreover technology is determinist. Friesen (2008), describes Rogers positioning of technology "as something that single-handedly and directly cause(s) or force(s) social change" (para. 42, unpaginated HTML).

Diffusion of innovation theory treats innovation itself as an uncritical good and as something that has an essentialist quality, which might be modified but not profoundly changed by an encounter with a user. Non-achievement through "resistance" or some other factor is cast as a failure, in spite of Rogers' claim that he is objective and non-evaluative (Rogers 1962, p. 108). Users are classed in relation to their co-operation with innovation. This classing is not simple positioning, since it is accompanied by status oriented descriptions. "Willingness to adopt" and becoming a "change agent" are both accorded high status, while those classed at the opposite end of the scale are not. Rogers would understand status ascription to be an empirically measurable phenomena, since status is "objectively" ascribed to different levels of technology use by socioeconomic studies, which validate the respective status of users in Rogers' classification. Innovation adoption itself is a source of status attributed by users, according to Rogers; "Undoubtedly one of the important motivations for almost any individual to adopt an innovation is the desire to gain social status." (p. 215).

Although aiming for empirical objectivity, Rogers also treats status "subjectively". This is despite his criticism of others for blaming individuals for non use (p. 106). Rogers lack of insight into his contribution to this blame attribution is apparent as Friesen (2008) notes.

> Rogers uses labels for degrees of adoption or resistance of the user that are telling: "innovators", "early adopters", "late majority" and "laggards." The character of these labels leaves little doubt as to how various responses are viewed in this model (para 41, unpaginated HTML).

The users own world view is absent from Rogers' model. Their framing and meaning systems, their contextualising of technology, and their construction of the tasks technology enables and requires of them, are barely considered. Users are positioned as rational choosers making (binary) decisions in a rational system.

Diffusion itself is metaphorically represented as a process for producing decisions. The diffusion process is imagined as a flow of information channelled by social norms and deflected by barriers and blockages. The metaphor is something like a "river contained by banks, channelling the water of information to the variably porous ground of a social system". It is a version of Putnam and Boys' (2006) "communication as a conduit" metaphor:

> The conduit metaphor treats communication as a channel that transmits messages. In this metaphor, an organisation surfaces as a container in which channels reside (p. 543).

The "diffusion system" itself is variably defined. Sometimes it is an organisation, sometimes it is a state, as in Roger's (1962)example of Iowa farmers (p. 148). Diffusion systems can also be centralised or decentralised (p. 160). *Diffusion systems* mean innovation happens in some kind of bounded entity, a systems view of reality, albeit as Lyytinen and Damsgaard (2001) note, without the feedback loops characteristic of most systems theory.

An essential part of Rogers' theory is the idea that innovation diffuses "over time". There is an implicit equation of short time to adoption with efficiency. Rogers reports for instance that "relative advantage", one of the key criteria for diffusion, "is positively related to its rate of adoption" (p. 218). An example is his suggestion that reducing the number of individuals involved in making "an innovation-decision" speeds up the rate of adoption (p. 233). Kirkup and Kirkwood (2005) carried out a ten year study of teachers' adoption of technology for distance education from which they drew very different conclusions from those of Rogers. They found that early adopters were interested in the technology in its own right, whereas "[l]ater adopters are less interested in the technology and need evidence that it will improve their lives or work" (p. 197) and that change is a gradual rather than a revolutionary process (see also Burdett 2003). Studies that look at the amount of time users need to adopt a technology, are remarkably few, Browne, Jenkins & Walker (2006) being one of a small handful. Browne et al. found a remarkably flat approach to innovation in online education over time, noting that while adoption levels had increased considerably, "the transformative impact of these systems on instructional practices has yet to be realised" (p. 17), the majority of academic users simply transferring course content.

The focus on diffusion of innovation has inspired research on the adoption by academics of

Blackboard and other educational technology in higher education. Those studies using a diffusion of innovations approach with Blackboard include Bennett and Bennett (2003), who used diffusion of innovation as a framework for a specific investigation into the adoption rate of Blackboard; Giardina (2010) who used a diffusion approach to study the use of Blackboard in flexible and blended learning in higher education; and Hixon et al., (2012) who examined the "next wave" of adopters, the "majority", whom they argue are now adopting online learning technology following the innovators and early adopters, in line with Rogers' theory. This was in the context of a mentoring program supporting teachers who were designing courses in Blackboard.

More general discussions of adoption of educational technology that cover several technologies simultaneously, and use diffusion of innovation as the theoretical base include Bull and Bull (2002). They understand adoption of technology into education as an exponentially growing force heading towards a "tipping point" and they warn that care should be exercised in adoption lest Roger's "entrenchment" of undesirable uses of technology arises. Gillard, Bailey & Nolan (2008) relied on it as a structure to support their justification and reasoning for encouraging adoption. Moser (2007) grounded her *faculty educational technology adoption cycle* in diffusion of innovation and Toledo (2005) developed a model of teacher pre-service technology education integrating several models of adoption of which Rogers' diffusion model was one.

As Information Systems researchers became more interested in the problem of adoption due to increasing failures of organisations to effectively adopt information systems so they turned attention to modelling human behaviour in much the same way as technical systems were modelled (Chuttur 2009). I.S. researchers found Rogers' model too complex, so their subsequent models were an attempt to both simplify and rationalise adoption. This gave rise to a plethora of models with similar acronyms, united in both "modelling" and in paying closer attention to the user.

Of those specifically dedicated to modelling adoption of educational technologies, *concerns-based adoption model* (CBAM) (Hall, Wallace & Dossett 1973) was one of the earliest, but modifications to it to reduce complexity gave rise to the most influential - Davis's (1985) *technology adoption model* (TAM). TAM is an attempt to create a statistically predictive model of use based on two attitudes or beliefs; degree of "perceived usefulness" and "perceived ease of use" based on "intention models" drawn from social psychology, e.g., Ajzen and Fishbein's (1980) model of *reasoned action* (cited in Davis, Bagozzi & Warshaw 1989, p.983). Davis et al., (1989) assert that the non adoption problem is one of "resistance" and that adoption is best explained by "intention to adopt" (p. 982). Their orientation is entirely to the concerns of "IS practitioners" (p. 999). Not for the first time the people responsible for technical implementation fail to understand the complexities of use from a user perspective.

The TAM model gave rise to many variants; TAM2 (Venkatesh & Davis 2000); TRAM, (Lin, Shih & Sher 2007) and TAME (Ahmad, Madarsha, Zainuddin, Ismail & Nordin 2010) as well as general tweaks to the model without renaming it (Cheung & Vogel 2013; Roca, Chiu & Martínez 2006; Stewart, Bachman & Johnson 2010). While varying in the extent to which they cast the user as an active impediment, these variants follow the model of denoting "intention to use", formed by other behavioural factors, which vary slightly from model to model, as central to understanding adoption. In fact some believe that the plethora of "patch up" models to TAM has led to theoretical chaos (Benbasat & Barki 2007).

TAM and its relatives remain popular explanations of use amongst both educationalists and educational technologists, and underpin a number of studies of the academic use of Blackboard and newer learning technologies (Abdalla 2007; Cheung & Vogel 2013; Martinez-Torres, Toral Marin, Garcia, Vazquez, Oliva & Torres 2008; Park, Lee & Cheong 2007; Saldivar, Maull, Kirshner & Sumner 2012). TAM itself represents the origin of a major research bifurcation in that "intention to use" and "usability" became separate objects of study. "Intention to use" led to further developments in motivation studies, and continued to foreground the teachers' intrinsic qualities, while "usability" studies researched technology design as the "figure" against the "ground" of user behaviour.

Bayne and Ross's (2011) deconstruction of the digital native/immigrant opposition exemplifies the passive kind of normativity which can be extended to all deficit theories that focus on the absence of skill or capacity amongst academic users of online learning technology. They understand this discourse as "de-privileging of the role of the teacher". They say they can represent this as a series of binaries, which they say involve,

> a structurally embedded de-privileging of the role of the teacher, aligned with the 'immigrant' position – the old, the past, the slow, the backward-looking, the association with modes of knowledge construction becoming 'obsolete', and dependent on

analogue (print) technologies*:*

Native	**Immigrant**
student	teacher
fast	slow
young	old
future	past, or ‘legacy’
multi-tasking	logical, serial thinking
image	text
playful	serious
looking forward	looking backward
digital	analogue
action	knowledge
constant connection	isolation

(Adapted from Bayne & Ross, 2011, p. 161; see also Rose, 2003)

Lyytinen and Damsgaard (2001) sum up the problems with the diffusion of innovation theory thus:

> An innovation (technology) has separate, distinguishable and objective features, which are easily recognizable by interested parties (1). The technology moves in a discrete package from an independent innovator to the adopter through a constant social "ether" called here a diffusion arena (2). The adopter’s choice to adopt forms an atomic, isolated decision, which is shaped by the push and pull factors (3). The decision to adopt follows a rational calculus that is based on observed technological characteristics, and other relevant information made available to the adopter through communication channels (4). The diffusion process evolves through distinct stages, which are determined by the push and pull forces and are distinguishable by changes in the adoption rate (5). Finally, the diffusion process has neither feedback, nor any “effective” history (6). (p. 5)

In the “digital native/digital immigrant” binary, and the interest in the diffusion of innovation that casts non-adopters as “laggards”, the role of the teacher is de-privileged, decontextualised and rendered passive. The discourse of "resistance" found more frequently in the organisational studies literature changes the narrative, as I now want to show.

The organisational focus: from passive to active non-use.

Following on Rogers' construction of the problem of technology adoption as an agentially motivated "flow" in an organisational structure that channels it, the literature on the adoption of educational technology by teachers has reflected motivation to adopt as a negative force. Rogers himself had frequently used "resistance" to mean non-adoption, despite positioning non adoption as a rational choice (see for instance Rogers 1983, p. 27, 198, 205, 250, 349). Authors who discuss academic adoption of educational technologies (Burdett 2003; Hamuy & Galaz 2010; Tabata & Johnsrud 2008) also treat "resistance" as synonymous with any non-compliance, uncritically understood as the cause of non adoption.

In this work the technology user is no longer sidelined. Instead their motivations including resistance are the focus of interest. But along with an active user, so a more active context, read as structure, frequently accompanies it in a discourse about "barriers". Thus it is that agency, left out of the literature addressed earlier, which focused purely on learning and development as the culprits for the gap in adoption, now enters the discussion. This has consequences for thinking about changing the culture of practice. If innovation is positioned as a "good" because it signifies positive progress, this is only marginally a disruption. More significant disruption arises from a failure on the part of users to understand how good it is. Most of the concern is located with the agent's failure to "normally" or even "excellently" negotiate the problem. In this respect a gap is acknowledged, but played down as a positive. Disruption by technology is a (moderately) radical good. The process of social change is imagined as a channel or force that propels this good.

From the perspective of the educational organisation, "resistance" and other intrinsic motivations along with extrinsic impediments are treated as "barriers" to be managed. These metaphors imply that resistance and barriers are to be broken down. In much of the literature written from an organisational viewpoint, the identification of the teacher as a resister is positioned with other barriers as something to be overcome (Abrahams, 2010; Bruner, 2007; Gutman, 2012; Johnsrud, 2008; Lesht & Windes, 2011; MacKeogh & Fox, 2008b; Mirriahi, Dawson & Hoven 2012; Newton, 2002; Tabata & Johnsrud, 2008; ; Quinn, 2012).

In an important study Reid (2012) reviewed the literature on barriers to adoption of educational technology by academics and identified important themes in the literature. She identified five aspects of educational organisations as barriers: technology, process, administration, environment, and faculty. Technology involves issues of access, technical reliability and complexity. Process issues include the quality of project management relevant and accessible professional development. Reid noted that lack of support for faculty can involve everything from unfriendly services support staff, support that isn't focused on faculty needs, inappropriate support scheduling or timing, unavailable just-in-time or troubleshooting support. She also noted that, "A major barrier to adoption of instructional technology and effective instruction in general is the lack of instructor skills and knowledge" p. 7). Administration issues included faculty anxiety about administrative control of access to and use of educational technologies and a perceived lack of clarity about goals. The biggest issue was a perceived lack of understanding about the required effort to move online. The organisational environment was also a problem:

> Institutional environmental considerations include organizational change, tensions between administration and academia, legal issues, and the effectiveness of instructional technology. (p. 12)

Finally Reid acknowledged that resistance on the part of teaching staff "to using instructional technologies can be found in institutions around the world and in different types of institutions…". (p. 16) Access to professional development, concerns about the quality and effectiveness of instructional technology, the level of technological and instructional background knowledge can all play a part in resistance to embracing and making "effective" use of the technology were all identified as key factors.

In short there are three major sources of problems with technology adoption and use, beginning with the subjectivity of the teacher who is using or not using the technology, including those arising from the technology, and finally the quality of the management of the introduction of technology (Conole 2007; Reid 2012; Snyder, Marginson & Lewis 2007). Each kind of explanation constructs factors in use slightly differently and points to different kinds of potential intervention. Some of this literature reshapes the idea of "resistance" or is sympathetic to it, while still taking an organisational perspective on it as something to be overcome in the interests of good management.

Sobreperez (2008) for instance understands non-compliance as an organisational problem, but suggests that it should not be dismissed as resistance but instead should be further studied by managers and developers, leading to accommodation of differing views. Selander and Henfrisson (2012) take a closer look at the meaning of resistance. They argue that the literature on resistance has understood it as resistance to a perceived threat. This "threat" may take the form of loss of power, inequity, de-skilling, or doubts about the alleged benefits of the change. They argue it should instead be understood as "a perception of seeing through the espoused goals of the implementers" (p. 310). Secondly they remark that most organisationally-based literature tends to examine active resistance. Broadening the concept, they posit that resistance can also be passive and is expressed as cynicism.

> Passive resistance is a form of routine resistance that influences the appropriation of an IT system on a daily basis and over time. One form of passive resistance that has received little attention is cynicism. (p. 290)

Their study implies that the cynicism of teachers militates against organisational acknowledgement of faults in the technology, especially by managers, while allowing both managers and teachers to blame each other. They also show a good deal of sympathy for users and their cynicism, suggesting that further investigation would probably find that empowering users was likely to mitigate cynicism. "Such empowerment could minimise users' needs to create resistance spaces as a means to support a sense of autonomy and dignity." (p. 311).

The idea of "resistance" has two independent and distinct intellectual origins. The managerialist account, which treats resistance as something to overcome stems from theories of organisational change and can be dated back to at least 1948 (Coch & French 1948) and includes influential work like Argyris, (1993) and Kotter (1996). The second account derives from (i) the Frankfurt School and critical theory (Giroux 2003) and (ii) the Foucauldian tradition, which calls upon the "microphysics of power", (Foucault 1995) and on "labour process" theory (Braverman 1974). In this literature, resistance is regarded as emancipatory. "Resistance" is something to promote. Many if not most exponents of this tradition acknowledge their critical orientation. Work in this tradition incorporates a critique of technology in universities into a general criticism of the tendencies of universities to rationalise the work of academics by using the new technology as a tool of "quality management" (Anderson 2008; Considine & Marginson 2000; Hamilton & Feenberg 2005; Lines & Arger 2006; Winter & O'Donohue 2012).

A good deal of the unease expressed by critical theorists is specifically targeted at the introduction of online educational technology. As with the orientation of those who generally criticise “managerialism” in universities, critical researchers adopt a holistic view of the system as a whole. Coates, James & Baldwin (2005) for instance criticise the commercialisation of content and the possible corporatisation of academic knowledge which accompanies the adoption of learning-management systems like Blackboard. Baggaley (2010) takes a labour process stand-point to argue that the concerns of Ned Ludd would be reawakened by today’s educational technologies:

> [T]he Luddite Manifesto … explain[ed] the workers’ concerns in detail, as relating to the specific ways the managers required them to use the technology, rather than being motivated by hostility to the machinery itself. (p. 339)

Some of this critical literature is also interested in exploring the experience of the technology and/or the experience of resistance by adopting the viewpoint and understanding of the teacher. McShane (2000) for instance uses a narrative approach to convey the experience of a teacher who must use online methods of teaching in an essay that treats resistance as a response to the loss of self-efficacy:

> Seb [the teacher] is resisting being shaped by the two-way, interactive technologies. He fears that without face-to-face contact he will become 'ethereal'. He is resolutely standing his ground, by keeping his face-to-face lectures; these are teaching events where he feels centred - by being the centre of attention. (p. 11)

Hannon (2008) uses two case studies of adopters to isolate a number of factors militating against adoption, such as a mismatch of values between the teacher and those embedded in the technology, or underestimation of the amount of work required to move online. While relying on actor network theory, Hannon adopts the standpoint of the teacher. There are times, however, when critical theorists’ preferences for institutional analysis can get in the way of understanding the user’s point of view. Selwyn (2007) examined the use of online technology for teaching from a critical theory perspective. He claims that:

> As is usually the case in educational debate, blame for this disparity has been most frequently attributed to deficits of skills, motivation, and know-how on the part of students, faculty, and the educational institutions themselves. (p. 84)

He addresses this problem by examining the social construction of technology in universities from the level of government policy down to “the day to day, lived experience of the student”

(2007, p.84). Curiously, although addressing the perspectives of government, commercial vendors, university administration and students, Selwyn overlooked the perspective of the academic asked to deliver online education.

In discourses centred on “resistance” and “barriers”, the deficit becomes a power deficit, whether it be the power of managers to control their domains, or the power of teachers to control their professional lives engage in self-expression (e.g., Hardy & Thomas 2013). Issues of knowledge, learning and development are redefined in terms of who has control over them. All of the deficit theories noted above, including the most normatively neutral found in the “cookbook” and “information literacy” perspectives, explain the problem of technology use with reference to a decontextualised actor. The only differences are in the degree of blame attached to the actor for the absence or low frequency of technological use. In this respect the actor – i.e., the academic who is grappling with technology use - is firmly cast as object, not subject. Equally the more normative a deficit theory of technology use, so the more the actor is positioned firmly as “other”. In this outsider role, the actor can be positioned either passively, as out of date or apathetic (Prensky’s “digital immigrants” or Rogers’ “laggards”), or as a “resistant” antagonist (some forms of TAM, and managerialist studies of resistance and barriers).

The organisational studies literature not coincidentally also adds a great deal more weight to the influence of structural factors to explanations of technological use and non use. The metaphors are particularly structural, calling up obdurate objects as barriers. Thus structure is also accorded a major role in the conceptualisation of social change and resistance. “Barriers” are, to follow the metaphor, not specifically gaps in practice, but do disrupt progress. The smooth progress of continuous social change (to desirable ends) is thwarted by these barriers. However, perhaps paradoxically, agency is also accorded much more influence, whether this is cast as problem *or* as solution. Agency, however, must be sufficiently forceful so as to counteract the strength of barriers, whether it is the agency of managers, the fact of which is taken as a given except by critical organisational literature, or the agency of users, which is generally problematised one way or the other. Both barriers and agency are notably social, being the outcome of relatively unmediated human activity. Objects themselves (whether understood “realistically” as material entities, or as coalescences of mediated human activity) rarely make an appearance in their own right in the literature examined so far. It is to technology and its role in use that I now turn.

"The technology made me do it"

In much of the literature I have discussed thus far, the technology itself stands passively to one side as something wrangled over by its protagonists and opponents. This does not mean that technology has been neglected by other writers. Technology is frequently treated as having an autonomous power itself to promote change. There are two tendencies here. The first is diffuse and is found in discussions about whether online learning technology has an implied pedagogy or not. The second is much more firmly established as a literature in its own right and is found in the study of "user experience" in which the focus is on the power of the design of the technology to shape the use made of the technology[3]. In these discussions the technology itself is treated a "driver" of use while the question to be answered has to do with the type of use, rather than its use or non use.

Technology and teaching

How does technology influence pedagogy? There are four variations in this debate. Firstly there is the argument that educational technology itself structures a more learner-centred pedagogy and this is "good". Secondly, that the structure of online educational technology reflects top down teaching methods and is a "bad", and teachers need professional development to avoid this bad practice. Thirdly, there is the claim that only good pedagogy will determine any kind of use of educational technology, pedagogy taking precedence over technological design. Finally some claim that the technology itself can be designed and developed so as to "instruct" or guide teachers in the good use of that technology.

Among those who argue that online educational technology of itself structures or enables "good" use, Bair and Bair (2011) make the paradigmatic case when they argue that:

> [I]t is generally accepted that online educators experience a change in their role from instructor to guide ….. Teaching online involves a shift to the sidelines, from being a visible center of attention in the face-to-face classroom to serving as a designer and facilitator of online experiences. This is a shift for which many faculty members are unprepared. (p. 2)

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[3] An even more "shaping" offshoot of the "user experience" approach is "persuasive technology", (Fogg 2002; Ham, Bokhorst, Cuijpers, Pol & Cabibihan 2011; Lockton, Harrison & Stanton 2010) a newer endeavour which has only just arrived into considerations of educational technology but which is sure to receive attention as pedagogical agents are technologised. (Park, Kim & Pobil 2011)

Affirming that this is a “common view”, McQuiggan (2007) points to research which says a shift from teacher-centred to learner-centred instruction is explained by online technology (p. 5). Other literature offering varieties of this position includes Hixon et al. (2012) p. 103; Lin, Singer & Ha (2010) p. 48 and Sang , Valcke & Braak (2010) p. 103.

A more dystopian narrative reflects concerns about the extent to which the design of the technology creates a negative pedagogy by structuring in inappropriate teaching styles (Lane 2008, 2009). Siemens (2006) argued that LMS’s design preoccupation with learning management and not with learning per se, was responsible for bad learning outcomes. While Hannon’s (2012) problems are not with the technology itself, he argues the practices needed for implementing the technology could lead to unforeseen contradictions and conflicts between teachers and learning technologists. Amory (2010, 2012) takes a similarly practice oriented position, arguing that the whole educational technology field is hegemonic, replicating instructivism in discourse and design.

These positions reflect a distinction made by Jones (2001) between “hard” technological determinism and “soft” technological determinism in e-learning discussion. According to Jones, “hard” technological determinism “claims that new technologies bring about changes in the pedagogy found in networked learning”; whereas, “soft TD (technological determinism) claims that these changes are not the inevitable outcomes of technology but goes on to suggest that successful use of the technology rests upon exactly the same changes.” (p. 1).

The idea of technology as originating structure has been seen by some as an opportunity to adapt teaching practices to technology (e.g., Haythornthwaite , Bruce, Andrews, Kazmer, Montague & Preston 2007) The idea of adaptation to technology has given rise to a sub-branch of literature known as “TPACK” or “Technological Pedagogical Content Knowledge”, which focuses on “the knowledge base teachers need to effectively teach with technology” (Voogt, Fisser, Pareja Roblin, Tondeur & van Braak 2012). For others it is the structure itself – the design of the technology that should (or will inevitably) be modified (Apedoe 2005).

A third variation on this treatment of the technology/pedagogy relationship treats good pedagogical beliefs as a precursor to effective technology use, and reflects the influence of both Prensky’s “digital natives” construct and Everett Rogers’ account of the diffusion of innovation. These predicate technology use on some form of ability or intention on the part of the user. “Good” pedagogical beliefs are frequently cast as an orientation to constructivist pedagogy. When So , Choi, Lim & Xiong (2012) examined student teachers pre-service beliefs about pedagogy as an indicator of their likelihood to use technology they found that:

> [Although] the direct effect of constructivist beliefs on prospective computer use is not very strong … the indirect effect of constructivist beliefs on prospective computer use with the mediation of attitudes toward computer (use) in education is strong. (p. 12 41)

Somekh (2008) too has found that teachers’ pedagogical orientation is one of the crucial factors in their ability to appropriate ICTs (p. 451).

A fourth orientation is to investigate new types of technology as a potential assistant to online pedagogy, a “servant” rather than a “master” orientation. Laurillard (2008, 2010) has explored the use of technology to assist teachers with developing online pedagogy pointing to the development of digital content repositories, housing “*reusable learning objects*” (2008, p. 146) and technological innovations such as the Learning Activity Management System, “an online tool for designing sequences of learning activities using standard individual and group learning tasks” (2010, p. 425). Another approach to technological support of teaching is to help teachers gain control over their own technological universe through the development of “Personal Learning Environments” (PLEs) or “Personal Learning Networks” (PLNs) by creating electronic social networks and using some form of electronic documentation like an e-Portfolio (see Seitzinger 2012).

An alternative to technologising the teacher is to technologise teaching, in an effort to eliminate the teacher. One such development is “Intelligent tutoring systems” in which the learner’s emotional state is taken into account using biofeedback mechanisms, and the learning adjusted accordingly. Both teaching (as demonstrated by Robinson & Sharp 2009; Lester, McQuiggan & Sabourin 2011) and psychological assessment of student progress (Kaklauskas et al., 2013) have been automated. “Learning analytics” represent a separate new field of technologised teaching by automating educational feedback through aggregating data about student performance (Knight, Buckingham Shum & Littleton 2013; Koedinger, McLaughlin & Stamper 2012), which has also been incorporated into Blackboard (Blackboard Inc 2013).

The debate about the role of technology in influencing the pedagogical use of that technology contains contradictory elements. Good pedagogy might be an agentic form of management of educational technology, or technology itself might structure good pedagogy. Nevertheless, those who are for and those who are against the technological formation of pedagogy understand technology as inherently pedagogical, and one way or another, as structuring use. The idea of technology itself as structuring use has been most developed in the field of "user experience", known to its adherents as "UX" (For example UX Matters magazine UX Matters Columnists 2013). This approach puts responsibility for technology use into the hands of technology designers.

User experience

The concatenation of methods and theories that goes by the name of "user-experience" (and also referred to as "usability", "user-experience–design", "user-centred–design", or "user–evaluation") can claim several points of origin. As befits an area of study that prioritises experience, Dewey's work is one obvious source. Rasmussen (2007) traces its intellectual origins to the human centred management approach emerging from 20th century industry's impulse to manage productivity. By the 1980's this was supplemented by the "social construction of technology" perspective, itself influenced by the less formalised, earlier version of the human centred approach in organisation theory. It was this that began to engage the IT sector in its efforts to develop a user-centred interface (Rasmussen 2007, p. 475).

Interest in studying user-experience was a reaction to the rather overly task oriented, instrumental approach of studies known as "human-computer interaction" (HCI) and grew from the idea of "adding the primacy of experience at the moment of experience", (Whiteside & Wixon, 1987, cited in Hassenzahl & Tractinsky 2006, p. 91). The development of user-centred-design, which focused on user-experience, countered the domination of design by software engineers. Interest in studying user-experience has in turn influenced the design of educational technology in all its forms (Ardito, Costabile, Marsico, Lanzilotti, Levialdi, Roselli & Rossano 2005; Debevc & Bele 2008; Fowler, van Helvert, Gardner & Scott 2007; Sydney University Publications Office 2013). User-experience explores subjective perceptions experiences and responses of users to technology from traditional technical usability, to beauty, or to hedonic, affective or experiential aspects of technology use (Hassenzahl & Tractinsky 2006). Hassenzahl, Diefenbach & Göritz (2010) say the field has three preoccupations. One deals with addressing human needs beyond the instrumental another stresses the emotional aspects of the interaction while a third deals with the nature of experience itself.

User-experience methods to capture the experience of users rely primarily either on ethnographic and phenomenological methods or on experimental psychology techniques. While ethnographic methods abound, they do not exclude other methodologies. For instance, it centrally depends on the development of "scenarios" of likely use, populated by "personas" - models of ideal-type user variants aggregated from research on real users (Pruitt & Adlin 2006; Richeson 2009). Demonstrating the user-experience tendency to a "mixed methods" approach, non-experiential research persists. Even recent user-experience studies of experiential phenomena such as "computer anxiety" can use a completely non-experiential epistemological and methodological design. Fakun's (2009) study of "computer anxiety" is a case in point. Occasionally data collection is automated by tools such as hidden mouse tracking for behind the scenes collection of data on how users move around the screen and the content in which they show an interest (Chapman 2011).

Existing studies use a fairly generalised grab bag of models and epistemologies and tend to lack a coherent theory (Hassenzahl & Tractinsky 2006). While attempts have been made to give these studies academic respectability by generating core themes and principles and establishing it as a separate domain from other fields of human-computer interaction this is an incomplete project (Law, Vermeeren, Hassenzahl & Blythe 2007; Law, Roto, Hassenzahl, Vermeeren & Kort 2009). Writers on usability in its theoretical mode still struggle with the ephemera of what "engagement" means (O'Brien & Toms 2008) or how "interaction" takes place between the user and the screen (Lim, Lee & Lee 2009). User-experience *implementation*, on the other hand, remains task and goal oriented. It is focused on the functional capture and analysis of subjective experience of information technology. Its literature is highly practical and covers methods of evaluating web sites and other software and on data collection practices and principles (e.g., Nielsen & Loranger 2006; Van Velsen, Van Der Geest, Klaassen & Steehouder 2008). But it is also highly susceptible to "cookbooky" grab-bags of technique (see for instance Courage & Baxter 2005; Horn 2010; Krug 2000; UX Matters Columnists 2013)

The location of any problem discovered through this work is in the technology design and not the user. Hence this literature looks to find inducements to enable positive user experiences (Thüring & Mahlke 2007). The introduction of play (Kuts 2009) and aesthetics (Tractinsky 2006) to computer tools are designer inducements to use where exhortation, standards and controls have failed to work. At the other end of the motivational scale, Kettley (2012) discusses the "disappearance of design":

> With advances in ubiquitous computing, based on peer-to-peer networks of many small computational nodes, developed by such research projects as Smart Dust and Speckled Computing, sensing, processing and actuation are hidden inside familiar objects, or combined with substrate materials to create new malleable computational compounds. (p. 66)

Critics from a movement known as "co-creation" or "co-design" or sometimes "co-experience", which has emerged out of user-centred-design, are attempting to remedy some of the shortcomings they see at work in user-based design. As the idea of co-creation or co-design implies these critics are worried that user-experience approaches tend to treat the user as an isolate and neglect the experience and use of technology as a social process created with others (Battarbee & Koskinen 2005). Co-creationists also criticise the methodological-object status conferred on the user by designers who practice as experts in user-centred-design who observe and/or interview largely "passive" users, whose only contribution is to carry out tasks as instructed or to give their opinions about products generated by others (Sanders & Stappers 2008). These critics propose the use of interactionist methods like participatory research or action research to inform user focused design (Greenbaum & Loi 2012; Sanders & Stappers 2008).

Conclusion: Deficits

What I have shown so far is the various discourses on technology use are largely instrumental literatures Their main objective is addressing problems like no use, low use or "wrong" use, problems defined as an absence of skill or knowledge, variously located in the user, the organisation or the technology. The various literatures point to the means of covering the gap by transferring skills, competencies and meso-level theories of teaching practice, of changing the culture of an organization, or by redesigning the technology. They also go a step further. They narrate the problem so that both the interpretation of the problem and the subsequent interpretation of the solution line up. By pursuing congruency and comprehensibility, these literatures are also sense-making. They constitute the field in that they define, interpret and solve the "problem" of non, or less than adequate use of online learning technology by academics. Each body of literature also understands itself to be capable of overcoming most of the problem, or at least the most significant and worrisome portion, on its own.

Yet the literatures discussed are problematic. The purpose of these literatures is generally unified, normative and instrumental - to get people using the technology for its intended purpose. Literature reviews of Information Systems research suggest that this is true for the discipline as a whole (Chen & Hirschheim 2004; Córdoba, Pilkington & Bernroider 2012). They are also deficit theories. They reduce the problem of technology use to one of method of transition. This obscures the deeper differences in tacit theories of knowledge and causation between them, but also fails to come to grips with wider ontological and epistemological debates about the positioning of technology in society and how mechanisms of change in technology use might be conceptualised from a variety of perspectives. These may include differences in causation, motivation, construction of knowledge, construction of purpose, and differences in ideas of what it means to be social, or indeed human.

Greenbaum and Loi (2012) make a telling point when they suggest that “the more traditional tools of design – particularly in the information technology field – do not stretch enough to capture, understand and unfold the multiple ways in which designs are used, appropriated and recreated by people in their daily lives” (p. 84). This quote points to a truly fundamental problem, one that applies to all the bodies of literature addressed here. Whether the perspective adopted be the point of view of the teacher, the pedagogy, the organisation, or the technology, the goal of deficit theories is to produce a normative use. The precepts of such normative use lie in the ideals of the originating orientation. For instance normative use behaviour might lie in precepts of good digital skills, good pedagogy, or for that matter best practice in any activity intended to be technologically supported. Or normative behaviour might be managerially defined by the standards of organisational management and purpose. Alternatively, it may be technologically defined by the physical or digital design of intended technological use.

Such instrumentality is no surprise. Technology after all, has long been treated first and foremost as an instrument, both literally and figuratively. Rogers (1983) definition of technology is exemplary: “A *technology* is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome” (p. 12). Implicit in this definition is that technology is also an instrument for keeping control over things. Control associated with technology shows up in many guises. As I shall later show, a major rationale for the introduction of Blackboard into the university in which this study took place was to co-ordinate with an organisation-wide ERP (enterprise resource planning) system, a system for integrating control over the key activities of the university. This is control by technological reach and standardisation. The why of this is rarely established or clarified since to ask why is to open up the question: what is “this” good for?

As well as being a tool for standardisation, the purpose of control might show up in the process of development of the technological standards themselves. For instance, Gulliksen, Göransson, Boivie, Blomkvist, Persson & Cajander (2003) derived a set of prescriptive principles for UX design. However, their study showed that these principles were, as the study progressed, more and more comprehensively ignored. Their solution to this was to develop another set of prescriptive principles to incorporate UX design into a software development project. Prescription here was the only tool in the workbox for generating use.

A preoccupation with normative, instrumental control means technological uses are defined top down, as a “good” – a teleological approach to adoption. Overshadowed by the predominance of normative and instrumental goals, there is far less research that pays attention to the idea of use as emergent from the arrangements people make to get on with their lives and the constructions they put on their activities with technology as they find ways to think about it or solve their problems with it and try to pursue some idea of the good as it emerges from their practice.

In sum, the question of how use is constructed between educational technology and academic teaching staff remains far from settled. The instrumental and normative purpose of the literature reviewed raises the question of what alternatives are available. Absent from the literatures reviewed above, are phenomenologically based experiential accounts of the building of use from the ground up. The “subject” is generally missing. The next chapter is concerned with those theories which frame the problem of a more phenomenologically based account of the development of technology use, especially as it pertains to teaching with technology and LMSs in particular.

CHAPTER TWO: THINKING ABOUT EMERGENT TECHNOLOGY USE: (1) THE PHENOMENOLOGY OF EXPERIENCE AND SENSEMAKING

There is a small but rich vein of reflective writing in which novelists like Lee Rourke (2011), or Charles Simic (2011) and other poets describe the way they use technologies as different as the pen and the computer. Here is Rourke (2011) spelling out why he writes his novels in longhand:

> I find typing annoying, if I'm honest, not the mechanics of it, but the sound. The constant tap-tap-tap-tap on the keyboard reminds me of all the offices I've worked in. The sound bores into me, it fills me with an anxiety I could do without. I feel like I'm signing off invoices rather than writing my next novel. Writing longhand is a whole different feeling. For a start, I can take my notepads and pens everywhere I go; which means I can write anywhere I want, when I want. This is good for me as my writing comes to me in fits rather than prolonged spells. Only when my work is finished in longhand do I transfer it to a computer, editing as I type up. I find this part of my writing process the least enjoyable.(para. 2, unpaginated HTML)

This is an account from the perspective of engaged experience, as Rourke draws attention to some of the feelings and responses evoked for him as he uses a computer keyboard, which he represents as memories of boring work where the very sound of his fingers 'tap tapping' away on the keyboard seem like a drill boring into him. Here the complex character of the experience of using a technology, of embodied cognitive and emotional experience is shown in vignette.

The switch entailed here is between the detached perspective on the use of technology, and a more involved approach to understanding how people use technology in ways that are personally and socially shaped, and do so in ways that emerge from the transactions, puzzles and every-day encounters people have, in this case with new educational technology. Justifying the need for a shift from "detached" to "involved" perspectives, Houkes and Vermaas (2009) argue that, instead of regarding artefacts like a computer or a program like Blackboard as an object from a detached point of view, they,

> may be regarded as means to human ends or as playing more intricate roles in human existence. We continually use, adapt, or even design artefacts for all kinds of purposes,

> and most of our knowledge about artefacts stems from and is applicable for practical purposes. Conversely, artefacts shape our everyday life and concerns, not only by enabling actions that are otherwise impossible, but also by influencing our choices, lifestyles and worldviews. (para. 5, unpaginated HTML)

This style, of involved understanding of artefacts as integrated into experience and as reported by those having the experience is the position explored here. Such a research perspective might be regarded as a generally phenomenological approach to the emergence of use as it takes a subjectivist stance and is engaged with understanding experience-as-lived and its influence on use (e.g., see Veletsianos & Miller 2008). Understanding concepts of educational technology use as they are built by the user is a direct contribution to understanding how use emerges from interaction, and how practices of use are changed and re-established, and is an important counter to purposive and normative approaches that seek foremost to extract use from the user.

In this chapter I want to examine conceptions of technology use from an emergent experiential perspective. This perspective is found both in closely detailed studies of teachers' experiences with technology and in more general social theoretical traditions like the phenomenological tradition; each of these has addressed the emergence of new social practices as both a practice and an experience. I do this to outline the relevant theoretical considerations informing my research, and to highlight some key controversies shaping the issues I explore in subsequent chapters. Such a review can point to the value of addressing broad questions such as: What does it mean to use technology in general and an educational online technology like Blackboard? How should we represent the experience of use? How should we think about the process of change, especially socio-technical change? How well have various traditions of theory and research attended to these questions? What problems and controversies are highlighted in that literature which might inform an approach more adequate to the task? The development of a fuller phenomenological approach needs, at the least, to develop a theory of practice that can address the dialectic between habit and inertia, and the possibility of change, a task I pursue in the next chapter.

A review of selected small-scale studies of educational technology that depict technology use as it is experienced shows a variety of interpretations of "phenomenology"; and "experience". One sparse but interesting body of research in this tradition has asked how teachers engage with new educational technology. It can be divided into four groupings. Firstly there are those few studies that take a directly theorised approach to undertaking a phenomenological study. These address educational technology across a range of tools. Secondly there are a small number of studies which demonstrate by doing – i.e., they are autoethnographic studies that use a subjectivist, implicitly phenomenographic writing style. Of these, only one addresses the experience of using Blackboard directly. Thirdly, there are a series of studies that, while using a broadly phenomenographic sensibility, focus on teaching online generally, and are less concerned with specific technologies. Lastly there are studies that use a generally qualitative methodology, broader than an exclusively phenomenological approach, but which refer to experience with Blackboard. Together these demonstrate the general absence of work which asks questions about the phenomenology of "use" and its relation to the experience of using. This work provides a somewhat more rounded understanding of the complexity of embracing new technology than the more instrumental kind of research reviewed in the previous chapter. It also opens up some fundamental puzzles about out the way humans make sense of their world, which I explore through Karl Weick's rich contribution to understanding "sense making".

The premise of this chapter and the one following is that the "use" of a technology is neither mere application of a set of skills, nor a decision, nor a result of some form of external social or technological "structure" pushing them into place. Rather it is a product of engagement and construction by the user, entailing their falling into uncertainty, the grasping of new meanings from old, as both inwardly and outwardly defined, and the modification of identity and of social relations as a result of this change. The premise in short is that technological use is less simple and more disruptive, but also more creative and engaging of the whole person, their subjectivity and their context, than has been depicted. Use entails the assemblage of an interconnected suite of skills, identity, social and socio-technical relations and the production of justifiable activities which accord with them.

Phenomenological studies of educational technology

The literature on educational technology that takes a purely phenomenological perspective on use is minute. Cilesiz,(2011) in a general call for more research into educational technology has gone so far as to argue that "so far phenomenology has not been offered as a research methodology in the field (see also Randles 2012). This is not strictly true. Cigdemoglu, Arslan & Akay (2011) conducted research on teachers' experience with an open-source learning-management system, Moodle, using a phenomenological design. This study draws only broad conclusions, however. Cigdemoglu et al's work traces unevennesses in the effect of experience on use without attempting to clarify and explain the meaning of use to the users, or how they construct their way into various uses of educational technology (p. 795). Cilesiz (2011) himself identified four other studies that use educational technology as their base (p. 503). These include Howard (1994) who, "investigated the first-time computer experience of adults; his in-depth findings shed light onto structural aspects of this experience including feelings, engagement, self-awareness, and attitudes" (p. 503), Veletsianos and Miller (2008) investigated the experiences of people conversing with digital "pedagogical agents" (or automated 'teachers'). Miller, Veletsianos & Doering (2008) studied the experiences of an educator providing hybrid distance education. Cilesiz (2009) himself had conducted a study of adolescents' experiences of educational computer use in informal learning environments.

Of these studies Howard's (1994) is valuable in that it understood use to emerge from identity, self-efficacy and specific interactions with technology. As he argued, users question their relationship with the computer and are sensitive to the experience, "when they are most uncomfortable with the technology" (p. 47). This, he concluded, "reflects more than frustration associated with the so called learning curve" (p. 47). Rather, it may represent a subtle but important dissonance that new users experience when confronted with the practical and workable as virtue-laden; that is: "Moving toward the machine requires an acceptance of the virtues of technology. If something 'works', it is good. Beyond its use, technology has little meaning for the user. When it does not work, it is 'junk'" (p. 47). Howard captures a good deal of the multifaceted disturbance of early encounters with computers, which may conflict with phenomenological reality by being overly rational and simultaneously conflict with identity in providing a point of negative comparison to human problem solving verities.

> For first-time adult computer users, the uncertainty experienced in the initial computer encounter may represent an uneasiness in accepting efficiency, expediency, exactness, practicality, and workability as measures of their worth as human beings. They may be uncomfortable reducing themselves to utility. New users may be grappling with aspects of their interactions with computers that are antithetical to other aspects of their being. They may be resisting a transformation. In the mundane technological experience of turning on a computer for the first time, new users may find more than a useful tool. They may discover something about their uniqueness as

> human beings in contrast to the 'machine.' At the same time, they may recognize a precariousness in their increasing adoption of technology. For those who appear to embrace the new technology and for whom the technology poses few questions, the characteristics of the computer may simply reinforce virtues of technology already held. (p. 47)

The phenomenological perspective adopted here illuminates aspects of use that are left opaque or unexamined by the more instrumental literature, diverted by its focus on driving implementation. Howard's orientation eschews viewing technology use as something that must be fostered and managed externally. Instead he offers a (phenomenological) understanding, as something the user simultaneously experiences and creates, which incorporates a significant proportion of identity construction, and about which the user must make sense. It is this perspective that is rare in the literature on technological use.

Three auto-ethnographic accounts by teachers using educational technology have offered rich insights into meaning, identity and affect. In each the dominant impression is one of a perception among users of problem solving on the run, combined with the feelings of uncertainty that this engenders. Lee (2008) offers a narrative of the subjective experience of a few working hours in the life of an online education instructor. This story emphasises work-load pressures and competing priorities experienced by teachers delivering online instruction. It does not name the technologies used. Instead it depicts the flood of information, the technological choices offered as navigational alternatives, and the feeling of connectedness with students all over the world. Time pressure is combined with a continual stream of problem solving, and one that appears never ending. Lee draws no conclusions but lets the account stand as having its own meaning.

Bair and Bair (2011) offer an account of teaching online from the perspective of two practitioners. They do not examine their emergent experience; rather, they focus on aspects of course delivery, specifically using Garrison's (2008) framework of elements of online instruction: "social presence", "cognitive presence", and "teaching presence". It is these parameters that Bair and Bair investigate in their own practice. They draw on their own reflections as well as student feedback about their courses and course evaluations and online peer observations to establish their data. In this respect the study is neither purely phenomenological nor auto-ethnographic. Bair and Bair point to six self-defined paradoxes. Social presence meant the technology brought faculty and students together and it separated them. Equally, computer-mediated communication was private and it was public. As to cognitive presence asynchronous text-based discourse both facilitated engagement and it inhibited engagement; students had more information and were less informed. Teaching presence meant that online teaching required both flexibility and structure while the technology made work easier and faculty worked harder (p. 5). The closest they come to a definition of successful use is their concluding quoting of Jacobsen, Clifford & Friesen (2002) that, the real challenge will be to "develop fluency with teaching and learning with technology, not just with technology itself" (in Bair & Bair 2011, p. 12).

Although quite different in style, Lee, and Bair & Bair each highlight the invisibility of technological problems subsumed to issues of course management and appropriate contact with students are similar and demonstrate the writers' experiential focus of attention. In addition the authors of both studies exhibit a degree of anxiety, as well as a modicum of achievement. The same can be said of the autobiographical style of Mwaura and Nyaboga (2011), a third auto-ethnographic account and one which reports on the use of Blackboard. Although structured differently from Lee's narrative account, it vividly conveys a sense of being "all-at-sea", and of finding insufficient support, both technical and pedagogical. At the conclusion of the paper there is a feel of despair about the whole project of teaching online:

> The documented approaches to effective online teaching and learning provide benchmarks for use by both teachers and learners but do not provide solutions to the many unresolved and critical concerns of distance education in general, namely the integrity of the entire process. (p. 107)

Despite a confident and authoritative writing style, they felt themselves professionally and perhaps personally compromised by the experience, being unable to wrest from the technology a form of use that they found appropriate.

These three auto-ethnographies reveal online educators' primary concern with the promise of a smooth and coherent technological experience for students. In the auto-ethnographic literature, the technology itself is not mentioned except as it is an impediment to the instructors' purposes. Paramount in all three accounts is a sense of problem solving on the fly, combined with the feeling of uncertainty that engenders. This contrasts with the scant attention to what educators actually do or feel, and the need to concentrate, as the instrumental literature would have it, on circumventing defects in the product or the teacher. Such literature is blind to both the experience of precariousness and sense of commitment that the auto-ethnographic literature conveys.

There are other phenomenological studies of the more broadly defined networked technology used for teaching. Jones, Asensio & Goodyear (2000) formulate a strongly pedagogy-oriented view of the use of networked technology. For them, the main factor determining successful use was the tightness or looseness of teacher organisation of students as part of their course design in networked learning. This aspect, according to Jones et al, was a solution to both the problem of engaging student participation and in co-ordinating responses between teams of student participants in networked learning. Failure in this regard was understood as unmet expectations of student participation:

> We wonder why both expert practitioners and early adopters display a common educational philosophy. That philosophy may not be well understood or accepted outside this narrow and possibly self-selected group. The disappointment we found expressed may have implications for a large-scale roll out of new technologies. Disappointment if widely experienced by new practitioners in the field of networked learning, could lead to resistance to the adoption of networked learning in the future. (p. 26)

That comment emphasises the importance of affect and of internal consistency of values. Non use of technology can arise from disappointment with the mismatch with pedagogy, found when trying out educational technology, pointing to the importance of peoples' feelings of dissonance, and the need for change regimes to respect people's individual values.

Amongst phenomenographic studies of teaching with networked technology generally, De Gagne and Walters (2010) offer a leading qualitative study of the factors that make online education successful. However, the study is less about the lived experience of educators than it is a qualitative study of the factors that make online education successful. They point to factors like boundary setting for students, time management, strong communication skills, a learner-centred approach and the need for continued education and training of teachers. Success is defined as good course design for student management, and they emphasise the need for professional development to impart knowledge on "how to do it". The study does not mention the type of educational technology used by any participants nor salient technological differences, eg, those between course management systems and social media in drawing conclusions about instructors' impressions of use. In that it emphasises use as successful pedagogical management of student outcomes, it was similar to Jones et al, above.

These two studies that incorporate phenomenological accounts but are not themselves conducted through the writers' experience, still manage to draw attention to the affective side of delivering online education, with success being equated with personal achievement or surmounting affective obstacles such as "disappointment". Nevertheless, their definition of successful use focuses on management by teachers rather than teachers' experience. Each equates use with overcoming online student management and course management problems and with delivering successful management of student outcomes.

There is also a group of studies which, while not phenomenographic, do focus on the use of the LMS, using a more generally qualitative perspective than many of those studies I have called "instrumental". These are valuable in that they describe other additional aspects of how teachers experience and understand the technology. West, Waddoups & Graham (2007) is the most highly cited general qualitative study of how Blackboard or other LMSs are used. This study analysed the responses by 30 people to a semi-structured interview, as well as 122 responses to a survey to determine how teachers understood the way their use of instructional technology (Blackboard) had changed and what had affected this. The authors' definition of technology implementation is, "the actual integrating of the innovation into a person's life until the innovation is finally institutionalized or a routine part of the person's experience" (p. 4). They distinguish this from "adoption", for which they use Rogers (1983) definition, as the initial decision to use technology. Thus they define "use" to mean use of technology in its establishment phase, between an initial "decision" and eventual "routinisation". Despite its somewhat rationalist caste, this is a helpful distinction as it focuses attention on the moments of change and acknowledges the actuality of the building of use or changed practices.

West et al.,(2007) describe the adoption and use sequence and are at pains to point out that this is not a linear sequence. The process begins with experimentation and moves through the overcoming of "challenges" – technical challenges and integration challenges. "Features" of an LMS are not adopted collectively but one by one. So, for West et al., integrating a feature of Blackboard into a regular routine and practice constitutes the more difficult challenge, a matter of teachers struggling to see how to apply Blackboard technical capabilities to teaching their particular subject matter (p. 17). As one way of dealing with uncertainty, West et al., suggest that teachers, "seek feedback from students and teaching assistants as confirmation points" (p. 18). As they grow more familiar, teachers are able to customise and adapt or reinvent tools to meet users' needs. Lastly, they say, teachers reach a point equivalent to Roger's "confirmation phase" and decide to continue using the tool, or alternatively, to reduce or discontinue their use (p. 18).

West et al., (2007) also make the point that reconsidering practice is a difficult process. First, echoing the findings of other researchers, they note that integration practices are initially defined by what has come before, and second,

> learning to overcome integration challenges associated with using a new Blackboard feature may mean reconsidering their own sense of what is good pedagogy, or even what the best methods are for class management, and what their responsibilities should be as teachers. (p. 18)

Although they do not explicitly draw attention to it, these are matters of identity and self-efficacy, demonstrating the deep shifts that may be necessary to construct "use". Despite West et al.'s emphasis on a relatively nuanced process of technology adoption and the way teachers integrate the technology and new features into new practices as extensions of their existing practices, there is still a hint that success ultimately means extensive incorporation of the available Blackboard tools by the instructors. In this respect they define use from a technologically-oriented standpoint, that of many organisational implementers, rather than deriving from a pedagogically-oriented student focussed perspective, that of many academic users.

Ge , Lubin & Zhang (2010) report on a qualitative study of the experiences of teachers who switched from Blackboard/WebCT to the Desire2learn (D2L) learning-management system. The researchers concentrated on documenting faculty experiences with the new LMS and on identifying needs for assistance and the use of support systems during the transition period. Past experience proved important in deciding the features that were liked. As other studies have noted, if systems were found not to be easy to use, users would look for "work-arounds" or quit using the system altogether. A central finding was the trade-off between flexibility and control. Blackboard was understood to offer control "since it was 'straightforward' with fewer options" (p. 441). While respondents liked flexibility and options in LMS design, "they also simultaneously wanted to have good control over the system" (p. 441). Furthermore, the researchers note,

> [W]hile D2L provided more options and freedom for customization, it could seem overwhelming to some faculty members. However, as the instructors gained more

> competence and confidence with the new system they began to exhibit greater appreciation for the perceived freedom. Moreover, they began to reconsider how they could better design their courses with the options available. (p. 441)

In this study the degree of control by the teacher was the primary condition of usefulness:

> The new LMS provided more options and enabled perceptions of freedom to customize, but also seemed overwhelming to use at first. The faculty members seemed aware of the trade-offs and chose control over ease, even with the initial discomfort of learning the new system. (p. 442)

Control, they say, relates to characteristics of the technology, but also to the characteristics of the faculty using it. Confidence and competence are two very important elements of a sense of control.

> We can also see that the users' competence, and therefore, their perceptions of confidence and control, may be related to their perceptions of the utility of the LMS, as well as their knowledge in using a LMS (including all their prior knowledge). Perceptions of utility are tied to users' prior experiences with an LMS and their expectations that the features of the LMS will enable them to solve problems. (p. 444)

Ge et al., here depict a complex set of conditions of technology use where utility for the user is associated with: control over the technology; prior expectations that it will be useful; and its efficacy in problem solving. This viewpoint does not depend on technology features per se to denote success. Use is defined as an experience of control and success in employing an appropriate configuration of the technology.

Woods, Baker & Hopper (2004) conducted a comprehensive, quantitative study of 862 teachers using Blackboard for blended learning delivery who responded to an online survey. I include it here as it, too, reports on qualitative and experiential factors, and directly addresses use of Blackboard. Their research addressed the use that instructors delivering blended learning made of Blackboard features but concentrated on the improvements to teaching that the platform might bring and on the instructors' perceptions of it. They found that,

> [T]he dominant use of Blackboard was for course administration and management purposes. Faculty primarily used Blackboard to post course syllabi, send email, and post grades. An overwhelming majority of faculty "never" (quotes denote the survey category ticked) used a Blackboard for more interactive course administrative functions, such as holding virtual office hours or collecting/returning assignments. Such findings suggest that, for the faculty participating in this study, a Blackboard serves more as a

> high-tech website and mailing system rather than an interactive course resource. (p. 291)

They speculate that this may have occurred because given the satisfaction with traditional methods of course administration and instruction, for blended learning there are few compelling reasons to adopt the corresponding features of Blackboard. Moreover,

> [A]lmost no instructional or interactive feature within the Blackboard was reported to be frequently or occasionally used by more than one-fourth of the faculty respondents, and in almost every situation, there were more respondents who never used a given instructional feature than used it at all. (p. 292)

The dominance of course management over course instructional use is a significant point of difference between this study and others. It does, however, parallel other studies such as Siemens(2006); Mallikowski,(2008); Lane (2008); and Zanjani,(2012), which remark on the tendency of faculty to use course management systems for course management rather than to facilitate learning. Last, they repeat the finding of many others, that: “The results further indicate that the main factor in determining Blackboard usage – whether for course administration or instructional purposes – is experience with the tool” (Woods, Baker & Hopper 2004, p. 294). Moreover, they emphasise the necessity of time – around four years is needed to develop a more sophisticated use of Blackboard. As in Cigdemoglu’s (2011) study, Woods et al., (2004) define technology use as primarily based on the number of technological features used and, indeed, here successful use is almost exactly aligned with the capacities offered by Blackboard. However, they also verify the findings of others that prior experience and experience with the system in question over time has implications for a broader use of Blackboard’s technological features.

Veletsianos, Kimmons & French (2013) also emphasise the role of experience. They set out to “to identify, describe, and make sense of initial instructor experiences with a social networking platform used in higher education courses” (p. 262) via a focus on experience captured by lengthy interviews, meetings and observations of participants in action. The platform they research, “Elgg”, is a social media management system that integrates social media to a single platform. The portal interface providing access also linked to standard educational software such as LMSs. Veletsianos et al.’s understanding of the idea of educational technology use begins with the construction of expectations: “All instructors had expectations of Elgg that appeared to stem from various sources including their prior experiences with learning technologies, their experiences with popular non-educational technologies, and their pedagogical beliefs and practices" (p. 266). They also noted that "all participants' expectations of Elgg stemmed from individuals' pedagogical beliefs and practices" (p. 267).

Actual use was quite variable. Veletsianos et al., report that instructors felt that "the platform and its functionality did not shape the way it was used and all [respondents] reported limited use of social networking features such as status updates, profile management, and microblogging" (p. 267). The teachers made relatively conservative use of the technology and "limited use of the environment's social networking features" (p. 267). This included: making it a repository for documents and information to be distributed to students; using it as a discussion forum; using it for students to deposit presentations; and to provide feedback (ie, as a formative assessment tool). As did Jones et al.,(2000) before them, this research concluded that "all faculty members were far less interested in the social aspects of Elgg than they were in trying to use it to support classroom management" (p. 269). As Veletsianos et al., put it,

> [N]o participant fundamentally changed his or her practice as a result of using the tool. Rather, as participants recognized incongruencies between the tool and their practice they either (1) tried to make the tool work in a manner that aligned with their pedagogical beliefs or (2) reduced/restricted their use of the tool. (p. 270)

Considering these various studies together it is clear that concepts of "experience" and of "phenomenology" are understood quite differently in the literature. For some, to conduct phenomenological or experiential studies means replicating a first-hand account or producing a close parallel to a first-hand account, an autoethnography. For others it merely involves participants reporting on their experience in ways that the researcher can control via their analysis. This latter more closely resembles the standard qualitative methodology for reporting of experience. This means that there are even fewer studies that explore the subjectivity of academic use of educational technology than the use of the terms "experience" or "phenomenology" within the studies would suggest.

There are four main constructs of successful technological use apparent in these studies. The first is to do with the subjective experience of the user. These studies cover use as a matter of involvement, frequently emotional involvement. Studies speak of the triumphs of competence, experiences of success and connectedness, the disappointments of failure. The second is to do with the extent of the adoption of the technology. This can be overall extent of adoption, or the successful incorporation into regular practice of “technology features” as an indicator of successful use. The third is to do with successfully managing a course. Course management in terms of both the successful management of student needs and engagement during the course and of administrative functions associated with running a course tended to dominate over considerations of educational style and outcome. Lastly there are constructs of successful use which engage with educational values through professional and personal values.

“Use” in these readings is an end-point. Also needed is an account of the means or process of reaching that end-point. The two studies that most successfully capture the process of engaging in educational technology use are West et al., (2007) and Veletsianos et al., (2013). West et al.,(2007) embellish Rogers’ diffusion of innovations theory by considering how people engage in innovation and what happens after they begin to do so. This process, they find, entails reworking both the pedagogy and the usages of technology in ways that may be unintended by the designers. In essence West et al visualise the process of implementation of use, as beginning with experimentation, then overcoming technical challenges and what they term “integration challenges”, meaning making some aspect of the feature they are trying to use fit into their regular practice and routine. Overcoming “integration challenges” would appear to be at the heart of any description of the process of constructing technological use, for this is an entree into understanding practice change. However their investigation of process stops there and they do not consider further how people go about knowing how to integrate use.

Veletsianos et al., (2013) unpack the process of constructing use rather more deeply than West et al., though they argue “no participant fundamentally changed his or her practice as a result of using the tool” (p. 270). Veletsianos et al. capture better than others how technology use is more than just a straight forward learning of features and skills in the ways intended by designers. Instead, like all learning, it involves a reformulating and rebuilding of use from the initial idea of it, to an executable complex set of practices and sense making. It is the process of internalisation and reshaping which is the interesting aspect of use. In the phenomenological studies, technological change itself is largely understood as both continuous and holistic, involving the incorporation of new tools and actions into the flow of experience. There is little indication in any of these studies that technological change caused radical disruption to social conditions, which is implicit in the older instrumental accounts of technology use. Instrumental and rational studies of the technology offer explanations for why people don't behave as anticipated. Typical forms of rational explanation include behavioural models such as Rogers' diffusion of innovation model, which explain adoption as a "decision" and invoke a causal chain leading to and from that decision as an orderly, logical sequence of adoption.

At the least, the phenomenographic studies reviewed here usefully go further than that, by suggesting a picture of adoption and use of new technology as complex, as something to wrestle with, and which consumes attention and personal engagement on many levels. Each of these studies contributes appreciation that adoption is, indeed, difficult and entails more than learning a few technical skills. The studies also emphasise that this process engages the identity, feelings and competences of the educator, and that it is inextricably tied up with prior experience and the capacity to imagine "use" both in terms of what has gone before as well as by visualising how it might fit the new conditions in which it is to be offered. In effect, adoption is not a "decision" but something occurring piecemeal as sense is slowly made of the technology and of what it might mean for the work that teachers undertake.

This body of work still leaves some important issues to be dealt with, however. Implicit in this corpus are central questions that have not been as systematically dealt with as they might have been, for example: How do we best understand the nature of experience and the ways people make sense of that experience? How can we understand the nature of change especially socio-technical change, and what roles do people play in embracing or resisting change? To explore the theoretical problems raised by these questions I will turn to three bodies of theory, sensemaking theory, practice-theory and socio-technical theories (social construction of technology, SCOT; and actor-network theory, ANT). These theories share common roots, in that they are members of what Gross (2009) terms "the practice-theory family" (p 359) whose intellectual origins he locates among the American Pragmatist philosophers, Charles S Pierce, William James, George Herbert Mead and John Dewey (p. 359). The characteristics of the practice-theory family that Gross highlights are its blurring of the Cartesian ontological distinction between body and mind, and thus the rejection of rational calculation of ends. It posits instead that "humans are problem solvers and the function of thought is to guide action in the service of solving practical problems that arise in the course of life" (p. 368). The corollary to this claim, he argues, is that "action in response to problem situations involves an alternation between habit and creativity" (p. 368). Moreover: "Only when pre-existing habits fail to solve a problem at hand, does an action situation rise to the forefront of consciousness as problematic” (p. 368).

The work of Weick, which I discuss below, expands on Gross’s nuanced description of the processes of understanding and the development of use. Weick addresses and renders more coherent some of the insights generated in the phenomenology of technology adoption. His theory of sense making is one of the three bodies of work that I draw on in this thesis; the other two are dealt with in the next chapter.

Theorising technology use: Sensemaking

Sensemaking theory is an influential modern instance of extension to philosophical pragmatism through a focus on adaptation in organisations, which can be used to think about technology use in organisations. The American pragmatic tradition informs the work of Karl Weick (Cox & Hassard 2007, p. 481; Elkjaer & Simpson 2011 [eg, "experience", p 64, "disruption", p 66]; Langley & Tsoukas 2010 [eg, "process perspective", pp 8, 9]). Weick himself identifies William James as a “predecessor” (Weick 2004, p. 654). Weick’s “sensemaking” approach has made a considerable contribution to Organisation Theory (Anderson 2006; Langley & Tsoukas 2010). Tsoukas and Chia (2011) argue that in making an ontological shift from organisations to organising, “Weick has enabled scholars and practitioners alike to pay closer attention to questions of novelty, process and agency” (p. 8). Certainly many studies have made use of Weick’s work to illuminate the process of sensemaking with technology in all sorts of organizations (Bansler & Havn 2006; Berente, Hansen, Pike & Bateman 2011; Davidson & Pai 2004; Griffith 1999; Orlikowski & Gash 1994). The use of the concept of ”technological frames” drawn from Bijker (1997), combined with a sensemaking perspective has made an important contribution to the study of technology in organisations (Orlikowski 2008; Orlikowski & Gash 1994). Despite the organisational focus of these studies, not much attention has been given to addressing technological sensemaking in the context of teaching and learning, however. This alone warrants the endeavour undertaken within my research project.

Weick sets up a strong antipathetic construction of the relations between people and their information technology. His substantive premise about cognition and technology is to set rational decision-making – of the kind instantiated in practice by Ford and Taylor, regretted by Weber and made into an art form by the Chicago School in the 1940’s – against his pragmatically informed, naturalistic understanding of how we reach a reflexive, plausible, retrospectively justified conclusion about a state of affairs that is enough to be going on with. How we reach that conclusion, Weick says, is through sensemaking.

Sensemaking is “about such things as placement of items into frameworks, comprehending, redressing surprise, constructing meaning, interacting in pursuit of mutual understanding, and patterning” (Weick 1995, p. 6). These are social-psychological process, which are heuristic, expedient and largely intuitive. Sensemaking is not simply interpretation because when people engage in sensemaking they are creating the environment they interpret. Sensemaking is also, in its later incarnations, not a matter of individual cognition. In early work (Weick 1969) Weick explores individual cognition, focusing on memory, recall, and consciousness. In *Sensemaking in Organisations* (Weick 1995) and thereafter, he makes inter-subjectivity the centre of sensemaking activity, as in: “Sensemaking is never solitary because what a person does internally is contingent on others” (Weick 1995, p. 40). Sharing is problematic, however (Weick 1969, p. 180). Meanings may not be shared, but experience and beliefs are (Weick 1995, pp. 63, 188).

In setting sensemaking against rational decision making, Weick has addressed the clash of two forms of thinking that might be used to solve problems in organisations; the rational and the naturalistic. But while the more rational forms of decision-making in organisations may be heavily codified, they are not totally technologised and “non-human”. However, he argues, management decision processes are increasingly becoming technologised management decision systems. In this way they are doubly rational, the machine rationality of systems ramifying the decision rationality of organisations (Weick 1995, pp. 177–178). This opens up a line of investigation on what it takes to discriminate between managerial rationality and technological rationality and how these may interplay. The overall thrust of Weick’s argument is to posit rationality as a form of structure, particularly as rationality is translated into technology. Rational systems are hard to argue against in the first place and “decision rationality”, whether it stems from human management or from a computerized conclusion imposes significant constraints on what is possible.

Yet the mechanism of sensemaking involves the pursuit of order, wherever it comes from. Ordering experience is paramount, but it has an amorphous, undetermined and shape-shifting quality. This is because, as Weick puts it, “the various kinds of order we come up with are a product of our imagination and need, not something dictated to us by reality itself (Weick 2001b, p. 9). Using imagination to "stabilise flows" of experience results in an:

> [I]ndefinite number of maps that can be constructed… It is the job of the sense maker to convert a world of experience into an intelligible world. That person's job is not to look for the one true picture that corresponds to a pre-existing preformed reality. (p. 9)

It follows, then, for Weick that, "the various kinds of order we come up with are a product of our imagination and need, not something dictated to us by reality itself" (p. 9), and using imagination to "stabilise flows" of experience results in an "indefinite number of maps that can be constructed" (p. 9). However, order constructed by imagination becomes a problem "when information technology pre-structures what people come to treat as their world" (Weick 1995, p. 179).

At the time Weick was writing, the most sophisticated technological systems were "expert systems". These expert systems suggested to Weick the sorts of issues that could become problems with further technologising. The "technological space" of digital learning environments, that is, the design of the platform which "affords the actual realisation of the object of the design activity", (Blin & Munro 2008, p. 480) tends to incorporate what are typically tacit theories of causation about the sequences of events it is designed to control. This can be problematic, as Weick avers, because it is not easily modifiable:

> Among the problems of such systems, are that they underestimate the probabilities of multiple 'conditional independent' occurrences, and these underestimates can lead to disasters when the 'inconceivable' turns out to be fairly common. These expert systems also are unable to reimpose new distinctions on the environment to observe what might be happening when the programmed distinctions break down. (This) technology gives the illusion that face to face acquaintance and prior history are not essential. (Weick 1995, p. 178)

He argues on this basis that we need to understand far more about what constitutes a "sensemaking support system" as well as much as we can about decision support systems. A sensemaking support system addresses the question: What is it that humans need to help their normal patterns of thinking in order to understand and process the sorts of environments they find when using information technology? [4] As Weick points out, information technology is an intrusion or interposition on the normal, less constrained patterns of shifting from one

[4] For a more detailed list of support system questions, see Weick 1995, p.179.

(naturalistic sensemaking) practice to another in the face of ongoing change. This is because from a sensemaking perspective: “Presuppositions about patterns that underlie concrete actions constrain interpretation.” (Weick 2001b, p. 11) [5]

The problem of being “unable to impose new distinctions” remains a problem for mainstream information technology. One implication is that conservatism is encouraged by the time lag in adopting new technology in large organisations, which tend to use “legacy” systems - technologies which remain despite the availability of newer or more effective systems or products. These are frequently structured into overly rational inflexible designs that further reduce reactive or prospective flexibility by being imposed across the whole organisation. Underestimating “conditional independent occurrences” therefore remains a problem. It is, as Weick points out, an absence of reactivity to the flow of events, to changes in environments that encumbers information technology in this respect, making it hard to work with. It can neither sense, nor make sense. Thus:

> Existing programs tend to focus on what is judged a priori to be ‘controllable’, which means that information needed for improvisation, refraining, or repunctuation is not available. The observer is trapped into the conclusions coerced by the technology and has neither the time, nor the data to question or override what appears to be a compelling synthesis. (Weick, 1995 p. 178)

Here, in many respects, Weick is echoing “Lady Lovelace’s objection”, which holds that: “The Analytical Engine has no pretensions to originate anything. It can do whatever we know how to order it to perform” (Turing 1950, p. 450). This is the sixth hypothetical objection to artificial intelligence imagined by Turing in his seminal article outlining what became known as the *Turing test*. Turing’s rebuttal to Lady Lovelace’s objection is that machines can surprise, and indeed have frequently surprised him (p. 450). Surprises or “implausible outcomes”, however, require just as much sensemaking activity as the imposition of uncomfortable regularities. Both are sensemaking occasions, according to Weick (see 1995, p.131). Moreover machines do not draw on a background of previous subjective and intersubjective meaning and

[5] This renders ironic one somewhat unexpected spin-off from sensemaking studies namely the development of a technology specifically to aid sensemaking in online education. This is software is known as “Sensemaker” http://www.sensemaker-suite.com/smsite/index.gsp. Missing the irony, it labels itself a “decision support system” (see home page op. cit.). This system has been used to overcome the limitations of Blackboard and aid the process of sensemaking by students, and by association, the sensemaking of academic teachers (Nosek 2006).

expectations to make sense.

As information technology becomes more flexible and responsive it can introduce greater variance in how it reacts, new instances of what seems a surprise, and differences in how it is interpreted. In "Technology as Equivoque" (1990) Weick argues that across three "properties of technology" there has been a movement from technology which is stable, somewhat deterministically explicable and relatively simple to organise around, to "something that admits of several possible or plausible interpretations and, therefore, can be esoteric, subject to misunderstandings, uncertain, complex and recondite" (p. 2), later adding "interactive complexity" (p. 6) to other forms of potential misunderstanding.

Furthermore, construction of sense under these conditions is not a localised process, confined to the relationship between the user and the technology. Instead, it is embedded in a larger system, a "technical system" consisting of a particular combination and arrangement of "machines, equipment and methods" to which Weick adds, "knowledge" and "design" (1993, p. 4). This interplay of technology and technical system, he points out, can place the technology as a precursor of the technical system, or, vice versa, as the technology may be introduced into a pre-existing technical system: "Thus, technology is both an *a posteriori* product of lessons learned while implementing a specific technical system and an *a priori* source of options that can be realised in a specific technical system" (p.5). A practical instance of differential movement in this interplay can be found in Neff et al., (2010) where new communication technology reinforced old technical and disciplinary system "silos".

Unlike the orientation of user-experience literature to technology as that which needs amendment in the face of user needs, Weick's approach emphasises the contingent in technology implementation. Not only is it dependent on and a reflection of the system in which it functions, but time is also a factor. The flow of time and the specific point when the new technology is introduced or an aspect of it is implemented influences whether it is part of the problem – the thing that is hard to understand - or, part of the solution – the correction that is introduced to make the new technology easier to understand. He observes in the same essay (Weick, 1990) that new technologies as they become more sophisticated and complex also become more abstract. This is an important insight that offers an architecture for how information technology might structure cognition.

New technologies [he says] are basically dual rather than singular. They involve the self

> contained, invisible material process that is actually unfolding, as well as the equally self contained equally invisible imagined process that is mentally unfolding in the mind of an individual or team. There are relatively few points at which the mental representation can be checked against and corrected by the actual process. (p. 16)

This, he implies, is the source of an epistemological break between new (information) technologies and those physical artefacts preceding them.

> Thus unlike any other technologies that have been used previously as predictors by organizational theorists, the new technologies exist as much in the head of the operator as they do on the plant floor. This is not to argue that one technology is more important than another but it is to argue that cognition and microlevel processes are keys to understanding the organizational impact of new technologies. (p. 17)

Moreover these are not static representations. According to Weick they leapfrog over each other and in so doing build new representations on both sides, “in the head” and “on the floor”. This results in “decoupling” of the actual process and the imagined representation of it. However, since the imagined technical process bearing no resemblance to the actual process, interventions that use it create, “a new technical system that is understood neither by the operator nor by the devices for self control originally designed into the material technology. The human construction is itself an intact and plausible view” (p.17).

These differences between real and imagined technical systems are easily illustrated by recalling the process of “sending email”. The imagined process is couched predominantly in thinking about content and social standards and accuracy in terms of level of address, the language employed, timeliness and so on. Few people except those who are technically trained think in terms of the technical process, and consider the matching of TCP/IP addresses, and the breaking up of an email into digital *packets* to be sent on to a number of *mail agents*, quite possibly via separate routes, before it arrives reassembled at the recipients computer. Even on the rare occasion that some form of technical representation is conjured up, it is as an “imagined” process, of an email flying through cyberspace with the material integrity and ballistics of a flying object.

Weick uses these observations to lay the foundations for a theory of technological “structuration”. A newly introduced technology at first sits on the outside of an organisation. Then, it steadily becomes incorporated into that organisation’s pre-existing “technical system” – that complex of people, machines and ideas and assumptions about how they are, and should be used, and their significance in the overall organizational context. The interpretations which are first applied are existing ones based on “traditional, institutionalised patterns of signification, legitimation and domination” (p. 20). However, the operator’s understanding of the technology, modest or otherwise, coupled with the strength of traditional and idealised patterns of dominance and legitimation serve to either ramify or modify the initial interpretations of the technology. Ramification is produced by “scripts” which include “direction giving, countermands, usurping controls, direction seeking and expected criticisms” (p. 20) – forms of institutionalised dominance. Modifying “scripts” include “preference stating, clandestine teaching, role reversal and mutual execution” (p.20) - forms of collegiality.

The structure to manage the heightened capacity for errors, mistakes, ambiguity and misunderstanding of technological systems is built up out of reactions to the various scripts and the degree of dominance of one sort over another, and “not some more static vehicle such as work flow” (p. 20). How technology is woven into an organisation depends on the mixture and the interaction of the action taken to implement the technology, the scripts that ramify or moderate this action, and the institutional forms that the “technology system” takes as a consequence. This provides the background for more of the same process. The point that Weick wants to make has been made by others - “that technology is both a cause and a consequence of structure” (p. 22).

The conditions that modify the whole system are associated with emotion and its effect on attention. The introduction of a new technology heightens the capacity for errors mistakes, ambiguity and misunderstanding. These create pressure, so consequent mental maps are made through the ramifying or modifying process, as above, but their enactment depends on the level of stress and whether heightened emotion is enabling, as it can sometimes be, or disabling. Failure of a technology, for example, a complete crash or simply some small portion of a program that does not do as expected is an interruption. Such interruptions, as Weick makes clear, are a constant threat to the conditions he has earlier depicted, of standard operating procedures and continuous processing brought about by sophisticated technologies and scripts and roles, all of which, he says, “become more tightly organised the more frequently they are executed” (p. 24). Yet, as continuous processing also induces more “stochastic events”, or normal accidents, interruptions leading to failure are more likely to happen. As Weick puts it, “virtually all of the effects of arousal on the already complex newer technology are in the direction of making it even more complex” (p. 32). In other words, new technologies come predisposed for sensemaking failure, and the sensemaking required by new technologies produces effects of discrepancies at the interpersonal and organizational level, which themselves require their own sensemaking.

Organisational sensemaking provoked by the introduction of new technologies takes the form of “premise controls”. Premise controls, or decision premises, are those carried in the head because more of the organisation is correspondingly carried in the head: “Cognition is an increasingly important determinant of organisational outcomes because with fewer visible artefacts, more of the organisation has to be imagined, visualised, and filled in from cryptic cues” (p. 35). Premise controls occur when managerial assumptions are built into technological and organisational design and restrict the cues that a subordinate voluntarily pays attention to, determining also what is considered irrelevant to the task or to the overall objective of the organisation. This voluntary control is more effective when work is non-routine and, therefore, necessary controls are difficult to predict. At the heart of these controls Weick says, is “either a delegation premise (that performers can make non trivial decisions regarding a course of action) or a directive premise (that they cannot)” (pp. 35–36).

In his only other work devoted exclusively to electronic technology, or "sensemaking in front of terminals", Weick does not directly address the idea of structuring. Instead he devotes "Cosmos versus Chaos" (1985) to the different ways electronic information environments can cause disruptions to, or collapses of sensemaking. In as much as a lacuna is a kind of structure, albeit as a hole in an existing one, these collapses ought to be considered as a part of structuring, but this article does not provide any significant theory of "structuration" that extends the model above. However, the manner of disruption of sense is honed in this work to apply to specifically electronic contexts and is, therefore, germane to understanding the relationship between technology and sensemaking. In it, he argues that electronic environments represent incomplete sensemaking environments, not simply because data is hidden, but because there is not enough of it.

> [T]hey contain only what can be collected and processed through machines. This excludes sensory information, feelings, intuition and context – all of which are necessary for an accurate perception of what is happening. Feelings context and sensory information are not soft-headed luxuries, they are ways of knowing that preserve properties of events not captured by machine compatible information". (p. 52)

It is difficult to do justice to Weick’s conception of sensemaking and technology in this brief account. Most significant are the ways that people build their own sense, even entirely imaginary sense, in the absence or distortion of empirical information for sensemaking by technological systems. They do this singularly at the level of the person operating the technology and collectively at the organisational level, and as a way of coping with the effects of both the products of sensemaking and sensemaking failure.

It could be argued that sensemaking theory is perhaps a deficit theory in so far as it suggests the problem of information technology use is the failure of information technology to meet the conditions of easy mental representation. However this stretches the idea of a deficit theory and additionally makes it the deficit one of the technology and not the user. To overcome the shortcomings of the machine, it is the subsequent efforts on the part of the "operator" and simultaneously, the social context in which the technology is being put to work that produce a further reflexive wave of misinterpretation, then more sensemaking. The motivation attributed to the actor is that of overcoming an inability to effectively work with technology and a feeling of unease produced by lack of sense. These "motivations" are reactions to circumstance, an evolutionary or ecological orientation, and not derived from any failure to reach a goal of use, in contrast to the laggards and resisters of instrumental theories whose failures are failures to reach preferred ends. "Thinking" is not a rational process in sensemaking, unlike the mental process assumed by decision theorists. Rather, it is a combination of conscious cognitive processing combined with unconscious "heuristics and biases" (Kahneman, Slovic & Tversky 1982; Gilovich, Griffin & Kahneman 2002; Gigerenzer & Brighton 2009), which are not uniformly bad thinking, as imagined by some. Kahneman (2011) has a strong tendency to think this way but heuristics and biases can in fact be adaptive or maladaptive.

As Weber and Glynn (2006) put it "(S)ensemaking pivots on mechanisms of action formation at the micro level of inter-subjective processes" (p. 1640). It concerns itself with micro-social and micro cognitive constructions rather than the broader sweep of institutional or societal-level constructs. In this respect it is similar to both practice-theory and theories like the social construction of technology, though these theoretical projects are more likely to represent macro and micro level practices as being inherently "the same" (Coulter 2001).

As Schatzki (2011) says,

> [L]arge social phenomena (like macro and global ones) have the same composition as do small, local, and micro phenomena: they consist of practice-arrangement bundles or of features or slices thereof. Large social phenomena might contrast with small, local, or micro ones, but what constitutes them is not inherently an instance of the latter. (p. 2)

Weick's concept of technological structuring tends towards the highly structured end of the spectrum of structuring. Information technology can produce insoluble puzzles because its inner workings are unavailable either for mental representation or to push and pull to find out what went wrong in the event of failure. Nothing is accessible for reinterpretation. This is one form of "hard" and relatively determinist technological "structuring". "Tools" in the metaphorical sense are also highly structuring because they prevent us from seeing alternative courses of action other than the ones prescribed by the purpose of the tool (Weick 1996). Tools here are used as an allegory by Weick for theories. The "scripts" that are produced to weave technology into an organisational technical system are also forms of structure, albeit more diverse and more amendable and modifiable than the mysteries of technology itself.

"Knowledge" on this account is any information derived from cues in the environment and cobbled together with prior experience and present contexts. Meaning is to be found in the technological, and social and organisational systems producing the context in which that knowledge is used. The process or mechanism for constructing technology use is "structuration", as described above, which is oriented to implementation rather than the development of new forms of technology or to new uses of old technology. Because sensemaking is a process of making new interpretations, new uses will emerge. The mechanism or action of sensemaking with technology is tightly specified by Weick. It requires attention – "noticing", in Weick's words – and that is set off by a cue. As Griffith (1999) shows, "technology features" are cues when using technology, and

> [W]hen features cause one to experience novelty or discrepancy and/or to provoke deliberate initiative, they are noticed. Technology features that trigger sense-making serve as a foundation for the process of how users come to understand the technology as a whole. (p. 480)

Sensemaking theory encompasses both "continuity" and "disrupted" conceptions of social change. Continuity occurs when prior constructs are available and appropriate for use to interpret new situations. Disruption occurs when they fail and a gap is left in the sense that one can make of what is going on. Efforts to overcome the latter can result in catastrophic collapse (Weick 1993, 2010) or it can produce entirely new perspectives (Weick 1995, pp. 1–4). Weick calls continuity approaches "interpretation" (pp. 7–8). Disrupting events and contexts produce "sensemaking", which has inherent in it an idea of the epistemological break, necessitating thinking in entirely new ways, that is, gap-spanning, puzzle solving.

Hernes (2007) points to Weick's use of both continuous and episodic constructions of change in his work as pertaining to two different kinds of sensemaking. First is sensemaking that takes place amongst conditions of continuous flux such as when people apply sensemaking in cases of extreme urgency; and on the other hand there is sensemaking that stabilises, and occurs in "the enacted world of tangible entities, technological artefacts, around which stability of meaning revolves in relative stability" (p. 118). Weick himself (1999) makes an elaborated set of distinctions of subtypes of both episodic and continuous change. Episodic change can rest on metaphors of "punctuated equilibrium", (p. 357) where periods of stability are punctuated by fundamental change; or "edge of chaos" (p.367) whereby an organisation is simultaneously capable of stability and instability; or "second order changes" (p.368), which replace one belief system with another. Continuous change is represented in the socio-cultural literature on organisations, as ideas of improvisation, translation, and learning. 'Improvisation' (p.376) involves continuing modification of work practices and ways of relating; "translation" (p. 376) is a term more closely associated with Latour, but for Weick is the "continuous adoption and editing of ideas that bypass the apparatus of planned change and have their impact through a combination of fit with purposes at hand, institutional salience, and chance. "Learning" for Weick, is an image of organisations as a setting "where work and activity are defined by repertoires of actions and knowledge" (p.376). Weick has been criticised for being overly constructivist and insufficiently concerned with the incorporation of the material, particularly artefacts, into accounts of organising (see Schatzki 2005; Bakke & Bean 2006). These criticisms will be addressed in Chapter Three.

Conclusion: Emergence

An "involved" analysis of encounters with technology reveals much more about the process that may be engaged in coming to a use of technology than is suspected by those whose primary objective is to move potential users from a state of non-use to some activity that might be called use. The writers whose work is mentioned in this chapter have at some level addressed the problem of how a workable sense of "use" arises for users, and what might shape the form that this use takes. To begin to use educational technology is also to arouse feelings, engagement, self-awareness, and attitudes. Moreover it is apparent that a sense of dissonance frequently arises from this initial encounter. There are a number of hypotheses as to the root cause of this sense of dissonance, but a significant one is Weick's observation that a separation can occur between the real but black boxed workings of a computer, and the imagined process constructed by the user as a means of understanding how to work with it. A second contribution of Weick's is his theory that change is not continuous but episodic, and that the distinguishing feature of episodic change is the type of thinking which is characteristic of each phase. "Interpretation", a relatively unproblematic use of prior mental categories, is most to the fore when what is new is more or less predictable. However sensemaking, a much stronger and more conscious form of thinking, dominates when puzzles have to be solved, because what it means to work with a given technology cannot be interpreted, and looks unlike anything encountered before. Despite these useful contributions, all writers continue to grapple with the nature of the factors shaping the final actions of technology users into a use. Questions remain as to the relative strength and substance of "structure" and whether it is predominantly to be found in organisations, or in proximate social encounters; in more universal social forces; or perhaps in technological "obduracy", or in combinations of all four. And if this kind of external structuring is so, how does this interact with personal structuring anchored in identity and commitment?

Given the general absence of sensemaking studies with a focus on educational technologies in any form, and especially from the perspective of the teacher's experience of using the new technology, the knowledge gap with respect to sensemaking and use of online educational technology is clear and it is this gap that my work aims to redress. It only remains to note that the 1990s emergence of sensemaking-with-technology studies in organisation theory coincided with interest by organisation theorists in practice theories, associated with the work of Bourdieu, (1977, 1990) Giddens (1984) and Schatzki (1996, 2003, 2011), and in science and technology studies (Pinch & Bijker 1984; Callon 1986; Klein & Kleinman 2002) and actor-network theory (Latour & Woolgar 1979; Law & Hassard 1999). It is to the latter linked bodies of work that I now turn.

CHAPTER THREE: THINKING ABOUT EMERGENT TECHNOLOGY USE (2) SOCIO-TECHNOLOGY STUDIES AND PRACTICE THEORY

In a lecture aimed at an audience where there were neither philosophers nor technical experts, the German philosopher Martin Heidegger thought aloud about the character of technology. Published in 1954 as *The Question Concerning Technology,* Heidegger (1977) offered a provocative framework for thinking about the place technology occupies in modern life. As Leonardi (2012) has noticed “virtually all social scientific research on technology and organisation – whether by promoting it or denying it – owes some intellectual debt to technologically deterministic thinking” (p.22) As commentators have observed, while Heidegger also seems often to be on the verge of a technological determinist account he avoids this (Dreyfus 1995). In this respect he anticipates the subsequent elaboration of various theoretical traditions like the social construction of technology, actor-network theory and practice-theory, which I want to discuss here.

In *The Question Concerning Technology*, Heidegger (1977) asks, "how do we generally think about technology?" He comes up with two answers: Technology is “a means to an end” and “technology is a human activity”. These answers make up what Heidegger calls the current "instrumental [aimed at *getting things done*] and anthropological [a *human* activity] definitions of technology" (p.3). He allows that these definitions are “correct” but that they do not go far enough. Rather, Heidegger sets out to investigate technology in order to prepare us for a "free relationship" to it.

For Heidegger the central problem is not so much the existence of technology but rather our *orientation* to technology. We will never experience our relationship to technology so long as we variously promote the technological, put up with it, or try to evade it. Until we think about our relationship to it we remain chained to technology, whether we passionately affirm or deny it. His attempt to "open up" a conversation is at once a democratic gesture and, importantly, a strategy to shift to a more reflexive discussion. This is because one of his central ideas is that things don’t have meaning outside of the full context of relationships that constitute the world into which we are thrown. Technology doesn’t determine us, since it takes an entire world to determine technology, us, and everything else. Even our attempts to maintain control over technology, to master it so that it doesn’t destroy us, is informed by our "instrumental conception" of what technology is. As Heidegger observes: "The will to mastery becomes all the more urgent the more technology threatens to slip from human control" (p.5).

These remarks are not to be read as endorsing Heidegger's own engagement with the question of technology so much as to endorse the value of the questions he has asked and to set the scene for my discussion of several intellectual traditions that work in the light cast by Heidegger's work. There are several related traditions of enquiry referred to as the "social construction of technology" and "actor-network theory", as well as a body of work usually referred to as "practice-theory." Each owes a good deal to Heidegger not least of all because Heidegger's pursuit of the fundamental meaning of "instrumentality" leads him to an old problem in philosophy and in the social sciences: the question of causality. That is, the shift to a social perspective on technology represented by each of these perspectives was inspired by one primary problem, namely the role played by technology as a cause or source of change.

While these interpretative traditions have informed my own research project, I also need to defend what to some eyes might seem somewhat different, or even incommensurable perspectives as well as make clear the problems I have with their work. In justification for drawing on several theories to develop my research that some might suggest are incommensurable, I offer two points. First, the theories outlined above have their origins in a common ontology, deriving broadly from Heidegger, Wittgenstein and the American Pragmatists. The second is the pragmatic defence by William James that "truth" should be useful and is to be found by attending to the practical consequences of ideas. (James 1907) As I will show, writers associated with these bodies of work have addressed the central interpretative questions in somewhat different ways. Of the two approaches, the social construction of technology retains the greatest sense of human agency and unlike actor-network theory, which primarily describes socio-technical relations, rather than processes, it elucidates a clear account of change. Practice-theory provides a striking account of the nature of practice and action but at the expense of leaving the quality of personal experience out of the frame. To elucidate these theories I begin by discussing the social construction of technology and actor-network theory before turning to practice-theory.

Socio-technical theories of technology: social construction of technology

Histories of the development of socio-technical studies frequently open with the moves to separate an account of technology in society from assumptions that technology was a "force" or a structure shaping society (e.g., Bimber 1994, pp. 80 - 86; Brey 2009, p. 100; Dery, Hall & Wailes 2006, p. 231; Howcraft, Mitev & Wilson 2004, p. 332; Oliver 2011, p. 374). Most writers on the subject credit Bijker and his essays on the technological development of bicycles in Pinch and Bijker (1984) and Bijker (1997) as the point of origin of the social construction of technology tradition (see also Brent 2005; Howcraft, Mitev & Wilson 2004; Jones & Bissell 2011). In his seminal contribution to sorting out the relations of social context and the use of technology, Bijker explored "both the social shaping of technology and the technical shaping of society" (1997, p. 3). Bijker begins with analyses of micro case studies of technologies in order to produce an understanding of macro processes of societal and technological change (p. 4). From this close description of the historical development of design and implementation and the shutting off of alternatives, he arrives at a conceptual framework for describing socio-technical relations that has four important interrelated features. "Interpretive flexibility" and "relevant social groups" co-form "technological frames", which eventuate in "closure" and "stabilisation" of socio-technical meaning and use.

Bijker refers to interpretive flexibility, to show by how the development of the bicycle could be understood quite differently through the eyes of two different relevant social groups. Central to his account is the focus on the way people use the bicycle. People who were trying to make sense of the bicycle and interpret its use for themselves, had to decide as they used it, what a bicycle was doing when it was "working" – or what it was "for". This, I think, is a point underestimated by many commentators on Bijker's work. Critics (as discussed below) tend to point to his claims of "flexible interpretation amongst relevant social groups" as the points of theoretical contention, and overlook the importance of use itself, combined with assorted expectations of the meaning of "working" as a turning point in interpretation. In fact, understood this way, Bijker's formulation of socio-technical change has many similarities with the way Schatzki's development of practice-theory emphasises how meaning evolves at the point of action and Weick's ideas about the importance of expectation in forming sensible meanings.

Bijker shows: "There is no universal time and culture independent criterion with which to judge whether the high wheeled bicycle was working or not" (1997, p. 75). For non users the "Ordinary" Penny-Farthing bicycle was an unsafe technology, one that could "easily topple over resulting in a hard fall; the machine was difficult to mount, not easy to ride and difficult to dismount" (p. 75). It was considered risky by another relevant social group also, but for them, this was an asset rather than a drawback. For young, often upper class men who wanted to show off, the element of risk was essential and made it for them, in Bijkers' terminology a "Macho Bicycle", and the "Macho Bicycle" was radically different from the "Unsafe Bicycle":

> [I]t was designed to meet different criteria; it was sold, bought and used for different purposes; it was evaluated to different standards, it was considered a machine that worked whereas the Unsafe Bicycle was a **non-working machine.** (p. 75 Bijker's emphasis)

In sum, he argues that technologies cannot be understood by referring to their intrinsic properties. Rather, judgements about their working or non-working can only be understood as a result of interpretive flexibility arising from different meanings attributed by different relevant social groups. As Bijker says; "constructivist studies of technology work by addressing it as a subject requiring explanation. In this approach, machines 'work' because they have been accepted by relevant social groups" (p. 270).

Interpretive flexibility resides not only in the interpretation of users and potential users, but also in the design of the artefact:

> [N]ot only [is] there flexibility in how people think of, or interpret, artefacts, but also … there is flexibility in how artefacts are designed. There is not just one possible way, or one best way, of designing an artefact. (Pinch & Bijker 1984, p. 421)

His story of the development of the ordinary bicycle into two forms (the "unsafe" and the "macho" bicycle) and their subsequent, separate fates, illustrates the "double artefact". "The Unsafe Bicycle gave rise to a range of developments that sought to solve the safety problem" (Bijker 1997, p. 76), whereas "The Macho Bicycle developed in the opposite direction: the front wheel was made as large as possible. This design trend produced important and lasting effects in bicycle technology even though the high wheeled penny farthing became obsolete in the end" (p. 76). It is the existence of two alternative "using practices" that ultimately produced two different design approaches (although many different designs) which establishes the bifurcation of meaning leading to the two different forms of machine (Bijker, Hughes & Pinch 1987, p. 172). Interpretation of what might be the subsequent desirable use of bicycles by the early designers of bicycles thereby influenced divergent designs.

The idea of variety in using-practices helped Bijker to establish what he calls technological frames, defined as arising not just from how technologists themselves think of the technology, but also from how non-technicians and users come to understand it. This emphasis contrasts with previous frameworks ascribing technological meaning making to technologists and engineers alone, treating “use” as a designed-in property of the artefact. Bijker also makes the point that a technological frame is not the property of a particular individual or group or of systems and institutions because “frames are located between actors not in actors or above actors” (p. 172).

It is interesting that this idea of technological frames reflects a suggestion by the American pragmatist William James for how to explain differences in the meaning of technological objects and artefacts. James observes the use of a tool in a manner very like Bijker, “One man conceives [oil] as a combustible, another as a lubricator,” and still another “as a darkener of wood” (James 1879 as quoted by Crippen 2010, p. 481). For different people, the object – in this case, oil – is valued and thus noted for producing different effects, so that the object’s “essence”, that is, the key set of features that make it what it is, “varies with the end we have in view” (James 1890ii pp. 335-336; Crippen 2010, p. 481). The compatibility of the idea of technological frames with pragmatism may account for the degree of its uptake by theorists of technology.

Bijker’s next move is to ask how meanings become stabilised. His model stresses the emergent nature of meaning-in-use. It occurs by various means of consensus finding as ambiguous features such as alternative interpretations of acceptability or fitness for purpose or the meaning of “working” are accepted or ruled out, and a dominant shared interpretation emerges. Bijker illustrates this concept by describing the development of two alternative objectives for the pneumatic tyre, namely damping down on vibration and achieving greater speed (Bijker, 1997, p. 84).

Two conceptually separate but related ideas give shape to the closure and stability model. The first, -“closure”- is adopted by Bijker by analogy with the study of scientific controversies in the sociology of science. Closure is reached when alternative, flexible interpretations are no longer in play as alternatives, and a consensus has been reached. The “interpretive flexibility of an artefact diminishes” (p. 86), and its pluralism decreases. Bijker comments that once this occurs it is incredibly difficult to see the previous alternatives by looking backward in history. Closure is a social process that takes slippery developmental contingency and turns it into decisive retrospective historical necessity.

The second development is stabilisation (p. 82). Bijker argues that these are actually two sides of the same process and are inseparable, analytically separated by him only for the purpose of illuminating their workings (p. 85). Stabilisation settles an invention or discovery into a matter of unremarkable fact. It consists in expressions of greater certainty about the "fact" of the artefact and in appending increasing amounts of subsidiary documentation of its existence and workings, "the number of definitions, specifications, and elucidations attached to statements about the artifact" (p. 87). Stabilisation, as Bijker also points out (p. 93), means that one does not have to specify features of the artefact in question as these have come to be taken for granted as part of the artefact as it has developed.

Equally, achieving closure and stabilisation does not necessarily free the agreed role and design of the artefact from negotiation and fresh controversy (p. 271). Because social groups approach the problem of technological design differently, design flexibility remains to some degree, even after closure and stabilisation. Technological development is as a consequence, not an achievement of "the one best way". Thus Bijker builds a model of socio-technical relations to incorporate both designers and users, and to tackle the problem of dualism and determinism.

Bijker's work, like the work of other social construction of technology writers has had its critics. The most celebrated is Langdon Winner (1993) who initiated a debate about technological determinism. Harking back to some of the virtues of earlier social theorists whom, he suggested, SCOT theorists were trying to supplant, (Marxists, Feminist theorists, those who notice the ethical consequences of social actions), Winner points to the lack of consideration of the consequences of technical choice on the people it affects (p. 368). He also attributes to SCOT theorists a lack of "symmetry", in the Latourian sense of the term, arguing that they study "the social construction of technical artefacts and processes" while neglecting, "the ways in which technologies transform personal experience and social relations" (p. 369). They also neglect, he argues, the role of power and the people left out of development of use but who nevertheless are affected by the technology. Further, they neglect the consequences for society of technological development beyond the immediate social relations around the specific technologies described.

These criticisms have been echoed in more recent work. Leonardi and Barley (2009; 2010), like Winner, point to a split between the development of technology and its implementation.

According to Leonardi (2009) the split has occurred because studies focused on technology change have addressed technological development, while studies of organisational change have instead looked at how technological implementation has changed organisations. Leonardi argues for a "mutually constitutive" approach to organisational and technological change that also removes the "implementation line" (p 279) – or the research practice of separating technological development from implementation. Klein and Kleinman (2002) take up Winner's critique of the size and definition of relevant social groups. They suggest that SCOT is "agency-centric" (p. 32) in two respects: First, that Bijker's reliance on snowball sampling to identify relevant social groups is not suitable for exploring the idea of "relevance" in defining social groups for study. They also say that Bijker "repeatedly points to the success of a relevant social group or artefact, but he never specifies the factors that contributed to this outcome" (p. 34). Their second criticism echoes Winners' "consequences for society" argument when they suggest that more attention needs to be paid to people's limited power and capacity to define outcomes. They continue by making a case for the reintroduction of a concept of structure to highlight this. They discuss the inability of agents to exercise power and the limits of capacity in each of the five elements of Bijker's framework in order to emphasise the structural properties of each.

Bijker's approach has specific limitations for application to the problem of how use of educational technologies may be arrived at. The absence of a well defined theory of the means of actual passing on of a collective view of technological use is a major impediment. Bijker does not specify the concept of knowledge or knowledge transfer but it seems he relies on a conception of knowledge as a process of improvisation and learning. Neither knowledge nor knowledge transfer is dependent on any quality of the artefact: it is not inscribed into the technology. Nor is knowledge transferable in the way that more instrumental theories of technology imply. Humans have agency, in Bijker's approach, whether as designers or users because technology is modified in the light of people's interpretations. Bijker does not treat technologies or societies as unified structures. His implicit theory of social change is a "punctuated equilibrium" narrative in which periods of rapid change alternate with periods of relative stasis, consistent with that of Weick. For both writers, the arrival of a new interpretation settles the question of how to understand some disruption for a while.

Bijkers work and the development of a social construction of technology approach have been put to work by a handful of researchers studying the development of education technology. [6] Brent (Brent 2005) has investigated new educational technologies drawing on work by Pinch and Bijker (1984). Brent says that Pinch and Bijker's idea of interpretive flexibility, "though flawed, is still a useful way to look at new educational technologies" (Brent 2005 para. 6, unpaginated HTML). He argues that online educational technologies are an example of interpretive flexibility and in a number of respects. Technically there are wide varieties of course packages competing with each other as well as with other more generic information and communication technologies that can be co-opted for educational delivery. These emphasise different methods of communication and course delivery, and are thus subject to interpretive flexibility. "Moreover", he suggests, "essentially the same technologies can be applied in vastly differing ways", (para. 7) constituting an interpretive problem. Further, the fact of the uneven distribution of internet access also affects both interpretation and use – an invocation by Brent of new divisions of relevant social groups. Yet the net effect of these instabilities of interpretation is to affect the meaning of "education":

> Because these technologies are in a state of 'interpretive flexibility', they are affected by our understanding of what education is. What we think it means to 'teach' somebody will to a large extent dictate, for instance, whether more technological energy is put into threaded discussion tools or video streaming tools. (para. 8 unpaginated HTML)

Brent's reflections on the interpretive flexibility of education is useful in pointing to a tension between the interpretive alternates of education conducted face-to-face – which evolves gradually over time as a "performance", whereby students participate – and "textualised" renditions of education formalised for online delivery that position students as "an audience".

Jones and Bissell (2011) are quite specific about the value of a social construction of technology frame. They credit the social construction of technology perspective on "technology-in-use" with drawing attention to previously overlooked aspects of technological significance, such as the continued use of old technologies well past the time when more innovationist or progressivist accounts would claim they were superseded (p. 286). Compared with "innovation", which centres on "novelty, on difference from competitors, and (often) on potential wealth generation" (p. 287), technology-in-use puts the focus on technology "in the

[6] Jones and Bissell (2010 p.287) acknowledge, "that the socially constructed aspect of 'use' in educational technology has been little explored while Oliver (2011 p.381) remarks: "Of the approaches considered [here] SCOT is the least visible in literature in the field of learning and technology."

wild” where, “cheapness, ease of use and repair and durability” (p. 287) may be more significant. When the social construction of technology approach is applied to educational technology, it overcomes the overemphasis on the transformative properties of information technology. They also argue that it has the potential to enlarge “our conception of what counts as an educational resource” (p. 287). “Another possible benefit of the SCOT perspective is to suggest ways of supporting the kind of learning that educators wish students to experience” (p. 288). Finally, they emphasise the possibility of “authentic activity” because both teachers and students can turn a generic educational platform into something it was not before, something which is responsive to their needs and reflects their understandings, arrived at in the way learners should proceed, “through deliberation over assumptions, assessment of interacting factors, and so on” (p. 290).

Despite these few instances, applications of the theory of social construction of technology to online education or to technology in organisations generally is thinly represented in the literature. Jones and Bissell (2011) acknowledge, “that the socially constructed aspect of ‘use’ in educational technology has been little explored” (p. 287); and Oliver (2011) remarks that: “Of the approaches considered (in his study), SCOT is the least visible in literature in the field of learning and technology” (p. 381).

Orlikowski (2008) adds to, rather than criticises the work of Bijker and other social construction of technology theorists by suggesting the value of, “complementing the notion of embodied structure with that of emergent structure, and the notion of appropriation with that of enactment” (p. 257) However, she argues that Bijker’s stabilisation embodies “structure” within technologies and gives instead a more integrated account of human agency and technological structure when she writes:

> Technology structures are thus not external or independent of human agency; they are not ‘out there’, embodied in technologies simply waiting to be appropriated. Rather they are virtual, emerging from people’s repeated and situated interactions with the technologies at hand (p. 262)

In a similar vein Jasenoff (2004) argues strongly for understanding “the interpenetration of science and technology with cultural expressions and social authority” (p. 35) as a form of “co-production”. By co-production, she means that science and society emerge together, as “joint achievements … each underwriting the other’s existence” (p. 33). This is a critique of theoretical explanations like Bijkers, which confer causal primacy on the “social”, that is, the idea that social reality is ontologically prior to natural reality. Her second criticism is that, “the discourse of social construction tends to inhibit the symmetrical probing of the constitutive” (p. 37). By “constitutive” she means to promote theories that equally address the constitution of nature and society and their meanings – the ontological problems.

Constitutive questions such as these lead directly to the concerns of actor-network theory. Indeed Jasenoff is counted by many to be an influential actor-network theorist, and many, if not most of the criticisms discussed here have been taken up by actor-network theorists and woven into a theoretical position to both critique and extend the work of social construction of technology writers.

Actor Network Theory

Actor-network theory can be best described as that offshoot of the sociology of science developed by writers like Callon (1986), Latour (1987) and Law and Hassard (1999). It is a "material-semiotic" method that maps relations that are simultaneously material (things) and concepts (or meanings). Its advocates assume that many relations between people and their things are both material and semiotic. Actor-network theory is a way of thoroughly exploring the relational ties within a network (which can be composed of a multitude of different things). As Latour (1991) notes, he is interested less in explanation and more in description; "explanation does not follow from description; it is description taken that much further” (p. 39). Actor-network theorists try to show how material-semiotic networks come together to act as a whole; the clusters of actors involved in creating meaning have both a material and semiotic character. These networks are always transient, caught up in a constant making and re-making.

The central value of actor-network theory lies in the various attempts to stress the inter-dependency of the social and the technological. Its advocates have attempted the elimination of sociological foundationalism and of dualisms of any kind from descriptions of the constitution of the social and of nature. The elimination of foundationalism takes away the grounds for any aspect of society, whether economics, technology or sociality itself, which might provide a basis for determinism. Similarly the elimination of dualisms removes the tendency of one side to “rest” on properties of the other, another type of foundationalism.

Removal of dualism is clear in the work of Giddens, who, with his “structuration theory” also attempted to eliminate agency-structure dualisms. It is also clear that by introducing “embodiment” into practice theories, Cartesian mind-body dualism is also to be eliminated. Actor-network theory extends the twin eliminations of foundationalism and dualism to theories of technology. Actor-network theory has already been extensively canvassed, as above, as a foil used to highlight contrasting aspects of other theoretical approaches, so I will endeavour to repeat as little as possible of that; nevertheless, there are some salient features that ought to be drawn out.

In overcoming technological determinism, actor-network theory blends technology into accounts of the social. It does so by treating the technological and the social aspects of any action or problem as co-determinate. As Howcraft , Mitev & Wilson (2004) put it,

> [T]here is no such thing as a social problem that does not have technological components; nor can there be a technological problem that does not have social components, and so any attempt to make such a division is bound to fail. (p. 330)

Therefore, the way to understand the constitution of technology and society, Callon and Latour (1992) say, is to assume a “symmetry” between humans and non-human objects (p. 365).

The term “network” in actor-network theory is not used to refer to social networks but rather, to the arrangements of actors or “actants” as Latour (1996a) sometimes calls them, to emphasise that they include non-humans: “Our empirical program does not claim either that humans and artefacts are exactly the same or that they are radically different” (Callon & Latour 1992, p. 360). They are not assuming that objects – a telescope or an MRI machine – and people have the identical agentic attributes, but that their degrees of freedom are limited by the same conditions. To explain how social arrangements occur without alternating “between negotiation and entrenchment” Callon and Latour argue that they recruit,

> the texts, the inscriptions, the instruments, the skills, the nonhumans, none of which has a decisive weight, it is true, but all of which, mobilized together, woven together, are enough to transform the indefinite pliability of a situation into an irreversible fact. (p.365)

Actor-network theorists, therefore, set out to follow the traces. They concentrate on tracing networks because they argue social relations are invisible. “[T]he only observables are the traces left by objects, arguments/ skills, and tokens circulating through the collective. We never see either social relations or things. We may only document the circulation of network-tracing tokens, statements, and skills" (p.351). However, their examples tend to illustrate how an organization composed of things and people stabilises from fluid to less pliable with the introduction of (usually carefully designed, sometimes incidental) things – objects, artefacts, tools and bits of nature. The flow of agency seems to drift away from humans towards non-human stabilisation. For instance, Callon and Latour use the example of a speed bump to trace the complex shifts in agency and meaning between humans and objects endowed with meaning. Installing a speed bump means control over speed, previously exercised by either a real "standing" cop or by a culture of cautious driving, becomes now shifted to an object. As they say:

> The program of action: "Slow down please for the sake of your fellow humans" has been translated into another one: "protect your own suspension for your own benefit." Are we not allowed to follow this translation through? Who made the move from action to behavior, from meaning to force, from culture to nature? We, the analysts or they, the analyzed. Who or what is now enforcing the law, the standing or the sleeping policeman? Who are supposed to have sociality embedded in themselves, the talking humans or the silent road bumper? To claim that only the humans have meaning and intentionality and are able to renegotiate the rules indefinitely is an empty claim, since this is the very reason why the engineers, tired of the indiscipline and indefinite renegotiability of drivers, shifted their program of action to decrease this pliability. (p. 361).

A necessary corollary of moving agency and meaning between things and people is to solve the problem of the unequal distribution of 'minds' between them. This is why Latour has argued against the use of cognition as a site of explanation. Latour has solved the problem by deliberately bypassing the idea of cognition. In their postscript to the 1986 edition of *Laboratory Life* Latour and Woolgar (1979) called for "a ten-year moratorium on cognitive explanations of science" (p. 280). Shortly afterwards Latour (1987) developed the idea of a cognition-free explanation of scientific knowledge. He concludes *Science in Action* with "Rule 7. Before attributing any special quality to the mind or to the method of the people, let us examine first the many ways through which inscriptions are gathered, combined, tied together and sent back. *Only if there is something unexplained once the networks have been studied shall we start to speak of cognitive factors*" (p. 258, my italics). Ten years later, Latour returned to a version of cognition, but nothing resembling a commonly accepted interiorised form. Instead, it is both technologised and exteriorised. The change comes about because he is deeply influenced by the work of Edwin Hutchins, particularly *Cognition in the Wild* (Hutchins 1996). As Latour (1996b) represents Hutchins:

> One central phenomenon, repeated over the whole book, although it is not treated as a full blown theory. Cognition has nothing to do with minds nor with individuals but with the propagation of representations through various media, which are coordinated by a very lightly equipped human subject working in a group, inside a culture, with many artefacts and who might have internalized some parts of the process. (p. 56)

Finally, because "the social" was also in danger of offering a foundationalist platform, Latour and his co-theorists disposed of the social along with cognition. The reasoning, as summarised by Restivio and Croissant, (2008) was as follows: "The problem, Latour and Woolgar (1979, p. 281) argue, is that the term social no longer has any meaning. Their original intention was, in fact, to render the term "social" meaningless because of its "pervasive applicability". We now know that everything is social, so we no longer need the term social" (Latour & Woolgar 1979 cited in Restivo & Croissant 2008, p. 217).

Getting rid of cognition helps to explain why knowledge, in actor-network theory, "always takes material forms. It comes as talk, or conference presentations. Or it appears in papers, preprints, or patents. Or again, it appears in the form of skills embodied in scientists and technicians" (Law 1992, p.381). But where does knowledge come from? Law's answer is that it is the end product of a lot of hard work in which,

> heterogeneous bits and pieces – test tubes, reagents, organisms, skilled hands, scanning electron microscopes, radiation monitors, other scientists, articles, computer terminals, and all the rest – that would like to make off on their own are juxtaposed into a patterned network which overcomes their resistance. In short, it is a material matter but also a matter of organizing and ordering those materials. (p. 381)

How do writers like Latour or Law think about change? Change is hard to characterise in actor-network theory because the focus is on the description of socio-material relations *per se* and not on their change. One attempt to account for change is found in Hutchins description of navigational activities on board a helicopter (as recounted by Latour 1996b):

> The first point is not to follow mental or individual activities but trajectories of modified representations. In other words, there is not, according to Hutchins, any meaning in the

> expression “I think” or “I represent”. What can be documented is a *shift in representation* (my italics) through different media. For instance, it is not observable in the chart itself, but it is there in a group trying to make features of the landscape correspond with features on the chart. There is no meaning in asking what is in the mind of the plotter. But there is meaning in observing how the plotter coordinates various media - bearings reported on the phone by the pelorus operators, instructions precoded on the chart, orders from the captain - in one single line on the paper (Latour 1996b, p.56).

Change here involves “a shift in representation”, an alteration of the “traces”, “left by objects, arguments/ skills, and tokens circulating through the collective” (Callon & Latour 1992, p.351), which are those things left behind when the action has moved on.

How then has actor-network theory been used to make sense of new educational technology? Hutchins’ and Latour’s theory of cognition was highly influential on many aspects of social theory, including theory that subsequently came to be represented in educational technology. Hutchins drew on Don Norman who was to become the “father” of user-experience approaches to technology design and in particular the design of web pages and software (Norman 2002, 2005). In later renderings of this reintroduction of a collective “actant” cognition, it is elaborated into “distributed cognition”, an idea that “mind” could be externalised into mind-like devices, (Giere & Moffatt 2003; Perry 2003) that has also been influential in education and in theories of technology such as “activity theory”, which considers the entire system of work and activity as mediating between individuals and socio-technical arrangements (Ligorio, Cesareni & Schwartz 2008).

There are a surprisingly large number of studies of educational technology inspired by actor-network theory, many of them appearing over the last five years. Even so, these studies are far outnumbered by mainstream learning technology research (Creanor & Walker 2010, p. 520). In what follows I outline some of the work that relies heavily on actor-network theory to illustrate how it depicts engagement with Blackboard educational technology.

Campbell and Clark (2010) use actor-network theory to account for the emergence of anticipated and unintended uses of educational technology. The technology is the Blackboard LMS and the discussion is about the development and effects of setting up an RSS feed into Blackboard, where outcomes were unexpected and students abandoned the LMS in favour of external readers if the RSS feed was unsuccessful. Hustad and Bechina (2010) studied the implementation of Moodle (LMS) outside of a standard Higher Education setting, used as a means of training judges for an athletics association. As befits an actor-network approach their focus is on describing the "complex socio-technical environment which unfolds while transferring from an offline to an online learning context for education of athletic judges" (p. 72).

Johanessen, Erstad & Habib (2012) understand teaching with educational technology to be negotiated between teaching practices "which are normally strongly inscribed with a definite pattern of action," (p. 785) and Virtual Learning Environments (VLEs) with a special interest in "how VLEs may contribute to shaping teaching practices" (p. 786). They particularly rely on ANTs' conceptualisation of agency as equally distributed between humans and non-humans, and its focus on description to allow them to draw "a picture of the processes of creation, development and sometimes dissolution of hybrid networks, i.e. networks consisting of human and non-human actors" (p. 787) in use of a VLE (Fronter) by two groups of staff; teachers in a primary school and teachers in higher education.

Rowan and Bigum (2012) are interested in higher education innovation involving educational technology. Their study of educational technology is characterised by two broad patterns:

> [A] 'corporate' approach marked by the use of proprietary software such as WebCT or Blackboard, and an 'idiosyncratic' approach - the development of local, bricoleur-like solutions for teaching online. In the case of the use of software like WebCT we can map some of the moves that have been made to make these performances of online teaching and learning durable. (p. 6)

Samarawickrema and Stacey (2007) complemented actor-network theory by drawing on Rogers' diffusion of innovations theory to describe the enabling and impeding factors influencing the adoption of Blackboard in an Australian university. Actor-network theory was used to overcome the individualist focus of diffusion of innovations theory. While attending to actor-network propositions of "negotiation" between human and non-human actants, Samarawickrema and Stacey tend to interpret actor-network theory in terms of "barriers", rather than tracing networks of negotiation. Thus they say:

> All study participants unanimously agreed that actors such as time constraints, heavy workloads, the need to reconfigure learning materials to suit new environments, the

> demand for research output, training, the need to master new work practices, professional exposure, intellectual property issues, policy issues, funding and staff attitudes – each impacted on their uptake of web-based learning and teaching approaches. (p. 321)

Wong and Tatnall (2010) investigated the use of Blackboard in an Australian university, by also counter posing actor-network theory and diffusion of innovation theory. They decided that actor-network theory worked better. In this study far more attention was paid to the nuances of actor-network theory. Wong and Tatnall draw on ANT ideas like “translation” and “negotiation”. They demonstrate negotiation through the process of translation during which actors move technological innovations, “into a form that is more appropriate for use by the potential adopter” (p. 170). Translation consists of the steps, “problematisation”, “interessment”, “enrolment”, and “mobilisation”, (Callon 1986) and although Wong and Tatnall occasionally struggle with the fit, they describe how the use of Blackboard was negotiated and transformed through each of these stages. Enriquez (2009) also re-imagines Blackboard through the lens of actor-network theory, not as something “finished”, but as something that enacts multiple ways of working, co-ordinated locally into specific forms.

Actor-network theory has been criticised on a number of grounds. One criticism is that it contents itself with description of “networks” rather than any critical orientation towards social problems, let alone arguing for social change (Spasic 2007; Whittle & Spicer 2008; Woodhouse, Hess, Breyman & Martin 2002). Perhaps in reaction to this criticism some exponents have recently taken an “ethical turn”, inspired by attention to ecology and climate change, to argue for “ethical integration” between humans and non-humans (Allen 2011; Jasanoff 2010). This ethical turn also includes Latour’s (2011) recent call for a politics of environmental issues, even though he does not specify how. Similarly, Oliver (2011) has argued that actor-network theory is insufficient for the development of a critical perspective on educational technology use on the grounds that while it opposes technologically determinist accounts it is still “technist”, and cannot account for the “cause” of networks. (See also Selwyn 2012b, pp. 86–87)

A related criticism is that, because ANT tends to privilege the descriptive, it appears to be difficult to use for any trenchant illumination of the practical effects of techno-social relations. Hanseth, Aanestad & Berg (2004) comment:

> Within the IS field, however, actor-network theory seems often to have been used merely as a methodology for description; as a way to perform a stakeholder analysis, describing and labelling the different actors, identifying interests, phases of alignment, obligatory passage points, etc. (p.119)

This suggests that although of all the theoretical positions so far examined actor-network theory most closely integrates technology and society, it may be difficult to press beyond its methodological and/or descriptive perspective. This critique can to some extent also be levelled at practice-theory. However practice theory incorporates applications of phenomenological and sensemaking work in what has been called the "practice turn".

Practice Theory

That practice-theory, SCOT and sensemaking are amenable to some degree of co-option into a single explanatory device may be explained by a common heritage. To argue that practice-theory, conventionally associated with European thought such as that of Bourdieu, Giddens and Schatzki derives from the American pragmatic tradition is contentious but warrantable. Gross (2009) makes the case that Bourdieu himself had noted the affinities between his work and Dewey's, and that his approach like Dewey's,

> grant[s] a central role to the notion of habit, understood as an active and creative relation to the world, and reject[s] all the conceptual dualisms upon which nearly all post-Cartesian philosophies are based: subject and object, internal and external, material and spiritual, individual and social, and so on. (Bourdieu & Wacquant 1992, p. 122 quoted in Gross 2009, p. 367)

Equally Gross makes a proviso that there is one crucial difference: "Practice theorists like Bourdieu routinely tie their analyses of practices to questions of social-structural production and reproduction, which have not been a major concern of scholars working in a pragmatist framework" (p. 368).

Expressions of practice-theory are diverse. As Postil (2010) notes, many social theorists argue that "there is no such thing as a coherent, unified 'practice-theory', only a body of highly diverse writings by thinkers who adopt a loosely defined 'practice approach' (p. 1). Similarly, Monteiro Jarulaitis & Hepsø, (2012) suggest: "Practice-based perspectives in information systems do not represent a well-defined body of literature but comprise a loosely connected set of theoretical and methodological approaches" (p. 170, see also Geiger 2009, p. 133).

Schatzki (2001) insists, and I think rightly, on treating practice-theory as a more coherent project, identifying four groups of practice theorists: philosophers [Wittgenstein, Dreyfus, Taylor]; social theorists [Bourdieu, Giddens]; cultural theorists [Foucault, Lyotard]; and theorists of science and technology [Latour, Rouse, Pickering] (p. 1, see also Reckwitz 2002, p. 244). Postill (2010) separates practice theorists into "first generation" who laid the foundations for practice-theory, [Bourdieu, de Certeau, Foucault, and Giddens] and "second generation" [Ortner, Schatzki, Reckwitz, and Warde] who are "testing those foundations and building new extensions to the theoretical edifice" (p. 6). Allowing that practice-theory has exponents in philosophy, cultural theory, history, sociology, anthropology, and science and technology studies, Schatzki argues that practice-theory moves these disciplines beyond current problematic dualisms and ways of thinking. As Schatzki (2001) says:

> [T]o talk of practices bespeaks such desires as those to free activity from the determining grasp of objectified social structures and systems, to question individual actions and their status as the building-blocks of social phenomena, and to transcend rigid action-structure oppositions. (p. 1)

Corradi, Gherardi & Verzelloni (2010) agree that "while one of the greatest difficulties in the collective appropriation of the concept of practice resides in the polysemy of the term itself" (p. 277), they nevertheless demonstrate a basic coherence in the way "practice" itself is conceptualised by ordering the concept around three dimensions. Their conception of practice points firstly to "the set of interconnected activities that, if socially recognized as a way of ordering, stabilize collective action and the common orientation" (p. 277). Equally, practice refers to a "sense-making process that supports the accountability of a shared way of doing things and that allows the continuous negotiation (ethical and aesthetic) of the meanings of a practice by its practitioners" (p. 277). Finally practice denominates the "social effects generated by a practice in connection with other social practices. This is the dimension of the reproduction of practice that answers the question as to what doing the practice does" (p. 277). It is safe to say that as with sensemaking theory, the evolution of practice-theory eventually encompassed a renewed interest in the relations between technology and social theory, and also occasionally merged with sensemaking theory. As Leonardi and Barley (2008) note the shift to a social perspective on technology was provoked by the way:

> [E]arly writings on the relationship between technology and structure usually depicted technology as a causal agent of organizational change, while overlooking the way social systems shaped technologies and their use. (p. 4)

Among those practice theorists who discuss the role of technology artefacts or materiality in social life according to practice-theory principles, Schatzki and Orlikowski stand out. Schatzki brings considerations of the material generally to the discourse of practice, while Orlikowski straddles boundaries, drawing on both sensemaking theory and on social construction of technology in focusing on the specifics of the social context of information technology use in organisations, but locates herself as part of the practice turn (See also Feldman & Orlikowski 2011; Orlikowski 2008; Schultze & Orlikowski 2004).

Schatzki contributed early to the incorporation of the material into practice-theory. He opens his acknowledgements in *Site of the Social* (2002)by admitting; “This book was borne of the realisation that the concluding chapter of my previous book slighted the role of materiality in social life” (p. ix). “A practice is a set of doings and sayings”, says Schatski, (p. 73) and these doings and saying constitute actions of which material objects are a part. Examples he gives are “turning knobs, handing something to someone, pouring water into a barrel” (p. 72). On their own they might be “tasks”; woven together they are “projects”, but all elements are integrated with both bodily and material entities (pp. 72–73). Thus objects and material things, as part of “orders”, the stable arrangements around practices, exert a causal impact on activities and practices (p.107). In particular, whenever “something breaks down or acts contrary to expectations, and people react to this situation, non-humans exert a causal effect on activities. They make activity happen by leading to it, by drawing activity – though not necessarily specific actions – out of people” (pp. 107–108). Broken things make people react, not just to mend them but to clear up the consequences, to design new activities for prevention of accidents, and to abandon old ones, or to design new and more effective artefacts. Thus artefacts in breaking down modify the future course and direction of activity (p. 108). His position, however, retains the meaning-making function of the orders around material objects, for Schatzki here does not consider the case of the simultaneous breaking of the artefact and its technical (or technico-social) systems. In other words, practice retains continuity with meaning even if actions change in response to circumstance. This one sided and evolutionary relation to the possibility and effects of breaks in meaning distinguishes Schatzki’s practice-theory from Weick’s sensemaking theory.

His arguments for including the material conditions in which practice occurs arise from his definition of ”social order”: “Social orders are …the arrangements of people, artefacts, organisms, and things through and amid which social life transpires” (p. 22). Practices, understood as organised activities, can only occur through orders. “Human coexistence thus transpires as and amid an elaborate, constantly evolving nexus of arranged things and organised activities” (p. xi). Together, arrangements and practices constitute the “site of the social.”

“Interdependence” is Schatzki’s definition of the particular kind of order meant in “arrangements”. This is to distinguish it from other definitions of order; “regularity”, criticised because social orders also include irregularities, and “stability”, criticised because social orders are usually not stable. Interdependence is important to the incorporation of materiality in practice-theory, because it draws into question the nature of the reciprocity. “An arrangement is a nexus of entities in which they relate, occupy positions, and possess meanings… (T)his conception of order applies more widely than to social affairs alone” (p. 21). Order is thus fundamental to social life and depends considerably on the positioning of the material, artefacts included.

Schatzki argues that material objects have been underrepresented in sociological theory, “as if the social was composed of facts, events and formations pertaining solely to humans, their activities and relations and constellations of these” (p. 110). He goes to considerable lengths to critique those theories that position “the social” as if it were the only relation amongst people. He argues that an abstract idea of social relations has, on its own, no evidence except in the observation of practices (p. 39). He criticises symbolic interactionism as overly “social” in particular, arguing not all relations are interactions and that in any case the full range of connections between ”arrangements”, of which people are only a part, must be described in order to have an adequate account (pp. 40–41).

Schatzki incorporates the material (objects, including, or especially the body) into an idea of practice as ongoing actions from which orders emerge, which likewise shape the actions (p. 96). Despite this, he does not go as far as actor-network theorists in according objects agency, although he includes actor-network theorists in the family of practice-theory. He is at pains to carve out a niche for human agency over the human/nonhuman symmetry advocated by actor-network theorists that makes the source of agency indistinguishable between them. He takes Pickering and Rouse in particular to task here (Pickering 1995; Rouse 1996; cited in Schatzki 2002, p. 109).

Symmetry in Pickering and Rouse's conceptions of it, argues Schatzki, means "neither human nor non human agency can claim priority in determination of the future" (p. 109). The purpose of the ANT gambit is to overcome "any remaining humanist division between a human 'inside' and a material 'outside'" (p.109); in other words, to remove the last vestiges of Cartesian dualism. Schatzki, however, still sees a place for human primacy of agency, albeit in a much reduced form from that of former social accounts. He agrees with Rouse and Pickering that "social relations, joint activities and co-existence generally are mediated by, and tied to material objects" (p. 110). However, in rescuing "residual humanism", Schatzki (2002, p.111) points to the differences between areas of social life that are "mediated and tied to" material objects and those that are "centred on" them. The latter is the position of actor-network theories, and is far a stronger connection than mediation, he argues. But it only pertains to some loci of activity, like those of science and technology. Even here, he says, there is differentiation between sites as to degree of "mediation" or "centredness". He gives as an example "those modern forms of non-face to face interaction that although inherently mediated by technological devices are at best only occasionally centred on them, e.g., email communication" (p. 112). The difference here is between technology as a purpose in itself and technology as a medium for some other purpose.

Nonetheless human agency drives practice:

> In any event, sociality is centred on objects to whatever extent it is because of the general ends of the practices through which it transpires. That objects play this role is due to the practices concerned, not something that objects force on humans. (p. 113)

Furthermore, any talk of "meaningfulness" and "intelligibility" in actor-network theories, he says, receives its force from its human and subjective source. We can only talk of these things as pertaining to the non-human to the extent we recognise them as similar to those we experience (p. 116). Ultimately, Schatzki comes down firmly in favour of the primacy of human agency. Having coupled artefacts with orders he avers that activities and objects are not equals: "The character of social existence is, in the end, much more the responsibility of practices than of orders" (p. 117 and see also p. 122).

At this point in Schatzki's arguments the question of the mechanism whereby "practices" change in order to produce new technological uses remains open. However, in later work Schatzki (Schatzki 2010) identifies some of the ways change takes place. He reiterates that social life occurs through a nexus of practices and arrangements where practices are chains of actions – practices "in the moment" – and that are linked together as a practice. Arrangements are layouts and configurations of material things. "Practice - arrangement nexuses" are "sites of the social"(p. 130). In terms of how these sites link to wider social arrangements, practice-arrangement nexuses link to supporting and co-ordinating nexuses, which are connected by the virtue of some function - perhaps they maintain, transact with, upgrade or have fun with the original nexus. These, in turn, are connected to wider networks of practice – arrangement nexuses consisting of perhaps governments, financial networks, similar industries, or workforce systems: "These nets, together with the even wider confederations that they form, make up one immense transmogrifying web of practices and arrangements. The entirety of this web is coextensive with socio-historic timespace" (p. 131), and materiality matters because "materiality is among the items in which coexistence and social phenomena consist" (p. 132).

So, his answer to the question, "How can social theory systematically take materiality into account?" is that, "materiality helps compose sociality and social phenomena" (p. 133). By "materiality" he means anything physical, biological, or natural, where "natural" means "it happens or changes on its own" (p. 133). But whether something is social or material, calling it such "does not mark a demarcation of things, properties, events, or anything else into two substantially distinct realms or categories" (p. 134).

Nevertheless, materiality enters social life in specific ways. First, materiality composes, with practices those relations Schatzki has called "arrangements". Second, "the entities that compose arrangements have a physical-chemical composition" (p. 136). This composition can affect social life whether its origin is natural (Schatzki's example is snow buckling a roof) or artefactual; artefacts are defined by Schatzki as "either physical objects, or realized in physical objects (as are informational and cyber entities)" (p. 136). Schatzki mentions a number of possible influences of the physical as understood in this way. In addition to composing arrangements whereby people may react (e.g., to snow buckling a roof), physical composition influences other properties of social life like spatial layout or distribution of things. However, the physical is not limited to composition but can also comprise physical events, and his list includes, "viruses, tornadoes, electrocution, disease, fatigue, centers of gravity, wear and tear, deterioration and rotting, and pollution" (p. 137). Furthermore, the physicality of objects may act, "by rendering combinations and sequences of action physically impossible, physically easier or harder, physically painful or pleasing, and the like" (p. 137). It also determines the location of arrangements in space and time and their duration, by virtue of physical properties such as the durability of stone, or the composition of human bodies (p. 137).

The third property of materiality affecting social life in this conception arises as, "biological and physical flows pass through practice-arrangement nexuses… Material arrangements are in some sense crystallizations of matter-energy flows. They also capture or embrace moments of biological flows" (p. 137). This aspect of Schatzki's theorising is important for any consideration of the relationship between academics and their use of online technology, as it illustrates the degree to which, for Schatzki, overwhelmingly, social and material arrangements are emergent and not constructed, for Schatzki understands the ramifications of "flows" to mean that although,

> credit must be given to human labor and technology for drawing materiality into social life. [Nevertheless] …organisms and matter-energy flow through practice-arrangement nexuses regardless of whether and how labor and technology channel, shape, or capture the flows involved. (p. 138)

Technology and materiality can mediate social practices making them dependent on that technology. For instance, the heating of houses facilitates such practices as "cooking, cleaning, reading, conversing, and bookkeeping" (p. 137). But technology and materiality can also be dependent on practices so house heating can be credited to house heating practices, eg making, installing, fuelling, running, and maintaining house heating machinery (p. 137).
As Schatzki summarises:

> But not only does technology mediate practices and nature, and not only do practices orchestrate technology and materiality-nature, but materiality-nature enables human practices, technology, and relations between them (pp. 137–138).

The "causality" under scrutiny here is between practices and material arrangements, but these are beyond general social control or even construction in the sociological sense of the word. The dialectical relationship at the heart of Schatzki's work is emergence, shaped slightly by the combination of social and physical conditions in which such practices emerge, but existing "regardless" (p. 138) of these conditions. Emergence is a term, which, though hinted at, is not used in "*Materiality and Social Life*" (Schatzki 2010); it receives extensive treatment later (Schatzki 2013) but even there the moment of emergence is not clear. It occurs at the coalescence of the practices involved, sufficiently to exist as organised activities, but: "[t]here is no definitive criterion of when this has occurred" (p. 37). The rest of his discussion is devoted to criteria for "organised activities" rather than the conditions of emergence. Since materiality, combined with actions composes arrangements, it is through Schatzki's discussion of forms of arrangements that it is possible to deduce the action of materiality in social life. Mostly this is a type of "shaping" but much mediated by the co-components of arrangements.

The third relation between practices and arrangements that Schatzki proposes is relatively simple. Practices and arrangements are constitutive of each other. Practices would not exist without arrangements and conversely, "most arrangements through which human practices proceed would not exist or would assume different shapes were it not for the particular practices that are responsible for them and/or carried on amid them" (Schatzki 2010, p. 140). The fourth relation between materiality and social life given by Schatzki is "intelligibility" (see also 1996, p. 37; 2001, pp. 50–51). Intelligibility requires that, "the material entities that make up arrangements are intelligible (in some ways or other) to the humans who carry on practices amid them" (2010, p. 141). Schatzki's rendering of intelligibility emphasises how it is integrative, continuous, and consistent with flows of events, as well as stable and stabilising. It is productive of order:

> Usually, … entities (ie physical objects) are encountered while engaged in particular practice(s). This means (1) that they will only have correct and acceptable meanings contained in that portion of a person's overall understanding of them that helps organise the practice(s) involved; (2) that they will anchor only that space of places which is coordinate with those meanings; and (3) that people will (usually) talk about and act towards them solely in the correlated right and acceptable ways. Of course people often suddenly alter which practices they are engaged in, such that entities can possess different meanings, anchor different spaces of places, and be acted toward differently. Moreover in a situation where others are carrying out one practice, a person can intentionally understand and act toward entities in ways characteristic of another. Usually, however, people participate steadily in given practices, meaning that they inhabit a world of stably meaningful objects events and people (Schatzki 1996, p. 116).

It is instructive to compare Schatski's conceptualising of intelligibility with Weick's sensemaking. For Weick, sensemaking is a fragile accomplishment, which although drawn from previous patterns of thought and action must be continuously reinforced. In this respect it is in direct contrast to Schatzki's sturdy conception of stability in intelligibility. Two occurrences can break sensemaking in Weick's account. Intelligibility might break down, via changes in events. Alternatively intelligibility might be unavailable, due to lack of sufficiently meaningful information, especially in things and people. For instance, in the case of events, some events may be available for intelligibility but are nearly impossible to make sense from. Weick's examples of catastrophic industrial breakdowns or wild fires are instances. Conversely, some arrangements are unavailable for intelligibility (or sensemaking). The 'black boxing' of the workings of the material and immaterial aspects of information technology mean they are not available for scrutiny in order to be meaningfully intelligible, therefore people must substitute guesses of their own, often to the peril of later congruency of meaning. This material unintelligibility may be combined in an arrangement with a social milieu which is equally unavailable for intelligibility. An example might be organisations that "silo" aspects of information so that any given person does not know what they should be going on with, or how they should interpret the various social and material cues around them. Relying on technical black boxes combined with social cue unavailability is a recipe for the breakdown of intelligibility.

Schatzki (2011)) adds a fifth relation, "intentionality"(p. 10). Practice is briefly described as related to arrangements "via the thoughts and imaginings participants have about them as well as via the actions participants perform toward them, including using them" (p. 11). Such a description, even when combined with intelligibility, the other potential mental act in Schatzki's account precludes any role for the unconscious, a role taken up instead by the way Schatzki describes actions coming together out of all the components of arrangements. Any unaccountable or unobservable aspect of practices arising out of reactions to events is not a mental or personal property.

How then does Schatzki deal with the problem of change? To describe how people construct use of information technology or educational technology, some kind of account of novelty or change is required. A new artefact cannot be incorporated into social life, totally by old practice. This explanation must include, to use Schatzki's terminology, an account of the origin of novel practices, and an account of the conditions, events and arrangements in which they are couched. The nature of change is a necessary component of the latter. For Schatzki, intelligibility or lack of it does not explain change, nor does 'intentionality'.

Schatzki's description of the kind of change to events he has in mind exhibits the same type of homogenisation as his description of intelligibility, where differences and discrepancies are still part of a single type of dynamic. Alterations resulting from change, according to Schatzki are differences of actions: "[I]n any given swath of space-time the mass of happenings – doings, sayings, and other events – that occur adds up to some mix of change, stability, fluidity, and continuity" (p. 5).

For Schatzki, only in action is a change determined. Before that, nothing can determine it:

> [N]othing regarding teleology or motivation can determine or fix, prior to activity, what a person does or why. It is only with the occurrence of activity that what a person does and why become determinate. The indeterminacy of activity does not imply that what a person does is undetermined, or random. What a person does is determined by the ends for which he acts (teleology) and that in response to or in the light of which he does so (motivation). But that for which a person acts, as well as that in response to or in the light of which he does so, are not definite until he acts (p. 5).

In this abstracted account of change, while mental states or beliefs or expectations (motivations) might affect actions, how they do so is not part of Schatzki's account. Change to practice arrangement "bundles" (pp. 6–8) is imagined by Schatzki as a process in which they mutate, bifurcate, merge, grow larger or narrow down.

Notably, Schatzki's formulation of change here does not distinguish between stability and continuity. His change dynamic is an unstable but continuous process, even though in his earlier rendering (Schatzki 1996) people create stability by acting as much as possible "in the correlated right and acceptable ways" (p. 116). Only in his most recent work (Schatzki 2013) does he suggest that there may be a difference between stability and continuity. However, he defines this in relation to the settling down of practices rather than in relation to their change. He calls the settling down, 'persistence' and argues: "There are two kinds of persistence: stability and evolution" (p. 40). How stability ever transmutes into any form of change, evolutionary or precipitous is left unexplained.

The issues raised here concerning initiation of change are made starker by contrast with Weick. Weick argues change arises from inconsistencies or discrepancies that are sufficiently large or cumulative enough to draw attention – to be noticed. They are noticed because they cause a break in meaning. Once noticed, something has to be done about reincorporating them into a system of meaning. This is a discontinuous rendering of “change”. Change for Weick is not a matter of a change of practice begun in redirecting action, but a change in type of flow of events from continuous to discontinuous, or punctuated, with consequences for the subsequent meaning or intelligibility of them. It is a different ontology of events and the continuity or otherwise of the meaning attending them. I suspect for any practice theorist in Schatzki’s mould, the concept of a break in meaning is unintelligible. The differences in perspective might be compared to differences in ideas of evolution. Darwin took a view of evolution much like Schatzki’s, whereby evolutionary movement was an unstable but continuous change. However Stephen Jay Gould (1990) a 20th century evolutionary theorist, depicted evolution as “punctuated equilibrium”, of periods of fundamental change followed by relative stability.

Schatzki’s lack of analytical description about how stability transmutes into change is puzzling given that in an exchange with Geels and Schot (2007 quoted in Schatzki 2011, p. 15) he argued that Geels and Schot put too much emphasis on stability, and indeed that:

> [n]ovelty and innovation can burst forth anytime and, although inextricably tied to the past and present, can set developments in new directions unanticipated by present actors. This means, incidentally, that any large social phenomenon can in principle collapse precipitously. (p. 19)

This puzzle is not resolved when Schatzki (2010) clarifies how he understands – and modifies – the idea of “causality” in pursuit of an idea of emergence. Causality pertaining to practices is not an existential ‘bringing into being”, but rather, cause creates variety. That is to say, it “lead(s) people to perform actions and practices to take certain courses” (p. 139). For Schatzki, cause is a form of shaping, and is just one of a series of complex relationships that shape events, stability and fluidity.

Co-shaping can also include “prefiguration”. “Prefiguration is the social present shaping/ influencing/ affecting the social future, above all, the nascent social future” (p. 140). It is not in any way teleological about the future, in that it does not depend on “possibilities” being present. The way Schatzki argues such projective influence is resolutely ateleological. Prefiguration should be, “understood as a qualification of possible paths of action on such registers as easy and hard, obvious and obscure, tiresome and invigorating, short and long, and so on. Material arrangements clearly prefigure practices in such varied ways” (p. 140). That is to say, “prefiguration” depends on proximate conditions, not ultimate “possibilities”. However, the key reason prefigurations are important for Schatzki is that these proximate conditions are “infinitely complex” (p. 140).

Nevertheless, prefiguring proximate conditions do not include personal ideation or motivations in any way that is knowable. Changes in practice-arrangement bundles can be intentional or unintentional and known or unbeknownst to participants. Changes are also typically piece-meal and gradual, with alterations in any component of a bundle being accompanied by continuity in others (Schatzki 2005, p. 475).

This would seem to belie the consciousness implicit in the rendering the locus of intentionality in: *Where the action is*, (Schatzki 2011) noted above. It is similar in other respects, however, in that it retains a continuous concept of social change in the words "piece-meal" and "gradual". Sudden or radical change is, however, associated by Schatzki with intentionality; as he continues: "Practices can, however, be changed more wholesale, when conscious intervention (from the inside or outside) reworks goals, alters rules, and redesigns projects" (p. 476). Nevertheless he has argued in the same essay, using the example of the establishment of a new academic department, that these "intentional" decisions are "components of *already existing* administrative decision making" (p. 475). This means that a material artefact such as information technology ought to, in principle, add a variety of optional paths for action, prefigure likely actions, constitute (and be constituted by) the practices that arise from using it, be "intelligible", and also be amenable to intention, albeit not consistently. Furthermore, the practices or uses it sustains should change gradually and in a piece-meal fashion. However, this does not illuminate the initiation of change.

There are parallel puzzles in Schatzki's account of agency. Schatzki's preoccupation is with the intersubjective rather than the subjective, so, there is little in the way of accounting for the person's experience of a given practice, or the sorts of meanings experience might produce for that person, even if there were good accounts of their emergent activity. Whether these are the repetitions of "habitus", or humans "altering their purposes" in response to some change in circumstance, the nature of altering purposes remains a mystery.

Schatzki (2002) treats the relationship between humans and artefacts in terms of "enabling and constraining" without describing how humans "hope to infer how things work" (p. 17). Personal and social meaning or conditions of intelligibility are effectively black boxed, and perhaps intentionally so, in order to preclude a slide into Cartesian dualism. Practice analysis takes place where intelligibility apparently springs into being – at the level of action. Schatzki is also far more interested in social ontological questions (Schatzki 2010, p. 124) than epistemological questions; the question for him is effectively, “what can we know about material and social relations?”, rather than “how do we know what to do with artefacts?”.

“Knowing” and finding meaning are, therefore, also problematic. They do not appear to arise necessarily from individual cognition. This is a distinction that others have made. Geiger (2009) argues that the practice-theorists approach to knowledge is at odds with Lave and Wenger. While Lave and Wenger might agree with practice theorists on the situated nature of learning the former subscribe to individual cognition as the basic learning unit, while practice-theorists propose that:

> Knowledge is created in a process of practicing, which involves activities of the body and the mind at the same time. Since knowledge resides in practices, it cannot be separated from the practicing body and always involves our senses and aesthetical judgements. Knowledge is therefore non-cognitive and consists of sensible elements, bodily expressions and tacit skills and aesthetic judgements of taste. (p. 134)

Transactions of knowledge take place through arrangements, although there is no explicit account of “know-how”. Nevertheless, in arrangements, agency retains the upper hand for Schatzki, unlike the equivalence between materiality and the human ascribed to social life by actor-network theorists, particularly Latour, Pickering and Rouse. Explanations of how specific practices change, such as the development of types of technology or implementation of various technologies are absent because discussion of change remains at the generic level, except that it can be said that interruptions or discontinuities of meaning as causes of change are neither necessary nor, perhaps, possible. The concern with continuity, interconnectedness and flow exhibited by Schatzki leaves him more preoccupied with construction as part of a flow, albeit one that might be “jagged”, than reconstruction of meaning after disruption. Schatzki (2013) says “[a] human life is prominently a continuum of activity” p. 32).

Perhaps Schatzki’s most troubling proposition is the assertion that “Participants in a given practice incorporate elements of, and are thereby governed by, a *single*, common structure: the organization of the practice” (Schatzki 2005, p. 480, my emphasis). This implies the existence at some level, of “shared meaning” (ie., knowing that the element of the practice that is yours is “the same” as the element of someone else’s), something Weick argues is impossible (Weick 1995, p. 41–42 see also; Hofstadter & Sander 2013). Meanings will always be idiosyncratic even if beliefs, values and experience are shared. It is my own contention that participants in using information technologies or any other practice may think they are participants in a single given practice; however, their own meanings and thus their micro practices and, indeed, intentions can differ sufficiently from any centralising “common” organising principle, that they will very likely give rise, either over time or in short order, to what Schatzki would call new practices. It is arguable that in any given social practice there is anything other than a superficial appearance of commonality, and that, in itself, may be just as attributable to the naming of the practice that gives it singularity, than to actual social consistency of acts in the practice. Thinking of a practice as “the same” and actually sharing the same meaning of it are two very different things. I will further develop concepts of separate practices imagined to be the one practice in the research section of this thesis in Chapter Six with an examination of the idea of the “genre”. To foreshadow that discussion: most participants in the research (and their social milieu) thought they were engaging in “teaching online”, (although some did not think it was “teaching”), but not only did their interpretations differ, so did their actual practice, and to a degree that sometimes the name (“using online teaching technology”) was the only commonality.

Conclusion: Theories of technology.

In this chapter I have reviewed several related traditions of enquiry commonly referred to as the social construction of technology and actor-network theory, as well as a more diffuse body of work usually referred to as practice-theory. These, in combination with Weick’s sense making perspective provide some of the basic intellectual or theoretical parameters for my own work. Several observations are in order.

First, each of these theoretical stand points – sensemaking, practice-theory and sociotechnical systems approaches like the social construction of technology and actor-network theory – are valuable for my enquiry. Each has something to contribute about the argument that technological artefacts like Blackboard at some point “interfere” with organisation or order. Each sets out in this respect to explore the possibility that social or technological determinism is at play in organisational or social change (Orlikowski 2005).

Second, while this poses some risk that I am drawing on incommensurate bodies of theoretical work, I am confident that this is less of a risk than it might seem. While the detection of internal incoherence in an argument or philosophical position may imply that the propositions do not support each other, there is something to be said for adopting elements of each body of theory outlined here, despite some degree of disagreement between them. Keeping to the boundaries established by a single theory means there will be some things for which one is left without the conceptual vocabulary through which to engage with them. This may include the absence of cognition in actor-network theory. Equally, actor-network theory and practice-theory address sensemaking theory's reluctance to get beyond the organisation and theorise broader shaping influences. It would also be of significant concern if an account that attends to thinking were to leave out action and the body or, as actor-network theorists suggest in the case of cognitive theories, to ignore the role of the material generally. Even Weick's elaborate version of sensemaking theory pays insufficient attention to information technology as part of the activity of sensemaking, except as it affects identity (as "tools" do in Weick's analysis) or it screens off opportunities to make physical sense of matters. Given my interest in the way a pedagogical technology like Blackboard enhances learning – or not – it matters that learning as a concept is more visible in those theories with a focus on cognition. Indeed, it is difficult to imagine a comprehensive concept of "learning" without cognition, although it is clear enough that some forms of learning are not conscious.

Nevertheless they have some differences as I discuss below, although selecting from each wisely as Orlikowski shows, can be beneficial to furthering an understanding of how we interact with our artefacts, that can be transferred to a study of academics' use of Blackboard. Sensemaking theorists and social construction of technology theorists understand change in quite different ways: Weick considers change both episodic and continuous, whereas Bijker envisages a more cyclical model of change, while practice-theory has trouble dealing with change as any more than evolution. Arrangements of actions and practices, especially in practice-theory are deemed to be continuously in production of meaning, so, change, too, is continuous. Bourdieu's preoccupation is with continuity – with social reproduction and with actors positioning with respect to the outcomes of social reproduction. Actor-network theorists just "follow the traces" of change. For social construction of technology theorists, "interpretive flexibility" is "in" the technology and the groups who use it, until they come to an accord; so, though meaning never entirely disappears, it is periodically unstable. Weick by contrast is preoccupied with discontinuity of the sort noted by Dewey, where habits fail to produce an intelligible situation in which to act, and an effort must be made to produce a sensible outcome. Subscribers to a sensemaking perspective can envisage moments when the world makes no sense at all and meaning breaks down. This is a source of change in that entirely new formulations of “what’s happening” can result that constitute permanently new ways of seeing, for individuals and collectives.

The various perspectives also manifest scale differences like the focus on small group and individual sensemaking, the preoccupation of Weick, and the macro-level social account of systematic instantiations of habitus – such as Bourdieu’s analysis of the reproductions of power and culture in academia (Bourdieu & Collier 1988; Howcraft, Mitev & Wilson 2004). Gross, (2009) who has explored “social mechanisms” in practice-theory understands this ultimately to be a shortcoming of Bourdieu’s rendering of practice-theory, for Bourdieu views “most lines of activity as connected to actors’ interests in leveraging themselves into favourable positions in multidimensional social hierarchies, and thus as tied to the maintenance or transformation of those hierarchies” (p. 368).

The work of Weick and of others oriented towards social psychology contrasts with the work of Practice theorists, and adherents of ANT and SCOT in a significant difference in orientation to the development of social norms such as the appropriate use of educational technology and an agreed state of what it means when it is “working”. For Weick, sensemaking is an essentially individual act, constrained by the limitations of cognitive processing as well as by what action and information is available to be processed. The general practice group of theorists (including ANT and SCOT) by contrast, tend to set personal disposition and cognitive predilection to one side and emphasise larger social structures, cultural or sociotechnical that shape activity. In both cases the mechanisms that might be used for accounting for the arising of something called “use” of educational technology are largely unconscious, and difficult to detect.

I refer to this work in detail because I am seeking a framework which will allow the depiction of how “use” arises in the sociological sense, as a counter to those authors who especially as depicted in Chapter Two, tend to understand the idea of technological use as an unambiguous, and already solved problem, and the primary issue as being how to change people so that they do use technology. The detail of these theories underlines that especially in the case of the practice group, the descriptions of mechanism are often too abstract to adequately account for explanations of and mechanisms for specific situated practices of technology use, and Weick has not provided any account of educational technology and sensemaking in such a way that would elucidate how people arrive at a use.”

My own approach derives both comfort and insight from Orlikowski, a theorist who best marries these disparate elements together in her applications to research as well as contributions to theory. She moves between all three positions with assurance, using them to shed light where it is needed, and on all manner of configurations and uses of information technology, especially in organisations, where her question concerns how practices, technology and organisations are "made sense of" together. Her interest in practice-theory shows up in a gradual shift towards explicitly exploring practice-theory itself, and how it is represented by organisation theorists. She distinguishes three modes of engaging practice-theory in research:

> The first mode emphasizes practice as a phenomenon – the notion that what is most important in organization research is understanding what happens in practice as opposed to what is derived or expected from theory; the second mode advocates practice as a perspective – the articulation of a practice centred theory about some aspect of organisations; and the third mode highlights the notion of practice as a philosophy – the commitment to an ontology that posits practice as constitutive of all social reality, including organisational reality. (Orlikowski 2010a, p. 23)

She locates her own research within the "practice as perspective" mode, and acknowledges Schatzki as a major influence on practice as a perspective (p. 25) as well as Giddens contribution to her own studies of structuration (see also Jones, Orlikowski & Munir 2004). She argues that the key contribution of practice as a perspective is the claim that "practice shapes reality" (Orlikowski 2010a, p. 27), but nevertheless, this mode entails retaining an ontological separation between technology and humans even though technology and humans are envisaged as mutually shaping each other. Despite this mutuality, they retain separate identities as entities, which they lose in the mode of "practice as a philosophy". Practices as a philosophy entail "a meta philosophical claim that practices are reality" (p. 27). This is the position adopted by Pickering and Latour, as also noted by Schatzki (2002). Orlikowski has also increasingly adopted this perspective (see Orlikowski 2010b).

Orlikowski has made a particular contribution to studies of technology in organizations focussing on micro-practices and specific technologies. While she draws on central premises that are shared amongst process theorists, for example, "frames" (Goffman 1974), "technological frames" (Bijker 1997), and "frames and cues"(Weick 1995), her notion of change is more in line with the practice-theory emphasis on continuity rather than with a

Weickian collapse of meaning. Both a sensemaking perspective and a practice perspective can be seen working together in Orlikowski and Gash (1994) where they develop a theoretical framework centred on “technological frames of reference” which relies on a particular idea of “interpretation” as well as of “sensemaking”. Orlikowski’s reading of interpretation suggests that for her, assimilating a new or disruptive turn of events is continuous, as it tends to be in practice-theory.

> We argue that an understanding of people’s interpretations of a technology is critical to understanding their interaction with it. To interact with technology, people have to make sense of it; and in this sense-making process, they develop particular assumptions, expectations, and knowledge of the technology, which then serve to shape subsequent actions toward it. While these interpretations become taken-for-granted and are rarely brought to the surface and reflected on, they nevertheless remain significant in influencing how actors in organizations think about and act toward technology. (p. 175)

In proposing this method of progression, Orlikowski and Gash rather confusingly elide a distinction made by Weick between “interpretation” and ”sensemaking”. For Weick, sensemaking is both a continuous process of meaning making, and (more frequently) a response to a period of confusion or inability to understand what is going on – a drop out of meaning from a situation. Yet, even when apparently continuous, sensemaking is not the same as interpretation. Weick wants to “pry apart” sensemaking from interpretation (Weick 1995, pp. 6–10). Interpretation is the retrospective application of consistency of meaning after sense has been made of disparate events and facts (p. 10). But interpretation has connotation of attending to something that was already there to be interpreted. It imposes apparent continuity. Sensemaking on the other hand is a two-step process. “Sensemaking is about authoring as well as interpretation, creation as well as discovery” (p. 8). At some point, creative, novel sense has to be made, before continuity can be imposed. Sensemaking deals with discontinuity and pre-structures interpretation so it can appear continuous.

More recently, Orlikowski has amended her understanding of interpretation so that the outcomes are less stable, habitual and predictable than implied in her earlier work, although still continuous. Instead of positing technology as a “structure” requiring interpretation, a constructivist position, she suggests that technology’s structure, or interpreted rules and resources, is emergent from the practice of its use (see Orlikowski 2008). This is more in line with the position of Schatzki on emergence. Other works of Orlikowski’s that illuminate the use of technology in organisations that are based on a practice perspective include Orlikowski, (1992, 1996, 2000); Orlikowski & Yates (1994); Orlikowski & Hofman (1997); Schultze & Orlikowski (2004). Orlikowski has shown that it is possible to successfully combine several related theoretical perspectives on technology and how it is used in the workplace. However her primary interest is in business information systems, and she has never engaged with the problem of use of educational technology. Thus she has not attempted a description of the role that concepts of educational pedagogy and models of delivery of teaching might play in forming technological uses. It is with the intent of combining actor-network emphasis on the inextricability of technology from society, with practice theory insights into macro level practice changes, and with special attention to the contribution of a sensemaking perspective to the importance of breaks in meaning in addition to the creation of continuities, that I have carried out my research with an aim of investigating the SCOT question of how to explain the emergence of ideas of technological "use".

CHAPTER FOUR: ON METHOD

The purpose of this study is to illuminate how a group of academics experienced adopting and using Blackboard a learning technology. This requires research methods that illuminated their experience of technology, how they made sense and how and to what extent their existing practices were modified or drawn on. While seemingly easy to specify in these terms, these parameters pose major issues concerning method. This is because the phenomenon is spread over internal and external representations, material and organisational structures and “doings” as well as “sayings”, to paraphrase Latour. Tracing the use of technology, its continuities and discontinuities, and those relevant and connected aspects of social life, requires several specific dedicated techniques, tuned to elicit histories, variant experiences and different “cultures” of educational technology use. The field that I want to explore involves capturing people’s own accounts and their activities as well as those more official, organisational accounts coming about the interplay of old practices and new requirements. Technological use is, above all, to be explored and understood in terms of what a user does, in addition to what they think and say they do. Following the physical traces, “documents, inscriptions, and materials” (Latour 2005, p. 177), is a third important site of research activity. Equally, I needed a range of methodical approaches that are congruent with sensemaking theory, practice-theory and social construction of technology and actor-network theory, so as to enable me to make sense across a number of sources and types of research information.

These expectations have been framed by my finding that there are not many examples of research that get close to how users of educational technology construct differential accounts and uses of the same technology in the same organisational setting. Even authors such as Orlikowski, who has traversed the boundaries between sensemaking and practice theories, tend to take the organisational point-of-view, comparing different constructions of technology as different organisational cultures. Her work is illustrative of the problems entailed in picking out relationships and frameworks to explain technological enactment at too-broad a level. As Chu and Robey (2008) indicate one result, can be a loss of capacity to illuminate the experiential, practical and sensemaking processes:

> [c]learly, Orlikowski identifies influences involving both individual understandings and social influences. However, the number of potential influences is so large and their nature so diverse that it becomes difficult to generate specific expectations regarding the occurrence of particular enactments. Moreover, it is not clear why users of

> technology would respond to one or more of these influences. (p. 82)

They argue for theoretical frames, “that would explain why actors respond with specific patterns of technology use and why their responses might change over time” (p. 82).

Below I explain how I set about settling my approach to the research project, discussing how and why I framed my study as a case study; then, how I uncover some of the historic and organisational traces left by the introduction of the new technology in documentary and oral evidence. Finally and because of the central role of experience, I discuss at some length how I set about capturing the experience of users of Blackboard, employing a range of phenomenographic and ethnographic methods including interviews, observations and some use of autoethnography. I conclude with reflections on my selection of participants, ethical issues, and the limitations of this study.

The case for the case study

My study is a case study, although a case study of itself does not define or constitute a method. It does, however, confer some expectations and restrictions on research activity. Some of the expectations are to be found in the conflicts over the meaning and performance of “case study”. One area of expectation of research activity over which there is disagreement concerns how respondents are selected, and the degree to which sampling methods, interview techniques, and the rigour of analysis should correspond with research methods and validity requirements in different research domains. The purpose in taking the case study perspective, including the extent to which it is useful for generalisation is another. What follows addresses both methodological and purposive issues. The case I am offering is a case *of* educational technology use in a university, but it is a case *for* providing illumination of the prefiguring of present-day technology use.

To think more clearly about what a case *is a case of*, the idea of case boundaries is frequently invoked. Thomas (2011), for instance, cites Ragin and Becker’s (1992) tight definition of case boundaries as the means by which “the parameters of particularity are set by spatial, temporal, personal, organizational, or other factors” (Thomas, 2011, p. 512). And this definitive approach to case boundaries has by no means faded over the last 20 years. Swanborn (2010) refers to case study boundaries as defined entities, as in the following definition of case studies, as:

> [C]arried out within the boundaries of one social system (the case) or within the boundaries of a few social systems (the cases) such as people, organisations, groups, individuals, local communities, or nation states in which the phenomenon to be studied enrols. (p. 13)

This appears to be putting a research methodological cart before an ontological horse. How a "case" of anything social is theoretically defined must include assumptions about the nature of its boundaries. A social system, as defined by Swanborn, is something like a circle in a Venn diagram to be superimposed on other circles in the same diagram. A different conceptualisation of the meaning of "the social", such as that aspired to in both practice-theory and in socio-technical theory is simply not amenable to this literalist configuration of boundary lines of and around "systems".

"The case is an integrated system", argues Stake (1995, p. 2) in a somewhat loose formulation. Given the debate entered into by practice theorists as to the constitution and level of integration of anything that might be described as a system of practices, this delimitation offers as little guidance to investigators faced with theoretical reconfigurations of socio-technical "space" as the description of case studies as "bounded".

Thomas (2011) gives a more satisfying definition of the case study that is sensitive to its conceptualisation in theory:

> Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame—an object—within which the study is conducted and which the case illuminates and explicates. (p. 513)

This is a definition of a case as conditioned by the parameters of the theory it illuminates. The paradigmatic resemblance suggested between case and theory is not to provide justification for theory by constraining research to fit it, but rather to anchor the relevant research method/s by using the same epistemological and ontological terms as the theory, and in order to confirm, contradict or modify it. In conditions of uncertainty about what the entity is, the question of what to trace, and how far to follow it, is, therefore, a matter of judgement as to the centrality to the case of any aspect of socio-technical practice and sensemaking as a phenomenon to capture, and a matter of serendipity, here as elsewhere, as to the availability of an accurate case research site.

Just as the scope of a case study is defined in essence and not just in area by the theoretical lens used, so, too, is technique. I will define how the methods I used are predicated on the theories in question in the method section below. Before that there is another limitation that I wish to cover, the matter of what the case study is "for". Establishing the epistemological value and purpose of the case study in social science has long been a vexing question. Yin (1994) and other classic authors in the field have attempted to define generalisable purposes for case studies. Yin claims the overall use of case study is for "analytic generalisation" – generalisation that alters or supports theory, where, he argues, "multiple cases should be considered like multiple experiments… If two or more cases are shown to support the same theory, replication may be claimed" (p. 31). He also applies this comparison with formal experimentation to single case studies. While he suggests they can be of many kinds, a "critical case", an "extreme or unique case" or a "revelatory case", (pp. 38–40) each revealing a different aspect of the phenomenon under discussion, ultimately, "a single case study is analogous to a single experiment" (p. 38). There are, however, a number of difficulties in prescribing generalisation as the ultimate case study rationale, especially by analogy with experimental design. Speed and uncertainty of change, "stabilisation" and retrospective judgements all cause problems for generalising from case studies.

Educational technology over the last ten years has been an extraordinarily fast moving phenomenon. The technology in use today will be either passé or normative in as little or less time than it has taken to move from "distance education" to "online education". Speed makes more uncertain the normal messiness of social action. This has three consequences for the nature of research in the field. First, generalisation in such a heterogeneous and rapidly developing field is "courageous", and very likely to prove wrong in so far as it is attempting to do what generalisation is for — providing guidance to a probable future. Recall William James' (1907) argument that the whole truth does not need to be established in order to act. Secondly, stabilising a particular configuration of events and conditions as a case in order to use them as an instance for generalisation lifts them out of their process of change, however that change takes place. Like pinning butterflies, the very phenomenon that makes the living process interesting may be lost by stabilising it. Third, a case which is analysed is always a case which has passed, and present interpretations may be different from those of the time. Retrospectivity, as Weick points out, imposes its own justification. This requires some elaboration. "Lived experience", argues Weick, (1995) means that "people can know what they are doing only after they have done it" (p. 24).

This, according to Weick has four corollaries. First, meaning is always an attentional process, but "it is attention to that which has already occurred" (p. 26). Second, whatever is happening at present will influence what people see when they look backward. Third, because what is to be interpreted is only a memory (the event having passed), then anything that affects memory will "affect the sense that is made from those memories" (p. 26). Fourth, "only when a response occurs can a plausible stimulus be found" (p. 26). Thus "meaning is not 'attached to' the experience that is singled out. Instead, the meaning is in the kind of attention that is directed to this experience" (p. 26). That is to say what is significant from the present is projected onto the past to reinterpret the past in terms of the present. This leads to "determinant histories" (p. 28). It is determinant histories (or "Whig histories", see Winner 1993) such as this that sensemaking theory, practice-theory and the socio-technical theories are designed to avoid. The focus of the oftentimes, over-hyped attention to developments in educational technology tends to be on a point a little ahead of the present, neglecting how the past has been reshaped to fit the narrative (see also Cox & Hassard 2007). In classical science this is not a problem because physical conditions can be replicated almost exactly, but no social setting is ever the same as one that has passed, for reasons of reflexivity, if nothing else. This renders the present interpretation uncheckable.

So, if the purpose of case study is not to be for universalist generalisation: How can it be used? There are other contributions to knowledge building that case study can make, which require less procrustean distortion of the study to make it fit the bed of the legacy of positivist thought. Flyvbjerg (2004) has criticized the conventional view that a case study "cannot provide reliable information about the broader class". He argues that context-dependent knowledge has a role in research in addition to that of context-independent knowledge. It is the building up of experience of many concrete cases that allows a beginner to become an expert. Indeed, "If people were exclusively trained in context-independent knowledge and rules, that is, the kind of knowledge that forms the basis of textbooks and computers, they would remain at the beginner's level in the learning process" (p. 421). That is to say, individual concrete cases are an important part of learning how to deal with similar conditions by association, regardless of formal generalisation. The "example" as it is usually used in learning is an illustration of the value of the concrete but non-rigorous case.

The importance of illustration by concrete recognisability and association for the purposes of learning is a point that Friesen, Feenberg & Smith (2009) also make, this time with reference to fictional writing:

> Phenomenological attention to the concrete, descriptive, and pretheoretical is most effectively realized through the development of short narrative descriptions of incidents or anecdotes of everyday experience. These descriptions do not appeal to a notion of statistical "representativeness" or generalizability. Instead, their validity derives from their being recognizable and compelling to their readers on a concrete, experiential level. This is accomplished through a process of writing and rewriting that bears some relationship to fictional composition, which, after all, must also be compelling and believable to readers. These accounts are initially developed through participation in, and reflection on experiences that one undergoes oneself, or that are "experienced" vicariously or otherwise gleaned through unstructured interviews. (p. 85)

Thomas (2010), too, argues for case studies not to be understood simply as poor research methods for generalisation but to be seen as owing their strength to their explication of exemplary knowledge and phronesis.

A third possibility for reconfiguring case study objectives is to continue to understand the purpose as a form of generalisation but on much more limited, context-bound grounds. Halkier (2011) still calls this kind of generalising "analytic generalisation", but by removing it from its positivist universalism and putting it in a practice-theory framework, he understands it, "as producing context bound typicalities" (p. 788). These are, he says, like social action itself "unique and typical at the same time" (p. 788), and should not be understood as stable representations, but as "representations characterized by contingency and instability" (p. 788).

Taking these arguments together, the value of the case study, particularly conducted with attention to drawing out and reproducing concrete experience, is that it helps us to learn how to handle like or typical situations, not necessarily analytically, but practically, but a further, more analytic purpose is to understand "prefiguration", especially prefiguration involving material practice. A case study as a snapshot of time can be used to understand how the previous conditions of technology utilisation and meaning may have exercised a prefiguring influence on the present. Schatzki's (2010) definition of "prefiguration" bears repeating here in a new context. "Prefiguration is the social present shaping/influencing/affecting the social future, above all, the nascent social future" (p. 140).

Prefiguration should be:

> [U]nderstood as a qualification of possible paths of action on such registers as easy and hard, obvious and obscure, tiresome and invigorating, short and long, and so on. Material arrangements clearly prefigure practices in such varied ways. (p. 140).

If the materiality of "shaping" is important to understanding prefiguration, so is its temporality, as other writers in addition to Schatzki have suggested. Looking back can reveal how users gradually appropriate technology designs to their own ends (Suthers & Medina 2010), or it can show how the rigidities of technology force apart understandings, and over time produce "incongruent frames" (Olesen 2012). Alternatively, it can reveal how historic, material practices become arguments for present practices (Bonner 2013).

Reading the influence of Blackboard on the present through the past can allow new sense to be made of present technologies. It may shed light on the techniques brought to bear on Blackboard, previous experiences of its relative obduracy or otherwise, past solutions found, and the interconnections established within and around Blackboard as practices of use have developed. Routines and perspectives that will prefigure current technological practice emerge from such prior experience and have a bearing on how technologies such as mobile devices, MOOCs, and social media technologies are received, even if the actors (human and technological) in the new practice or, indeed, the practice itself are not precisely those enacting and enacted in the old.

To explain why the same technology in the same setting may generate different specific patterns of technology use, and why these might change over time, investigation must focus on academics' experience of changing practices in the context of a change of technology like Blackboard LMS. I am interested in what sorts of structuring occurs, either holding them together as a recognisable practice or conflicting, jostling and pushing them into new shapes. In order to investigate this, one site, one population of people and one time period helped to shape and define my case. I chose a group of academics who were at various stages of working with Blackboard courseware used as a learning-management system, in a particular school of an urban university. The time period is circa 2008. This requires four justifications. Why this group of academics? Why within the school? Why Blackboard? And why 2008?

The case setting: Why this group of academics?

The sixteen academic interviewees for this project were from a School of moderate size in an urban university. The interviewees were not drawn from across the whole school but were academics who largely knew each other and who on some occasions had worked together, most often on tasks concerned with course or School administration. They shared quite a number of important commonalities. A general social science disciplinary orientation was one, although they were engaged in four different professional practices of social science. Amongst them, there was at least as much interdisciplinary variation as cross disciplinary variation that framed their approaches to teaching and learning and made it more or less constructivist and more or less teacher-centric. Participants' experience of Blackboard was, institutionally, if not personally, of the same duration, as Blackboard had been implemented across all members of the School simultaneously. They were also subject to the same organisational policies and procedures regarding both Blackboard and teaching practices in general. Therefore, they had to answer to many of the same professional and organisational purposes.

All of them were required to offer some online presence in addition to teaching face-to-face, and typically by providing some form of online educational adjunct to their face-to-face teaching, so the majority experience could, with a stretch, be called "blended learning". (For definitions of blended learning see Bonk 2006; Graham 2008; Kitchenham 2011; So & Brush 2008, esp. p. 321). Three academics had offered courses in the past which were wholly online. There were a number of notable differences within the group. They ranged in age from their mid-twenties to early sixties; a little over one half of them were in their thirties and forties. They had a wide variety of experience with, and interest in information technology generally, ranging from two who had professional levels of skill and experience and another who had an extensive academic interest, to a small number who would have been defined by the instrumentalist writing as classic "resisters". Professionally, they ranged from junior contract staff to professors, with the bulk being at tenured, mid-career lecturer level.

Collectively these people all belonged to the same school and all had experience of blended learning. All had been employed for more than two years, and five had been employed within the school for more than ten years. Four were male, and the rest were female. Gender, I will note, made no difference to technical capability. Two of the men were at a "beginner" stage, despite exposure in both cases since the inception of Blackboard in the school, one male was a creative and technical expert and one had competently incorporated it into his work-flow. The expertise range was similar amongst the women, two being beginners, remaining so despite opportunity and exposure since the beginning of their employment, although they had less exposure than the two beginner men. Four of the women were creative and/or technical experts, and the rest competent incorporators. Differences in teaching approach were the same whether across or within disciplines, as I have already mentioned. However, the majority of academics subscribed to a broadly constructivist conception of teaching, at least in theory. Only one truly, but pragmatically used a top-down teacher centred approach to teaching.These academics represent diversity within sameness. Their diversity is as described, and the sameness comes from their relatively homogeneous organisational and technological setting, which creates a degree of cultural and experiential similarity. In comparison to other settings, this may not be the same kind of diversity or similarity as found elsewhere but it may, nevertheless, be recognisable.

As is common with phenomenographic studies I decided to keep the number of people I interviewed to a manageable size. I worked with twenty informants. Sixteen interviews were open-ended, in-depth interviews with academics, which included observation of Blackboard use conducted with academic staff who were using Blackboard during the period of the interviews. Four informants were technical staff who gave background information about technical, historical and contextual aspects of Blackboard. The method used to collect the latter was part interview, and partly, correspondence of various sorts, mostly email. Data collection was supplemented by a small number of other methods. I had access to focus group transcripts that had been done with a very similar set of users of Blackboard in the same school some years previously, and I also had the results of staff satisfaction surveys, though these had very little depth of experience (in the phenomenological sense) reported, being survey results asking only a very few questions focusing on staff use of teaching technology. Phenomenographic studies typically work with small numbers of people. For example, amongst topic and method-equivalent studies written up as journal articles, Akerlind (2004) interviewed 26 university academics; Eynon (2005) had 21 interviewees, interviewed for an hour and a half each; Samarawickrema and Stacey (2007) had 22 participants; Hannon (2008) used 24; De Gagne and Walters, (2010) used 11 and Veletsianos and Kimmons (2013) used three. Amongst PhD topic and method-equivalent studies, Deutsch (2010) used 20; Tuttle, (2012) used 20 and McDonald, (2012) used a sample size of 10.

I selected academic staff using a combination of snowball and purposive techniques. Sampling was ”snowball” in that these informants indicated others who they thought would be interesting to interview, usually after the conclusion of their interview when they understood in practice, the purpose and process of the study. It was purposive in that I approached a range of colleagues whose work I had some understanding of, and who I thought could make an interesting contribution. I concentrated especially on ensuring those most likely to be experiencing noticeable “use” conundrums were represented, people who felt they could not use Blackboard very well. These people were slightly more embarrassed by their lack of skill than those who felt themselves more competent and therefore were marginally more difficult to recruit. The rationale for this was Segal’s (2010) comment on Heidegger’s observation that;

> [E]veryday experience is for the most part too close to Dasein or the human being for the human being to even notice. Martin Heidegger claims that to begin with immediate experience is to be able to think in moments of disruption or disturbance of the everyday. For it is in moments of disruption of the everyday that the everyday announces itself as an explicit theme for thought. (pp. 379–380)

People who are less familiar ought to be people who notice their own adaptations more. However, this created two difficulties. They were less willing to co-operate, since, as they said, “I’m not very good at this”. Second, because they had done less, there was less to show me on the screen and interviews tended to be shorter. In some cases academics had delegated their online elements of teaching to more junior staff. Mostly this was done not by the competent-with-technology but time poor; rather, by people who would prefer to avoid engaging with a technology they did not understand or like. Here I tried to interview both the effective non user who was in charge, and the actual practitioner producing the online course. In a few cases this activity was shared, with the more technologically capable person carrying out the less frequently needed, more technical aspects of course design such as “tweaking” the look of the site, or turning functions on or off, while the less technologically competent person concentrated on adding content. It says a lot about the problems of developing collective practice, given the nature of teaching online that neither my interviews with people in the act of using Blackboard nor the act of online teaching itself was ever done in groups.

Why this school? And what was left out?

I have raised discussion of whether the scope of a case study described as “boundaries” does justice to alternative ideas about how a social system might be construed. It is more in keeping with the requirements of addressing a phenomenon spread over many representations and actions to sketch out a web of salience, and then to justify where and why investigation of it stops.

An academic sitting at his or her desk, leaning forward, slightly frowning, concentrating on putting material into fields using functions described and made available by software on the screen in front, is potentially connected to many tens if not hundreds, possibly thousands of others, in an enormous web of relations, and not just through the computer. These may be peers, in the “walking down the corridor” sense, or more collectively in the whole “Scholarship of Teaching and Learning” sense. They can be managers either as represented by particular superiors or by policy documents and work imperatives or by the way organisational relationships are formally structured. They might be technologists, in the form of administrative staff who help with technical problems, staff members with responsibility for training and facilitation of software use, or the never-met but influential designers of the product in use, or at an even wider macro scale, in the mass of companies whose software forms an interactive cloud around the particular piece in use. The web of relations will include students walking through the door with a query about how to use the LMS, or individually contacted by email. Or it might be students in numbers, inhabiting a course, or as an imaginary audience for development of some part of instruction, online or otherwise. They may be part of a web of relations that might be represented by students existing as a statistical mass that is only made analytically accessible through the LMS. This complex web of relations also includes the university, as a concept attached to a culture and as an institution connected to other universities and the state, both of which are webs connecting to much wider practice. While all of these impinge on the case, not all are included; research focus must mean that some strands of the web are accorded a lesser role.

Primacy of place goes to recording the educational technology experience of academics and to ascertaining how their experience links with their practice. Beyond this, the research limitations imposed on documenting this extensive web of relations were theoretical salience, perspectival salience and the serendipity of access. Theoretical salience meant ruling out, for instance, systematic pursuit of the meaning of technological experience in the context of the total life experience of an academic. This is just not sufficiently relevant to the use of educational technology, although to the extent it was raised unsystematically – as an issue of work-life balance in interviews – it has provided some interesting insights. Perspectival salience means that although students, for example, are the *raison d'etre* of the university and of the bulk of academic practice, but students are not included unless they are seen through the eyes of academics. Accessibility precluded collection of some parts of the design context of the technology such as the design perspectives of the Blackboard program developers. The corporate software designers of Blackboard, while integral to the look and function of the software have not been interviewed or contacted as part of this case. Nevertheless, their intentions, in so far as they can be gleaned from the software and its documentation are included: They are part of the network of interrelations which impinge upon, influence and are, therefore, effectively part of the case.

Full access to the web of relations between people and things that constitute practice in the organisation, no matter how theoretically or perspectively salient these are for the study, is also impossible, as Suthers and Medina (2010) have pointed out. For one thing, "group accomplishment is historically situated" (p. 3). A good part of it exists only in recollection, but also the means by which activity is organised by a range of practice and relations, even in the present, is only fully available to participants. The analyst has access just to a partial window. This may sound obvious, but even writers like Latour, so intent on "opening the black box", neglect to think from time-to-time that even when open, all the contents might not be visible. The choice of the school itself was a matter of serendipity of access combined with the research and perspectival advantage of personal experience.

Why Blackboard, and why 2008?

I selected Blackboard because of its status as an ordinary tool and its ubiquity. 2008 was good point in time to look at its use. That year was probably the point of maximum ubiquity for Blackboard globally when it proved to be the single most-used educational technology in universities. Blackboard makes a good object of study because of its ordinariness. Ordinariness comprises far more of our lives than it does of our studies. Jones and Bissell (2011) argue a similar case for their study of educational technology. As I do, they too claim that "that the socially constructed aspect of 'use' in educational technology has been little explored" (p. 287). They also argue a case for examining technological ordinariness, suggesting that it is the very fact of the settled establishment of the four applications they choose to examine that leads to them being easily overlooked for new uses in education. They maintain (p. 286) that old technologies are ubiquitous, and there is ample evidence that old technologies persist long after new technologies are supposed to have succeeded them. As a “mature technology”, Blackboard occupies a similar humble position in university education to that which Jones and Bissell assign to their technologies.

> None of these tools is ‘the latest thing’, and no one is likely to claim that they will revolutionise education. They are all fairly mature tools, and used daily by countless practitioners with little thought other than the need to get a job done, just as a joiner might use a hammer and nails. (p. 288)

Blackboard is ubiquitous but unexciting, and is used to get the job done.

Limiting research to a single technology (Blackboard) has several other features that make it a useful site for study of technology use and change of use. First, it helps to define and circumscribe the meaning of “online learning”, notoriously difficult as a general proposition, given the plethora of types of technology and styles of use (Bacow et al. 2012). Second it confines the uses being explored to one theatre of action, assisting with answering the question of why people who are using the same technology develop different interpretations and uses. Third, Blackboard is developed around the idea of content and student management. This aspect is most easily seen by contrast with forms of educational technology that are not. It differs from “post LMS” online learning technologies in that while they include content they are not so exclusively fixed on its display and management. Instead, many understand “online learning” differently as Stephen Downes (2012) describes. As an oversimplification, Downes intention in presenting “connectivism” as a more appropriate representation of learning in a media and information rich world is to cease to understand knowledge as propositional (as arguably Blackboard does) and to understand it as a product of communities and networks. The corollary is that the problem of online learning lies in finding, in a vast array of possibilities, how to construct and organise knowledge. This more or less entails students going to where the knowledge and its framing is – “platform independence” (p. 25) rather than an instructor bringing it back and hoarding it away inside an LMS.

Blackboard can therefore be understood as an historic instance of a particular way of understanding the delivery of online education. Thus, the study of Blackboard in this thesis constitutes a snapshot of a particular conceptualization of online learning as framed by an artefact. Once “use” is developed as a concept associated with the framework offered by Blackboard, however, that use is not constrained to Blackboard alone but is then available for adaption to other educational technologies; it will bear traces of its inception, however. In this way, use of Blackboard is set to be a “prefiguration” of future educational technology use, however, that is interpreted as “bad” or “good”. As I write, the difference in the two approaches can be seen in the difference between xMOOCs (prefigured by LMSs) and cMOOCs informed by connectivism (Quinn, 2012; Hill, 2013).

Fourth, Blackboard is quite rigidly structured in comparison with subsequent educational technology systems. So, if practice is likely to be steered in any obvious way by the structure of a digital artefact, it could be this one. Inside the operating space there are only certain, sometimes quite lengthy routines which will be successful. Unlike more generic forms of software, for instance, “Word”, there are no multiple navigational and operational pathways to the same ends. Choice is constrained in Blackboard by both imagined ends and the design of how to get there. The arguments and negotiations necessary to use a technology like Blackboard are, therefore, more likely to be visible and conflicting than in a more flexible and generic technology.

However, my focus is not simply on Blackboard as a convenient technological substitute for “social structure”, constraining and enabling action, as Blackboard is not simply structure. Blackboard as with other phenomena can be understood objectively and subjectively. Objectively, Blackboard is “what is on the package”, the description the vendors give it and as it is understood and implemented by technologists as a piece of technology. However, it may also be understood more phenomenologically as residing in the definitions of the people in its sphere of practice, definitions that lack crisp boundaries. Blackboard itself is indeterminate in this respect, at least in the terminological usage of academic staff. Online courseware at the university consists primarily of Blackboard, the mainstay of online delivery, accompanied by a suite of lesser-used online courseware and lecture capture tools, all collectively kept behind a password-protected wall. They are accessed by staff (but not students) through a portal called the “Learning Hub”. The other main online function that requires mastery by teaching staff is the Course Guide Editing System, used to present all courses as choices for students on a publicly available university web page. Blackboard and the course guide editing system represent the two great encounters teaching staff have with software designed to transmit course intentions and content. The two of them overlap somewhat in both function and the timing of maximum usage, both being most extensively used at the outset of a course. The two of them are also entwined in practice.

While I focus on the use of Blackboard by academic teaching staff, these staff, as I shall describe, often do not make clear distinctions between types or genres of online delivery of courses and course-related information. Users may refer collectively to Blackboard, the Learning Hub, the course guide system or components of all three and their support technologies as “the DLS” (a portmanteau term to be explained in detail in the next chapter), or they may compartmentalise different parts of the system under headings belonging to another part, and some cases even not knowing whether the course editing system is separate from Blackboard. Indeterminacy over distinctions between course guides and Blackboard is understandable, as course guides are automatically added to Blackboard after submission through the (separate) editing system, and so appear as part of it. Nevertheless, academics’ definitions of technology pertaining to Blackboard are characterised by a peculiar mix of fluidity and stability across all of the online functions they use to set up courses. Mostly staff know what each other means when they say “the DLS”, although if pressed they would individually give different definitions inclusive of different technologies. Definitions would typically include Blackboard as a component of “the DLS” however.

The importance of tracing phenomenological understanding means that Blackboard is not the sole technological focus of this work; rather, I follow the meanings of my respondents as to their understanding of that with which they are dealing. I use a phenomenologically generated definition of “Blackboard” or “the DLS” or whatever academic teachers’ own definition of their online teaching environment is, taking account of the fact that they may use one term for technology “incorrectly” to refer to another. Indeed, their slippage between software varieties descriptively and in use constitutes one of the many slippages in meaning and practice that are so important to investigate in order to understand academic online practices.

Humdrum though Blackboard might be, it is ubiquitous both inside and outside universities. In the case of the university under discussion, Blackboard was adopted as an “enterprise-wide” system. Like Foucault and Bentham’s panopticon, Blackboard is designed and installed, not in this case for “all seeing” functions, [7] as for ”all doing”. A “panoperacon”, it homogenises ways of doing education across an organisation and brings them into alignment, as I shall elaborate in the next chapter on the design and implementation of Blackboard. Moreover, it is

[7] Although a number of writers have used Foucault’s metaphor of a panopticon to describe online learning systems, Blackboard and WebCT in particular. (See Epling, Timmons & Wharrad 2003; Kitto 2003; Land & Bayne 2004).

ubiquitous between universities. Its genericism and cross-university ubiquity is one reason for the choice of 2008 as the year of interest.

For Blackboard 2008 was the year of maximum use. At a best-informed estimate, it was the high point of the dominance of Blackboard globally as the single most used educational technology within universities. Caveats surround this estimation, however, because despite regular citation of the dominance of Blackboard in the literature about educational technology, on careful examination this claim derives from the same few sources, mostly American. Systematic statistics stating the prevalence of online education and the extent of use of Blackboard are, in fact, very rare. American statistics derive from three major sources, the Campus Computing Project, the Babson Research Group survey, and the New Media Consortium's annual "Horizon Report", all of which are financially and publicly supported to a greater or lesser extent by "Inside Higher Ed", a daily online news publication focused on the US higher education industry (Inside Higher Ed n.d.).

Integrating data from the Campus Computing Project reports of 2008, 2010, and 2012 shows that Blackboard was used by 71.0% of US campuses in 2006; 66.3% of campuses in 2007; 56.8% of campuses in 2008; (no figures available for 2009); 57.1% in 2010; 50.6% in 2011 and 44.8 % in 2012 (Green 2008, 2010, 2012). Little of no formal data is available either on the prevalence of online education in Australia over the last ten years or on the types of technology in use in Australia to deliver it. This information is not specifically collected by any government agency. Using informal research of my own – scanning university websites for information on learning-management systems used, plus that available from Mark Smithers' blog (Smithers 2009), it is possible to suggest with a degree of confidence that Australia lagged slightly behind the US but the institutional adoption pattern of Blackboard was more or less the same; Blackboard became the most commonly used LMS for the time period 2007-09. After this point, other LMSs, especially Moodle, began to overtake Blackboard, and the rise of open and social educational technology was becoming apparent.

Method: Documents and traces

Documents, both electronic and physical enabled me to access the history of Blackboard in the university and also allowed me to see to a limited extent how different versions of Blackboard had been implemented. To the extent that the internal workings of Blackboard itself constitute a “document”, this approach accords with actor-network theory’s notions of “inscriptions”. In “Laboratory Life”, Latour and Woolgar (1979) define inscription devices as; “any item of apparatus or particular configuration of such items which can transform a material substance into a figure or diagram which is directly usable by one of the members of the office space” (p. 51). This description separates the material substance from its inscription. But digital technology changes this, by becoming the agent of inscription of itself. This creates its own problems. As Janet Murray (2011) makes clear, stability is an issue:

> Inscription technologies and transmission codes change over time. When they coalesce into lasting arrangements, we recognize stable formats or platforms. Representational forms are also changing, but they tend not to disappear even over long periods of time and remain available for meaning making. The digital medium rests on binary code inscribed on electrical charges, and it includes multiple evolving inscription and transmission technologies. Its formats and platforms are therefore also shifting, making it harder to stabilize conventions of representation. (p. 32)

Researching Blackboard granted me direct experience of this instability.

The technology of Blackboard as used in the case setting is unstable in that it was constantly tweaked by educational technologists and information technology services specialists. Moreover, as each year passed, Blackboard itself was from time to time upgraded, as was the web based environment in which it was couched. Thus, the supporting documentation that was largely reliant on the associated web pages was upgraded or amended along with the technology. This had the effect of changing the language used to describe it, making both Blackboard and its electronic and policy context unstable and unreliable documents of technology. As a result, documentary research was largely bounded by availability. Where I have undertaken historical research, for instance, on the introduction of the Blackboard LMS to the university, I was constrained, sometimes extensively by the disappearance of policy and other documents due to the evanescence of such documents online, particularly in the late 1990’s and early 2000’s. In one instance, the only remaining copy of a document was a printout, buried in the desk of someone who had been working on the issue at the time and who kindly copied it and sent it to me. Nevertheless, by using what was available online, occasionally archived on the “Wayback Machine” (*Internet Archive Wayback Machine* n.d.), supplemented by personally interviewing or writing to some of the people who were instrumental in the introduction of Blackboard, I was able to build up a reasonably complete history of its introduction. The documents themselves do not simply record, but instigate and stabilize through the policy imperatives they contain, many of the changes that I address in tracing the history of Blackboard. It is somewhat ironic that due to the virtual or immaterial nature of electronic documents, many are, indeed, absent.

Method: Phenomenography

Phenomenography is committed to making the life-world visible – the "pre-reflective ground for our being in the world" (Berndtsson, Claesson, Friberg & Öhlén 2007, p. 259) – in the experiences and meanings of people as these emerge from everyday life. Everyday life as Berndtsson et al. (p. 259) say, includes interdependency between personal life and shared life. It also includes time as experienced as lived time and space also as it is experienced by human beings. Yet, space includes things. Berndtsson et al. draw special attention to the ontological elements of aspects of the life-world. Echoing Heidegger and Merleau-Ponty, they argue that the things that occupy lived space are not mere objects:

> [T]hings are not just material – they are seen as "something" and call for action on our part. A pen is not just a piece of plastic containing some steel and ink. Normally, one regards it as a pen, which might be useful if one wants to write. It is not just material or a piece of handicraft—it is primarily a tool. Such a tool can be an extension of one's embodied existence as is the white cane for a blind person. In this way, tools also express something about the persons using them. (p. 259).

In this way, Berndtsson et al. call attention to the integrated socio-material nature of the life-world. Perception, experience and material conditions are one, and frame time and interactions. Tools and their use (one might say particularly their use) are integral in this description to the formation of the life-world, as are the interpretations and experiences of others around us. But Berndtsson et al. also argue that some aspects of life-world can be foregrounded while others become the general context: "We can simultaneously be directed towards certain aspects and phenomena, while other phenomena are experienced in a co-presented manner and taken for granted" (p. 260). It is generally the social world that stands out as the focus of our attention while those things perceived as non agentic in their own right slip into the background. Phenomenographic researchers themselves tend to pay attention to the former while neglecting the latter. What is needed in this study is to find a way to foreground socio-material relations.

The conditions of gaining access to lived experience, inclusive of experience of materiality, require first, that the life-world of the researcher shares conditions and interpretations with the life-world of the researched: “By meeting people, talking to them, listening to their narratives, observing their use of tools and the environment, etc., we gain access to life-world phenomena” (p. 261). This is because, in the words of Friesen (2012): “Any study of lived experience or research motivated by a phenomenological question is, in effect, an exploration of a small part of the shared life-world” (p. 43). It also confers a responsibility to invoke life-worlds in the mind of the reader of the research in order to convey those representations which elicit life-world “resonance” therein. Friesen argues that for a reader:

> Any hermeneutic phenomenological study… is an exploration of the shared life-world that is invoked or simulated through descriptive, evocative language. However, while this “sharing” of a common life-world is an important goal, the ultimate aim of this type of research is even more ambitious: To bring these shared experiences and meanings to explicit and reflective attention. (p. 46)

There is an argument to be had here that I will not elaborate as it is a digression from the main thesis, though a matter for further research using this thinking, that “explicit and reflective attention” is itself one step short of the true aim. [8]

The second major condition of gaining access to lived experience is to find a way to successfully capture life-worlds through, “meeting people, talking to them, listening to their narratives, observing their use of tools and the environment, etc” (Berndtsson et al. 2007, p. 261). However, phenomenography typically neglects method (Bowden 2009, p. 2), preferring to explicate its epistemology (see for instance; Marton & Booth 1997 founding exponents of phenomenography, and Prosser, Trigwell & Taylor 1994 for an account of use with academics).

[8] The aim of hermeneutic phenomenological study is to ensure that the researcher focuses on creating the phenomenological corollary of “truth” in the mind of the reader (“plausibility” as Weick argues, (1995, pp.55–61) or some other form of authenticity, like Gaukroger’s “accurate representation” (2012, p.9) rather than to focus on validating with the researched that theirs is the “true” account of conditions as seen through informants’ eyes. Validation with the researched is actually a step to creating a sense of research validity for the reader. This is especially so, since despite many arguments to the contrary, it is not the researcher who is the arbiter of academic truth but key readers in the form of peer reviewers or examiners. The former might have the role of barristers in arguing a case for truth, but the latter are judges, and determine its fate. Interpreting research method this way is a logical consequence of any pragmatic understanding of research which prefers a Jamesian idea of use and usefulness over positivist accounts of objectivity. While I will regretfully leave the rest of this argument for another time, the ontological base for it is the equivalence and sharability of life-worlds.

Where method is discussed, phenomenographic researchers focus on interview, typically with regard to openness of execution, and detail of analysis method. For instance, Bowden, (2009) draws attention to the absence of method discussion in phenomenography, but then talks exclusively in terms of interview method and analysis without introducing other forms of data collection. This focus on interview is also apparent in the limited phenomenological research on educational technology (Cigdemoglu, Arslan & Akay 2011, p. 792). Where additional methods are considered, they are frequently mentioned rather than explored, for example, Berndtsson et al., (2007) who refer to “observations, interviews, narratives, diaries, biographies and images” (2007, p. 262), without further expansion, and Randles (2012), who refers to “interviews, conversations, discussions, observations, focus group meetings, and… participant journaling” (2012, p. 12), also without further elucidation. Against this minimalist trend, van Manen (1990, 2011, pp. 63–69) explicates several methods including asking “selected individuals to write their experiences down”, “interviewing”, and “close observation”, which, van Manen says, also imply researcher engagement and involvement in the activities observed.

Interviews alone are insufficient and must be expanded to take account of the material aspects of an investigation of technology. Both the material circumstances of “lived space” as Berndtsson. et al., (2007, p. 259) would describe it and the actions that create and modify the work being undertaken must be captured. Otherwise the material aspects of lived space, its arrangements and networks are difficult to discern.

In light of the above, I interviewed academic staff, but was situated where I could view the action, in front of their computer screen, with them, and while they engaged with Blackboard. As the parameters of phenomenography suggest my own experience both of the technology and of the academic setting was essential to the gathering of information, as was the particular relationship I already had with the participants – that is to say, it framed a specific ‘intersubjectivity’. I did not ask academic staff to also write about their experiences. This would have been onerous for people whose days are spent closely scheduling time for other work-related writing. Last, to understand the historic and current context, I collected online and physical documentary “traces” of the organisational process that had shaped the adoption of Blackboard, along with some accounts from people who had been present at the time of its introduction, and from people whose job it was to interpret the technology in the present.

Hasselgren and Beach's (1997) "naturalistic" approach was helpful; while I had some topic areas I wanted to cover in the interviews, I also wanted to maximise the freedom for interviewees to express their own preoccupations and puzzles. It was important to me that they engage to some degree in the experience of interacting with their Blackboard course and the structure and navigation of Blackboard while they were talking to me. Accordingly, I asked them to use Blackboard to open a course of which they were particularly proud, or their favourite or most recent or most prominent course and to show me around it while they were talking about what it was like to teach online. This achieved several ends. First, interviewees were more relaxed when engaged with something they were familiar with and were less self-conscious than when merely sitting to be interviewed. Second, I was deliberately avoiding putting them on the spot by asking about uncomfortable experiences. Some were, indeed, uncomfortable with interacting with the computer, but their blame for this was directed at the machine and not at me for asking them to do something difficult or to show me a failure. Third, I could directly see how confident they were with the technology, and where their uncertainties lay. Fourth, it is entirely in keeping with the phenomenographic method to interact with people who were actually having the experience and asking them to explain it to me.

Working this way was enormously advantageous to the interview process. The computer became the "third person" in the interview and the focus of the attention of both of us. Thus the interview was less formalised as it removed much of the self-conscious, face-to-face aspect of recorded interviews. I was able to see how confidently or cautiously users approached routines such as logging on and opening courses and whether they understood in conventional or novel ways what was asked of them by the process of adding something to the course. Phenomenographically, therefore, I was able to capture something a lot closer to "experience". Furthermore, the process of working through a course, whether just "showing me around" or simulating "putting something up" meant the design of Blackboard and the intentions of users as they were trying to execute course design and management became prompts in themselves, provoking discussion of aspects of use that had been puzzling or had constituted "micro fractures" in the practice or the understanding of the academic concerned. It also meant that respondents were less reliant on recall and could demonstrate rather than describe the issues and points of interest they wanted to convey. In addition, if I asked about a belief, such as the degree to which they understood using Blackboard as "teaching", the answer was apparent in both word and deed. Last, it gave an arc of structure to the interview process itself, both of us, the interviewer and the academic user, being satisfied that the interview was completed when a course or a successful online teaching project had been explained.

Some time was spent during the interviews navigating around participants' courses and the interviews themselves usually extended to over an hour and sometimes accumulated over several sessions into a significant number of hours per person. Several interviews were conducted over a number of iterations and two added up to nearly five hours cumulative duration. None lasted less than an hour and the majority, more. This was despite booking a shorter one hour allocation for interview. Academic staff were interested to keep exploring and demonstrating their solutions once they "got going". However, it was also due to the fact that they were interacting with the technology as well as with me, so that the technological interaction frequently meant their concentration was on the task and not on the interview. There were slow points during which they were trying to navigate or to complete a task, or alternately, the technology itself had slowed and we had to wait for a response. Long pauses, sotto voce self-talk through routines, and quizzical examination of the screen for clues as to how to proceed might have been essentially silent actions but they were integral to the process of capturing the phenomenological experience of using Blackboard. Interviewees were recorded and transcribed but in retrospect, it would have been better to have had some form of either video recording or keystroke monitoring as there were sections of the interview where I had to simply describe for the Dictaphone what was happening while the interviewee was silent or murmuring during typing or trying to navigate the site. To cover those periods of silence in recordings, I later added details of unspoken interaction to transcripts from memory and diary notes of the encounter.

The Advantage of Personal Experience

My personal experience was invaluable; I had a pre-existing relationship with the academic staff I interviewed. This made gaining entree into their experience somewhat easier. Many were used to calling on me to help them with aspects of putting courses on line. Consequently, during the interviews those who had a technical problem might explain it to me in more depth than otherwise, and those who had a new solution, technical or teaching, also thought I would be interested.

Personal experience took three forms. I worked in the school for a number of years as both a sessional and a contract teacher. This work gave me contact with the school in addition to studying for a higher degree, which focused on use of technology. Both meant that people knew I was interested in issues concerning technology and use. Working within the school also gave me access to many meetings of the Learning and Teaching Committee as well as to general staff meetings and I got to know staff as they went about their daily tasks. This then, allowed for the sort of close observational work and sharing of interpretations to which both Latour and Woolgar (1979) and Orlikowski and Gash (1994) refer, as well as knowing where academics and the school were experiencing difficulties with teaching and technology.

I also ran several courses myself, the most difficult of which, without doubt, was a course called *Contemporary Social and Political Theory* for Masters level students which was run asynchronously as students were distributed globally across many time zones. Teaching this course brought me close to the trials associated with cantankerous technology, obscure instructions for use, the helpfulness of help-desks, and the constraints of technologically closed systems that do not allow experimentation or addition, and that are managed by people who are not using the technology themselves in order to teach. This gave me an appreciation of the difficulties of producing anything like a living, “breathing”, teaching interaction.

I became an informal “go-to” person for my colleagues to solve mid-range technological problems, usually at the beginning of semester. This was when academic staff would need to upgrade or modify Blackboard and associated systems but would not remember how they had done it last time or who might have not mastered an intervening upgrade to technology. I tended to be called upon when people felt that the problem was more one of forgetting or not knowing something that they ought to know and, so, was too trivial or too embarrassing to bother formal technology support staff to solve the issue. In many cases they did not know who these support staff were, and had never rung the help-desk; they knew me and where to find me. As much as anything else, it was this experience that set me on the track to find more detail about how and why teaching academics were experiencing the levels of frustration they were expressing to me.

Making sense of the data

To analyse interviews I trialled qualitative software but found that this tended to overly focused on lexicality at the expense of context and holism. It is all too easy to make categories based on frequency of utterance and ignore that which is not said but shows up in behaviour or even by absence of mention. So, ultimately, I went back to listening to and reading the transcriptions of interviews so that I could synthesise as well as analyse. This tendency to fragment interviews into utterances and to build categories from the bottom up instead of holistically is a problem also remarked upon by Bowden. He, too, solves it with a preference for dealing "with the whole transcript all of the time" (Bowden 2009, p. 12) thereby dealing with the problem of decontextualisation by avoiding initially decontextualising, rather than by remedying it after abstraction. By iteratively moving through the transcripts and recordings I could collect together the overall "shape" of an experience, as well as the illustrative details, even though this was time consuming.

Shaping the categories for discussion came from reflection and the write up. Friesen (2012), discusses Van Manen's idea of "dwelling with a problem" throughout the process of research inclusive of analysis "as it is being formulated, while he or she may be away from her desk and studies, during formal interviewing and analysis activities, and throughout the writing process" (2012, p.47). "Dwelling" allowed me to think over and integrate what interviewees were telling me with what I had read and what I knew from practice. The categories I discuss are necessarily mine and not those of the researched, though the people interviewed certainly contributed to my formulation. Like Walsh (2009), I do not want to reproduce what is inside someone else's head. She says:

> What I do want to be able to say is that, following a given interview context, analysis of the transcripts enables me to differentiate between a number of different ways of seeing the phenomenon that are apparent in that kind of conversation […] The person's conception of the phenomenon is unlikely to be stable: it may vary with time and context. Also, it is not possible for the researcher to 'be' that person; the researcher interprets the communication with the person. (p.16)

The method for analysis and inclusion of data was initially structured by the two broad categories of, on the one hand, interview evidence for struggles, dissonance and disturbance of workflow, and on the other, evidence of "use" of Blackboard or of conceptual rebuilding of some kind. This broad categorical division was informed by the work of Weick. Within these two broad divisions, further category development was informed by selecting a particularly notable reaction – for instance, adding decorative elements to the interface, or using it for reproducing lecture notes, and checking that kind of activity against all the other transcripts for like behaviour. This method tended to throw up similarities and differences, and the sub categories themselves resulted from considering how best to summarise those likenesses and differences. In this way I build up an annotated list of categorical headings populated with every example I could find within the transcripts of that kind of behaviour. This eventually grew to be a 40,000 word document, too large to be incorporated whole, so it had to be summarised down to the most illustrative instances of that category. Because I was moving through the transcripts as a whole repeatedly, I could also appreciate the individual 'story' of how particular people managed the transition, and so could also draw more holistic conclusions about, for instance, the type of pedagogical outlook that a particular staff member exhibited, through many small indications scattered throughout the interview. These holistic summaries could then form part of the comparative analysis. Ultimately, I drew on ideas that arose from thinking of experience and interpretations as constituted by many types or layers of encounter with the technology.

Ethical issues

The University conventions and formal, professional standards were applied to both the interviews and to the subsequent use of interview materials. University ethics approval was sought and granted as "research involving participants" which may fall under "risk level 2",due to the recording of interviews and the potential for interviewees to be identified by their peers if the resulting transcripts and reporting were not kept confidential. Staff were fully informed of the purpose of the research and the uses to which it would be put and asked to agree to use of their interview transcripts. Data has been protected, being accessible only by me on my own computer, and anonymity has been maintained by removing identifiable references to the participants, both on transcripts and in the final research discussion. In specific instances where participants asked not to be directly quoted, this was also complied with, although I did discuss the difference between confidentiality and anonymity where this occurred. Due to the nature of the study, explicit references to the university itself are unavoidable, as its name appears in many of the documents and references used. However any record of institutional arrangements that might be identifying, beyond the level of the school itself, has been kept to a minimum. University documents themselves are or were at the time of writing, publically available. Many were found simply by searching the University website. Others were archived on the internet archive "Wayback machine". [9]

The purpose of attention to ethical issues in research rests on two pillars: Reduction or elimination of harm to those researched, and fidelity. The four primary guidelines that Christians (2005), argues are common to ethical guidelines, "informed consent", "deception", "privacy and confidentiality" and "accuracy" (pp. 144–145), reflect these two central concerns. Informed consent militates against coercion and use of results that may be unexpected or contrary to the interests of the subject. Injunctions against deception act to both reduce harm and also to increase fidelity. Making assurances that can be breached in a manner which harms participants involves deception. But fidelity is also compromised by deception, in that it reduces credibility in the eyes of those researched or in the eyes of the relevant community of scholars. Privacy and confidentiality (which in Christian's essay is elided with anonymity) assure harm is not perpetrated by "the disclosure of private knowledge considered damaging by experimental subjects" (p. 145) and accuracy ensures fidelity not just to the subject, but to the very idea of "truth" in social science.

Christians' point is that in practice these are extraordinarily difficult strictures to uphold, not simply because of moral failing of some sort in researchers, but because of the exigencies of research itself. Instead, Christians argues for more attention to be paid to "interpretive sufficiency", to "the researchers authentic resonance with the context and the subjects self reflection as a moral agent" (p. 157). The difficulty with conventional approaches to ethics, argues Christians, is that it entails extrinsic ethics "which give us a truncated and unsophisticated paradigm that needs to be transformed" (p. 158) because it limits and undervalues the active involvement of participants to chose their own value of ethical considerations. I would also suggest that it substitutes extrinsic judgement for fostering a culture of internally assimilated ethics and thus mistrusts the judgements of researchers as well as the researched to, "choose between competing conceptions of the good" (p. 158).

[9] These are available publically at;

http://wayback.archive.org/web/*/http://www.rmit.edu.au/online

http://wayback.archive.org/web/*/http://www.rmit.edu.au/learninghub

http://web.archive.org/web/20050725115423/http://www.rmit.edu.au/browse;ID=idjlhbrob6dj

The issue of trust in ethical judgement is made more acute when the researcher is an insider, for "confidentiality" comes to mean not simply the correct management of research documents but day-to-day attention to word and deed. This may be in situations that are thrown up by normal work and that are similar to the research information, or where "insider" information from research might be helpful, but it runs the chance of breaking a confidence. In one respect this is no different from the constraints around the confidences of normal existence but in another, it could be construed as potentially more damaging because of the extent and purposive nature of the investigation, which gives access to a more intense or wider range of insights and confidences than might otherwise be the case. At a peer-to-peer level this involved paying attention to only sharing positive teaching or technical ideas should this come up in the course of the interview; retaining anonymity about who had contributed them; and avoiding negative comparisons between people. It could also be said that self-interest may come to the aid of ethical judgement in these circumstances; because the relationships were ongoing, there was more pressure to behave in a trustworthy manner and to retain high ethical standards. Insider research confers benefits as well as risks. Unluer (2012) identifies five with which I concur. These are (a) having a better understanding of the culture, (b) being less intrusive on the normal flow of interaction, (c) having prior established relationships (d) knowing the politics and how it "really works" and (e) having a great deal of contextual knowledge that it generally takes a while to acquire (p. 1). In developing the analytic categories for discussion as well as for negotiating the research itself, this privileged knowledge was invaluable.

Limitations

Inevitably the process of research leaves a few regrets and omissions. My greatest regret with respect to the technical aspect of the engagement is that I did not find a systematic way to record the actions of interviewees while they were working on their course as we were talking. Any technological method of doing this would have formalised the interview process and made respondents feel more subject to technological scrutiny, and might have impeded the naturalistic flow of the interview. However, it was a gap in information useful for reaching an understanding of how their use of technology was manifest. Finding a way of "freezing" the different versions of courses shown to me during interviews, for later inspection would also have been of assistance. Again, presenting the disadvantage that it exposes respondents to a Foucauldian degree of hidden technological scrutiny.

In terms of the research design, hindsight suggests that paying much greater attention to tracing the networks through which individual academics had learnt how to use Blackboard would have been of great benefit. Although it was obvious most learning was autodidactic, people would occasionally refer to formal courses or to someone who had assisted them. Were I to repeat the study I would have more systematically pursued these links. Instead, I allowed the respondents to take the lead on the basis that if contact with others had been important to them it would have been mentioned.

Finally, the study was limited by the methodological problem identified by Suthers and Medina (2010). They understood that the key to analysing the reproduction of practices is to be aware that “for participants, the current context is partially constituted by their shared history, including prior practices and resources that are easily reinvoked” (p. 7). The difficulty is that while these are readily accessible by the participants they are not present to the analyst. Pattern recognition is obscured if the instantiations of the practice vary and identifying which are relevant to the participants is also difficult. Suthers and Medina solved the problem by shifting the level of analysis as soon as it became apparent that the intersubjective meaning-making of a group was drawing on prior episodes. They turned attention to these episodes to show how prior resources are constructed then returned to micro analysis to show them in use. They could do this because theirs was a study of observable group interaction. While group interaction between academics occurred in my study it was not readily observable, and neither was it fostered by the online environment, so, reconstruction to the extent it was possible was largely a matter of using my own prior experience. However, this problem was to some extent ameliorated by the way the homogeneity of the environment of Blackboard made similarities and differences in practice stand out.

Conclusion: Method

In this chapter I have spelled out my approach to achieving a finely grained examination of socio-technical use, focused so as to try to decompose the many elements that compose a practice like “use of online learning technology”. Instead of comparing technology use *between* groups, as Orlikowski, Yates, Okamura, & Fujimoto (1995) have done, I compared the various uses made by teachers facing similar circumstances in order to see the extents to which they evolve practices that are similar or different. This entails interrogating the idea of “use” to better understand the elements that compose it by looking, for example, for micro fractures of practice and meaning and any papering over of these that might be going on. It also means not treating practice as a shared meaning, Weick, (1995, p.188) suggests that this is practically impossible, [10] but asking to what degree practices and experiences are shared, or at least understood as similar.

[10] Weick (1995) argued that “Although people might not share meaning, they do share experience” (p. 188). Bourdieu too felt that society was not bound by the direct relations of shared meaning through interactions, but is instead connected by “fields of practice”.(see Postill 2010, p. 16).

CHAPTER FIVE: MAKING SENSE OF BLACKBOARD

> Technology is an integral part of our lives, and equally, the way we apply technology in our teaching is critical to our students' learning and their overall experience at RMIT. Those who have been using Blackboard for many years will notice the enhancements of the new version. For those who have not yet fully embraced online technologies in their teaching, I encourage you to take this opportunity to explore and consider the many benefits that a blended learning approach affords both teaching practices and the students' learning experience". (Palmer 2011)

The introduction of Blackboard involved a major reframing of practice, and a rearrangement of the earlier arrangements of higher education. However, despite unceasing advocacy, the adoption of online education across Australian universities has not gone smoothly. Twelve years after the introduction of Blackboard, and its affirmation through exhortation and embedment in university policy statements, a Deputy Vice Chancellor of RMIT found it necessary still, to appeal to staff to use it. The introduction of this kind of educational technology appears to some to have taken place as a "management fashion", couched within a broad set of social, political and economic factors invoked to support it (Pratt 2005, p. 58).

> The management fashion setting community shapes the transitory collective beliefs among management fashion followers that certain techniques are rational and progressive amongst stakeholders. (p. 61)

At the least, a university's decision to adopt a range of online technologies including Blackboard can be seen as part of a broader set of "rational" and "beneficial" practices or it can read as part of a different history in which neo-liberal policy and managerialism play a crucial role. Though these raise important interpretative and theoretical issues, my purpose here is somewhat simpler. I will describe Blackboard along three parameters: as a functional design; as an instrument of interpretation; and as an organisational arrangement.

My question, which provides both purpose and shape to this chapter, is this: What is Blackboard? Several considerations suggest initially that there is no easy answer. "What Blackboard is an instance of", even as a class of software, for example, is not immediately clear. Blackboard is frequently referred to as a "*learning-management system*", which is but one of a plethora of terms employed to name these things. Coates et al., (2005) collect together terms like "*learning platforms*", "*distributed learning systems*", "*course management* *systems*", "*content management systems*", "*portals*", and "*instructional management systems*" (p. 20). To these can be added Nosek's (2006) definition of Blackboard as a type of "*collaboration technology*" (p. 136), and Storey, Phillips, Maczewski & Wang's (2002) generic and diffuse definition of Blackboard as part of a class of "*web-based learning tools*" (p. 2). The term "*virtual learning environment*" is also used coterminously with "learning-management system" (Paulsen 2003; Suri & Schuhmacher 2008) although at times the former term includes personal learning environments that are much more individualised and controllable than learning-management systems, and where "the user can manage the content and applications that will facilitate the interaction between all the participants (colleagues, tutors and students) in the process of building knowledge" (Casanova, Holmes & Huet 2009, p. 482). In other words, a virtual learning environment may be at one definitional extreme be a coherent "platform"; at the other, a collection of applications with no unifying characteristics and architecture.

The problem with this vocabulary is that it is either ambiguous, or refers so abstractly as to include software that hardly counts as an instance of the same class. Learning-management systems, course-management systems and instructional-management systems overlap in definition to a considerable degree, although here too there is argument. Watson and Watson (2007) define a course-management system as a subset of a learning-management system, on the basis that a learning-management system "incorporates a great many features by providing the structure of the entire learning process within an organization" (p. 29), whereas a course management system just provides a number of tools for offering a course online. The confusion does not stop here. Watson and Watson add: "A Google Scholar search of the phrase "Blackboard learning-management system" returned 36 articles identifying Blackboard as a learning-management system, while the Blackboard company itself refers to its product as a "course-management system" (p. 29), and further compounding the issue they add; "LMS (learning-management system) has its history in another term, integrated learning system (ILS) which offers functionality beyond instructional content such as management and tracking, personalized instruction and integration across the system" (p. 28). The remaining terms; *content management systems*, *distributed-learning systems*, *portals* and *learning platforms*, can also refer to a class larger than themselves or to one that is significantly different. A content management system is frequently used to refer to the system of editing, modifying and publishing content for web pages, usually as an interface visible only to site authors and invisible to the users. In a literal sense the work of *content-management systems* and *learning-*

management systems is strictly analogous, but they are separated by two vernacular meanings of the terms as separately applied to web authoring systems and to educational technology. Compounding matters, content-management systems and course-management systems are referred to by the same acronym (CMS). However, the term "content-management system" serves to draw attention to Blackboard as web-based. Indeed Blackboard draws on a number of programming languages, and html is one of them (Boufford 2010).

Distributed learning systems (the matter of staff confusion referred to in Chapter 4) -can refer directly to learning-management systems or they can be a stand in for distance learning as a whole (Bell & Kozlowski 2006). However, at RMIT the term was specifically employed to mean a platform to host a suite of educational technologies, including Blackboard, to provide an organisationally coherent and value-consistent approach to teaching online (see McNaught, Kenny, Kennedy & Lord 1999). I shall provide more detail of the implications of this positioning in the discussion of the history and development of the RMIT system, below.

A portal as suggested by its Latin origin and meaning – "gate" – in the world of information systems, refers to a single point of access to a wider realm of information. In strictly definitional terms this could be applied to an LMS as a portal to information, but *learning-portal* is more commonly used to describe the web page that functions as the point of access to multiple learning tools. At the outset, for all users at RMIT this was initially through a web-page called "The Learning Hub". Subsequently, students were shepherded into a more personalised specialist student-designated portal called "My RMIT", and it provided access to a wider suite of functions including most of the electronic tools they used within the university; the Learning Hub was thereby rendered invisible to students and available to staff alone as a point of access. Referring to Blackboard or any other LMS as a learning *portal* is to draw metaphorical attention to it as a "gateway", presumably to a city of learning.

Calling Blackboard a learning-platform is also to make an alternative metaphorical claim for it as the necessary base from which to operate electronic learning activities. The term *platform* as used in Information Technology is both ubiquitous and vague. Its ubiquity makes it oddly difficult to find well-sourced definitions. Definitions of computer platforms are to be found in undergraduate textbooks, in blogs, in online dictionaries or in Wikipedia, making it difficult to point to reliable, original information. Historically, the point at which a platform came into being was after programs were separated from the hardware of computers and coded onto paper or card, then made electronic. The languages used were subsequently “stacked” so that one program relied on another for basic code that was effectively summarised to be used by the next layer. Platforms were developed that would act as templates (formally stable constraints consisting of integrated design rules) for particular types of program and which would serve to provide a common unifying base while keeping functions separate (see Gawer 2010, p. 490). A computer operating system is a platform for application software, and an operating system itself relies on the “platform” of hardware. Claiming that Blackboard is a “learning platform” (eg, the proprietary claim made for Blackboard Academic Suite by Bradford, Porciello, Balkon & Backus 2007, p. 2) is a claim that it is a base or template on which multiple learning activities and management functions rest. While this is true, it displays a touch of grandiosity by implying that it is as fundamental as the platform offered by an operating system like Windows, or Apple OS. Nevertheless, the Blackboard “*shell*” is a concept that draws on the platform idea of a unifying base for a diversity of separate activities and uses. Blackboard course sites begin as an empty shell of which several types are available. A shell contains no course content and no enrolled students or course producers. It is a unifying base on which diverse curricula can be built. In short, if the polysemic vocabulary, as above, points to nascency and to the unsteadiness of the language, it also signals the conceptual complexity of the whole class of “educational technologies”. Multiple overlapping class descriptors point to ambiguities in technological relationships between wholes and parts. Hardware, software and the class to which they belong are also significant “shapers” of use, as I will discuss in subsequent chapters.

In this chapter, I propose to approach Blackboard in three ways. First, thinking instrumentally about it as a tool to be taken at face value, Blackboard can be described as “a technology”, a set of relatively stable software propositions for teaching. Second, in its potentially creative, constructive mode, Blackboard can be understood as a medium for opening up new possibilities and connections. This is something accessible largely through the visual evocations of its “screenworld” – a more uncertain interpretive environment. A third way to look at Blackboard’s shaping influences is to treat it as embedded into a technical system called a university. The university controls much of the “arrangement of machines, equipment and methods”, along with “knowledge and design”, which as Weick says, constitutes the “technical system” of any given technology. Expressed in Bourdieuian terms, the technical system in which Blackboard is embedded forms the field in which a logic of practice can evolve (Bourdieu 1990). As I argue here, we can only understand Blackboard as a part of an organisation by reconstituting the historical process whereby the university took on Blackboard. These three facets of Blackboard – its tool-like design as an instrument present in hardware and software; its function as a medium of representation; and its instantiation into organisational culture can be used to make sense of it. Blackboard as artefact, as a medium and as a technical system, come together as an instrument with which academics must work.

Blackboard as Technology

As with all computer based information technology, a factor frequently overlooked is that Blackboard relies on the hardware and architecture of the computer. This physical structure shapes understanding and affects concepts of use in two major ways. First, physical hardware is subject to physical effects, so, computers are only available where there is electricity; and the internet only where there is wired or wifi connectivity. Physical features make things possible, as the invention of the computer mouse created a new kind of input interface, or the addition of a web-cam opened up the possibility of a virtual visual encounter with another person, for example.

The realisation that there is a physical dimension to computers usually occurs when something goes wrong – the electricity supply fails, keyboard keys stick, mouse batteries go flat, or the screen develops an odd optical effect. The codes on which a computer operation is built can also have object-like behaviour. This, too, makes things possible and is also noticed at times of its malfunctioning, such as when software includes bugs, or viruses take over a computer, or a program collapses in a “blue screen of death”. Failures of hardware and software constitute a disruption of the workflow for which a computer is used, and as a consequence, can be disruptive of the flow of attention and set up expectations of further failure. I shall address the consequences of “artefact failure” on the users in more detail in Chapters Six to Eight. Second, hardware functions also must be imagined, as Weick has pointed out (and as described in Chapter two) electronic environments represent incomplete sensemaking environments:

> [T]hey involve the self-contained, invisible material process that is actually unfolding, as well as the equally self-contained equally invisible imagined process that is mentally unfolding in the mind of an individual or team. There are relatively few points at which the mental representation can be checked against and corrected by the actual process. (Weick 1990, p. 16)

These inner workings and process executions must be imagined by the user but imagined in the absence of references to anything tangible. As Weick says, this gives rise to a splitting of a schematic, imagined world of workings from the world of people and those real relations and sequences on which a computer depends. As these worlds bifurcate and become increasingly unrelated to each other, differences emerge. Real and imagined processes that get out of kilter have consequences for “use” in that false expectations or unrealistic, imagined structures can lead to either disappointment and “resistance” or inaccurate formulations of activity and use.

Blackboard as a Medium: The Screenworld

One of the single-most important developments in the history of computing was the realisation that people do not have to understand how a machine works in order to be able to use it. While technologically, the use of stacked platforms to bridge the gap between the hardware and the screen via layers of code may explain how the artefact of Blackboard comes into being, it does not explain the “screen-world” of Blackboard, the difference being the computer environment equivalent of the difference between a noumenal and a phenomenal orientation to understanding. The transformation of the computer for users from a literal calculating machine with physical and numerical mechanics to a metaphorical world occurred because programmers, in an effort to make computers easy to use, turned their attention to how children learnt. Making a computer easy-to-use meant humanising it, and in order to humanise it programmers looked for people who did not think technically - quintessential non experts - and found this in children (Alan Kay in Palfreman 2008, p.10:15 mins to 11:08 mins). Children did not know how the machine worked. In following them as they assimilated it, programmers like Alan Kay noticed how tactile and visual children were as they mastered an activity, and incorporated this into what subsequently became known as “the human-computer interface” (HCI). The first “graphical user interface” (GUI) was part of a program called “Sketchpad” designed by Ivan Sutherland in 1963 as part of his PhD. It sensed the placement of a stylus on a screen and “drew” lines to match start and finish points that could be dynamically curved or relocated. Barnes (2007) notes that “Sketchpad was the first interactive computer system, and the first to use computer graphics along with computer-aided design (CAD)” (2007, p.19).

While Sketchpad provided direct visual feedback, the invention of the mouse (attributed to Douglas Engelbart) some five years later provided a simulacrum of tactile feedback. Both transformations naturalised the performance needed to use a computer, and made it interactive and much more intuitive. Neither innovation was adopted into mainstream computing for some time, and had to await a third paradigmatic shift, the idea of the personal computer. The screen became further enmeshed as a representative surface when, with the introduction of the personal computer it became necessary to make the computing environment sensible to the ordinary user. Soon thereafter the screen moved from the textual and numeric to the metaphorical via the now ubiquitous introduction of the "desktop metaphor", by analogy with office furnishings. This immediately contributed both "representativeness", and metaphorical inconsistency to the working space of a computer, leading to many of its current strengths and limitations as an imagined space (see e.g., Kaptelinin & Czerwinski 2007). But it also opened up the possibility of using metaphor to make sense generally of computer environments (see Hobart & Schiffman 2000). Removing the necessity to know how a computer worked and replacing that with interactive visual and tactile representations made both the screen and the inner workings of the computer into imagined places. The inner workings are hidden by this move, as Weick has remarked, and, so, for most users, there can be no empirical checkas to whether the guesswork they make about its operation is right. Thus the mechanical and technical character of computing is "black boxed". On the other hand, the screen is utterly visible. It becomes the absolute object of focus and absorbed attention. In the same way that a proscenium arch and backdrops obscure the workings of a stage, leaving the watcher free to invoke the full meaning of the drama, removal of the need to pay attention to "workings" frees up an imaginative space on a computer, the space Sherry Turkle calls "the subjective computer" (Turkle 2005, p.19).

Like an art canvas or a piece of paper, a screen is two dimensional, but once made representative and interactional, the screen itself became the opening to a "lifeworld", the "cyberspace", a place with its own virtual volume, upon which could be projected values, and beliefs, actions and behaviours – a cultural space. Becoming a cultural space makes a computer amenable to two transformations linked with practice. First, its representative capacity can provide an arena for the exercise of analogical forms of representation and meaning, grouping representations into metaphors, genres and other interpretive classifications. Second, in becoming a "medium" it can transfer cultural practice, in as much as "media" are ineluctably associated with communicative transmission. In the words of Turkle (2005,), a computer is both "a constructive as well as a projective medium" (p. 21).

Representation and interaction set screens apart from the computer as a calculating machine, for this gives them the capacity to act as a cultural medium, but the term “medium” is slippery and a great deal of effort has been expended in media and communications studies on defining and theorising it. Without becoming overly enmeshed in a very large debate, it is still necessary to position the idea of a medium as both a representation and a form of transmission so as to inform properly the idea of a computer “practice”. The idea of a computer as a “digital medium” entails specification of each of the terms – “digital” and ”medium”. The term “digital” requires some clarification of how a digital medium differs from other media, which has implications for the resulting changed practice, but the term “medium” also requires clarification, since it bundles together three different conceptions of what it might be a medium of; transmission – a container that holds thought, representation, which displays thought to others, or expression, a creative moment of thought.

Murray (2011) provides a good example of the bundling together of the three conceptions. For Murray, a designer working in the media and communications tradition, “medium” is a meta term that is ontologically prior to, and encompasses other processes. In this respect she follows the tradition of media and communications studies, which treats mediation as fundamentally communicative. She defines “medium” as, “any combination of materials and cultural practices that is used by human beings to support the intentional communication of meaning” (p. 45); further: “It is important to remember that a medium is both material and cultural: a stone and chisel only become a medium for writing when a society develops practices of marking the stone and interpreting the chisel marks” (p. 45).

Hers is an argument for acculturation of the material by the addition of a shared communicative mode. It is in the detail of Murray’s description that her reliance on an older model of communication becomes apparent. Murray elaborates the communicative process as consisting of “three nested processes: inscription, transmission, and representation” (p. 45). The process of inscription is one of “making perceptible marks on a receptive surface” (p. 46). Classically, this invokes a pencil and paper, but in a digital environment, according to Murray this may be accomplished by a mouse and key board, a finger on a digital multi-touch screen or by use of any other electronic input device. Inscription can, thereby, be reliable or unreliable, and it can be transparent or non-transparent. Pencil and paper have become so reliable over the years such that using them is “transparent” – no longer needing to be the subject of conscious thought. An “unreliable” inscription tool might be a keyboard with sticky keys, and a “non-transparent” one might be the complication of multi fingered gestures put to use on a tablet screen.

Transmission for Murray is the process of “turning a meaningful message into a coded signal of some kind and transferring it from sender to receiver” (p. 46). This framing of “transmission” closely resembles Claude Shannon’s “information theory”. Shannon, according to Gleick was the architect of information theory, inventor of the “sender → message → receiver” model of communication (Gleick 2011, p. 219; see also Hartley 2012). In order to make transmission possible Shannon reversed the prevailing idea of “information” by eliminating meaning. Eliminating meaning universalises the carrier code. It does not then matter whether the source of the information is a person, a storage system (like a phonograph or a server “cloud” system) or a stream of clicks from outer space; these can be homogenised by coding into data or a signal that can be transmitted as if they are equivalent, despite their disparate semantic sources.

However, for Murray’s more cultural version, transmission still carries traces of meaning. She argues: “Transmission codes are logical structures established by social agreement, like Morse code patterns that correspond to letters of the alphabet, or the unique phone number assigned to every landline or cell phone” (p. 46). This seems a slightly more muddied and less logical rendition of transmission than Shannon’s. Murray for instance argues that transmission codes like inscriptions can be reliable or unreliable, transparent and non-transparent, but the latter category includes “the many password barriers that regularly challenge our memory and patience” (p. 47). But password codes are not part of a transmission system; they are deliberate barriers to access, like gates beside a road barring access to the road, they are not part of the “road” itself. The transmission system can operate perfectly well without them. The transmission system itself consists of those codes and protocols that act as a carrier. Stripped of meaning, the transmission system is only “cultural” in as much as the codes are recognised in standards for communication, allowing decoding and reassembling into meanings at the other end. Even in the absence of a transmission decoding system at the receiver’s end, it is still possible to argue that a message has been sent; just that it is unintelligible by virtue of the receiver not having the key to the code.

Transmission understood as a carrier or conduit, operating purely as the means of containment of communication is one possible meaning of the term “medium”. However, there is a second possible meaning for “medium”. This is to be found in Murray’s final property, “representation”. Representation is for Murray the most cultural layer of all. As she argues:

> “The inscription layer is grounded in the physicality of the inscription materials; the transmission layer is grounded in the logic of the coding system. The representational layer is more diffuse, created by cultural tradition and open to an ongoing process by which we negotiate meaning with one another. We understand what words mean not because the meanings are fixed or absolute, but because we draw on shared contexts and associations to interpret them”. (p. 47)

Here her argument better resembles Wittgenstein’s argument against “private language”. While the meaning Wittgenstein had in mind when he made this argument is still a matter of debate, on one reading this is to commit to the concept that language, (or in Murray’s case, “representation”) is always social – the “community view” of language (see Candlish & Wrisley 2012). However, it is arguable whether representation must always include something recognisable by “the other” as social, especially if we think of a graphical user interface (GUI) in its original form, “Sketchpad”, as a screen connected to a computer, but not connected to the as-yet not-invented internet. How, without connection and communication is a computer a “medium”? I think the answer is to be found in a secondary meaning of “medium”, that of a medium of expression. One may understand the “inscriptions” made on a screen by Ivan Sutherland’s stylus as representing something only to the inscriber. This makes it an equivalent to a private language. The possibility of private representation is always inherent in any expressive medium, representing something to one self. Similar instances of representation which are non-representative beyond the originator may include abstract art that needs a catalogue entry before it is intelligible to the viewer, or maths written in a private code, but which is used nevertheless to work out a problem of concern to the creator. Da Vinci’s coded notes to himself are another example. A private representation can help solve a private problem.

This argument seems to be heading towards an embrace of post structuralism, suggesting we follow Barthes down the path of the non-interpretability of the author’s intentions (Barthes 2002). However, I am not making a case for the impossibility of representation of one person’s intentions in the mind of another. I am arguing for a pragmatic position. A representation does not necessarily have to be social to be useful. An expression as realised on a screen (or canvas or other surface) might be capable of being interpreted by another, but that is not the purpose of its creator. Its intended purpose is to express something for the author, and to provide a kind of emotional resonance.

Before the screen became available, the computer was an instrument – a calculator. With the screen it became capable of representation and the representations themselves became digital artefacts. A computer with a screen is capable of manifesting as multiple "digital artefacts", defined by Murray (2011)as "anything made out of electronic bits and meant to be directly used by human beings as an artefact" (p. 45). Moreover, these are interactional. This gives them the capability of acting as a medium of expression, allowing for types and genres to develop. Yet, modes of expression, particularly art forms, are also emotionally resonant. Genres of expression, especially when coupled with a material artefact take on a life of their own as did the novel, for instance – writing of a particular style represented in a particular kind of material artefact, such as the book of a certain length and style. This constitutes one kind of emotionally resonant form realised as a genre. Computer artefacts that are representational and interactive can now take emotional resonance to even more sophisticated levels and detect emotion and respond through "intelligent agents" (see Gratch 2011). This has the potential to form a peculiar, intense kind of emotional resonance where the "digital artefact" becomes agentically ambiguous, and the "machine" of the computer disappears entirely as a factor in the relationship.

It was only when computers became capable also of communicating at a distance that they assumed the capacity of becoming a medium of communication. Even this has been substantially transformed by the capacity of computers to act as an expressive medium. "Transmission" understood through the lens of the "computer-as-a-calculating-machine" gave rise to the linear information model of transmission in which meaning is stripped out. Expressivity, however, gives rise to an entirely different and intrinsically meaningful form of "transmission", in which the human side of communication comes to the fore. Hartley,(2012) calls this a "dialogic model" of digital communication. As he describes it, "'meaningfulness', 'social networks' and 'relationships' surface as crucial components of the process. They replace 'content', 'information', or the 'message' with human interaction based on self-expression, … description and argumentation… as well as play, 'phatic' chatter, and imaginative invention" (pp. 2–3). It is only through the computer's capacity for enabling expressiveness that this new form of communication is made possible.

On this account a computer generates four broad metaphors of use. A computer can be construed as: an instrument of calculation capable of processing large amounts of data; it can be construed as a tool and medium of representation and expression, via “digital artefacts” (tools) and their expressive uses and resonances; it can be construed as medium of communication of “information” via transmissive codes and standards; or finally, as a social means of communication, carrying all the meaning of dialogue. These are metaphors arising from the “field” of computers and the internet and accessible to those who use them for making sense of their own activities. (For Bourdieu’s "field" theory applied to media see Couldry 2003)

Arguing for the significance of understanding a computer with a screen as a medium of expression, affording both representation and interaction, reminds us of its expressive and creative capacities. This is not confined simply to “interpretation” as a final act in the chain of communication, as the idea of “medium of transmission” on its own suggests. However, retaining the idea of the computer also as a medium suggests that those mental tools, the various frames and schemata that we use to compress and organise meaning in other media such as literature also play a big part in how a digital artefact is understood and, indeed, some of the same conventions may well be co-opted into the use of it. The metaphor “library” transfers directly across from literature to a computer, for instance.

A screen is a particularly effective expressive medium because it is simultaneously a place of writing and reading. In theory, at least, the screen (or the computer) considered as an expressive medium detaches the expression of an idea from becoming locked onto a particular form of material representation or artefact. The medium will always to some extent be the message, but while an artistic expression may only be scratched or chiselled once into stone, a digital concept like online education, can be invoked through multiple “digital artefact” representations. Blackboard might be one. Wikis, email, Facebook, blogs and YouTube might be others. Possibilities for expression via a range of digital artefacts become wider outside the bounds of the LMS. The substance of a digital artefact when this is understood as the equivalent to the material base for a medium of expression, is also representational and blurs into resemblance to a “genre”, a very non-material representation. This is because a digital artefact is based on a materiality, the movement of electrons, which is transmutable in a way that normal physical materiality is not. Because a computer is simultaneously a place of reading and writing it can be written into new forms very readily. Thus an artefactual stability which mirrored the material stability of things, once an intrinsic property of tools, is now lost in favour of transmutability. In addition to this artefactual instability, computerised tools are also subjects of cultural instability. Instability of digital forms result from the newness of computers, culturally speaking – meaning that established conventions of shared cultural interpretation are not yet settled – and from the fluidity of a digital artefact arising from constant rewriting of the object itself, leading to the need for more or different cultural conventions to be established. How Blackboard itself is realised as a digital artefact is the subject of the next section.

The Blackboard Screenworld

Blackboard has a screen-world design made up of interfaces and navigation rules which could stand in as a virtual corollary of the surfaces of a physical object. A description of these gives some indication of what people encounter as "shape" when they move around in the software.

The Proprietary Definition of the Screenworld

To the extent that it reveals the intentions of screen-world design, the university version of Blackboard and its system of justification and use can be counterposed with the proprietary version of the same by examining the Blackboard patent. The patent application for Blackboard registered in the USA in January 2006 (Alcorn, Cane, Chasen, Chi, Gilfus, Perian & Pittinsky 2006) sets out nine core functions.

- the instructor user is provided with an access level to enable the creation and editing of a plurality of files associated with a course.
- an announcement file.
- a course information file.
- a staff information file posted to all registered in the course.
- a course document file posted to all registered in the course.
- an assignments file posted to all registered in the course.
- a dropbox file.
- an asynchronous communication file.
- a synchronous communication file.

It then goes on to 34 other claims, which specify internal relations.

The patent application also provides a justification for itself by arguing the case for online education over geographically based education as its premise for its existence. Alcorn et al further argue that simply using the existing provisions of the Internet for education is too complex. This provides the rationale for providing a specialised work-flow structure. The remaining rationales resolve into the advantages of having all "players" – instructors, administrators, technical systems and students within the same system – justifying on the same, organisation-wide control premises as earlier Enterprise Resource Planning (ERP) systems.

The features identified by the company "Blackboard Inc." as identifying Blackboard the LMS do not greatly differ from generic features attributed to all LMSs, so, the patent as with all patent applications is an attempt to stake out ownership of the widest and most generic set of specifications. Nevertheless, it is a demonstration of how Blackboard is framed as mainstream and normative in relation to onlinelearning technology generally. The supplementary arguments for the patent position Blackboard as providing order, imposing itself between the technical difficulty of long-distance access and the informational mess of the internet to provide organisation-wide assistance in the smooth operation of the internal functions of an organisation.

While this is not a definition of "what Blackboard is for" identical with the university's sense, the patent constitutes the proprietary view of use, by framing teaching and the set of relations needed to carry it out in a very similar way – hierarchically constructed, dominated by a production line metaphor, treating units of intellectual transaction as essentially static objects of information, intended as a system of management, and constructed as a totalising solution to the problem of distance education delivery and as a definitive producer of order. However, Blackboard's power to shape use does not rest only with its architecture, for use is a verb that specifies movement through that architecture. Knowing what it is representing as a tool to work with and knowing how to create representations by using it are central to "knowing what you are doing".

The University Blackboard Screenworld

At RMIT the proprietary design strictures were complemented by a series of normative descriptions of use offered by the university. The version used by the university at the time of interviewing was Blackboard 7.2 (RMIT Learning Technology Service (LTS) 2007; Smithers

2009). The two major components to understanding and learning Blackboard are the functions provided – analogous to a vocabulary – and the navigation rules used for moving around and acting in it – analogous to a grammar.

The version of Blackboard in use at the University opens with a menu layout of available functions. These are “Announcements”, “Course information”, “Staff information”, “Course documents”, “Assignments”, “Communication”, “External links” and “Student tools”. These represent major course-structural categories and are supplemented in the menu by some administrative functions – “Resources”, “Course Map”, “Search”, “Logout” and “Control Panel”, the latter viewable only by staff. It is important to note these areas were controlled by IT managers and some functions available in proprietary Blackboard had been turned off for staff or student use in the version operating at the university. The company website in 2004 listed a far wider set of functions and features than were used by teaching staff within the University, listing 20 “capabilities” in total (Blackboard Inc. 2004). These functions represent embedded ideas of the tasks necessary to offer online education; they are the “object spaces” to which educational objects are added.

The University policy document, “*Teaching and Learning Using the Distributed Learning System: A Model Course Structure for Blackboard*” by RMIT University DLS Professional Development (2002) sets out in short imperative instructions substantive areas to be used and suggested uses in Blackboard. Together with the proprietary structure, they formed a set of expectations. The policy document demonstrates the close shadowing of the (external) technological design constraints by the (internal) policies for use.

What Blackboard “is” cannot be separated from what it is “for”. What it is “for” is co-constructed by many groups of people, its designers, organisational policy makers and actual academic users. The policy document noted above illustrates the mutual constitution of Blackboard as a form of structure, set by the university and Blackboard designers prior to use by academics. From the perspective of academics, the document and Blackboard can be taken together as a single representation. It structures because it intends limiting and channelling agency, as well as structuring, per virtue of the fact that like any tool it only offers certain possibilities for action.

A number of structural elements can be discerned from a reading of the policy document.

First, the whole educational sequence captured in the document is constructed as a linear process or production line. This mirrors premises about the teaching process. The document begins with directive "information" about academic administration, the course requirements, and the teacher, supported by various resources. Then it moves to "means": The means of receiving course "knowledge" via course documents, and the means of communication about the process. Last it provides for the "product" of student and staff effort – assignments. In envisioning the teaching process as inputs (information, resources), modifying actions (absorption of course knowledge, communication) and outputs (assignments, tests, surveys), it models itself after Fordist production.

The second element of note is the positioning and role of the teacher. In the "Model Course Structure" policy document, the teacher is positioned so as to have maximum control over the interactions of students on the premise that the major role of teaching is student management. That student management is prioritised over student education can be seen simply by examining the number of instructions and caveats devoted to the management aspect of teaching compared to the small fraction devoted to actualising educational transformation. Student management as a primary function shows up not simply in setting parameters for the course content to be mastered and key dates – it is even more overt than that in managing student interaction. Academic staff are advised to limit student contact with themselves, to "discourage students from sending emails to you", and communication between students and group communication is also to be closely monitored. Online conversations must be moderated by the teacher. Times must be set for communication to, "avoid the discussion dragging on or petering out". Limits must be set on who can communicate with whom. Group pages must be "accessible only by identified members of a group" and available "only used if students are organized in specific groups for team tasks". Students' interactions with anyone – other students or staff – are presumed to be potentially anarchic and the teacher's intercessory role is constantly called up.

This control is, however, not only imposed by the policy guidelines themselves. They are also a reflection of the design of Blackboard. The presumed role of the teacher is of dominance and control. This is reflected in design in numerous ways. For instance while self-representation is available to the teacher in a diversity of functions, especially the "staff information" function where self representation can include images as well as textual representations, students do not have access to the same degree of self-representation. There is a "student web-page" but it is not referred to by this document, perhaps because of its low importance. It allows for a thin and minimal self-representation of student identity compared to that afforded to staff. Moreover, communication is top down. A sideways peer-to-peer communication is discouraged or impossible except where it can be monitored. The exception is the student "roster", but this acts to keep such communication out of Blackboard. Communicating "up" is either discouraged or confined to "legitimate" queries.

The only people presumed to be involved in the course are the students and the teachers. In large classes with tutors or junior staff, the hierarchy of status is maintained by the limited functions granted to subsidiary staff to represent themselves electronically or to add materials. Control over legitimate users also means that the digital equivalent of bumping into someone in the corridor is severely curtailed. Other teachers cannot see how teaching takes place unless they are invited. This has ramifications for the passing on of practice, as a Blackboard course is private teaching space, at least from the perspective of students and teaching colleagues. In many respects this is not greatly different from standard face-to-face teaching, except that it is possible to wander into a lecture but not possible to wander into a Blackboard course. It is not a matter of this design being a general problem of online teaching; it is a problem of specific closure in Blackboard and similar LMSs. Open courses like cMOOCS are conspicuously free of these constraints.

Course privacy is negated when administrative scrutiny is called for. All actions within a Blackboard course are potential data and much about them is collected and made available as performance data. Hierarchy in Blackboard is defined by the extent of available visibility of others' practice and the capacity to intervene. Those at the top, the technical administrators, have the greatest power to do both, and students have the least. "Teaching" is defined by this hierarchy, making other configurations of teaching, especially student-led teaching or collaborative discovery well nigh impossible.

The third element that is apparent in the policy document is how the teaching materials are treated. Nosek (2006) comments on: "Blackboard's conceptual view of collaborative support as essentially providing a common depository for static artefacts", noting also that documents cannot be collaboratively edited (p. 137). This is reflected in the patent document, above. "Course Information" includes "references", "External Links" consists entirely of references, and "Course Documents" have as their core, "Resources and presentations". All of these are object-like. None are dynamic or modifiable except by the lead teacher, and the very design of Blackboard as a series of fields for adding "objects" encourages a "repository" approach. Moreover, the mode of teaching also reflects Claude Shannon's linear "sender → message → receiver" model (and metaphor) of communication noted above in my discussion of transmission models, above (Gleick 2011, p. 262; Hartley 2012, p. 2). It was Shannon's contribution to information theory that separated "information" from the design of its channels, and thus set the scene for the development of both the modern computer and the internet, providing a ready-made metaphor for the role of teaching in the "channel" of Blackboard.

"Teaching" by this definition is the operation of a production line process for which "knowledge" consists of object-like texts and representations, and which is manipulated via text injunctions and "communication" to create the outcomes of education, as evidenced by "assignments and tests". The major part of the process is "student management", whereby students are understood to be the least responsible (and therefore least able to change Blackboard elements, and most in need of management) of a hierarchy of course-realising actors. Strict status definition is maintained between technical administrators at the top and in descending order, academic teachers, their subsidiary staff and students at the bottom. Further, communication also occurs largely top down in a sender-receiver model. "Knowing what you are doing" in Blackboard requires absorbing this metaphorical interpretation of "teaching". Many other writers have made similar comments on the crafting by Blackboard of a specific formulation of teaching as a "transmission model", (e.g., Coates, James & Baldwin 2005; Lane 2009; Malikowski 2008) and I shall discuss these further in the context of analysing academics responses, below.

Navigation

The second major component of understanding and learning the screen-world of Blackboard is the process of adding educational objects to the functional spaces described by the architecture. Navigation is the active part of using Blackboard. It moves the focus of "use" from semiotics to process. Navigation is frequently what people mean when they talk about learning to use a program. They mean the active part of adding materials, the "how do I?" rather than the "what" of Blackboard. As the active component it can be considered as the locus of practice, for it is here that both new skills and new interpretations are called up.

In Blackboard, navigation can be complicated and non-intuitive. Nosek (2006) provides a typical example of the navigation process for one function, the adding of a document to “Course Documents”:

> In Blackboard, if one wants access to a document for displaying to and updating by a class, one must typically do the following: 1) navigate to the document through a series of Web pages; 2) download it; 3) navigate to the downloaded location; 4) open it up in the application; 5) modify it; 6) save it to the file system; 7) delete it in Blackboard; and 8) re-add it to Blackboard. (p. 136)

This description highlights the elaborate sequence of steps needed to add information to Blackboard, a sequence that calls attention to itself by stressing the limitations of memory and schematic visualisation.

“Buckets in Blackboard” is a mixed metaphor for the functions of Blackboard and their navigational separation. The term is derived from a description that turned up in my interviews with academic users of Blackboard. Interviewees understood it as a series of separate functions or “buckets”, separated by the navigational design, which stipulated that each function stood more or less navigationally alone. Blackboard must be entered by one sequence of actions, a task is executed, and then the function must be navigated away from, frequently using a separate sequence and one that does not simply reverse entry procedures. There is little or no “sideways” movement possible between functions without first navigating back to a starting position and from there, entering a new function. Like a tree diagram, it is the “trunk” which provides access to otherwise separate elements. This navigational design emphasises the modularity of the component functions of Blackboard, suggesting that each function is strongly relational to its parts within a bucket and more weakly related between buckets.

Navigation is a form of shaping in that it is a sequential action of steps that must take place in the same order. Some software designs there are multiple pathways to a substantive action but in Blackboard these are limited, and in many cases, just the one sequence that will lead to a desired result. Some sequences in Blackboard, as Nosek notes, can take up to eight steps. Moreover, these must be mechanically repeated in sequence each time information is added. There is no possibility of developing shortcuts that come with the accumulation of experience, as occur, for instance, in the shortcuts of skill application that arise from manipulation of physical objects such as wielding a hammer or driving a car. Limited, complicated pathways of navigation make Blackboard appear inflexible and onerous. It is rigid in that its features cannot easily be rearranged, especially by the academics using it, as there is no user access to the visual and navigational architecture of Blackboard.

In contrast to the metaphorical understanding required by mastering "teaching" in Blackboard, navigation is a form of process learning relying largely on memory and because of the design, expertise may assist speed but not changes to work-flow. I will discuss the meaning of "navigation" as a concept in more detail in the next chapter after setting out the basic parameters of Blackboard and of teachers' experiences of it; save to say that navigation, being a primary experiential interaction plays a great role in how teachers understand and use Blackboard. Taken together, architecture plus navigation is the means by which a fluid practice, one reconstituted differently on every occasion of its exercise when occurring face-to-face, is broken down and redistributed into predefined "containers" in Blackboard. Blackboard by its architecture separates out functions that were previously inseparable in the classroom – such as "information" from "communication". In navigating between these architecturally separate functions to divide content between them, the deconstruction of classroom education is enacted.

The University as a technical system

Given the theoretical approach adopted here, it is important to locate the introduction of Blackboard as a practice, by contextualising it in its immediate social and organisational linkages and relationships. However, a major problem facing any attempt to discuss Blackboard as part of an organisation is the difficulty of grasping "an organisation". From a practice perspective an organisation is a set of practices within which use of Blackboard may be understood as one, or as a constellation of practices. It is impossible to speak of an organisation from the perspective of process and action theories that render it fluid and enacted by all its parts and influences, without separating these out by using the very language under question. And as soon as they are separated, they begin to look as if they can be separately constituted away from "organisation" or as binaries within an organisation.

Putnam (2013) does an excellent job of drawing attention to some of the binaries that are so difficult to analyse while retaining a sense of the synthetic integrity of organisational processes; binaries such as "text and conversation as the durable and the fleeting; the organisation as both univocal and multi-vocal; the flatland of the micro and macro (by which she means avoiding describing macro and micro social activity as superior or inferior “levels”, and) the mediation of the subject and object” (p. 29). Putnam tackles the conceptual dilemmas of discussing organisational process head on and her analysis is worth elaborating.

Putnam adopts a “dialectical” frame for her theory building which takes account of the tensions inherent in describing organisations as process and action-based with any degree of accuracy. She describes five standard *topoi*’ of resolution of such tensions in theory but settles on methods that do not attempt to reconcile oppositions but rather, implicitly or otherwise, recognise incompatibilities and either leave them as indeterminacies or move to a different level of theorising and transcend or reframe them. These topoi or “standard forms of inventions in theory building” (p. 28) are useful tools for negotiating the awkwardness of finding terms in which to discuss organisation without obliterating unities and enacted arrangements by the very act of describing them; equally valuable is Putnam’s description of organisation itself, illustrative of one path through the minefield of language of analysis.

Putnam draws on Taylor and van Every (2000) to set out a description of organisations consistent with a process ontology of organisations as arrangement of actions and events. Both Putnam and Taylor understand communication as deeply constitutive of organisation (Putnam & Nicotera 2008). This leads Putnam to frame organisation in terms of “conversations and texts” (Putnam 2013, p. 23), an approach which she points out is common in organisational theory (p. 29). However hers is a particularly dynamic definition, which captures a good deal of the necessary sense of emergence and fluidity. She is particularly sensitive to capturing how an action can accumulate with others into an “arrangement” and thence into an “organisation” in the sense used in practice-theory.

In her account, organisation begins with conversation and immediately recruits materiality and action. “Conversation is the site of organizing through co-orientation in which humans and non humans form a relationship as they orient around something to be done” (p. 25). Described this way, language is not simply a matter of alignment but also of specifying the particular attitudes and relations that connect actors. Conversations become stabilised by texts. Texts reflect what was said in the past and enable those conversations to move through time and space (p. 26). Abstracted from the conditions in which they arose, texts become the basis for new conversations and in so doing blend ”I” into “us”, as “macro actors” emerge as a spokesperson or collective voice.

> Macro actors translate what other actors want, reference other actors, speak for the silent and absent, and redirect individual sensemaking into a larger collective narrative. In this narrative distinctions amongst actors emerge, new rules and contracts take shape and roles emerge. Through referencing others who are often removed from interactions and putting them in collective narratives the spokesperson reconstructs the entity as an organisation that becomes the source for future conversations. (p. 26)

For Putnam, it is the presence of these meta-conversations which ramify with other conversations that form the grounding for collective entities, communities of practice or other collectivities of action. Meta-conversations are subject to “sensemaking (that) creates a new collective that re-frames and brings a form of closure to previous conversations” (p. 26). This new meta-entity becomes itself the basis for organisations. “Thus the constitution of the organisation as an entity develops recursively from meta-conversations of multiple communities of practice” (p. 26). Putnam’s definition has the advantage of not needing to introduce any “force” or outside influence other than the self-ramifying processes of conversations that become abstracted and encoded into subsequent conversations, showing up as texts and communities along the way as they are stabilised and made distinctive.

As I shall illustrate below, the history of Blackboard shows how the conversations about what it ought to be acted to reformulate the organisation of the university setting into which it was drawn; and yet these conversations can be seen to be influenced by what was already understood to be possible, materially and organisationally. Putnam’s integrated but fluid definition of organisation is meant not to endorse discussing organisations as if they were primarily systems of communication, but to find a way to illustrate the mutually constitutive theoretical stance I am endeavouring to maintain, while showing how Blackboard was inscribed onto, and incorporated into the university in such a way that they both modified each other and ramified each other as “organisations”.

Blackboard as a history

While Blackboard at RMIT could be said to have begun with the development of a teaching and learning strategy in 1997, Blackboard courseware for online course delivery was first introduced to RMIT in 1999 (correspondence with Mark Smithers, Aug 2011). It was at first managed by the Information Technology Service of the university. At that point in history, Blackboard LLC, at that stage something of a start-up company merged with the CourseInfo company and became Blackboard Inc, in 1998 (Wikipedia Contributors 2013a). The organisational context of the time was a directive from the then-Vice Chancellor circa 1999 that 60% of learning needed to go online (interview with John Benwell, June 2002).

In essence this early period saw a series of decisions. In 1998 the university announced its commitment to two priorities involving development of teaching Quality Assurance (QA) strategies and development of IT infrastructure to support teaching. Coincident with this, in June 1998 RMIT also released its *Information Technology Alignment Project Report* and in September, its *Web Review - Assessment of Web Page Teaching and Learning* (Duck Digital 1998). This web page was designed to provide the main form of access to online support for teaching staff in the new systems and processes, but was assessed as containing many defects. Significant improvements in information accessibility, stability and readability were recommended. Then, in Semester 1, 1999 the *Benchmark Project Report* collected information on all aspects of the running of the new DLS. 2000 saw the development of a QA Process for renewed and online courses (subjects), (RMIT Learning Technology Service (LTS) 2000). This document specifies that all courses will have an online component and it also specifies the tools that will be used for the 23 tasks that are deemed “online” activities. By 2002 about 1000 courses were online at RMIT although most involved “blended” delivery (McNaught 2002). In this period between 1998-99 and 2002 we see a convergence of broad organisational and policy processes and ideas that informed and fed the project of introducing online education in a packaged, rationalised form, which were caught up in an heroic phase until 2001 (a time coincident with the global “dot.com bubble” and subsequent “tech wreck”) that subsided into a more pedestrian implementation process during 2002 and the following years.

The introduction of Blackboard to RMIT was bundled together with the introduction of other online teaching courseware packages and with a university-wide student management system (SMS) under the steering of the Information-Technology Alignment Program (ITAP) (Caldwell, Czech, Ferguson, Lord, Nimmervoll, Quealy & Watt 1998; Kennedy 1999). Both major systems were new and their introduction simultaneously placed some significant capacity and financial stresses on the university. The Annual Report of 2000 notes expenditure for that year of more than $11 million devoted to developing an online learning environment. It also notes “Implementation of the Peoplesoft Academic Management System was initiated to improve the interface with students for admissions, student records, academic advisement and financials. Total cost will exceed $12 million” (RMIT University 2000). This was in the context of a total university budget of $70 Million for capital expenditure on IT that year. Indeed, the subsequent failure of the latter became spectacularly public as later attempts to resurrect it put the University's budget in the red (Ketchell 2002).

Flyvbjerg and Budzier (2011) point out that while an average of 27% of large IT projects have cost overruns, averages are not the most significant issue. They suggest that looking at damaging failures which are statistical outliers is more fruitful. Fully one in six large IT projects fail spectacularly with cost overruns of 200% and schedule overruns of 70% (Flyvbjerg & Budzier 2011 p. 3). Thus, this IT project crisis had many of the hallmarks of one that Perrow calls a "normal accident", being almost an inevitable consequence of business as usual (Perrow 1999). "Business as usual" at that time was concerned with asserting over the organisation control in the form of master systems, both electronic and administrative. The simultaneous or near simultaneous introduction of a number of organisation-wide master systems that were intended to integrate with each other meant that any failures were likely to have wide-ranging consequences. The larger context of crisis coloured the organisational setting for adoption of specific online learning software. It was against this rather fraught background of IT failure and resultant financial constraints that Blackboard was first implemented. While the overall purpose of the ITAP program was designed to "align" information technology throughout the University, (Fallshaw 2000; McNaught et al. 1999; Weiss & Kennedy 2000), in reality the specific purposes of the project changed as it moved through different phases. The first phase was primarily administrative, involving the development and implementation of a student management system (SMS) based on a report to the university by an external consulting company, SMS Consulting, which had occurred prior to 1998. The second phase is that of concern here, the development of integrated educational information technologies.

A measure of both the breadth of its scope and importance to the university of the ITAP program in its educational phase is the statement in the *Summary ITAP Report*, as appears on the publically available archived web page: "RMIT is investing $50 million over the period 1999-2001 on aligning information technology to the needs of the core business of the University – teaching & learning and research & development" (Kennedy 1999). Its significance lies in the scale of the financial investment, the "alignment" of "the core business" of the University, in all its breadth, diversity and complexity, and in its leadership, which was reported by the ITAP Summary as; "Management of the ITAP teams is the responsibility of the ITAP Director who reports to the DVC (E&T) and to the Education and Training Executive

Committee (ETEC) through its I.T. subcommittee chaired by the DVC" (Kennedy 1999, under heading 7, unpaginated HTML). In essence, this means that the director reported to a Deputy Vice Chancellor through an executive committee. This high level reporting is an indication of the crucial strategic value of the project to the university.

Despite the reference in the summary document to research and development as a priority, in fact the emphasis in the second phase was on education and training. As McNaught et al., (1999) make clear, this emphasis was underpinned by the RMIT Teaching and Learning Strategy 1998-2000. Note how at this stage, "teaching" is the first word of the title. Later, this was reversed to reflect the changing priorities of University teaching policy, and "learning" was put first, ahead of "teaching" in the title. This reversal is indicative of a shift of pedagogical practices that were aligned to the pressures inherent in the introduction of online systems, as I shall discuss below. Tellingly, there was no equivalent holistic policy document for research and development. In the ITAP Summary document, the Director hopes "The Research and Development Strategy will be factored into the program as it is developed" (Kennedy 1999, para. 2 of introduction, unpaginated HTML). The Education and Training IT Alignment Program report (hereafter E&T ITAP Report) had as its slogan, "Creating a competitive edge for RMIT by aligning Information Technology with the Education & Teaching Strategy" and identified the purpose of the educational IT focus as being,

> adding value for the learner to current quality programs through more choice in time, place, pace and mode for individual learning. A direct benefit is being able to provide improved support for life-long learning. (Caldwell et al. 1998)

Using a welter of metaphors, the project "nested" technological systems, (the DLS – which is simultaneously a technical system and a "team") with a similarly named administrative oversight function, the DLE (the Distributed Learning Environment). Subsequently, online learning systems at RMIT became collectively and ubiquitously known as "the DLS", although as I have noted, my interviewees never quite knew precisely to what the term referred. This attempt to create an enveloping neologism which gathered together a disparate suite of tools and processes was deliberate, as McNaught et al., (1999) show. There was a deep desire to make the project a principle-driven culture change, and this meant its products could not simply be seen as a suite of tools, but had to embody a sense of a University-wide change process.

One result was to overload the acronym DLS with meaning that was simultaneously vague and tended to split and spill over into adjoining meanings. McNaught, et al., (1999) write:

> How have we designed our Distributed Learning System (DLS)? Here are some of our principles:
>
> - a suite of tools, not just one;
> - integrating educational principles into the description of the toolset;
> - IMS compliance of all tools; [11]
> - a team approach to all online projects; and
> - involvement of all seven faculties in a benchmarking exercise to evaluate the toolset and the effectiveness of the learning environments we are building.
>
> (p. 73)

The introduction of the DLS was contextualised by the University's financial crisis and prior IT failures, and so faced significant pressure to succeed. This was compounded by it representing possibly the most major dramatic shift in educational delivery in the University's history. ITAP became a protean project. The imperative to treat the project as a massive cultural and values shift as well as a technological one, meant that therefore many novel organisational structures and processes and associated terms were needed to describe and circumscribe it. The result compounded the complexity of the undertaking and the potential for slippages of meaning, as can be seen in the following paragraph from the summary document:

> In 1999, the major ITAP undertakings are the acquisition of a Student Management System, the development of a Distributed Learning Environment (DLE) comprising a Distributed Learning System, and the alignment of Faculty I.T. plans and budgets with the ITAP recommendations and the Teaching and Learning Strategy (Kennedy 1999 para. 3, unpaginated HTML).

At the same time that the DLE (with Blackboard) was emerging, the university was also introducing its Student Management System (SMS). This had serious consequences for the DLE. It took over human resources in that it required constant redevelopment to make it work. It took over financial resources in ways that drove the university to the brink of

[11] Note: IMS Compliance refers to the EDUCAUSE IMS Standard http://www.imsglobal.org/. "IMS" as far as I can ascertain, is a meaningless acronym that just refers to the name of the non profit company that developed the standard.

bankruptcy, and it took over language in that the terminology built into it of “courses” within “programs” proved technically impossible to change to match that pre-existing in the university, and so pushed out the original terminology; university wide reference to “subjects” in “courses”. This vocabulary change affected all aspects of university terminology, including that used for Blackboard. It necessitated changing all references to “subjects” to references to “courses” in every other system that intersected with the SMS.

Furthermore to continue to confuse matters, the student administration software, referred to in the ITAP document as “The Student Management System” is still today, on the IT section of the university website, referred to by its proprietary brand name, “PeopleSoft”. This name is used both on the website and in administrative forms downloadable for access permissions. An example from the current website shows how the term “PeopleSoft” refers to a specific product – “PeopleSoft quick guides. The documents listed contain information about common tasks associated with the use of PeopleSoft” (RMIT University ITS 2011). To make matters slightly worse “PeopleSoft” was neither the name of the company that offered the software, nor of the actual student management software application, since a number of applications were offered by Oracle (the owner company) under the brand “PeopleSoft”. (For company history see Wikipedia entry, *Blackboard Inc*. Wikipedia Contributors 2013b) (For similar effects of the same technology on other universities, see Wailgum 2005).[12]

The reflexivity of the aspirations of the change process with the software itself can be glimpsed in the way the ITAP document spelled out the purposes of the DLE – that is, creating the Distributed Learning System (DLS) in which Blackboard is situated. The section headed “The Distributed Learning Environment (DLE)” reads:

> The DLE is being developed to 'enable the introduction of student-centred flexible learning environments' (Teaching & Learning Strategy 2.2 E). The objective in creating the DLE is to enrich the learning environment for students by using information technology, in the form of a Distributed Learning System (DLS), to enhance rather than displace classroom interaction. The Benchmark Project DLS (Semester One, 1999) is an

[12] PeopleSoft is actually a suite of software tools used for building specific enterprise applications. To further complicate matters, another acronym, “Academic Management System” or AMS also referred to a PeopleSoft product, a database meant for managing academic and student data. (See the university webpage glossary of terms and Weiss and Kennedy (2000).) The term “AMS” was frequently used by staff as if interchangeable with the term “DLS” (Distributed Learning System). It is against this internal background of organisational distraction, resource starvation and a Gordian knot of terminological issues that Blackboard was introduced

integrated suite of software that provides facilities for:

- Collaboration among teachers and learners via threaded discussion and other synchronous and asynchronous exchanges. The conversations initiated in the classroom can be continued out of class.
- Authoring tools for generating electronic content and links to other content.
- Testing and quiz tools to provide students with instant feedback.
- Performance tracking facilities to enable early intervention in cases where students or groups of students are having difficulties.
- Wizards and templates for the development of interactive learning programs with built in diagnostics (Caldwell et al. 1998).

Three points of note emerge from this edict. First, neither Blackboard nor any other specific software was mentioned but rather, technological functions dominate and they echo the most common functions of Blackboard. “Teaching” in effect, was made to match technology. The consequence of this was to make the introduction of Blackboard itself a self-fulfilling prophecy. Second, the point was firmly made that information technology will “enhance rather than displace classroom interaction”. This reflected a particular view of the nature of student learning and the role of the University where a culture of student-led, hands-on investigation and research was promoted (Hough, NcNaught & van Schaik 1998). [13] Third, there was a strong emphasis on student-centred approaches to learning, or “enquiry based learning”. The latter looks benign and even desirable. However, as Lattas (2009) has argued there is a politics in what she calls “an emerging rhetoric of learning without teaching” (p.85). She suggests that there is a good deal of synergy between the introduction of online learning technology and the emergence of this rhetoric. Technology is one of the driving forces removing teaching from “time dependent, location dependent and situation dependent” settings (p. 85). The reconfiguration of teaching to learning de-emphasises the teacher to “guide on the side”, teachers becoming service providers, making them more amenable to rationalisation and severing student education from dependence on numbers of teachers. This rhetoric, she argues, serves to assist the “capitalist expansion” (p. 86) of internet delivered educational products and fits closely with an instrumentalist approach to education.

[13] It is interesting to consider how the rise and then virtual demise of the term “flexible learning” matches the change period and its shift to “learner centred” instruction. It meant education anywhere, any time (see Department of Education, Employment and Workplace Relations (DEEWR) 2005).

In Lattas' analysis and in the rhetoric underpinning the ITAP document, we have represented the three corners of the triangle that holds the practices of university teaching staff in place. What ideal it is for? The marketplace of learning. What ideal medium is it delivered by? Increasingly online, although "blended" learning is the stated preferred form. And by what ideal pedagogy? Student centred, "teacherless" learning. They are mutually supportive, ostensibly a self-reinforcing virtuous cycle. They feed into the same metaphor of floating, "flexible" self-directed, self-fulfilling, individual choices. Between them they create an architecture of control and of order, a set of imperatives to which academic teaching staff must respond. As they stand they also illuminate a good deal about why both teaching and teaching technology take the forms they do, and why this will most likely continue to be more so.

As if to reinforce this tripartite anchoring, and point to its rationality, the next section of the ITAP memo sets out the case for measurement:

> Measurable outcomes
>
> The success of the IT Alignment Program, and, by extension, the return on investment for the University, will be measured by:
>
> - the degree of engagement by the entire University community in utilising technology to provide a better quality and more cost effective service to our students and to the community at large; and
> - the redirection of staff effort into more value adding activities.
> - The University is seeking to become a student-centred learning institution where the focus is on learning rather than instruction. RMIT is unique in terms of the breadth of change contemplated in the T&L Strategy and among the early adopters of a fully integrated and systematic approach to the use of I.T. to achieve this (Caldwell et al. 1998; Kennedy 1999, para. 3 of section 6, *Measureable Outcomes*).

All the elements of market rationality are on display here, reflecting Noble's (1998) "digital diploma mills" prognostication – the university as a business in a busy marketplace, the introduction of technology as a teaching solution and the reorientation to "learner centred" approaches – all are elements in the commercial transformation of teaching. This conversion "entails the commoditization of the educational function of the university, transforming courses into courseware, the activity of instruction itself into commercially viable proprietary products that can be owned and bought and sold in the market" (Noble 1998, para. 6, unpaginated HTML).

The ITAP memo ended with a burst of optimism:

> ITAP is a University-wide undertaking however, that must be sensitive to the varied needs of the diverse discipline areas across all Faculties and both sectors. The program must achieve a degree of involvement and engagement by staff in a manner unparalleled by past experience. To this end, it is intended that staff have access to forums inside Faculties and broadly across the University to engage in the reshaping of tertiary and vocational education. (Caldwell et al. 1998, final paragraph, unpaginated HTML)

Both the ITAP project itself and the introduction of Blackboard appeared to be the beneficiary of an accretive confluence of organisational, political and cultural pressures all bearing in the same direction. This did not mean that things proceeded smoothly. The years between 1998 and 2002 in which most of the work was done to put the system in place were also notable firstly for the "massification" of universities which was just taking off circa 1995-1998. Lines (2000) reports a fourfold increase in the student population in the Australian university system in the fifteen years prior to 1999. These years also saw the introduction of several of the hallmarks of managerialism, such as "Quality Assurance" and the development of staff appraisal and competency measures. It was a period characterised by an almost manic belief in the capacity of IT to fix major organisational bottlenecks and solve efficiency problems across all forms of organisation, not just universities, although universities were far from immune to the enthusiasm (and I use this word in its eighteenth century sense - see Heyd, 1995).

One policy effect resulting from Blackboard had a particularly counter-intuitive effect, driving a wedge between academic and organisational concepts of "education". In October 2006 the "Minimum Online Presence" (MOP) project commenced (Louka 2007). This required that all courses (ie., subjects) had an online presence by Semester One in February 2007. It specified that all parts of Blackboard should have some content with the exception of "course content". That is to say, the university did not require that Blackboard be used to teach, just to provide course information to students.

The rest of the story of Blackboard at RMIT up to 2008 can be told quickly. In December 2007, Blackboard was upgraded to 7.2 (RMIT Learning Technology Service (LTS) 2007, p. 2). Training courses commenced for using Blackboard (like "*Getting Started with Blackboard*") and in more advanced design of online teaching, while the SCoLAR system for storing online teaching objects was installed and Lectopia installed in selected lecture theatres. The Learning Hub Portal application was upgraded to version 1.40 on Thursday, 14 February 2008 (RMIT Learning Technology Service (LTS) 2008; RMIT Academic Development Group 2008). REAP (RMIT's E-Learning Advancement Program) introduced new online education by adding Wiki's, Blogs and Podcasting facilities and also offered training in their use. The year 2008 was the point of development which had been reached by the time I commenced interviewing staff members.

Conclusion: Blackboard

Here I have shown that Blackboard is a sensible corollary of an object, and two phenomenal entities – an educational medium and a technical system. I have also shown how disruptive to institutions the introduction of such technology can become and certainly was in this case. To smooth over such disruption, use must be made of it, but this, too, is not simple. Blackboard exists as a tool by virtue of being part of the socio-material practice of University educational processes. But this statement serves to hide two different logics of practice. The two logics are predicated on what "use" and "working" mean, first from an organisational perspective and second from a teaching perspective. I will more comprehensively address the meaning of "working" to teaching staff in the following Chapters, Six to Eight.

The "sensable" parts of Blackboard are its material electronic presence and electronic manifestations as various "buckets" for content and information – announcements, groups, discussion boards, grade centres and so on. What is not sensable is the use of Blackboard as a medium, a subjective space, or its existence as a "technical system" of interlocked people, methods and administrative requirements. If Blackboard is understood as a medium, a digital concept like "online education" can be invoked through multiple "digital artefact" representations wrapped in a code of sensemaking that indicates and shapes the constitution of education through the digital medium. If understood as a "technical system", a particular combination and arrangement of "machines, equipment and methods" (Weick 1990, p. 4) governed by organisational imperatives, this imposes separate and different constraints that constitute use of Blackboard, with containment and consistency being hallmarks. Both systems of sensemaking are for understanding non-sensable systems – phenomenal systems – in order to lend each an internal consistency to make them manageable for use.

The effect of the two phenomenal systems with their own schemes of sensemaking is to produce two logics of practice, the organisational practice logic jostling the educational practice logic for recognition. To those schooled in professionalised concepts of the academic identity and academic teaching, electronic systems largely oriented to management appear a poor substitute for prior teaching practice. The values and precepts that underpin face-to-face teaching must be consciously rethought and modified to the point of distortion to make them fit the new medium. For those charged with making the system work, innovation is a problem as it challenges the scope of the system and exposes it to the risk that teaching methods and practice will be developed outside of organisational containment and may diversify beyond consistency. To each system of sensemaking the other presents as a conundrum.

The differences between the two phenomenal systems are found not only in their oppositional logics but in their playing out as a process. For a conceptual language to elucidate this I will again turn to Weick. Weick (2001c) describes two idealised axes of organisational design, “chronically frozen systems” and “chronically unfrozen systems”. A “chronically frozen system” is characterised by “job descriptions, assigned tasks, rules, structures and so on” (p. 412). Considerable effort is required to build the belief and solidity necessary to keep this kind of structure in place. Should a designer wish to orchestrate change, these structural elements must be loosened and modified. “Essentially the trick is to educate system users in the art of de-committing themselves from concepts in which they have made considerable investments” (p. 413). This runs the risk of calling the whole structure into question and weakening the “initial commitments” (p. 413). Its advantage is that it is a system where process is slowed deliberately and flexibility is exchanged for the solidity of structure. Its disadvantage is that pulling at the seams of one aspect of belief may unravel the whole.

“Chronically unfrozen systems”, in contrast, start with process rather than structure. Chronically unfrozen systems are characterised by “uncertainty, fluid job descriptions, occasional overlapping assignments, and healthy amounts of improvisation” (p. 413). The effort involved here is in the maintenance of loose structures. “Improvisation and anarchies are costly in time, costly in coordination costs, expensive in dollars, and costly in the demands they make on people’s attention… people have to watch things for longer periods to make any sense out of them” (p. 413). Because these systems are highly fluid and process oriented, in order to negotiate collective action, people must temporarily freeze such systems. But the adaptability of a process orientation makes even temporary provisional freezing less necessary: “In the chronically unfrozen system people negotiate less often about less consequential events because their continuing improvisation and short memories make them update themselves more often" (p. 413). While the technical system pertaining to Blackboard is "chronically frozen", in the case of Blackboard as a medium for educational practice, I shall argue, few rules exist except those which can be gleaned from previous practice and in any case, the making of digital education is understood as a semi private activity. This means that the rules and structures which govern the technical system are largely absent and, ipso facto, it operates more like an unfrozen system. Thus it can be said that the two phenomenal systems have different logics of practice, one educational the other administrative, and in addition they have two separate process orientations, one to stability the other to fluidity. Thus they also require separate sets of sensemaking activities to operationalise them, both within themselves and in relation to each other.

Set against the logic implied by what "use" and "working" mean from a teaching perspective was the totalising logic of new management systems, whose imperative was aided by the huge expense entailed in implementing them and set against a backdrop of financial crisis in the university. This logic ensured that ever increasing aspects of teaching practice got implicated in interlocked electronic and management systems. This imperative eventually meant that teaching "quality" values were largely jettisoned in favour of mere electronic "presence" as any use that could be easily universalised overtook other values that were more difficult to operationalise. Teaching, under an electronic regime, got translated into "course management". Much as described by Putnam (2013), change took place not so much by initial explicit intent as by the rolling out of policy documents. This supported the instrumental logic of an administratively ordered minimum, but universal use of Blackboard and associated technologies in a way which produced the maximum isomorphism and interchangeability of parts. (The course guide templates for web publication and their influence on course production in total were a case in point).

Corralling teaching practice into an electronic framework developed a process logic which was repeated in many different instances of capturing work processes, but as if discovered anew each time. First electronic forms were offered as if they represented new parallel work options to staff who may choose to adapt them into their practice. Then, as it became apparent that change was moving slowly or not at all, gradually administrative sanctions and forms of inspection were introduced. Then, finally the "optional" element was removed and the electronic medium was presented as the only means to operate.

The imperative was to ensure that from a management point of view the electronic system kept on working. Differentiation was contained by both the nature of what is possible on the delivery platform and by the sanctions against stepping outside it. Compliance was ensured by fiat. Optimisation was achieved via the inspectorate of Quality Assurance, itself modelled on a manufacturing paradigm. "Quality" is contained in a specific understanding not so much of teaching itself, but by what is externally demanded of teaching by the pressure of the economics of delivery, by funders goals and by student preferences. "Working" means "able to be measured", "controllable through policy edict", and "consistent" in that one part is sufficiently similar to another to be counted as a member of the same group or set of functions, whether teaching programs or teaching methods or methods of measuring both of these. While there is some recognition of process, "product" counts for more because it is understood as more manageable. "Working" means in short, "able to be managed". And "able to be managed" fits neatly with the wider practice logic of the corporatist university.

An online system is inert until it is enlivened by use and use generates practices that may either expire through lack of enactment or be passed on to become universalised. Use can only occur in a "sensable" environment, however. A word of explanation is required. Weick(1995) comments that:

> The prefix 'sense' in the word 'sensemaking' is mischievous. It simultaneously invokes a realist ontology, as in the suggestion that something is out there to be registered and sensed accurately, and an idealist ontology, as in the suggestion that something out there needs to be agreed on and constructed plausibly. The sensible need not be sensable, and therein lies the trouble. (p.55)

Hough, NcNaught & van Schaik (1998) spell out the central issue raised by the introduction of Blackboard into a university as a technical system when they write:

> So, we are imagining a convergence of space and resources planning with professional and teaching activity, but this is built on explicit choices flowing from our disciplines, and congruent with the professional projects of staff; rather than a simplistic injunction to put 'everything online'. (p. 345)

"What is Blackboard?" is, therefore, in addition to being a question for the university, a question for academics wrapped up with the question of what "teaching activity" becomes when digitised. "What is Blackboard?" is therefore also dependent on the experience of digital education as used and understood by academics.

CHAPTER SIX: ACADEMICS DISCOVER BLACKBOARD: ACADEMIC PRACTICE AND NEW TECHNOLOGY

She was a tall, well-built young woman in her thirties, fresh-faced with hair cropped short when I came to her office talk with her about her experience with Blackboard at RMIT University. We met in her small, windowless room, which was reasonably tidy and well-ordered for an academic space at that point in the semester. She was one of the very first people I interviewed. I knew that she had come out of the information technology industry before a career and life-change found her in a university undertaking both a PhD and teaching using Blackboard. I had known ASM14 (as I will refer to her here) for some years at this point, each of us in various roles and relationships, but this was the first time we were having formal discussion set up for my purposes as a research interview. I was aware even as I pushed the ”record” button on my audio recorder that the social dimension of research is like any other social encounter, one silently shaped by all sorts of conventions, fears and expectations. My chief fear at that point was somewhat technological in nature, namely that the machine would somehow not “work”. What she told me was in its own way exemplary.

ASM14.

A: Because I had an IT background someone said “We were going to run this course online, can you run it?” But they didn’t actually know what that meant and they didn’t have anything there and that was actually the course that I ran via email. And I went “Okay” as you do when you’re a startled Ph.D student, as you know, and so you go “Oh okay … no worries”.

And the thing that amazed me was that I saw all this richness in the face-to-face classroom, and particularly the importance of the social in the face-to-face classroom, and yet, after I ran that first course online then of course I was like “Well shit, what are people who really know what they’re doing, actually doing in the online stuff?” And we were just … the university was in the process of trying to encourage the use of online environments and we had Blackboard, the earliest versions of Blackboard, and so I got involved with trying to understand what that looked like.

And what I found was just this very, very bland environment that didn’t actually take into account … the social and yet … that to me was such a critical point in regards to learning, both from my own experience and then later confirmed in the literature. And

> so it was sort of that idea about "Hell, how does this sort of work" and that led me to the whole lot of stuff both about learning and also about online learning environment design.

Here was someone with no fear of using online educational technology but who was also worrying aloud and in a fundamental way about the value of using Blackboard given a backdrop of prior experience in many classrooms, both as a child and young person and later, as a teacher. This sets the theme and the question addressed in this first chapter on academics experience: How and in what ways does prior practice shape the way people engage with a new technology?

A highly simplified narrative of my research project would proceed along these lines: A technology - Blackboard - was introduced into a university largely as a management tool. As will become clear, many of the academic teaching staff interpreted Blackboard as a way to "deliver teaching content", even if this was neither the intention of the software designers nor the declared purpose the university has assigned to it. Although a good many staff had previously used Blackboard, much of the technology was upgraded between the end of 2007, and the end of 2008, covering the period of this investigation. These changes were quite diverse and numerous. The version of Blackboard was upgraded (to 7.2); additional features for teaching were added, such as the SCHoLAR teaching object repository and LECTOPIA lecture capture; and in addition the whole web portal supporting online education delivery was also changed and substantially upgraded in February 2008. Thus even for prior users, the sytem they were trying to use appeared to be novel technology. The potential then for experiencing disruption was great.

As I will argue here, the experience of using the "new" system was very varied. The staff I spoke with and observed ranged from those with little experience of teaching online to those with a great deal. However, all had had some previous experience with teaching as a face-to-face practice – some had extensive experience. This provided something they could draw on for inspiration, or alternatively something that might shape or conflict with how they experienced online learning technology. In this and the final chapters I want to outline the actual experience and use of Blackboard by a number of academic teachers. First I want to briefly remind the reader that in each case these teachers engaging with new technology did so from a framework of "imbricated" practice (Leonardi 2011).

Before Blackboard: Academic practice

The teachers ranged in age from their mid-twenties to their early sixties and they worked across variety of academic levels from professor down to Lecturer Level B or A (or Senior Tutor) roles. In several cases the junior staff member was either primarily responsible for, or a major assistant in creating the Blackboard course. As may be easily inferred from this range of interviewees, interest and expertise in online education varied widely among the cohort, some being classical "resisters" while others were enthusiastic converts who worked at a high level of sophistication. Enthusiastic and technologically literate academics in this group were largely female and in their late thirties to mid-forties. Of course, this may reflect either (or both) of sampling technique or composition of the relevant area of the school as only four of 19 interviewees were male; the school itself was comprised of a majority of female staff.

Organisationally, all interviewees knew each other or knew of each other, although they were distributed across four different professional social science disciplines – Sociology Legal Studies, Political Science and Youth Studies. Disciplinarity did not appear to play any special or major role in shaping their approach to, and use of Blackboard. All engaged in "blended learning", involving a mix of face-to-face teaching and some kind of online presence and several of these teachers had also tried wholly online teaching. Most were unaware of the organisational policy mandating a degree of online presence in each subject, but in practice they largely adhered to its intent.

From the standpoint of practice-theory, each of the teachers I spoke with had a well-developed *habitus* grounded in various practices associated with face-to-face teaching like managing classroom-based discussion of "knowledge content" grounded in reading texts, and reading, taking notes, writing essays and preparing for other kinds of assessment activities. By *habitus* I follow Bourdieu (1977) in talking about the characteristic lifestyle, values, dispositions and expectations of social groups like academics acquired through the activities and experiences of everyday life and work and anchored in the body. Habitus can be understood as a structure of the mind characterized by a set of acquired schemata, sensibilities, and dispositions. As Belland (2009) says, "Habitus generate schema, which in turn tend to lead to certain actions" (p. 357 see also Friesen 2009). This formulation, while interesting contributes too generally to illuminating the distinctive *habitus* of academics. For that we need to explore what we can call the "academic epistemology".

As Vaast and Walsham, (2005) argue, there appears to be a general lack of theoretical explanation concerning the precise mechanisms of bringing forth new ordering: “The literature has not yet examined, at the micro-level, what makes agents transform the way they work and how these changes may be shared among members of the same work group, as IT is used ” (p. 66). Vaast and Walsham draw on practice-theory as an explanatory device. They argue that while we may not know *how* practices change, we do know *what* a change in practice involves : It is recurrent: “As agents repeatedly and regularly act in certain ways, they contribute to the enactment of social structural properties” (p. 67). Practice is also, “a materially bounded and situated action” (p. 67). “As agents experience a change in their situation (e.g., introduction of a new IT in the work place), they often gradually adapt their practices. In turn, the change in practices may contribute to transform the situation further” (pp. 67–68). Finally, practice is social; “members of a community engage in practice” (p. 68).

> Different communities exhibit specific ways of acting and uses of the same technology. Hence, if after the implementation of IT, an individual agent changes her recurrent ways of acting, but if this change at the individual level is not spread at the level of the community, this does not constitute a change in practice. On the other hand, reflexive agents act purposefully, and agents who engage themselves in new actions are the ones who carry out changes in practice. (p. 68)

So, for Vaast and Walsham: “Practice changes if social agents’ recurrent and situated actions change, if agents use IT in new ways and shape a different IT-in-use, and if these changes are socially shared and repeated” (p. 68).

While Vaast and Walsham’s progression provides an adequate general explanation of the transfer of practice with respect to the advent of new practices for using educational technology, what remains to be explained is how, exactly, “agents” “gradually adapt their practices” and what, in this setting, constitute the social transfer mechanisms that transform actions into practices. Below, I try to clarify how the existence of a general academic epistemology influences how academics may deal with Blackboard and how and to what extent this leads to a new form of practice.

Academic epistemology

The *habitus* of academics leads them to deal with “knowledge” not as lived experience made sense of by common sense, but rather, to understand, convey and assess knowledge as abstracted from lived experience. So argues Laurillard (2002):

> (T)he central idea is that academic learning is different from other kinds of learning in everyday life because it is not directly experienced and is necessarily mediated by the teacher. Undergraduates are not learning about the world directly, but about others descriptions of the world, hence the term 'mediated'. (p. 4)

This peculiarly academic method of conceptualising knowledge is at the core of the academic practices that have traditionally constituted university teaching. These are essentially discursive practices – text generated, text generating, interwoven with orality, argumentative, fluent, expansionary, expository. Academic practice is centred on taking a theme originating in either direct experience or experience mediated though the intellectual and discursive work of others, and through expert content knowledge, developing around it a supportive structure of argument and analysis and higher order abstraction, which enable finer gradations of theme and variations to be discerned, or that provide a platform for a more comprehensive closing abstraction. It is from these very specific practices which constitute academic knowledge – what it is, how it should be passed on, how to judge its merit and worth – that the array of supporting academic practices have developed.

Academic knowledge has traditionally been defined by qualities like its disposition to abstraction, generalisation and objectivism, while applied knowledge has been characterised as concrete, contextualised and relative. It is its abstraction, as Laurillard has argued, which allows academic knowledge to be mediated – through an “expert” (a lecturer or researcher), through text and through the more recent development of educational online technology. It is academic practice oriented to abstract mediated knowledge (the spoken word and written text as arguments and expositions) that are carried forward on the ledger of practice, moderated by ontological and epistemological propositions about knowledge as derived from ideas of objectivism and relativism in their enactment in educational technology.

Indeed, as Laurillard (2002) suggests, abstracted knowledge is decontextualised knowledge, but this very feature makes it a better fit for computational metaphors. The metaphor makes a model for cognition, or as Laurillard says, “The idea of knowledge as an abstract Platonic form had a new impetus from an information- processing model of cognition” (p.

13). The metaphoric idea of information processing as a model of transfer of abstract knowledge also favours computerisation of education as a good form for transmission of abstracted knowledge. The irony that cognition as information processing is a metaphor drawn from computerisation is lost as academics and software companies rush to exploit the apparent epistemological symmetry between "student cognition" and the "computerisation" of education. This observation points to how prior metaphors of academic knowledge might provide a "hook" for academics to go on to develop particular practices in online education.

Laurillard (2002), distinguishes two longstanding streams of thought about academic knowledge. The first is the object-like form of knowledge represented by the "transmission model" and the second arises from the work of Dewey, and more recently, Vygotsky, Piaget, Bruner and Papert, "all of whom argue for the active engagement of the learner rather than the passive reception of given knowledge" (p. 13). The first stance treats academic knowledge as a stable body of second-order abstractions from the world of experience in a particular sphere of endeavour. This gives it a disciplinary character that allows it to be constituted – and imparted – as a coherent body of ideas. The second position is to treat everyday knowledge as situated and acquired from context and direct experience. Students failure to extrapolate from one setting to another and difficulty with transferring theory to practice indicates the context dependent nature of knowledge (p. 13).

Laurillard is critical of the viability of both positions, arguing that academic learning relies on what is essentially a dualistic epistemology. Students must extract from experience as first order learning, but subject that learning to second order analysis. Furthermore, some forms of knowledge are *a priori* second order, such as learning from description or availing themselves of the insights of others. Situated knowledge remains situated until it can be formalised and abstracted in order to be described or conveyed as someone else's insight. "Learning" involves adding to experience derived knowledge, a way of looking at and interpreting the world. Such interpretation is already on the way to producing abstracted academic knowledge. Laurillard argues that teaching must embrace both epistemologies, "the twin poles of experiential and formal knowledge" (p. 23).

As an underpinning practice informing approaches to adoption of educational technology, both of these apparently sharply contrasted concepts of correct educational epistemology continue to inform academic orientations to teaching. A reflexive understanding of student learning has been extrapolated to theories of development of the educational attitudes of teachers and academics. Wiesenberg and Stacey (2006) document the pervasiveness of this idea. For Jarvis (1999, 2012) and Mott (1996), professional practice is overlayed by a meta-theory of practice, which evolves with informal and formal learning experiences within the profession.

Attempts have been made to measure teachers' philosophies of teaching. Pratt and Associates (Pratt 1998; Collins & Pratt 2011) codified meta-theories into an instrument called the *Teaching Perspectives Inventory* (TPI), which traces epistemologies. Schraw and Olafson (2008; also Olafson, Schraw & Veldt 2010) argue, however, that the epistemological positioning of teachers is incomplete without also assessing their ontological world view. Their inventory allows teachers to position themselves on both an epistemological and an ontological axis, demonstrating teachers beliefs about the nature of reality as well as the sorts of knowledge orientations they find necessary to convey it. Applied to a small sample of teachers who were also post graduate students, most of them appeared to be both epistemological and ontological relativists; a somewhat smaller number were epistemological relativists and ontological realists, believing that "curriculum (is) changing and student-centred" but that there is " one underlying reality that is the same for everyone" (Schraw and Olafson 2008, p. 33).

As Laurillard (2002) has indicated a second significant parameter of academic knowledge is the weight placed on abstract-generalist versus concrete-contextual knowledge. This distinction is at the heart of arguments about the nexus or lack thereof between pure and applied research and education (see for instance Yanchar & South 2009). No matter what epistemological perspective academic teachers might wish to use to inform good pedagogy, abstract-generalist knowledge is the mainstay of academic identity. This "double anchoring" of educational practice, one grounded in beliefs about teaching and the other in the practice of academic work, may be the reason that teachers express difficulty in putting their student oriented epistemological beliefs into action. They are simply undone by established academic practice.

Disciplines and tools

One way academic practices are collected together to play such a powerful part can be understood through examining the role of disciplines. There have been a number of highly public disputes and controversies, focussing on the claim that academia is grounded in entrenched differences between the practices and mind sets of the different disciplines. The crux of the argument is that the organising principle of characteristic academic practices is founded on disciplinarity. C.P. Snow's (1959) influential argument that the sciences were "incomprehensible" (p. 11) to anyone versed in the humanities stirred a long examination of the role of the disciplines in shaping academic approaches and practices. Snow ordered academic differences into two powerful binary disciplinary opposites while Bourdieu (1988) by contrast, organised power and conflict around the two alternative poles of first, "academic capital", organisationally based power, seated on the economic and political power of the faculty, and second, "intellectual capital", or cultural and symbolic reputation based power dependent on prestige amongst peers. However, here as for Snow, the disciplines– in this case medicine and law – are understood as the organising principle behind both poles. Wacquant (1990) argues that increasingly business schools adhere to "academic capital" while the natural sciences and artists are rooted in "intellectual capital". He suggests that for Bourdieu, the social sciences and the humanities occupy a middle ground but one that is "similarly internally organised around the clash between socio-political and scientific authority" (p. 680). Bourdieu's is clearly a more sophisticated and nuanced argument than Snow's, although still committed to the idea that disciplines are the organising principle of academic practice.

Becher and Trowler's account of "academic tribes and territories", too, has had influence on conceptualising the central role of the disciplines in establishing and maintaining academic practice. A first account (Becher 1989) was prompted by Becher's irritation at the simplicity of Snow's "two cultures" analysis. Inspired by Geertz, he set out to conduct a more anthropological study of academia (see preface to the first edition, Becher, 1989). He made an argument for the influence of disciplinarity on academic practice that Trowler, co-writer of the second edition (Becher & Trowler 2001), later disavowed as overly deterministic. An attempt to corral academic practice into a single metaphor, (tribes and territories) and to understand disciplines as a form of shaped epistemology across four analytic dimensions became an exercise to account for change that cut across disciplines. By the second edition, (2001) the emphasis was far more on the social influences breaking down university disciplinary distinctions – globalisation (understood largely as the effects of increased communication), the massification of student intake, state regulation and accountability requirements, the incursion of industry into state-university relations, the marketisation of knowledge, increased managerialism within universities and finally, the growth in disciplines and their fragmentation into sub-disciplines. All of these change factors have collectively made the university and its disciplines both more homogeneous and more fluid. This renders the rigidities of the "tribes and territories" metaphor as applied to disciplines somewhat redundant. Trowler (without Becher) concludes:

> [T]here is no doubt that the influence of the knowledge structures of different disciplines on academic practices generally is considerably weaker than it was, and that other forces powerfully shape how academics behave, how and about what they talk and think and, very importantly, what they care about. (Trowler 2011, para 22 unpaginated HTML)

The setting for my own research suggests that while disciplinarity may once have formed an ordering structure for academic practice, the fluidities which have swept over universities in the last decade or more have blurred the boundaries, if not entirely removed them. Disciplinarity may be waning as a cultural force. Indeed, studies of the culture of higher education, such as that of Williams van Rooij, (2011) suggest that managerialism in universities may well mean sub-cultural differences found in organisational roles are more important than disciplinary adherence. This means that the prior experience that acts as the starting point for the shift to online education may have become both more general and more personal than disciplinarity as an organising force would allow.

Arguably, the waning influence of disciplinarity on academic practice bears out Bauman's (2000) thesis, "that liquids (fluid contemporary social arrangements) unlike solids, (traditional structure) cannot easily hold their shape". Nevertheless, some areas of academic practice remain untouched by any great degree of change, particularly technological change, and persist as relatively solid frames and models to be used in new situations. The *Ithaka S+R US Faculty Survey 2012* (Housewright, Schonfeld & Wulfson 2013) provides a snapshot of contemporary US academic practice and may point to equivalent academic preoccupations in places like Australia. (This is possible given the way the US acts as the dominant source for scholarly and educational ideas, see Arnove, Torres & Franz 2012, p. 59, 60). Although the Ithaka survey focuses on "scholarly communications", it captures a wider spectrum of scholarly practice. As an indicator of occupational priorities and preoccupations amongst academics, it is one of the few recent studies to empirically examine a broad sweep of contemporary academic practices.

The Ithaka study is particularly useful in that it documents changes to academic practice over a number of dimensions of practice and over time. Selecting from it those academic activities which are potentially most affected by changes to technology shows, by and large, how little affected are most academic practices by digital tools and digital media and connectivity. It highlights the conceptual, metaphorical and, frequently, the physical importance of text and of print-like activities to scholarly practice over almost all the dimensions of academic practice studied. Even where the transmission means was not a printed copy, the behaviour in relation to it drew heavily on physical print-like activity. Thus, with regard to the types of materials used in research the Ithaka study could report:

> [R]espondents rated traditional formats of scholarly communication highly in comparison to other material types. Virtually all respondents indicated that peer reviewed journals and journal articles are very important in their research, and about two-thirds of respondents indicated that scholarly monographs or edited volumes published by an academic publisher were also very important. (p. 14 and Figure 1)

The same is true of the types of materials used in teaching. Most scholars relied on the textbook. Only in the humanities do films, audio, artwork, or other non-textual sources for teaching outrank textbooks in popularity. In the social sciences these are ranked third after textbooks and scholarly articles. However, it may be inferred that in the humanities these are likely to be the subject matter themselves, rather than used for the primary purpose of mediating teaching and learning (p. 16 and Figure 3).

New techniques of search and research marked a significant break with prior practice and a move to digital methods. But the rate of change may be stabilising. The Ithaka study reports:

> Over time, we have seen a clear trend away from respondents reporting that they begin their research at the library itself –in either its physical or digital instantiation – and towards beginning at either scholarly or general purpose online resources. But the 2012 cycle of the survey showed a slight break in this trend as the share that reported starting at the library catalog grew slightly and the share that reported starting at a specific electronic research resource or computer data-base declined slightly, although the overall pattern remained the same. (p. 18)

In addition, there has been a particularly notable uptake of the use of digital books amongst academics:

> 70% of faculty respondents indicated that they have “often” or “occasionally” used scholarly monographs in electronic format in the past six months, and only about 10% indicated that they have not done so at all, with little variation between disciplines. (p. 31 and Figure 13)

The extent of research collaboration was reported by the Ithaka study (p. 41 and Figure 21) and was one practice that did vary significantly between broad disciplinary categories. Scientists reported high levels of collaboration, while:

> [A]bout three quarters of humanities and social science faculty members agreed strongly with the statement that “I principally pursue my research alone, with only occasional or informal engagement with other scholars”. (p. 40)

While the Ithaka study did not report on whether collaborative behaviour in research activities extended to a greater likelihood of engaging in collaborative behaviour with each other generally, it is probable people self-select for preferred levels of gregariousness across their occupational activities. This has implications for the likelihood of collaboration and peer mentoring when learning to use digital technologies. The suggestion is that social scientists and those in the humanities conduct their work, whether digitally mediated or not, by themselves. Furthermore, the Ithaka study did not report on whether “collaboration” was itself digitally mediated. This makes it hard to estimate the general penetration of digital practice into academic practice overall.

Other academic practices surveyed do not necessarily help to estimate the degree of comfort that academics have with digital technologies. The use of digital tools for research demonstrates a high level of specificity of use. It appears that academics selected digital tools not because they were generally comfortable in a digital world, but because one or two tools provided key functions. For instance, over 60% of social scientists used software for quantitative analysis dropping to about 25% who used digital methods of simulation or model generation, and around the same percent engaging in text mining. Fewer social scientists (less than 20%) were writing code, or mapping data (p. 42 and Figure 22). Conversely,

> Other respondents – principally, although not exclusively, faculty in the humanities – clearly indicated that they are not interested in incorporating more technology into their research; among those who indicated they are not interested in more deeply integrating digital research activities and methodologies, over two-thirds of respondents indicated

> that digital research activities and methodologies are 'not valuable or important' for their research. (p. 44 and Figure 24)

Use of specific digital tools for research analysis does not appear to either be an incentive to use other digital technologies or to facilitate a suite of skills that might be adapted to other digital uses.

If the Internet could be said to have revolutionised one thing, it would be the availability and spread of information. As the authors of the Ithaka study put it:

> The impact – both actual and future potential – of digital technologies on the ways in which scholars communicate with each other through all channels cannot be overstated. As traditional scholarly communications media – journals, and increasingly books as well – have been made available online, the marketplace for these materials has changed significantly. And new media and variations on traditional formats have offered up new opportunities for communication among scholars. (p. 55)

Despite this, the study indicated that this was a source of tension and that academic experimentation with alternative methods of publication and publicity for research was curbed by considerations of tenure and promotion (p. 38). Research scholars are making relatively tight judgements about desirable and appropriate audiences, and no doubt with this in mind. Survey results indicated that for nearly 90% of scholars, "[s]cholars in my specific subdiscipline or field of research" are the most important audience (p. 56 and Figure 31). However, the general public ranks low as a potential audience, identified by less than one third of respondents as important, "with roughly the same share who indicated that the general public was 'not at all' an important audience" (p. 56).

The importance of peers as an audience has a predictable effect on the choices academics make of media for publication:

> Respondents reported that they publish most frequently in the scholarly communications formats that they themselves read, and that they choose specific venues based on their perceived reach to other scholars like themselves. (p. 56 and Figure 32)

These are, as indicated above, peer reviewed journals and scholarly monographs (p. 14 and Figure 1). Only some one third of faculty use more personally direct methods of communicating their written research. Sometimes this is via disciplinary repositories like arXiv or SSRN. Fewer use other means.

> Slightly less than a third of respondents indicated that they make final or pre-print versions of their work available through a personal webpage or blog, a repository provided by their college or university, or a discipline-focused cross-institutional repository. (p. 60)

This traditionalism is in spite of the "rise and rise" of the influence of open access and social media in the dissemination of research, as attested to most frequently by academic blogs on the subject (Lindsay 2013; Lowenthal & Dunlap 2012; LSE Blog Admin - Curator 2012; Terras 2012). The measurement of academic influence through social media is now being formalised through "altmetrics" (i.e., alternative metrics) that widen the base of impact assessment of a work from citation counts to include other kinds of reference to it (Priem, Taraborelli, Groth & Neylon 2010). This has the potential to capture alternative research dissemination such that it may be utilised for promotion, making it more attractive to academics.

One final influence on academic practice needs to be clarified before I describe how the academics I studied deal with Blackboard. This is the question of whether and to what extent, if any, the development of distance education has affected academic practice in ways that might in turn play a role in the response to online education technologies like Blackboard.

The Evolution of Distance and Online Teaching Practice

The "common orientation" derived from the development of distance education and applied as a practice template to online education is to begin with print or print-analogues and thereafter to move to other more technologised forms of communication and representation. Taylor (2001, pp. 2–3) provides a sketch history of the development of online education from its distance education origins by describing not practice per se but the variation in their supporting technologies as five "generations" of distance education. While he does not ascribe time periods to these generations, he does imply that this has developed over the last thirty years. Taylor's generations begin with the first generation, which he calls the *correspondence model* based on print. The second generation is the *multi-media model* based on "print, audio and video technologies." These are Print, Audiotape, Videotape, Computer-based learning (e.g. CML/CAL/IMM), Interactive video (disk and tape). The third generation, the *tele-learning model*, is based on "applications of telecommunications technologies to provide opportunities for synchronous communication." The technologies include audio-teleconferencing, video-conferencing, audiographic communication, broadcast TV/radio and audio-teleconferencing.

The fourth, the *flexible learning model* is based on online delivery via the Internet. It uses interactive multimedia online internet-based access to net resources, and computer-mediated communication. The fifth and last generation, Taylor calls the *intelligent flexible learning model*, which he says "is essentially a derivation of the fourth generation, which aims to capitalize on the features of the Internet and the Web" (p. 2). It consists of Interactive multimedia (IMM), online Internet-based access to WWW resources, computer mediated communication, using automated response systems, and campus portal access to institutional processes and resources.

This mini history of distance and online educational technologies suggests how Blackboard might be understood in terms of its technological capability, but secondly, and perhaps more importantly the influence of the technologies of the earlier "generations" of distance education on teaching using Blackboard with respect to the practices that have grown up around them, and the extent to which those practices form a interpretable order that can make sense of teaching using Blackboard.

Print as the oldest medium, is perhaps the easiest to see, as it is reused and adapted as an idea mobilised in online technology. The extent to which print (and its corollary metaphors) is used as an ordering principle along with later technologies also being adapted as metaphorical ordering ideas remains to be clarified. However, the early design of distance course resources as described by Haughey, (2010) is almost indistinguishable from the resources also brought to bear in contemporary (but perhaps not cutting edge) lecture theatres:

> Resources for a course might include a textbook or books, written by some of the major course authors, a variety of audio visual materials and a study guide which integrated the information in the textual and audio-visual resources. (p. 55)

This set of resources and associated practices can, in turn, also be understood to provide a practice template for teachers turning from the lecture theatre to online delivery. Newer and more cutting-edge technologies lack such a guiding metaphor or previous practice, making them harder to understand and use.

The evolution of online education from its distance educational beginnings points to usages that have become embedded as practice. These appear to be passed on as Corradi, Gherardi & Verzelloni (2010) suggest, "the set of interconnected activities that, if socially recognized as a way of ordering, stabilize collective action and the common orientation" (p. 277), which is the first of their definitional concepts of practice. The elements of academic practices I have discussed do not constitute an exhaustive list. They do represent a set of likely influences, suggesting ways academic teachers understand knowledge and disciplinarity, as well as how their work is affected by concurrent practices of their own research or how they understand distance education. The discussion above suggests that academic practice especially in the humanities and social sciences (which are most relevant to my research project) involves treating academic knowledge as an abstraction carried primarily by text, and communicated by reading and listening to experts.

After Blackboard: destruction and construction

How then does this habitus engage with a new technology like Blackboard? How, for example, did academics understand Blackboard as educational and how did they respond to Blackboard? Blackboard design has been criticised for promoting a particular view of "education". Blackboard architecture along with its navigational features is the means by which a fluid practice of education, one which is reconstituted differently on every occasion of its exercise when occurring face-to-face, is broken down and redistributed into predefined "containers" in Blackboard. But the shape of Blackboard design, as I have also remarked in a previous chapter, treats education as a linear, productionline like process where teaching "objects" are both reified and rendered static. Teaching or "instruction" as it is referred to is visualised as the processing of these elements into tests and assignments. It valorises the place of the teacher in the pedagogical model, a model characterised by a top-down, teacher-centred pedagogy where the communication model can be conceived of as hub and spoke or "one-to-many", and it prioritises student management over education, and acts as a panopticon, subjecting the actions of "lower" beings to hidden scrutiny by those in charge, whether they are teachers, or further up the hierarchy, administrators.

Academic staff found the internal design features of Blackboard difficult to circumvent. As ASM 4 said:

> **A:** And also if you think about running … and WebCT in particular for this, WebCT you start with nothing and then you get to build it up from there and it has a much longer learn, it has a much steeper learning curve but once you …
>
> **Q:** So it's more like getting a database with no fields filled in sort of thing.
>
> **A:** Once you're in it there's not even any fields, like you just go into this

environment and then you get to pull things into it the way you want to. Whereas Blackboard has a very…

Q: Yes the structure's already there.

A: And it's already there and you just populate it. So it's that population. And … I've forgotten what I was going to say about this.

Q: About whether it's student driven. You said in a US context Blackboard…

A: Yeah. Blackboard, if I'm using Blackboard and I've got 20 students, it's probably actually quite good. WebCT's definitely quite good if I've got 20 students. The problem is that that's probably one of the only parts of the world that has that model so where you create a group of 20 students and you have an individual class that is actually of students.

Q: Yes and you can see that in …

A: Most other places have massification which means you've got a lot more people to find to manage. So the course management system becomes a student management system which is all then about you know ….

This respondent felt its internal structure militated against Blackboard being used for education and instead substituted student management for education.

The constraints of design meant that these academics tended not to treat Blackboard as "educational". ASM 15 wasn't engaged with Blackboard at all, despite a strong face-to-face student-focussed pedagogy and good technical skills in using a computer:

Q: Because I think what's interesting about this is you are, you're extremely instrumental with it. It's not beyond your capability to whack in links and to do…

A: No, no,

Q: … this has got nothing to do with your technology capacity. You can clearly find your way around that, very, very easily. I mean just watching you do that, bing, bing, no problems.

A: No problems.

Q: It's lack of interest in finding your way around and lack of really a reason for doing things I would say.

A: Yeah, that's right. We're doing fine as it is so why chuck out what's fine because somebody suggests this might be a fun thing to do. Not on spec.

ASM 7 while highly technically proficient was also very engaged with providing a high-quality, student-centred face-to-face program but when asked about whether Blackboard as a form of teaching she replied:

> **A:** Oh right. Is it teaching? Yeah, I guess it is teaching…
>
> (break)
>
> **A:** ….for me the DLS is very secondary to the teaching process. All the DLS is a means of making the material available much more widely and as I said, in previous times I would have printed notes.

Some who had reacted to the constraints of Blackboard design were able to articulate the conflict with their own representation of education. ASM 14, cited earlier, was a case of this conflict

> **A:** And we were just … the university was in the process of trying to encourage the use of online environment and we had Blackboard, the earliest versions of Blackboard, and so I got involved with trying to understand what that looked like. And what I found was just this very, very bland environment that didn't actually take into account any notion of the social and yet … that to me was such a critical point in regards to learning, both from my own experience and then later confirmed in the literature. And so it was sort of that idea about "Hell, how does this sort of work" and that led me to the whole lot of stuff both about learning and also about online learning environment design.

Here the conflict between the two representations of education, the technologised and the professional is quite explicit; the lively face to face experience against the "bland" asocial world of Blackboard.

The constraints built into the design of Blackboard had four discernible effects. The first was to put people off it – avoidance. The second was that some tried to 'break out' or at least expressed a wish to do so – forms of escapism. The third was executional uncertainty. People had difficulty deciding on what actions were educationally significant and what parts of Blackboard could and should be usefully modified. The fourth was to find a use. The first two are instances of not coping or versions of non-use. The latter two show the tentative beginnings of technological adoption and social change. They are the genesis of rebuilding.

Avoidance

Avoidance of Blackboard occurred because it was “too hard”, but “too hard” frequently meant that people did not feel they could impose their own conception of education onto Blackboard. Strategies of avoidance included doing the minimum, or getting someone else to do it. Both allowed educators current approaches to teaching to remain unchallenged by the frustrations of technologising.

For ASM 2 frustration with technical barriers made him give up on incorporating the technology, in spirit, if not in practice. I had suggested he put a bit more information about his lectures in the file information on Blackboard. His response:

> **A.** Yes I agree with you, I agree with you, but I couldn't be bothered. It's too difficult.

However, as a teacher he was a patient and devoted instructor who was deeply knowledgeable about his subject and who for his lectures would painstakingly (given his equivocal relationship with technology in general) provide historically accurate and aesthetically interesting images in Power Point, which not only complemented his lectures but expanded in their own right on the point he was trying to convey. He was also scrupulous about seeing students who wanted meetings, and generally a good, committed teacher. However, he disliked almost all forms of electronic communication except for telephones.

ASM 8 qualifies as a partial incorporator of Blackboard because she had a junior staff member to run the online side of the course. Her own philosophical input into the online presentation of the course was minimal except in as much as the course reflected the general culture of the academic program concerned. She ran a forty minute lecture followed by workshop style group work, which is a fairly traditional approach. She put a lot of work into making lectures interesting and relevant to the world occupied by her students. She also put a high premium on face-to-face interaction especially when students had problems:

> **A.** … but I find for some students, especially if it’s a difficult topic, I will call them in and we will have a conversation or I’ll talk to them on the phone because you can get that more immediate interaction and just progress much faster. And you can pick up on whether or not they’re actually keying into what you’re talking about you know. Like today I had a student come in who was struggling and you need to … I need to read them when they’re at that point because it’s the only way you can find out whether or not they’re actually coping with the material or…(ASM 8)

Because of her general lack of technical proficiency, for her, whatever was happening online was a closed world, dealt with by the junior staff member, right down to email:

ASM 8

Q: And do you use email to any great degree with students? What sort of … like does it tend to be generic or is it specific? Do you know do you send out the big announcement type, generic…

A: (Name of staff member) does. Yeah.

Q: …this is how you all went with your essay kind of…?

A: Well (name of staff member) does that. If there's … like for example, there seems to be rumblings about something, they don't get something, so we'll send out an email to clarify it and say we're going to talk about this next week and this is what you do or this is what you don't do. And then you've got the ones who will email with their research questions, their essay questions, and so with each one of those there'll be sort of an interchange of emails so. Yeah so we use that a fair bit. I don't like them sending essays to me on email, I don't accept that.

She did not see using Blackboard as a learning environment even when I prompted her by using the term. However, this may have been because she had almost no direct experience with using Blackboard. "I mean but you just need to be more proficient than I am and I'm just a beginner." Avoidance, in sum, was a way of dealing with dislike as well as lack of technological skill.

Escapism

Those people I have called "escapists" were aware of the pedagogical and technical possibilities of forms of online communication and interaction other than Blackboard. They had either tried to use these in conjunction with Blackboard, or felt frustrated by missed opportunities occasioned by being confined organisationally to Blackboard. Their vision for technologised education lay well beyond the bounds of Blackboard:

ASM 12

A: The idea is … like its problem … I'm about to kind of give up on this. I've tried to use the DLS in the theory that it provides a single point of entry for the students and that there's somewhat greater security in having in house tech support for it, but it is so frustrating when you've got tools like Survey Monkey, when you've got things like WordPress.com to do blogs, which are much better than … I'll show you some blogs in a bit, some blogs in the DLS and some blogs my students did outside the DLS. But administratively the DLS is far more difficult than free, off the shelf tools if they're available online. The interface is less intuitive; administratively it takes far more time. There are nice open source content management systems like Drupal that can do everything - that you can tweak easily, you can access to the back end. But we … unfortunately because we've kind of pushed it in a couple of the courses I've done, we keep running into problems that folks that are trying to manage the system aren't aware exist. So folks weren't aware that the survey tool dumped out data in such an inconvenient form.

Likewise for another teacher:

ASM 14

A: The actual achieving of learning objectives, you know web subjects so far and Blackboard is so far outside the realm of useful I think, unless you do a hell of a lot of hard work, and that's where for me things like simulations actually take you to a whole other level. So for instance some of the stuff I've seen in 'second life'. You know the environment adds another level of value over and above what you are getting either on campus, if it's an on campus stuff, or the social stuff that it adds is so far over and above the value of a course management system that it's just streets ahead. But don't try and make it into a classroom experience you know.

These teachers were hankering for more flexible ranges of digitised teaching tools.

Executional uncertainty

Conflict between user's ideas of educational significance and Blackboard educational functions meant that many users developed quite idiosyncratic approaches to what aspects of Blackboard they used and what they considered irrelevant. ASM 3, and ASM 11 for instance eschewed the discussion board as "non educational":

ASM3

A: I think its admirable for anybody to spend hours of their time showing non-racist…(attitudes?) and showing students how to respond on a message board but I don't actually think it's much pedagogical use. I don't actually think they get that much from it.

ASM 11

A: Getting students together? No. I don't use the DLS for that purpose at all. I'm not a very, I'm not a… I have yet to be convinced that it's worth all the effort of having a discussion list and moderating a discussion list.

Some enhanced aesthetic aspects of Blackboard that they may have felt might attract students into using it.

ASM 9

Q: Oh you've got a real thing about changing buttons…

A: I do, I like…

Q: I can tell the ones that you like yes.

A: Yeah I don't know why.

Q: That one's crocodile skin.

Other users took a more global approach. 'Minimalists' removed from their courses all but the minimum necessary elements to keep it functioning from their perspective, and were highly incurious about exploring the educational or administrative potential of Blackboard or adding any further capacity, either to Blackboard or through any other form of technology. (ASM 2 ASM 6, ASM 15).

ASM 15 is typical of the approach

A: No, I don't want it.

Q: No, don't get rid of it, leave it there but just turn it off so it's invisible and just cancel that because it's already unavailable.

A: Virtual Classroom.

Q: Virtual Classroom, okay, click Modify. Untick. Submit. And then click Ok.

A: Cool, I'll get rid of a few of them then.

Q: Now if you go back up to here, click that, you'll see Virtual Classroom has gone.

A: Good we'll get rid of a few more of them because I don't want a lot of them.

For all of these people, the educational functions of Blackboard were abstracted or irrelevant. Sorting between marginal and main technological functions and effects to produce "education" was not guided by the software.

Finding a use

The most "adaptive" behaviour was to actively, albeit often tacitly, "find a use". "Finding a use" for Blackboard was in some instances, by simply designating it as implicitly teaching through use. So, for instance, "teaching computer skills" and "keeping students on track" became the justification which maintained a fig leaf of educational use for some academics.

ASM 6, for instance, understood Blackboard and teaching to be parallel universes, but could see a glimmer of pedagogical possibility in the notion of technological skills development for students.

> **Q:** Do you regard the DLS as having any pedagogical value at all?
>
> **A:** Yes, I do regard it as having some.
>
> **Q:** What is it? Sorry about coming at the question so abstractly.
>
> **A:** Well quite apart from anything else, it is enhancing their computer skills and their sort you know, of use of the internet um, to delve into materials that I place there. So it's helping them with research to that extent, I think. Um, ...and..." (tails off.)

A different method of incorporation into teaching philosophy was to use the DLS as an administrative enforcement device. In the case of ASM 11 this purpose and his general approach to teaching had a lot in common.

> **Q:** And do you ramp up your DLS at all, any closer to those particular times? (When assignments are due.) Like do you use it for more, I mean would you use it for instance to, if you got six email queries about the one thing would you put something up on it?
>
> **A:** Yes, I do.
>
> **Q:** Yeah.
>
> **A:** I do and I have. Yeah, I do. If I've got a query about something and I realise that in fact something's not coming across very well, then I'll put it, I have in the past. I've put it up, a DLS notice. So it's actually a really good notice board and I do pretty much every lecture mention the DLS in some way. So people know that it's part of what's happening in the course, but I'll put it up. And in fact if it's still in lecture time at that stage, at the next opportunity, I'll mention that I've put something up on the DLS in relation to this issue. I'll say "A number of people have asked me about blah, blah, blah and I'm sorry I wasn't very clear" or something like that, about it. "It's on the DLS now".

Such uses are not content education, however. Where content education was at some level, a purpose of incorporating Blackboard, the ambiguity about which functions and effects constituted such education still played a part, but one which was solved by emphasising one "affordance" or capability of Blackboard.[14]

[14] For explication of 'affordances', see Gaver, (1991); Day and Lloyd, (2007); Bloomfield,(2010). Yet, the idea of "affordances" does not settle the problem of whether the flexibility to create new use "comes from" the technology or the user.

Developing 'genres of use'

One adaptive approach was to build up one or more functions of Blackboard so that that function became almost the entire raison d'etre of that teacher for Blackboard. This exaggeration of one aspect of teaching using Blackboard formed a series of stylistic categories I call "genres of use". I use this term because the genres of use reflect relatively stable usage patterns, which, while founded in Blackboard overall, are not necessarily characterised by academics' use of the same tools or techniques each time to achieve a recognisably cohesive genre effect. These are the formations made by academic teachers about what sort of teaching activities Blackboard is "for" – how its tools might be used to produce some form of content. Genres of use serve as a way of grouping a series of tasks into meaningful entities of content. Their metaphorical correspondent in the non-computer world is the kind of written work which one might produce in an office – a lecture, a report, a seminar, a journal article – genres of written work that could even have the same topic but represent different expressions of it.

This definition differs from other researchers' approach to technological genres. Yates and Orlikowski, (2002) for instance, specialize in genres of technological communication and define these communicative genres as being discernible by form. By this they mean "observable aspects of the communication". They illustrate with attributes, such as "medium (e.g., pen and paper, telephone, or face-to-face), structural features (e.g., text formatting devices such as lists and structured fields), and linguistic features (including level of formality, specialized vocabulary, or graphic devices)" (p. 15). For Spinuzzi (2004) on the other hand, technological genres reside in objects or object like entities. He lists for one case study such things as spiral note books, sticky notes, lists of people and priorities, "multiple online genres" (unspecified) and "speech genres" (also unspecified) (p. 110).

I have in mind a much narrower definition for the genres of use that were created by the group of academics I interviewed. I do not mean "format", or "physical medium" as Yates and Orlikowski or Spinuzzi emphasize; instead, I mean something more like a literary genre, a combination of technique and content producing a recognizable style. Academics' genres of use were defined by their envisaged purpose. They were not deliberate genre formations in order to create a unique or interesting style. They are only apparent when they are compared to other academics assumptions, and structuring of the same or similar technological functions for alternative purposes. In this respect much as the "story" form in literature is one recognizable meta-level type of writing, but can form many genres as sub types within it, so the technological forms at hand to create genres of use are the “same” thing – the available tools in Blackboard and in its setting of related technologies – but it is the uses of them and the intentions of users, formed by prior practice and belief, that mould the end result into different genres. Moreover, one genre of use may have been a dominant form for a particular user but this did not prevent the inclusion of other secondary genres from time to time. Generally, only one or two types of outcome were prioritised, however.

Genre 1. The same as a lecture but online

Distribution of lecture notes and support material was a much used genre of Blackboard. This genre of use takes the metaphor of “lecture notes handout” and substitutes online distribution for physical distribution. However, the motivations behind this were various. It was not simply a matter of replication or extension of a previous practice. Academics usually elaborated online material in some respect, even in the most minimal of online engagements. It could be a spur to finding illustrations to embellish notes, or to put more detail into an announcement than would occur if it were solely verbal. The level of elaboration pointed to that academic’s focus of communicative attention, and indicated the significance they attached to some particular aspect of the course.

> ASM 7
>
> **A:** Yeah, I use it regularly just for this sort of really basic uploading stuff - So I don't have a problem with it …
>
> **A:** …for me the DLS is very secondary to the teaching process, all the DLS is, is a means of making the material available much more widely and as I said in previous times I would have printed notes. So summarised the lecture material, printed notes and distributed those at the lecture. But they would be available for students who could get them via email, or in even earlier times students could get those notes from my office.

For this genre, the metaphor is “the lecture handout”. The usual justification was that students would have access to notes over more time and in greater detail than previously available through written handouts in lectures. Thus even usage of Blackboard that was intended as a mirror image of document delivery in face-to-face teaching had begun to adapt and change in the technological environment.

Genre 2. Storage and curation

Some academics used Blackboard as storage, providing an elaborated online library of course relevant materials, using as their rationale that they were providing an information curation system so students had easy access to materials that are vetted by the course provider.

ASM 16

A: So this is my… this is all the readings, so it's got quite a few… I actually had more than that but I must've changed it. That's what I do; I forget what I've done. This will show you. This is more, what's the word? Got a lot more in it than a lot of other online courses that I might run or whatever.

Q: But that's because it's wholly online thought isn't it?

A: No, it's also because I love this stuff. I love all this theory. And a lot of this is my PhD.

[break]

A: … it's got a whole lot of literature, masses of information from literature with quotes and all sorts of things.

[break]

A: They're all readings.

Q: … so they're all readings.

A: And some of its newspaper. And then in the whole module itself…

Q: Do you put those on yourself or do you get the library to do…?

A: Oh no, I do that. Oh what I do I get them to digitise it and then I link it in here and so it's all part of the reserve area.

Q: So you just put the links in?

A: Yeah, that's right. Well some of it when you actually click on it comes up as a newspaper article.

Q: Some of them you can get direct links onto the internet but others…

A: This has got references.

Q: So this is huge, right.

A: So basically…

Q: Oh it is, it's a massive one.

A: I over cook things, I'm known for it. But that's alright, I don't have a problem with that.

The metaphor here is library like, with Blackboard as a repository. The justification for this academic of her approach was in fact personal – she simply liked adding resources and she used it as a repository for herself. However, she also expressed some degree of expectation that her students would, auto-didactically, sort their own way through the mass of resources.

Genre 3: Managing communication and relationships

ASM 5 used Blackboard for managing communication. She actively encouraged students to use them as it reduced her workload.

> **Q:** Do you think there's any actual sort of need for … I mean if it wasn't a policy imperative, would you be using the DLS for those courses?
>
> **A:** I think I probably would primarily because I've got 570 students so it creates an easy access for me that I can send out group emails via the DLS which is a lot easier than if I was doing it through GroupWise for example. And also I can place stuff up there and tell the students to go to there rather than, you know, "Check there as your first port of call" rather than check with me as your first port of call because otherwise the email traffic is kind of huge. With email, students seem to think it's a 24/7 idea and, for example, I will get just as many emails on the weekend as I do during the week.
>
> **Q:** So it's like texting? (Meaning students use emailing teaching staff the way they use mobile phone texting with each other.)
>
> **A:** Yeah absolutely. And it's easier for them to kind of send an email asking me than do the things that you might want them to do like look up the course guide or you know. So it allows me in some regards to kind of shape the student engagement because I try and say "Look at the DLS first" you know.

She built on this permanence, effectively constructing uses on an "affordance" of continuity she found in Blackboard. That is to say she made the most of the fact that through it, contact with students could be construed as non-episodic, while face-to-face, it is episodic and sometimes disrupted in lectures and tutorials.

> **A:** **…**for example, this year we had a you know really disrupted start to the semester so we had week one, then we had a week off, then we had the next week, then we had a week off.
>
> **Q:** Yes.
>
> **A:** So rather than kind of just allowing that disruption to play out how it would I actually set some homework between week one and week two to actually try and connect that introductory lecture to the next one and to try and actually generate engagement between those two events. And it was still disjointed, but otherwise you've seen them once for the introduction and here's your course guide and all the rest of it

and then two weeks later you're trying to you know.

Q: Re-engage them.

A: Re-engage.

And it was with the deliberate motive to engage students with Blackboard that these kinds of homework assignments were set up by this teacher. Asked whether she would have done this anyway in a weekly class, she agreed, but went on to describe how Blackboard helped counter the disruption of breaks in tutorial schedules.

Genre 4: To create an experience

A number of the academics I interviewed and observed used Blackboard to create "an experience". Experiential elaborations could range from illustrations that were literal to illustrations that were metaphoric and action based. Visual enhancements were more frequently added to the teaching materials themselves, rather than to the Blackboard environment. Some added one or more items which could be classed as "multimedia" illustrations of a teaching objective, a PowerPoint presentation containing images, a joke or cartoon, (ASM 6) to which were added diagrams and graphs or quotations; (ASM 7,) but these were not integrated into Blackboard with any great degree of technical sophistication beyond seeking them out and uploading them. Others would use multimedia in the classroom (film, PowerPoint) but not upload it to Blackboard (ASM 8, for instance, did not feel capable). On the other hand, ASM 9 put to very creative use images interspersed with other content apart from lectures, such as "events" which gave her Blackboard courses a characteristic "edgy" feel.

Some were keener on adding social media possibilities such as the Blackboard Blogs and Wikis to make an "experience". ASM 13 saw these additions as "as a way for students to be able to share their practice wisdom and their knowledge that they generate around particular things. What they might have done in a particular situation or something". ASM 14 had a lot of experience in immersive gaming type environments and advocated their educational possibilities, such as using them for hypothetical scenarios that students could work through. However, she found that to set up an immersive learning environment within the current online teaching and learning system was too technically difficult and work intensive. Instead, she set up "objects" for students to come together around and discuss. These could be images or texts or demographic data, which were used as a focus to which students reacted in writing, and that then formed the basis of a discussion.

For ASM 12, a rich learning environment was a richly technologically mediated environment, so, she was concerned with setting up multiple expressive as well as receptive channels for student interaction with her and with each other. These included external blog and wiki technology, or any social media, internal or external to Blackboard which she saw as having possibilities for enhancing students' capacities to interact with each other and with the materials she provided or they found, so that they experienced both a technologically and connectively rich learning space from which they could take what they needed to develop their ideas.

These examples are progressively more "immersive". A very high level of thought about educational design and deliberate effort had gone into one particular teacher's Blackboard course, a teaching site that could be considered a proactive role play environment.
In short, ASM 10 set up face-to-face role plays that showed up that there was little time to reflect and carry out the role play over the same period of real time. She would discuss this with the students as an incentive to getting them online.

> **A:** …cause I find it better to frame the online role–play, to explain why they have got to do it online, because many of them don't really like online. So I give them that rationale.
>
> [break]
>
> **A:** **…** But the idea is they have done a number of role-plays they have got practice skills in role-plays and they are aware of theoretical issues, but that when they do the online role-play they prepare. So it's not just a role-play it's a complex series of steps really. First of all you start with set readings, then you have a discussion board, then there is the online role-play, and then there is a final reflection on the role–play, which is an assessable journal and it's the only part which is assessable as such, because you want to create – you know – no anxiety.

This was by far the most elaborate use of Blackboard as the setting for experiential education. ASM 10 used Blackboard supplemented by email and face-to-face teaching for creating a simulation of a work environment in order to teach specific work related skills. The metaphor in all of these formations was of situating and illustrating experience.

These four genres of use constitute the most readily apparent forms of usage amongst this group of academic teachers. They are an illustration of the propensity of users to subdivide the technological possibilities built into Blackboard and form simplified but coherent structures to use for teaching. There is a fifth "empty" category.

Genre 5: A "learning management" tool

In the version of Blackboard in use at the University, the full array of available functions for "learning management" had been made visible, and the policy of "Minimum Online Presence" mandated those of them that were most concerned with learning management rather than teaching functions. Despite this, no teacher I interviewed used Blackboard as a total learning management tool, that is, for delivering the whole process of a course through the full set of available features of Blackboard.

As a genre of use, then, this is something of an empty category. It is a "design" category, present in the architecture but which has failed to be filled by use. Potentially, Blackboard could have functioned as a workflow management process for the entire sequence of course related tasks, from setting out course content, and communicating with students to the setting of tests and assignments, using the "dropbox" to date stamp assignment submission and returning work and results to students through Blackboard. Its explicit design was not reflected in the development of a category of use which followed the design, however.

This lack of use by the academics of the array of management tools in Blackboard could be attributed to a number of factors. It could have been due to the presence of other organizationally sanctioned technological systems especially for assignment submission and results distribution, or it could be because staff felt students were not familiar enough with Blackboard for this method of management to be considered reliable. When asked, it became very clear that most academic staff saw their own usage of administrative functions as rudimentary, especially for management of testing and assessment. In fact, most people used it for "outputs" to students like course content and communication, and not "inputs" for teaching management, like student task submission and grading functions.

ASM11

Q: So you don't use any of the assessment tools, any of the preset modules, any of the …?

A: No.

Q: Okay. Have you ever tried to use any of the assessment tools or anything?

A: No. No. No.

Q: You're just, they're just like a black hole sort of stuff are they? Yeah, right. Okay. Yeah.

A: You are looking horrified.

Q: No, no, I'm not. I'm not. You're just exactly like most people.

A: No, I don't use it. I use it where I think is what the students want it to be used for, which is basic information about the course online so they can get the information whenever they need it.

In general, the design structure of Blackboard as an overall course management tool was ignored in favour of using the functions that most assisted the academics' personal genre of use. We may speculate that these people simply did not see the remaining unused functions as pertaining to them.

Conclusion: Academic practice and Blackboard

A fundamental finding in my research is that the onrush of technological innovation in universities and the introduction of educational technologies into a practice field that was essentially reliant on face-to-face modes of teaching break the coherence of academic practice and sensemaking. This is followed by the "repair" of constructing or reconstructing concepts and practices that will bridge the gap. The academics I spoke with demonstrated some level of capacity for this as they developed genres of use.

The process of rebuilding the meaning of "education" to fit their use of Blackboard harnessed and aligned many of the knowledge structures that had gone before. This by itself is not a new observation. From a social-psychological perspective, Dewey (1997; see also Elkjaer and Nielsen on Dewey 2011), Weick (1995, 2001a), and Proulx (Proulx & Inzlicht 2012; and Proulx, Inzlicht & Harmon-Jones 2012) identified similar kinds of cognitive process. These writers point to expectations that are ruptured by breaks and collapses of meaning, and which are then rebuilt by casting about for cues in present environments to interpret the current situation. In this process, identity is frequently ruptured along with meaning, especially professional identity, and it, too, must be rebuilt. Identity maintenance recruits emotions and values into the collapse and rebuilding process.

The Ithaka study that tracked changes to academic practice indicated some of the contemporary repertoire of practice that teachers might be dipping into in order to construct their use. Print and text dominate as the source and reference point of knowledge, even if this is conveyed in a variety of modes. If digitisation could be found anywhere other than in teaching itself, it can be seen increasingly in the ways that research is conducted, making more use of digital research repositories, digital data collection tools and digital publishing. It was hard to estimate how much electronic means influenced collaboration for the purposes of research, however.

The most significant influence on expectations and practice appears to be academic epistemology, the particular approach to knowledge building and transfer that Laurillard (2002) dubs "mediated":

> "The central idea is that academic learning is different from other kinds of learning in everyday life because it is not directly experienced and is necessarily mediated by the teacher. (p. 4)

This not only determines that knowledge itself be abstracted from its situated origins in order to be passed on; it also centrally positions the mediator. The mediator, (the teacher) as Brent (2005) has noted, "performs" teaching. How a teacher performs teaching in a traditional setting is not fixed by "academic practice" in general, however. It is also individualised. Influences and motivations for styles of teaching are multifarious – how they were themselves taught, what priorities they have set for their subject, and how they think of themselves as a teacher - each is very an individualised and variable aspect of teaching practice: People's "use of technology becomes structured by these memory traces, experiences, knowledge, meanings, habits, power relations, norms, and the technological artefacts at hand" (Orlikowski 2008 p. 267). The first seven of these attributes, those which are not properties of technological artefacts, are aspects of academic identity.

The second primary influence on the precise form of technology use is that of the knowledge structures inscribed on "the technological artefacts at hand" (p.267). Such personal norms, habits and expectations are those brought into the electronic context when using Blackboard. Blackboard itself comprises a set of expectations, arising both from its design and from the organisational purposes for which it has been implemented. I have already commented on its linear model of "course management", which resembles a process line for production of education, and its tendency to divide the teaching processes into separate "buckets", along with its positioning of the teacher in the centre of a spoke and hub model of communication. These constitute a design teleology.

The core observation about practice-based approaches to technology use is that, in the words of Salovaara, (2008):

> Design does not determine how and for what purposes a system will be used in real settings, but rather is a component in a more complex, evolving process in which unforeseen contextual features, social factors, creativity, and opportunism, as well as new user interpretations, also play a part. The result of such a process is a multitude of different uses for the same system, each use having a different history behind it. (p. 209, see also; Orlikowski 2008; Jarrahi 2009; Orlikowski 2010b)

The practice approach differentiates between a technological artefact that inscribes designers and developers intentions and a technology-in-practice, which refers to "the specific interaction structure routinely enacted as we use the specific machine, technique, appliance, device, or gadget in particular ways in our everyday situated activities" (Orlikowski 2008, p. 263). This difference also elucidates one of the fundamental questions about technology use: Why "[have] these technologies have been utilised differently by different organisational actors, even in the same organisation setting?" (Jarrahi 2009, p. 258). The answer may lie in the variability of disruption to previous academic practice. The following chapters explore different forms of academics'experience of disruption as they struggled to incorporate Blackboard into their practice.

CHAPTER SEVEN: "ONCE WE WERE LOST AND NOW WE ARE FOUND": NAVIGATING BLACKBOARD

As the thesis has developed to this point, we need, as Heidegger advises, to avoid any taken-for-granted view or "conventional" view of technology. This is the insight of Heidegger's account of technology as enframement: "Technology, or what can be referred to as 'technicity' concerns itself with the ontological way in which things reveal themselves via a 'sending' [Geschicht]" (Godzinski 2005, p. 2). Enframing, as Godzinski argues is understood by Heidegger as both "a challenging" of, and a form of revealing nature, "nature" being understood as the stock of resources or a "standing reserve" turned by technology into uses. Enframing is a way for uses to be seen and understood, a representation that is made tangible through products and performances. Enframing is also how we already respond to technology: We do not have a choice about whether or not we do so. "More importantly", says Godzinski, "our response to the challenge that enframing emits, is neither completely predetermined nor free" (p.4). As an analogy this difference between machines as tools and techniques and technology as "enframement" can be understood as the difference between the frame of a painting, a mechanism which presents or displays the painting but also limits its circumference, *and* the representations constituted by the painting itself. It has been hypothesised that not only do we see such images as representation, and not as flat surfaces composed of pencil marks, paint or pixels; but that we go on to invest such representations with a life and agency of their own (Mitchell 2005). These remarks preface my treatment of how academics dealt with Blackboard and point to a central question: How did these academics enframe Blackboard as a technology?

Education as represented by the Blackboard technology is an enframed practice, a representation of education as displayed (and confined) by the mechanisms of the technology of Blackboard and the skills teachers require to operate them. "Technology is therefore no mere means. Technology is a way of revealing" (Heidegger 1977, p. 12). Our response to the "challenge" of revealing is "ordering" (pp. 18–19). Put simply, technology, through representation, creates new understandings in embodied practice and thereby changes the social order.

Heidegger characterised technology as something usually "ready to hand", able to be grabbed and applied to a task without much thought about the instrument itself. However, the mechanisms of educational technology can manifest as extremely “unready to hand”, breaking the flow of action and forcing attention to the mechanism itself. Heidegger himself argues that “breaks” act to bring everyday actions and tacit accomplishments to conscious attention (Heidegger 2008, p. 105,in 1962 ed, p 75). The question is whether the same “unready to hand” disruption also occurs with respect to technologised education, that is to say, to the “representation”, and not just to tools and techniques? The introduction of Blackboard as a teaching technology to previously untechnologised sites, I argue, “breaks” or disrupts both properties of enframement. It disrupts the frame or form of education by imposing a particular design structure on how it is presented, and it disrupts the representation of education, understood as the professional understanding or philosophy of education that teachers have developed as part of their general academic practice (see general academic practice section, above, Chapter Six), by taking it from a face-to-face mode to a technologised mode of delivery.

In practice, these two aspects, themselves part of tacit knowledge, are not cleanly separated by users or potential users. Rather, educators collapse together both issues as making Blackboard problematic to work with. An analysis requires exploration of how academics experience Blackboard as a problem, as a source of disruption, and how do they explain the breakdowns and frustrations involved in using Blackboard? How do they attribute educational “failure” when using Blackboard? I have previously described the content of Blackboard as analogous to a vocabulary, and the form as analogous to a grammar. Grammars prescribe rules of navigation. Clarifying these questions therefore entails discussion around how people navigate Blackboard.

Navigation and the user interface

A user interface consists of the screen surfaces and items on it to be manipulated and navigated in pursuit of a task, as represented on the screen and as manoeuvered by interactional devices like a mouse or a touch-pad. A user interface is also a surface to be “read” so as to understand the meanings and semiotics of the symbols there-on. The metaphorical equivalents in a physical workspace are the folders, pages and pens needed for writing, and the written surface itself.

Materiality enters a more abstract realm in the world of the program interface. Interfaces perform the role of virtual infrastructure. Navigation requires the user to interpret the features of an interface to carry out tasks. It requires entering the design world of computer use in a more fictive sense than the direct encounter with the machine as outlined above, as breaks and mental-model failures. Navigation involves the construction of a symbolic world around the metaphor of the journey, as its name implies. However, it also retains an artefactual quality as the interface "does things": It acts as a tool in addition to being a pathway.

The presence of surfaces means that navigating around a user interface retains a vestigial sense of tangibility, due partly to the physical action required to manipulate symbols on screen, (typing, mouse movements) and partly to the activation of spatial memory, a navigational sense which is cognitively separate from other forms of understanding. (See for instance, neuro-imaging studies of London taxi drivers Maguire, Frackowiak & Frith 1997; Maguire, Spiers, Good, Hartley, Frackowiak & Burgess 2003; Maguire, Woollett & Spiers 2006.) But because a user interface is also a surface to be "read" it is, therefore, the entry point to the mediated "screenworlds", the means by which a computer becomes a medium of both representation and transmission. It is the opening to a cybernetic lifeworld and a techno-cultural space. The successful interaction with digital technology is marked by the disappearance or "transparency" of that technology:

> Artefacts tend to become transparent to the individual when he or she is fully engaged or absorbed with them. The engaged absorbed individual is not aware of the technology as separate objects. (Turner 2013, pp. 32–33)

This Heideggerian "concerned absorption in the world" (Heidegger, cited in Turner 2013, p. 33) applies equally to the disappearance of the "surface" of the software as it does to the physical materiality of the computer; but representativeness and requirements for interaction of user-interfaces for navigation carry particular problems which mean that they emerge from their disappearance and manifest themselves in consciousness.

Symbolic ambiguity

Interfaces found on the computer screen have both symbolic and navigational elements. The design of these has been found to influence users' learning and use of electronic technology so as to inhibit adoption (Ziamou, Gould & Venkatesh 2012). Navigation is a rich source of ambiguity. For most people who learn a program by doing, the actions they take and the symbols on the screen do not have names. Navigational terms like "breadcrumbs" are frequently meaningless for interpretive discussion of interfaces, although most people would be familiar with the little row of links at the top of many web pages, which are separated by a

> symbol or similar, and where clicking on them to the left moves you to larger categories of information closer to "home"; and to the right, to increasingly specific information. Webpages and software programs are full of objects for which learner users need to know the name – dropdown menus; pop-up windows; dialogue boxes and so on – and actions that users need to differentiate between, such as knowing the difference between "select" and "choose". The interpretational difficulties of navigation and task execution are illustrated by the example of ASM 3: She is trying to move content to a new folder:

A: And so Move, Copy is that how you do it?

Q: Oh those two, no, there is no Move.

A: Yeah, you don't want Remove.

Q: You don't want Remove. You have to Copy to Move.

"You have to copy to move" is a sentence that makes no sense at all out of the interface context and in the operational 3D world of real life. These slippery half-known meanings are the same as the guesses at internal machine actions which Weick describes, above; at one level the property of the machine or software and at another, frequently non-contiguous level, the property of the sensemaking of the user.

The metaphorical quality of many of the terms used for comprehending and navigating software and computer interfaces generally was meant to improve understanding of how to work with them. Yet the interface environment is so distant from the original source of the metaphor, and these metaphors frequently collapse. "Copy" and "Move" are on-screen metaphors for real-world actions, and as such retain an overriding meaning derived from their real-world origin, easily confusing their intended interface meaning. Although they are now well-assimilated terms in their computerized meaning, an appreciation of the size of the metaphorical gap can be gained by imagining "copying" by hand as by biblical scribes, or "moving" something around in the physical world. These are somatic gestures but computerisation removes their somatic context.

The development of the interface (and with it, navigation) as a textual metaphor has been well traced (Brent 2005; Hobart & Schiffman 2000; Terkourafi & Petrakis 2010). Metaphors as they are adapted and reconstituted for use in novel environments become increasingly reshaped, with a consequent high likelihood of violation of their original meaning. The whole "desktop" metaphor is problematic in that it combines information access and information display in a way in which the source metaphor does not. "People typically do not have to choose between making visible a desk or a file cabinet; they can see both and use them independently of each other" (Kaptelinin & Czerwinski 2007, p. 3). A classic, often-cited, example (not, to my knowledge, attributable to a particular author) of metaphor violation by interface design is the metaphor of the "trashcan on the desktop". Using the "start" button to stop a computer is another, frequently used example.

In Blackboard, variants of metaphor violation are quite easily found. Announcements and discussions are "course tools", for instance. Other examples are the arrangement of Blackboard into categorical divisions that treat communicative modes as separate from "course content", and asking the user to distinguish "course information" from "course documents" within "course content". "Blackboard" is itself a metaphor, the source of which is a surface with infinite free-form possibilities for conveying information, which itself is fixed in time and place – constituting close to a direct contradiction of the functional metaphorical qualities of Blackboard the software, untrammelled by location in space but severely limited in its capacity to be redrawn to better convey information.

Navigational ambiguity

Blackboard navigation design in version 7.2 (and immediately earlier and later versions) could be characterised as using a directory tree schemata as the underlying navigational element, and the fields of a table or form as the overlying visual element. It has almost no pictorial-symbolic or iconic design features, and is not at all skeuomorphic, that is, inclusive of design elements derivative from physical objects. Navigation in Blackboard brings with it not only ambiguity but cognitive load (e.g., Dror 2011; Errey, Ginns & Pitts 2006). A typical workflow to add content to a page requires eight steps or clicks on different icons and navigational parts of each screen along the route to the desired page. Remembering this puts a significant strain on short-term memory. Miller's seminal work suggests that the number of steps that can be retained in short-term memory is "seven plus or minus two" (Miller 1956 see also S. P. R. Rose 2003, p. 125). Navigation in Blackboard takes up most resources of short-term memory. Other aspects of navigation also consume the same limited capacity, such as at the same time as remembering navigational steps, for instance, also trying to form an overall perspective on, or schema of the workspace design in its entirety in order to know where to fit new knowledge (Chalmers 2003).

One interviewee, ASM 14, who had put a lot of thought into her use of Blackboard, described navigating Blackboard this way:

> **A:** So that idea, as I think I've said to you before, the design of … for me, the design of Blackboard is like 100 little Tupperware containers on a table and you've got to open each lid and you can't open another lid until you've closed one, and that means that although you're not … and I don't know what the correct term is for this, you probably do, you know will have a better idea … your engagement with material is linear even though it's not linear like you would think as a book…
>
> So take as a book, you know a book is a good concept to think about it, in a book you've got a number of ways of accessing information. Table of contents at the front, index at the back, chaptering and also that great capacity just to flick it around and move it back and forth. Well the point is that you can engage with multiple bits of information at the same time whereas the design of most e-learning environments that are heavily resource delivery orientated, like Blackboard, is that you are forced to engage on one piece of information and you've got to close that off to then engage in another piece of information. And that means you've got to close that one off to engage in that one and then you've got to remember well where was that other bit …

The internal arrangement of 'folders' in Blackboard draws on both long- and short-term memory in unanticipated ways. Whittaker (2008) postulates three drains on long-term memory caused by rigid folder structure:

> Errors creep in because the main tools we have for organizing digital memories are folders. Folders force classification – a cognitively difficult task – requiring users to predict the future context of retrieval. Such prediction is hard. There may be fundamental shifts in the ways that users construe certain information (as work or interests change), rendering old folder labels useless. Folders also hide information; once an email message or document is filed, I may never think to look for it again, because it is 'out of sight and out of mind'. Finally 'premature filing' occurs where users' anxiety to keep their workspace clear for future information processing leads current information to be filed in inappropriate places. (p. 174)

Moreover, Blackboard makes additional demands on short-term memory. The access to Blackboard is highly controlled by set routines that cannot be varied. "Access" in Blackboard is not just a matter of software access via a series of portals and logins; it entails a form of moving around and navigation consisting of little chains of invariant action, which separate one task from another and have the effect of breaking up task accomplishment into non-naturalistic, machine-designated ways. Here what must be remembered and foregrounded in active short-term memory is the overall pattern of Blackboard layout and design, with each function several clicks removed from the next, added to by the steps to move to, and operate within each section. Adding a further layer of complexity to task completion, the subcategories of Blackboard do not resemble each other in terms of workflow, the series of actions needed to execute a task. They may use similar form fields for entering information but they are not identical. Differentiating between them is another drain on attentional resources.

Thrift (2005) argues that material culture has changed sufficiently and new forms of materiality are emerging, "which question our usual concept of mediation because they are neither 'inside' nor 'outside' but are the work of mediation itself" (p. 231). He gives as examples of the resultant new "sensoria" that enable new framings and imaginations, the "registers" of this new kind of materiality – the screen, software and the body. He suggests that "what surrounds us and is embedded in us is increasingly a machine reality… that depends on new senses of 'human' and 'material'" (p. 231). This lends a quality to "screenness". It becomes a new "sensorium", a surface that for Thrift requires a particular form of attention, a special form of sensing. Thrift writes an account of the origins of screenness that has its roots in the German psychophysical tradition, which theorised the co-construction of the physical and mental world, after which the "vast epistemic apparatus" (p. 237) of screenness grew up in conjunction with cinema, grounded in an already present practice of interpreting photographs. As visual impressions are interpreted as bodily sensation, that which is represented becomes a new reality.

Thrift's description partly fits with the general tenor of actor-network theory, where technology and actor co-create a phenomenon. The sensoria of screens and the sense made in conjunction with them work together as an epistemic apparatus. Actor-network theory, however, is infrequently used to describe experience of computers due to its own epistemological constraints. A search for other literature using an actor-network approach to screens and their navigation reveals very little; the few writers discuss screens rather than navigation (Cypher & Richardson 2006). Actor-network theory appears to fall short because it cannot discuss the process of navigating a technology in terms other than as a total process in which the outcome is the focus, for example, actual naval navigation described in Latour's original instance (see Latour 1996b). For analysis of online education as used by academics, this approach provides few avenues for prising apart elements of the total process from the rest of an academic experience of Blackboard, for instance, different types of formulations of the screen. These might be representative of concepts, as when the screen is discussed in terms of the interpretation of semiotics in its symbols, or it might be topographical, as when the screen is discussed as a spatial process of navigation.

A similar difficulty also arises from a practice-theory perspective. What is accessible as a social practice in a mediated environment is the mediated product or performance – 'teaching online' – as it results from the work behind the scenes. The practices used to produce the product or performance are socially occluded. Few people ever watch other people navigating an electronic screen as a matter of regular practice, except those who are researching user experience, and sometimes, technicians. The moves themselves are suggested to the ordinary user through texts – screen tips and user manuals – but rarely through observed action. The extensive use of metaphors in interface design is one solution to the conveying of a common social practice of computer use, but its constructed and artificial origins mean that the metaphors appropriated are frequently uninterpretable or wrong (Dørum & Garland 2011). In fact, a whole industry is devoted to decrypting the signalling process for the transfer of computer practice. The central concern of user-centred design is how to convey a common social concept of use. Thrift indicates a fruitful line of enquiry when he suggests that a "new sensorium" requires a "special form of sensing". This special form might be elaborated via an understanding of "sensemaking and wayfinding". Reworking Siemens' (2011) concepts of sensemaking and wayfinding, which he applies to search for information on the internet as a whole may offer a way to access the distinctions of various epistemic orientations found in an interface.

Sensemaking and Wayfinding

Siemens is a practitioner of online education who also was a co-founder, in 2008, of the earliest form of Massive Open Online Courses (MOOCs), a course called *CCK08* (Cormier 2008). Most of Siemens' intellectual work takes the form of internet ephemera – Blog posts, PowerPoint presentations on SlideShare, and online courses on online education. However, he collected together a good deal of his thinking in the area of information behaviour and educational technology in his PhD thesis (Siemens 2011). One contribution developed through his experience of using online environments for teaching is the separation of sensemaking from wayfinding in electronic environments. He understands navigation by sensemaking and wayfinding in an open, informational context. That is to say, the landscape of discovery he addresses using both techniques is that of information on the internet as a whole.

For Siemens, being able to make decisions about what to do in an educational information environment, means as Weick (1995) says, “that sensemaking involves placing stimuli into some kind of framework” (p. 4). However, the framework by which orientation to information is achieved, says Siemens, is formed out of two “information related activities: (1) sensemaking to determine the meaning of information, and (2) wayfinding for spatial orientation in order to navigate information” (Siemens 2011, p. 2). Despite the differences in application of the ideas of sensemaking and wayfinding – Siemens, to the electronic world “outside” the LMS, and in this thesis to “inside” it – the distinction between the two types of knowledge separates finding *meaning* in an electronic context from finding *orientation*, and it suggests that each perspective relies on somewhat separate mechanisms and approaches. This is an especially useful distinction as these two information mobilising techniques effectively give rise to two distinct types of information practices.

Sensemaking

Sensemaking as an information practice is information seeking and organising. Savolainen (1995) on whose work Siemens draws, renders Bourdieu’s concept of habitus in practical terms as “way of life”. This he regards as the basic context for information seeking. The objective of such information seeking is to achieve a mastery of life brought about by instantiating order, or as he puts it, “keeping things in order” (p. 267). As a teleological goal for the process of using an LMS, “keeping things in order” is mastery of use. Understanding the specific functions of the interface in relation to the larger coherence of the intended design of use of Blackboard and of the comprehensive project of “teaching online”, draws on sensemaking to know how the various parts relate to the overall project of “keeping things in order”. And Blackboard, unlike life, is more likely to specify an anticipated order, via the names of its folders and the arrangements of tasks, and the icons and text cues that sensemaking oftentimes must second guess. Approximations are more difficult in a pre-ordered environment that requires a specific order to operate, such as the Blackboard interface, as is the effect of leaving unintended ambiguities in the layout of things. The sensemaking user must work hard both to fit interface cues into personal frames and to second guess the intended proprietary design frames that these cues are meant to invoke.

Wayfinding

The sensemaking process is carried out simultaneously with wayfinding. For Siemens, wayfinding is a process of orientation to the context of general electronic information. However, it has a software specific pedigree in its use for interface design. A good deal of research on wayfinding for interface navigation concentrates on navigating virtual environments (Burigat & Chittaro 2007; Chen, Chang & Chang 2009). These are by definition more spatially "realistic" than the sort of user interface that must be navigated in task-oriented software such as Blackboard, reflecting the origins of the wayfinding concept in physical navigation, for example, for London taxi drivers, as is cited earlier (Maguire, Frackowiak & Frith 1997; Maguire et al. 2003; Maguire, Woollett & Spiers 2006), for ancient mariners (Davis 2009); and for the streets of Vienna (Raubal & Winter 2002).

The linking theme in each setting; whether physical reality, virtual reality, or the commonplace two-dimensional software interface, is that of overcoming the problem of disorientation. Disorientation is particularly a problem in electronic environments (Chalmers 2003; Darken & Peterson 2002; Dørum & Garland 2011) and results in a "feeling of being lost" (Dørum & Garland 2011, p. 129) or the absence of a sense of place, so that users "may become so disoriented they do not know where they were, where they are going, or more importantly, where they are" (Chalmers 2003, p. 596).

Academics engage in sensemaking and wayfinding

Both sensemaking and wayfinding depend on building adequate mental schemas of different kinds. Sensemaking seeks frames that make things meaningful; wayfinding seeks frames of orientation. Each relies on a meta sensemaking framework of meaning seeking. However, wayfinding emphasises the need to actively interpret place rather than simply follow directions. Both rely on schemas of various sorts, but schemas, mental models and cognitive maps are not yet well understood (Darken & Peterson 2002, p. 1). Dorum and Garland (2011) concur: "The term mental model is often confused or used interchangeably with other related terms, such as mental imagery and cognitive mapping. Accounts of how mental models develop vary between scholars" (2011, p.130). Importantly, they also make the point that "on one hand, the mental model of the user can direct the navigation; on the other hand, an interface can affect the mental model held by the user" (2011, p.130).

Feeling ‘lost’

First and foremost, navigation invokes a problem: “Where am I?” The elements noted above each contribute to this overarching feeling of being lost. Chalmers (2003) suggests that the phrase, “I’m just not good at computers” stems primarily from a sense of limited competence with navigational accessibility, a major component of which is disorientation. Working with a computer induces a limited and circumscribed sense of place. One example was ASM 10 who was extremely proficient at teaching online:

> **Q:** Just looking at that, you haven't changed any of their artwork or buttons or banners or anything like that? You are just using it as is?
>
> **A:** I'm very much "as is". 'Cos I'm not that great at computers. Even though I have used them for many years in terms of online learning…)

Chalmers (2003) points to three ways that people overcome these complexities. They use schemas – “knowledge structures that store concepts in human memory” (p. 596 quoting Satziner 1998); they manage cognitive load by applying greater cognitive effort including procedural knowledge of how to use the concepts(p 598); and finally, they develop retention by “chunking”, or reducing information by subsuming it to categories; so, the class of the concept takes over from, and stands in for the details that comprise it (p 599).

All these strategies increase the effort needed for comprehension but simultaneously simplify the mental pictures for dealing with it. Both increased effort and greater simplification make it easier to miss something that later turns out to be important. The problems, as created by both ambiguous metaphors and ambiguous pathways for navigation in Blackboard add to other pressures already noted, which lead to a collapse in sensemaking. Here however, rather than a catastrophic disruption as caused by a technical failure, sensemaking pressure is induced by the complexity of the task and the difficulty of retaining sufficiently complex mental schemas.

Green , Jeong & Fisher (2010) describe the foremost importance of visualisation of information on a screen for the execution of complex tasks.

> The successful visualization of complex information relies fundamentally on its ability to stimulate human cognition. Humans see what’s visualized, emphasize information of interest through focused attention and elimination heuristics, and interact with representations of relational knowledge to reach a goal or complete a task that the

> human has chosen but that the visualization must facilitate. Each facet of human cognition engaged while using a visualization needs consideration; cognitive processes are typically not linear, and perception, categorization, and problem-solving activities inform and motivate each other throughout the interaction. The loss or impediment of one cognitive process hampers or stymies not only the other thought processes dependent upon it, but the path taken by cognition as a whole. (p. 1)

Stymieing the "path taken by cognition as a whole" is as good a definition as any of what the collapse of meaning is about.

In general, people who are not coping with a technology like Blackboard tend to deal with it by refusing to engage. These become the "laggards", "refuseniks" and "resisters", as identified and pathologised in much of the instrumental literature on computer use. However, some do take tentative steps. Wayfarers who find their landscape confusing do not venture far from home. ASM 10, quoted above, who had not altered many of the alterable design features of Blackboard is a case in point, at least for those things she regarded as non-central operations of Blackboard. But caution about getting lost may help explain the regular finding that users of Blackboard generally do not use many features; most instructors use Blackboard to post documents, lectures and course information (Gerdes & Kuhr 2004; Lin, Singer & Ha 2010; Malikowski 2008; Mwaura & Nyaboga 2011; Woods, Baker & Hopper 2004).

What makes the experience of navigational perplexities and interruptions different from technical breakdowns is that when a machine is working, the mechanism itself does not need to be thought about. However, navigation and interpretation of interfaces is an ongoing accomplishment. When it works the processes are pushed to a mental background activity and not simply discarded as a problem in the way of, for example, technical breakdown. The distinguishing feature of handling interfaces is automaticity. Both the practice of the skill and the reference point for meaning are characterised by automaticity.

Green et al., (2010) distinguish two types of expertise on the basis of how they are learned: Procedural learning in the first case and inference learning in the second. Procedural learning, they say, "is sometimes called skill learning, as it is the learning most common to motor and iterative tasks that require repetition to master; it is also referred to as script learning, which captures the idea that there is a 'recipe' or 'roadmap' to be followed" (p. 2). They describe the skills required as of the bike-riding or recipe-following sort, which like a road map or recipe, are distinguished by being composed of learning from declarative facts. They call it “the ’knowing how’ of any sequential task” (p. 2) and note that it is acquired by repetition and soon becomes automatic, “requiring little conscious focus” (p. 2). This is an interesting distinction, suggesting that procedural skills entail both somatic and rule-following elements and that there is a relation between somatic skills and rule following.

Inference learning on the other hand, they say, is built around categorisation and classification, and is dependent on the ability to draw a conclusion about whether something is the same as, or different from related items. “Categorisation and classification are important building blocks of inference, and inference is used in a variety of reasoning, including induction, deduction, and comparison” (p. 2). Such categorisation is essential for complex, consciously processed tasks such as deciding whether we like something or are competent at it, or deciding on the information to use and tasks to accomplish that will constitute “teaching online”. Importantly: “Inferential learning, unlike procedural learning, does not lend itself to automaticity and when complex, involves sustained attention, problem-solving, a variety of reasoning heuristics, and decision-making” (p. 2). Any interruption or miss-design that takes attention away from inferential thinking disrupts the flow of attention and leads to frustration or incomprehension.

Experiencing disruption

Technical failures and material disruptions are underestimated in accounts of experience and use of educational technologies. The hardware of computers and their servers and cables along with printers and other peripheral devices, along with their electricity supply constitute a physical or material infrastructure. These may be subject to all sorts of breakdowns or maintenance interruptions in the course of delivering computer services. Software applications can also crash or be “buggy”, and websites can become unavailable due to maintenance or hacking. These latter are a form of virtual or quasi-material breakdown. Monahan’s (2008) pictorial account of disruptions brought about by cabling, trench digging and repairing computers calls attention to the embodied and material substrate of virtual networks, often forgotten in imagining the uses of disembodied “virtual” cyberspace.

One reason for the underestimation of technical failures is that the materiality they arise from is frequently both literally and figuratively buried – a “system of substrates” (Star 1999). While it may be literally underground, (Graham & Thrift 2007; Star 1999) or as Weick (1990) reminds us, buried behind the scenes in a machine “black box” that cannot be checked, it is also buried in consciousness, a background to the flow of work, a Heideggerian “ready to hand” (Heidegger 2008, p.105, see also Graham & Thrift 2007; Star 1999).

It is the latter unconscious quality of material infrastructure that makes material disruptions also cognitive and sensemaking disruptions (e.g., Weick 1993). The confusion following an expectation that a command should work that occurs when it doesn't work, perfectly illustrates the union of technical and sensemaking collapse in one event. Interruptions make infrastructure “unready to hand” (Weick 2004, p. 656). Unready to hand is one definition of the experiential sense of “not working”, although not one extensively addressed either by practice-theory or by the Latourian notion of “assemblages”. This example is illustrative but the dual role of virtual materiality and immaterial social and cognitive processes in collapse of meaning is inadequately addressed, either by theories of the “social”, which tend to leave out the material side of formations of experience, especially breakdown, or ANT, at least in its most “strong” form, which has trouble conceiving of immaterial processes (Farías 2013, p. 3). Moreover, educational technologies, as Monahan (2008)points out are sites of perpetual change as “infrastructures require continual attention and constant alteration, even as they normalise the unequal distribution of resources” (p. 93). The state of physical and psychological disruption is never finished.

Breakdowns and unexpected activities

Technical failures or unexpected activities were most frequently felt as a disruption by new or unfamiliar users. Users may have been using the software for up to three years, but for various reasons had not gained control or confidence in using it, or had not otherwise progressed. Technical failures are issues that appear, at least on the face of it, to occur because of the nature of the machine, though in some cases this is a displacement attribution. In essence these are problems of difficulty in locating causality. Causality could be an issue in two ways. Failures might be externally attributable technical failures, and the most common of these were that the system might stop all together or grind along very slowly, or it might be impossible to gain access to Blackboard for some putative technical reason. On the other hand, failures to accomplish a Blackboard work task might be described more accurately as a failure of technical mental models. Mental model failures were essentially failures of the imagination, frequently coupled with not enough information, that is, not possessing enough of a picture of the technical workings of Blackboard to be able to make sense of what was happening, even when it worked the way it should.

Stops

Failures might take the form of complete stops: “I couldn’t get in on Friday” (ASM 3), or they might be temporary but regular stops:

> A: It’s never intuitive. And nobody’s around to help you and you’re stuck with this stuff and then sometimes it doesn’t work. Another example of that, I had library links, the first year I was here I put links to the library for all the readings. They fell over on a weekly basis (ASM 15).

This type of failure was experienced as offering no options for moving on with the work in hand, especially by beginners. They had no repertoire to deal with it. Technical failure could be accompanied by a good deal of emotional upset, as in: “See how frustrating it is? See how stupid and frustrating it is? No wonder people get bloody distressed by it” (ASM 2).

As I found when interviewing and at other times, in setting about helping some staff with Blackboard and other mid-range technical online administration, they tended to treat a system failure as a final, non-negotiable blockage. Unless prompted, they would rarely ring the university’s Help-Desk. Generally, their approach to failures was to wait until something happened. They would sometimes get an off-the-cuff report, from another staff member who had also experienced an outage, that the problem was general. Even if they did consider formally contacting technical support, on the occasions I was there, they would frequently ask me to report the fault. This was because they struggled with the language and interpretations necessary to report what had happened. Without a conceptual framework consisting of some kind of model of the functions and attributes of the software and its place in the overall scheme of things, this kind of reporting is quite difficult. Staff confronted with this kind of failure also did not try to experiment with finding a workaround. This, too, contributed to a sense that the technology was non-negotiable. Possibilities such as testing the parameters of the failure by logging in as another staff member, or checking with a workmate to find if the system was working for someone else often did not occur to them. Repertoires that allow a user to test possible alternatives such as these are only developed with experience and expertise. So, often the failures confirmed that the system “didn’t work”.

Slowdowns

The reaction was different when a computer or program failed by grinding along very slowly. Rather than being felt as a collapse of process it was understood more as an interruption. In one example the respondent ASM 2 clicked on a link but instead of reacting to the slowness (which I comment on), he returned to modifying a self-created user manual in which he has written the steps to be followed when using Blackboard to access a course. It appeared he was very used to slow computer behaviour and had developed a routine that accommodated it.

Here, too, causation was problematic. I had found previously when assisting staff that often people were unable to distinguish between a slowdown for which their own computer was responsible and one that was systemic. I had on a number of occasions commented that someone's computer was running slowly, to be met with a response suggesting that the user thought that was normal behaviour. When I investigated further, the culprit was usually a full computer disk. Not only were people unaware that this could occur, they also did not know how to fix it.

However, resignation to slow operation is not the same as failure to notice. My sense is that computer reaction slowness often formed a constant irritating background that amplified other forms of frustration. Thus, using a computer was not pleasant emotionally. The experience dragged on. Moreover, it tended to affirm a sense of lack of competence and control.

Accidental inaction

In the following example, staff member ASM 2 has just attempted to clear an area in order to add new material to it. I had suggested he use "delete".

> **A:** I did it, nothing happened.
>
> **Q:** It should do.
>
> **A:** It didn't.
>
> **Q:** Well just see if you can get rid of the content.
>
> **A:** I tried backspace then, it didn't work.
>
> **Q:** You need to go back to Control Panel, I don't know why backspace did what it did but it got you back out of this. Let's just add a content area. And we'll call it … no, select that and …
>
> **A:** It won't let me delete. (ASM 2)

This sort of failure to follow a command is a challenge because there is, apparently, nothing wrong. The step taken is one that in the past worked, and is, to all intents and purposes the right step to take. The machine fails to make sense. This kind of occurrence appears to users not to have a rational cause. Their manifestation adds to a user sense of not being in control, and not understanding what is happening – classically a sensemaking breakdown.

Technical Mental Model failures

Mental model failures occurred when users found it impossible to work out what the machine should do. The example above is also a mental model failure in that the imagined model of a working computer, which suggested that using the “delete” command actually resulted in a deletion, failed to work. More examples arise from suspicions of unpredictability.

Somewhat paradoxically, another agent of lack of control is one’s own actions because interaction with the computer is understood as unpredictable. In addition to fears about inaction, when action is wanted, as exemplified above, there are fears of action when inaction is wanted. For instance, ASM 8 expressed anxiety that documents that are open but inactive and in another program might still somehow end up displayed in Blackboard to the course participants.

> **A:** Hang on, I’ll just get off something because I don’t want that to go up by accident.
>
> **Q:** No it won’t unless you put it there.
>
> **A:** Okay. (ASM 8)

This is still an experience that the machine has some form of agency, but a more-active agency that might be triggered by one’s own actions. It is a fear of a known action taking place in an unknown space – a black box which might produce any one of a number of results. It is another source of anxiety to think that unwanted documents might suddenly and unexpectedly appear in a public viewing space.

Other types of failures

Vilbergsdottir, Hvannberg & Law (2013) have aggregated other failures of use into a set of values they call “Failure Qualifier values”. These are interface elements that are:

> Missing: When the test participant fails to find something in the user interface that she expected to be present.
>
> Incongruent mental model: When the user interface is unclear because it does not match the test participant's mental model or previous experience.
>
> Irrelevant: When the user interface contains information/objects that do not contribute to system services and are unnecessary.
>
> Wrong: When the test participant notices that something has gone wrong, e.g. an apparent programming bug.
>
> Better way: When the test participant suggests that something in the user interface could have been done differently.

> Overlooked: When the test participant is given a task, but she or he overlooks an entity in the user interface, i.e. the user does not see the existing entity or fails to realise that she/he is supposed to interact with it. (2013, p. 3)

While this list fills out more of the potential problems that might be experienced by users which lead to sensemaking difficulties, it leaves out pure technical failures, such as interface elements or whole machines that stop working. In addition it is premised on a rational user, so problems such as fears of action when inaction is wanted, as discussed above, are not canvassed. Rational users from the perspective of usability studies look for "rational" design faults. Psychosocial reactions such as non-logical fears and projection and personalisation of blame are not included.

Explaining it

While the blame for the failure might rest with the machine in the eyes of the academic, they were only too aware that for students the blame tended to be attributed to the academic running the particular Blackboard course:

> You know I almost have to kind of go to a fool proof kind of a sense about that which actually kind of lowers the level of what you can do with it because something that might work with 50, or if it falls over for you know 10 of those 50 …They go "She stuffed up" you know. (ASM 5)

Academics' consciousness of being judged by the failures of a technology that is largely out of their control or understanding added to the tension and risk associated with using Blackboard. The consequence was a collapse of trust.

> ASM 5
>
> **A:** I don't look at the feature through what is potentially innovative and starting from outside of that. And…
>
> **Q:** So it's not like, "Here's a thing, what can I do with it?"
>
> **A:** No.
>
> **Q:** Yes.
>
> **A:** No, because I don't trust it. I don't you know, and that's the thing. You don't get the opportunity to go here's a thing, what might it be good for in the context of what I'm doing. And the training doesn't necessarily look like it offers you that because it's you know generic. (ASM 5)

In the absence of transparent causal relationships between actions and their consequences in an electronic environment, the alternative is faith that the machine will work. Complete stops and temporary failures undermine the faith in the machine. The very randomness of their occurrence gives rise to uncertainty. Rather than the embodiment of rationality, the technology is experienced as recondite and temperamental, qualities more frequently associated with agency than structure. TSM 17 reported to me an academic, who, contemplating the possibility of losing his entire Blackboard course through a system breakdown, replicated all of it in another type of software, an extreme form of undermined faith. But failures of mental models have the same effect. Where something is supposed to happen but doesn't, the machine proves unreliable, untrustworthy, but this time it is also ambiguous. Attribution of causation had the effect of attaching morality to the failure. This might be moral agency or moral neutrality. Where the machine was determined to be the cause, the failing was more or less treated as morally neutral. However, this changed where a human in the background was deemed rightly or wrongly to be the cause, or the machine itself was anthropomorphised. This tendency to make a moral judgment about a technical failure is dependent on the location of the point of view about the technological system. People are more likely to blame external factors than themselves (See Brown, Stacey & Nandhakumar 2008 p 1040). I have already noted the strength of the deficit model of academic users to be found in the instrumental literature on their failures to take up educational technology. In this literature, the “observer” is outside, and not the user. However, for users themselves, located at the centre of the problem, agentic “blame” sometime lies with their own failure to grasp what is going on, but frequently lies elsewhere. It could be with the complexity of the system (usually treated as morally neutral), or it could be with something agentic “behind” the machine.

Agentic blame

Attributing agency correctly in Blackboard is a major puzzle, as it might occur though machine or human omission, or though machine or human commission and unless the user “knows the system”, this is impossible to guess from experiential evidence gained by using the program. Moreover, there is no form of experimentation the machine alone without also recruiting in some extra source of information that might reveal an answer through interaction. This all the more so as activities, once the province of human action behind the scenes, can be automated over time.

An education developer (TSM 17 – not the webpage developer cited below) described how her job had changed from creating "course shells" to providing access to Blackboard sites, something not yet automated. "Course shells" are containers for the main Blackboard software to deliver courses and Blackboard associated tools such as blogs and wikis. They also contain the lists of students and staff who utilize the courseware (RMIT University & Ebbott 2012).

The recent automations mean that while she did not have to create routine course shells, non-routine courses were still created by her.

> **A:** There's a course scheduled in PeopleSoft, scheduled to run. It will have a site created for it 28 days before the start of when it's scheduled for. And that's an automatic process.
>
> **Q:** What happens if people want it sooner?
>
> **A:** If people want it sooner, we have to create a non-standard dummy shell, which is at a program level. And people can develop in there and then when the real site becomes available we have to export and import into the site.
>
> **Q:** Right. Okay.
>
> **A:** It was a decision that was made, 28 days; we have talked about it because we have had a number of staff in the college who need earlier access for development and things like that. And basically the DLS team said if we can get agreement from central business that we need them created earlier they'll do it but central business are happy with 28 days. So we stuck with 28 days so we have to do the work around.
>
> **Q:** Why does it need to be coordinated across the University?
>
> **A:** Because it is an automated process. And every decision that's made about the DLS and the admin towards being that we need to have agreement from all three colleges. It's just the way they've worked. So that's fine. So that's how we get around that. We create the dummy shell. So that's another thing that I'll do for staff. If they need earlier access I'll create the dummy site. I create program level shells, do things like if they're teaching and two different courses have different codes, but they're the same course but have a different code and they want to use the same materials then we set up the link between the two courses, so that they're pointing to the same Blackboard.

Here it is possible to see how variations on who, or what is "behind" the way Blackboard works is not apparent to users, even when it changes. It is also apparent how automation engenders the need for extensive co-ordination, which itself makes processes take longer and become less flexible, so, more flexible work-arounds are created.

The education developer's job also meant that she was responsible for the technical side of course completion processes that had not been automated, and those initiating processes that had not been automated.

> **A:** And there's a new process too where courses automatically roll over. So it's a clean shell in terms of all the announcements are cleaned out, all the student discussion responses are gone. Grades are gone from the grade book. All previous students are cleared out of the shell. But all your content and stuff remains. So you're not starting with a blank shell every semester. You've got your previous semester's content so you can change all that sort of stuff.
>
> **Q:** If somebody makes a request to leave the other stuff in, that's possible?
>
> **A:** The new method means that academic staff have access to an academic year's worth of previous Blackboards…
>
> **Q:** And that's all of your previous courses, or only for a year?
>
> **A:** Only for an academic year. And then they're archived.
>
> **Q:** Okay. And unarchiving courses, I've never tried archiving or unarchiving.
>
> **A:** In terms of archiving they're basically just left on the server but access to them is switched off.
>
> **Q:** Okay.
>
> **A:** I suppose if you wanted access to them, and I've never had a request to do it…
>
> **Q:** To access it. Yes.
>
> **A:** … but if you wanted access to something from, for example next year if you wanted access to something from 2007 I mean we might be able to, but I think we're supposed to be able to switch it back on.
>
> **Q:** I think people don't, yes. But I think people don't know that's available. I think they think when things are gone they're gone. Yeah.
>
> **A:** Yeah. Yes, the communication hasn't been the best, I don't think, with the new admin system.

Processes such as these mean that the academic now no longer has long-term control of course management and content and is now beginning to feel controlled by the automation or by the education developer or by some other level of IT administration. But low levels of organizational communication combined with low levels of information at the program interface and to indicate how the system is managed mean that academic staff cannot know who or what is changing things and whether changes are permanent or reversible, or indeed in any case, whether “work arounds” are possible. Only with enough knowledge of the possible can an academic request process flexibility.

A consequence of not knowing the cause of Blackboard action is logical inexplicability. Here is ASM 8 looking for a course she teaches.

A: There should be other courses like “(name of course)”.

Q: Yeah but if you haven’t been put into them you won’t appear.

A: Yes but I teach them.

In this example, not technically an example of something going wrong, but of something going right, the system appears non logical and “blame” is unattributable. It fails to make sense.

External attribution of blame

One way to make sense of an incomprehensible system is to externalise the responsibility. While this can be understood as “attributional egotism”, the “tendency to attribute favourable outcomes to the self and unfavourable outcomes to external factors” (Brown, Stacey & Nandhakumar 2008, p. 1040) it is also a sensemaking adjustment. Others’ modus operandi and motives are never entirely clear, or are usually less clear to oneself than one’s own modus and motives. It makes sense to shift attribution for the nonsensical to a location that is inherently mysterious.

Interviewees quite frequently talked about “they”. “They” are an unspecified target, responsible for how Blackboard works. “They” could variously and simultaneously be the University, the management group responsible for administration of Blackboard, the original designers or the machine itself, or some combination thereof. The point was not to directly attribute causal blame but to externalise the source of frustration. This was rarely expressed as an explicit theory of agency but showed up in agency-attributing, “it does this” statements about unexplained machine behaviour.

One staff member, (ASM 2) did make one remark which attributed a form of personality or agency directly to a “them”. He felt that the possible multiple functions of Blackboard were largely inaccessible as even using basic functions was frustrating. He hypothesized that this made it unlikely that anyone would go on to use other functions, equally useful but unused, because user academics had already exhausted their capacity to deal with complexity:

> **A:** You see the thing is, in your comments about the navigation and whatever is not clear, well these are only, these are only snapshot in time comments. Because the next one the navigation might be more complicated or less complicated. My bet is it will be more complicated. Or the next one it might be less complicated, and the one after that it might be more complicated. These are ephemera in my view. These are not deserving...
>
> **Q:** They are reflective of a mindset; they are reflective of a particular approach to usability design?
>
> **A:** Well... they might be reflective even of the approach of a particular person, but what is more important ... you are talking about cultural interaction between different cultures. And what **they** are not doing is being culturally sensitive. If we went to another community and were not culturally sensitive, we'd be in real trouble.

"They" were also invoked if an academic found that at the beginning of a new semester when he or she went to check on a course, that things had been changed. The software may have been upgraded, renewing their uncertainty of how to manoeuvre around, or the course content may have been removed in ways that were not anticipated. All together the capacity of "they" to intervene had several consequences. The space was no longer understood to be a privately controlled workspace, thus ownership of the material and the site was not experienced as personal but as, somehow, more distant and organizationally owned than the materials and design of face-to-face teaching. Second, it was experienced as an unstable, unpredictable space in which many things happened spontaneously and were out of the control of the academic concerned. Uncertain expectations and unclear attribution of cause came about through experiencing the whole system of Blackboard and its design and support as a "black box". "They" invokes autonomy of Blackboard as a technology, which is not present in more tangible technologies where mechanisms can be seen and potentially understood.

Coping with it

In addition to the automaticity arrived at by mastery of somatic skills, mastery of meaning can be processed automatically, as when it is captured by meaningful metaphors. While Dørum and Garland (2011) note there is little research which analyses the cognitive principles that make a metaphor effective in interface design, they do also note that it is individual familiarity and repetition that make metaphor work for users of educational software. As they say:

> [R]ather than being associated necessarily with the specific nature of the information or

> its presentation, these types of metaphors are developed from repeated encounters with the target domain, providing a generic and frequently implicit framework for interaction. Metaphors like these are based on perceptual patterns that emerge during sensorimotor activity as we manipulate objects, seeking spatial and temporal orientation. (p. 130)

Automaticity is enhanced by metaphoric spatiality and congruity with the meaning intended to be signified, which in concert with the embodied reference points of metaphor (Lakoff & Johnson 1980) makes this kind of skill more similar to the skill of the procedural knowledge used for navigation than might at first be apparent.

By far the commonest approaches to coping, especially with the obduracy of the material or apparently material world, are the development of fudges and workarounds. These are products of innovative improvisation. Breakdown and error are more or less permanent features of complex systems but can also be thought of as the source of inspiration and innovation (see Graham & Thrift 2007; Perrow 1999; Weick 1998). However, as Graham and Thrift argue, while improvisation allows the work of maintenance and repair to go on, “the quality of improvisation is key, since fault-finding and repair is a process of ongoing, situated inquiry” (Graham & Thrift 2007, p. 4). But this knowledge of fudges and workarounds is hidden knowledge, “the way in which maintenance and repair is officially represented in most bureaucracies as subordinate hides this work from view, for example, in worksheets that cannot acknowledge this knowledge” (p. 4). Hidden improvisations and attributions of meaning may become available for social transactions by being realised as arguments (Geiger 2009, pp. 136–138; Weick 1995, p. 135), or as expectations (Weick 1995, p. 145) but in both cases facilitative settings such as meetings or other communicative occasions must be available and focused on the issues.

Finally, the informational and social connectivity field in which navigational and interpretive skills must be developed differs considerably in the confines of an LMS, from the spread of information and sociality that presents itself in either the “real” social world or even the virtual world of the Internet as a whole. Visibility and sharing of process when negotiating design and orienting to information are much more difficult when working inside an LMS. Savolainen (2009) identifies two contexts of information seeking which have in common concepts of spatiality and sociality, albeit in ways which are rendered differently. The first is “small worlds” and the second, “information grounds”. For Savolainen, both may be found in the physical world but also in virtual worlds of social media and communication; however, I suggest that Savolainen's dual concept can be extended to describe the information architectural context of any virtual domain.

For Savolainen the term "small worlds" describes small-scale communities where the world view of participants is bounded by the limits of that community and constrained to concerns and priorities that are very much local within it. In a physical small world, "location determines those everyday things that require significant concentration and those that require no concentration at all" (p. 40). This translates to online communities. If movement of individuals is easier, each community maintains relatively stable boundaries – "each virtual community places itself within text-based, small-world boundaries of its own design" (p. 40). "Information fields" by contrast are more informationally open contexts. Movement is less constrained in both physical and virtual settings. "information grounds are thus associated with something positive, inviting, attractive, free, and not constraining" (p. 41). Moreover, they occur over a number of locales whether physical or virtual. In sum, while both concepts describe networks of sociality in information seeking, small worlds are closed, self-referential locality-bound networks, whereas information fields, while also determined by sociality and social connections, are "places of information seeking and sharing" (p. 41), but ones where the meaning of the locale itself is less significant in constructing or bounding the form of information seeking.

These two concepts, if abstracted from Savolainen's application to specifically social communication settings may be adapted to describing differences in information behaviour and sociality in digital settings not designed or designated as social media. The implications for practice-theory in the passing on of digital coping practices in Blackboard are that some of the layers of disruption in the use of Blackboard that I have identified at the outset of this chapter may provide more access for social information seeking and sharing behaviours than others. Specifically, those layers that I characterised as "technical disruption" (breakdown or slowdown of material infrastructure) and the need to learn how to "read" navigational and interface cues are forms of situated experience corresponding to "concrete contextual knowledge", using Laurillard's distinction between the two epistemic practices of academia, abstract-generalist, versus concrete-contextual knowledge. The other two layers of disruption, to educational practice and to organisational and "technical system" support structures engage, by contrast, more abstract generalist knowledge.

When the products and performances of online educational technology arising from alteration to the more abstract practices of "education" and "organisation" are visible and socially accessible, they form information fields, while the skills and processes which technical breakdowns and the navigational and interface reading of Blackboard call upon – situated skills are, for all intents and purposes, small worlds, inaccessible to others and pertaining to locally defined priorities and problems. Social change and the passing on of knowledge, especially the change entailed in technology use is, therefore, far more constrained by inaccessible, situated small world practice than by the more open information field practice. Moreover, from the perspective of practice-theory as a whole, skill and process practices are themselves constrained from transfer by their situatedness. This does not allow for their easy abstraction and generalisation and, hence, makes them only transferable as singular anecdotes. The necessary skills and processes for managing those situated aspects of educational technology – quasi-material infrastructure and navigation and interface meaning – are trapped by software design in general, in a kind of practice *cul de sac*, unavailable for passing on as "lessons", leaving the impression that technology is deterministic, since the majority of resources and strategies for understanding how to use it are local and contained within it, and insights and practices about use are not, perforce, of situated locality, or public.

Conclusion: Interfaces and navigation

The breaks, interruptions, misunderstandings and disorientations which arise from faults in material and quasi material infrastructure or from absence of navigational cues and sense, or from misconstrued interface symbolism and metaphor disrupt the situated world of academic work. That this world retains the concrete and tangible immediacies of the physical world is captured in Thrift's (2005) concept of screens presenting a new sensorium. A sensorium covers and conceals the working of a black boxed computer and its technical infrastructure. Instead of having to understand "how it works" technically, it presents a simulacrum of "workings" only some of which emulates the workings concealed. A screen sensorium also calls forth in the user schemas and epistemic processes based on spatiality, tangibility and situated locality, Laurillard's (2002) "concrete-contextual knowledge", an epistemology based in sensorimotor manipulative and navigational skill.

The "flow" of academic work is dependent on both systems, the computer system supporting the sensorium of the computer screen and the skill set needed to use it. Both should be "ready to hand” in Heidegger’s sense of unconscious working. It is the rising to consciousness of one or other of these systems interrupting workflow that is experienced as “not working”.

However, a second significant property of material and quasi material infrastructure and of the sensorium of navigation and interfaces is that these systems are hidden or private. The workings of computers are deliberately cloaked and unavailable both technologically and administratively. System infrastructure is deliberately removed from manipulation and made the domain of experts. It is in its raw empirical form, unavailable to users. Sensorium dependent workflows are also largely private. They consist in steps worked out by particular people as responses to “situated” problems, the responses derived from an array of resources and instructions cobbled together in idiosyncratic bundles of actions aimed at making things work. They are hard to watch unless the observer is present and all the time looking over the shoulder of the user, and they are hard to record as a process unless, for instance, deliberate capture technology such as cameras and keystroke capture devices are set up.

Yet, the literature of “use” is suffused with the idea of technological adoption and diffusion being based on social connection. Ziamou,Gould &Venkatesh’s (2012) study of the adoption of new interface designs draws attention to Rogers’ diffusion of innovations theory with respect to the integral nature of the notion of social influence as part of the theory. I have previously remarked on the influence that Roger’s theory has had on the idea of use both directly and in inspiring similar theories of use. Ziamou, et al., highlight “how external social influence (e.g., expert opinions, media) and interpersonal social influence (e.g., word of mouth) affect adoption” (p. 218). But they add that “social learning” is also likely to be linked to technological acceptance and adoption. “This conceptualization comes from the idea that people learn about a given object by observing other people acting on the object” (p. 218). The same assumption underlies “situated learning” (Lave & Wenger 1991), or the idea that people acquire new knowledge and skills in concrete situations on the job, by working and interacting in close proximity with fellow workers. Also implied in both is the idea of incidental or informal learning that takes place as the need arises (Eraut 2007; Marsick & Watkins 2001). This is itself predicated on a premise of opportunities to observe being afforded by the two kinds of access previously described – social access (ie., assuming the act of work activity is visible to others as it is carried out, and it is acceptable to view it) and technological access (assuming the technological and infrastructure means by which it is done is not shut away from observation).

It is precisely the capacity to observe that is precluded in technical and material infrastructure, leading to an inability to deal with breakdowns, while difficulty of observation of others' strategies and solutions also means that disorientation in interface navigation and misinterpretations of the metaphors of interfaces cannot easily be remedied by the passing on of practice. it is clear that given the "closed" and "ready to hand" unconscious nature of much pertaining to physical and screen technology, "social connection" is an insufficient mechanism for either accounting for, or actually promoting use.

Turning again to the three theoretical perspectives used to provide illumination in this thesis, it appears that sensemaking theory is better equipped to discuss the "small world" systems entailed in negotiating the physical and spatial but inaccessible aspects of Blackboard as met by "ready-to-hand" but unarticulated sensorimotor skills, especially when one or the other breaks down. Practice-theory understands society as an ensemble of social relations, and depends on the social recognition of a way of ordering to stabilise patterns of behaviour into formations and assemblages and on social connections to pass them on. For practice theorists, practices must be interconnected with one another, and social reproduction distinguishes practice from actions (Corradi, Gherardi & Verzelloni 2010). Practice-theory shares with the social construction of technology (Bijker 1987), a commitment to placing the social in a central position to account for technology use. In this respect it is also ill-equipped to provide an account of socially closed, skill based, situated systems and their relationship to technology use. Farias (2013,) mounts an argument that actor-network theory cannot deal with the "virtual", by which he means not virtual technology but non material or non-corporeal phenomena such as affect or sense. As he puts it: "ANT battles one asymmetric understanding of the social, which assumes the ontological priority of the virtual with yet another asymmetry, which does not just give priority to the actual but also denies the virtual" (p. 6). ANT concentrates on the assemblage of (realised) actor-networks. Moreover, it concentrates on descriptions of networks rather than explanations of how they occur (Fox 2005, p. 102; Law 2009, p. 141). The upshot of this is that it cannot account for how differentiations emerge from actual associations. For Farias these are macro differentiations such as political, economic, religious, touristic or legal qualities. However, the inability to see or account for differentiations also applies to micro associations and micro-practices. Because artefacts and the people who use them are synthesised into an "assemblage", practices "emerge" and these are unavailable for differentiation and explanation. Sensemaking theory can deal with such closed systems because it deals with micro-processes as its foundation. It also sets out to describe instances of non communication and non organisation where social relations are not adequately formed and their effects when neither technical systems nor appropriate responses are “to hand” (Weick 1993).

If skills and processes may be largely closed to the easy passing on of practice, the products and performances to which they give rise are much more readily observable and open. These are practices which constitute the production and performance of “education” and the (social) organisational and disciplinary infrastructure that supports and shapes it as well as responding to it. These correspond more readily to Savolainen’s (2009) description of an “information ground” in that they are open to information seeking and sharing and are less dependent on locales. They are not as deeply embedded in the materiality or quasi materiality that constrains technological infrastructure, navigation and interface comprehension. The visibility of technological products and performances and the necessity of social and communicative relations to produce and support them ensures that a great deal of literature is devoted to their analysis and assessment while very little is devoted to the small world of embodied and material technological experience. Production and performance are also more open to illumination by both practice-theory and by actor-network theory since both eschew cognitivism for an understanding of knowledge and learning as something people do together.

Practice-theory tends towards a continuity approach that has difficulty countenancing the idea of meaning collapse. In the next chapter I want to I want to locate collapses of meaning and show how variant collapses occur. Having explored common antecedent practices generically above, Chapter Eight shows their specificities and what happens to them under pressure. I explore instances of collapse and differentiate types of collapse to show their consequences for my research cohort of academics using Blackboard.

CHAPTER EIGHT: MAKING SENSE OF IT ALL

> If philosophy begins with astonishment, then the origin and ordering – of all Heidegger's thought was the wonder of all wonders: that things make sense. (Sheehan 2011, p.1)

If I am to summarise my key insight it is this: Blackboard can be read as a number of layers, each requiring a differential response and mastery. It is a collection of tools and mechanisms, a set of spatial and symbolic designs and it is also a medium for cultural practice and production. The last is what Murray (2011) calls the "representational" dimension of digital technology (p. 47). This representational layer requires a completely different strategy of coping, involving negotiation *and* cultural adaptation. For Murray the representational dimension is at once diffuse, partly created by cultural tradition and yet open to an ongoing process in which we negotiate meaning with one another:

> We understand what words mean not because the meanings are fixed or absolute, but because we draw on shared contexts and associations to interpret them. (p. 47)

Just as the representational layer allows for (re)production, it also becomes a means of expression. My purpose in arguing that we understand a computer to be a medium of expression (as a screen affords representation and interaction) is because "expression" opens up a wide field of creativity. The link that Heidegger (1977) made between manipulating a technology to produce something, "mediating and striving, shaping and working, entreating and thanking" (pp. 18–19) and creating new forms of order is that the process, "challenges him to approach nature as an object of research". So, he concludes: "That challenging gathers man into ordering" (pp. 18–19). So it is that self-expression when engaged in building and producing the new forms of education occasioned by the representations of educational technology may call forth new social orders. In this way we understand that Blackboard provides an opportunity for a practice, in this case academic practice to change, a process involving a "breaking down" and a "reordering". It is the elucidation of these propositions that is the purpose of this chapter.

The breakdown of sense

The breakdown of sense that the introduction of Blackboard as a new way to conduct teaching occasions is substantially different from the breakdowns of sense relating to skills, processes and workflows when there is a breakdown in technological infrastructure, navigation and interface comprehension. A breakdown of sense has several manifestations, one type of which occurs as unexpected events. Weick has identified three forms of unexpected events that disrupt practice as normal (Weick & Sutcliffe 2007, pp. 27–31 see also ; Weick 1995, pp. 145–154). The first of these is, "when an event that was expected to happen fails to occur" (Weick & Sutcliffe 2007, p. 27). This was the case when ASM 2 tried to log in and it failed and he expressed his frustration, or again as he tried to delete something and it didn't work; his expectations were that something that had worked before would continue working next time. There is apparently nothing wrong, but a routine which was perfectly functional in one instance inexplicably fails in another. In Blackboard there is no point of reference to a source of reinterpretation; users must seek their own. One strategy is to repeat the failed activity or routine a second time to see if it then works. Frequently this is successful within a computerized environment. However, there is no cue or feedback to say why it might have failed initially and why it worked after a second attempt. A second strategy is to try something new – to go back to the point of origin and repeat all the steps or to find an alternative pathway (of which most programs offer a few) to achieve the same objective. These loops of self-generated testing behaviour themselves depend on some measure of familiarity with how a computer is likely to behave when it fails, even if they do not carry an explanation. Self-generated testing under conditions of failure without reference to expert knowledge or visible internal (computer) actions is also likely to produce personal explanations of convenience which are either wrong or significantly oversimplified, however.

As isolated by Weick & Sutcliffe (2007), a second form of the unexpected is, "when an event that was not expected to happen does happen" (p. 27). The technical system supporting Blackboard has the potential to cause massive, non-negotiable interruptions to workflow, if it ceases to operate; more than this, it is the "means of production" and if it stops working the whole of work in that mode of production also stops. So, keeping on working is not just a matter of moving to a different task, it means moving to a different task in a different mode of production. Depending on the failure, this could mean moving to different software, a different computer or a different medium, such as pen and paper; network outages and hardware breakdowns are potentially catastrophic disruptions.

However, it is Weick's third form of failure of sensemaking that is germane to understanding the collapse of, or break to the idea of education instanced by the introduction of Blackboard. Weick's third form of failure arises when something that was never imagined to be possible occurs. The introduction of Blackboard is a case of this, both in whole and in part. Blackboard technology upgrades and tweaks or changes to its online context have the same effect, introducing a whole new way to think about an approach or to execute a task, which was outside of previous imagination. This type of comprehension failure is very close to Heidegger's "deworlding". In Dreyfus's (2001) exegesis of Heidegger, he explains the concept thus: "Occurrent beings are not only revealed in breakdown but also revealed when we take a detached attitude towards things that decontextualizes, or in Heidegger's terms – deworlds them" (2001, pp.153–154).

The very idea of replacing face-to-face teaching with online learning is, as an initial idea, more or less unthinkable. So many of the properties associated with teaching are also associated with close personal proximity. The warm affirmation of a correct or useful response, the detection of conceptual struggles, the design of lessons just beyond the current capabilities of the learner, the spotting of incidental learning opportunities, or as ASM 15 emphasized, the role of emotional intelligence in mentoring personal change – these all appear to be beyond automation, and as if they ought to remain dependent on the physical and psychological presence of the teacher.

The "unthinkable" aspect of using Blackboard, the one which breaks meaning at a macro level, is the replacement of a personal, proximate form of teaching with a form of instruction dislocated in time and space and from personal and performative intervention. Brent (2005) notes that this performative quality of teaching, "this phenomenal persistence of the performative" that requires the presence of a person has resisted being subsumed to "500 years of technologies that could in principle have replaced it with textualization" (2005, para 14 unpaginated HTML). Only with the advent of the learning-management system did new technologies offer substitution instead of offering a new form of support and supplementation. As a result, the combined effects of automating teaching, previously understood to be intimately dependent on a face-to-face relationship, and automating its effects on institutions and education as a whole, require very large adjustments to the framing of what higher education is "about".

The proposition that meaning can collapse is not a self-evident idea, particularly to those who emphasise the continuity of practice, such as Giddens or Bourdieu. As an example of this kind of thinking, Elizabeth Shove's work on the importance of understanding practice-theory for policy building draws on the work of Giddens, Schatzki and Reckwitz and demonstrates a continuity approach to the conception of social practice. In the work of Shove, Pantzar & Watson (2012) the authors understand practices as complex connected entities of which practitioners are carriers and change to be the cumulative effect of modifications to practices - performances reconfigured. As might be anticipated given their relatively static account of social change, their attention is on mapping these configurations and on showing changes over time with a view to finding how they might occur. The analysis that results is descriptive of linked actions. Their's is primarily an action-oriented rendering of practices, in Schatzki's (2001) words, "the actions that compose a practice are either bodily doings and sayings or actions that these doings and sayings constitute" (p. 55). As with other practice, theoretic approaches Shove et al.'s (2012) concern is with avoiding the methodological individualism inherent in the 'behaviour management' approach to policy change; collective change is given precedence over individual behavioural alteration in their analysis, but the effect of resorting to description is to eliminate explanation, especially social cognitive explanations. Meaning collapse, possibly because it is too close to "culturalist mentalism" (2012, p 6, drawing on Reckwitz, 202, p 244) is not considered part of the dynamics of social change. Rather, social change is explained more as an evolution, a continuous modification of collective activity. In this respect, Shove et al.'s approach is an exemplar of the application of practice-theory as a continuity approach to contemporary social and environmental problems.

Both practice-theory and sensemaking theory and to a lesser extent, actor-network theory share an indebtedness to the American pragmatic tradition. A pragmatic theory of action includes attention to both habits and to the problem solving which occurs when things no longer make sense. Gross (2009) outlines the dynamic between the two. He maintains that;

> [T]he main way humans solve problems, the pragmatists held, is by enacting habits – those learned through social experience or from previous individual efforts at problem solving. (p. 366)

But this technique, while predominant, does not work on all occasions. Sometimes habits fail to produce ongoing action, and the actor is left with no repertoire of alternative habitual actions to turn to. Gross continues:

> Only when pre-existing habits fail to solve a problem at hand does an action-situation

> rise to the forefront of consciousness as problematic. Then, the pragmatists argued, humankind's innate capacity for creativity comes into play as actors dream up possible solutions, later integrating some of these into their stocks of habit for use on subsequent occasions. (p. 366)

Here Gross makes an elegant and concise summary of pragmatic theory. In a few words, he outlines a comprehensive pragmatic theory of change. It is not of itself new, but it is a clear mechanism of change. But neither is it detailed, especially with regard to the accelerated change of social action concerned with technology. Remaining to be explored especially with reference to the use of technology, are the questions of the kind of circumstances causing a collapse of meaning; and in the effort to rebuild, the sorts of conditions causing people to give up, and how, if they do not abandon their project, they make progress?

Academic experience of meaning collapse in a technological context

Because of this degree of technological change and accompanying organisational change, the general consequence of encountering Blackboard was to experience many kinds of disruption stemming from different sources – all are facets of working with technology. A first source of disruption was the behaviour of the technology itself. Breakdowns and unexpected activities by the software and technical side of Blackboard and its supports, which can be conceived as a quasi-material infrastructure, were one kind. Anticipating (rightly or wrongly) technological behaviour that did not occur was another. A second source of disruption lay in learning to use the technology, more or less in the sense of reading it: To both navigate around the required sites, and carry out tasks and to distinguish one thing from another at the interface; to un-plait terminological confusion; and to separate one type of technology from another. My interviewees experienced an example of the latter – separating the establishment of a web presence for the course guide from the learning-management system itself, especially where processes were entirely "back room" and automated, like the loading of completed website course guides into Blackboard shells. A third source of disruption is the intrinsic disruption of the introduction of a new way to do an old thing – education. The introduction of new technology, whether wholly, as for teachers first moving from face-to-face to online teaching, or in part, as an upgrade or tweak to existing technology, requires the development of new practices, even for those who are experienced in the old forms of Blackboard. This disruption flowed over from challenges to teaching practice to challenges to identity. A fourth source of disruption was to the organisation of the University – “the technical system” – the interconnected machines, equipment and methods, plus internal knowledge and design (Weick 1990, p. 4) that add up to the organisational support system necessary to make technology work. The disruption was caused by the introduction of policy changes concerning the development of online learning sites by the University. These also might have been rightly or wrongly interpreted, but they had the same effect, that is of pressuring academic staff to change practices. They also had the effect of introducing (or highlighting) ambiguities and conflicts of meaning about Blackboard and its purpose, between the University management and academic teaching staff.

These disruptions can be considered through the lens of Laurillard’s (2002) dual epistemology approach, as outlined in Chapter six. The first two types of disruption can be considered disruptions to situated experience. They are the immediate intrusions into the habits of workflow encountered in using the technology itself. The third and fourth disruptions have a more abstract quality. They reflect changes to ideas of the self, of work and of organisation, and of organisational systems. All four add up to separable but interlinked epistemic processes that are a necessary foundation for use of educational technology.

Weick (1990)has argued that:

> New technologies are basically dual rather than singular. They involve the self contained, invisible material process that is actually unfolding, as well as the equally self contained equally invisible imagined process that is mentally unfolding in the mind of an individual or team. There are relatively few points at which the mental representation can be checked against and corrected by the actual process. (p. 16)

This is the source of the meaning gap or epistemological break that prevents the continuous unfolding of practice. As thinking about the new technology becomes elaborated and abstracted, it separates sufficiently from any empirical reference point so that the two systems can evolve independently of each other. They become “decoupled”, in Weick’s words. The imagined technical process becomes, “a new technical system that is understood neither by the operator nor by the devices for self control originally designed into the material technology. The human construction is itself an intact and plausible view” (p. 16).

The apportioning of blame, an effective attribution of agency to the machine by academics as noted above derives from the imagined systems of how an otherwise invisible technology works. However, while Weick had in mind an erroneous technical schemata, evolving from an invisible machine process, here academics anthropomorphise machine mechanisms as a matter of agentic, malign design, and in great part because it is impossible to tell which part of intertwined machine and human design and action is 'behind' the problem.

Weick's distinction between empirical and abstract knowledge systems is very like Laurillard's distinction between situated (contextualised) knowledge and abstract (mediated or mediatable) knowledge. The difference is that for Laurillard, the two forms of knowledge necessarily remain linked and inform each other as a precondition to making sense, or to "education". She worries about abstraction corrupting the process of transmission. Weick, on the other hand is concerned that the abstraction itself reflects nothing that is situated within the computer.

The creation of a series of abstractions, ever more divorced from reality is an attempt to solve the initial problem: A break of any sort, whether from computer hardware breaking down, being unable to log-in to a program, or the action of "delete" not working are all interruptions to both task and meaning. At the most basic, an interruption of this sort takes attention away from the flow of the task and switches it to the mechanisms of its accomplishment. At a more profound level this is an interruption to meaning.

Sensemaking is often initiated by negative affect or, in plain language, feeling uncomfortable or anxious. The feelings accompanying technology adoption are frequently left silent in analysis of technology, or when spoken of are treated as epiphenomenal. (For instance, much "technology acceptance model" literature is of this sort, mentioning "motivation" but not discussing its quality.) Proulx and Inzlicht (2012) argue for their centrality. In the right circumstances feelings of disruption are the first step to sensemaking. Under the wrong circumstances they paralyse action, or where self efficacy is under threat, anxiety is turned outward onto other people or things in a deflection strategy, (e.g., Phelps & Ellis 2002) for example, the mysterious "they" who are responsible for technological systems. The importance of affect to sensemaking lies in its centrality to meaning making, for as Proulx and Inzlicht (2012) define meaning: "At its core, meaning is the expected relationships that allow us to make sense of our experiences", but "when these expectations are violated by experiences that do not cohere with prior relations, we feel something"(p. 317). This "something" has been identified by many authors prior to Weick or Proulx and Inzlicht.

It has been called “disequilibrium” by Piaget (1937/1954), “dissonance” by Festinger (1957), “uncertainty” by Van den Bos (2001), a “feeling of absurdity” by Camus (1942/2004), “anxiety” by Kuhn (1962/1996), and “uncanniness” by Freud (1919/1990), (Proulx & Inzlicht 2012, p.317). So many have described this negative fracturing experience that Proulx and Inzlicht understand it to be “a core psychological motivation” (p. 317) that accompanies meaning violations. Their theory of resolution of this emotionally motivated sensemaking experience is, “all experiences that violate expected relations 1) evoke a common, biologically based syndrome of aversive arousal, which in turn 2) motivates fluid compensation efforts to relieve this arousal 3) where the meaning frameworks recruited in these efforts may share no content whatsoever with the violated relations” (p. 317). But those frameworks are aimed towards maintaining expected meaning relationships, otherwise referred to as “schema (Bartlett, 1932), schemata (Piaget, 1937/1954), paradigm (Bruner & Postman, 1949), prototype (Rosch, 1973), script (Nelson, 1981), narrative (McAdams, 1997), assumptive world (Janoff-Bulman, 1991) or worldview (Thompson & Janigan, 1988), among many others” (p. 317).

Sewell (1992, p. 10) and Swidler (2001, p. 79) suggest that practices consist of two main components, schemas and resources. Without schemas, resources are a collection of things, unidentified as having uses or meanings, but without resources, schemas remain unpractised; not enacted. Both writers also subscribe to the view that some schemas are “deep” structural schemas, which, in Sewell’s words,

> are also pervasive in the sense that they are present in a relatively wide range of institutional spheres, practices, and discourses. They also tend to be relatively unconscious in that they are taken-for-granted mental assumptions or modes of procedure that actors normally apply without being aware that they are applying them. (Sewell 1992, p. 22)

In this rendering of practice Sewell suggests that the empirical and the schematic worlds are separate but contingent. Schemas are portable meaning systems, applicable to a wide variety of circumstances as these are encountered. Schemas have explanatory power when the technological processes under discussion resemble the empirical world, as they do with technical breakdowns. However, the further we progress into the mediated constructions that technology is used for, the more greatly schemas are challenged by competing abstractions.

On coping and rebuilding: Recovering technology 'at hand'.

One difference between coping with technological breakdowns, or navigational and interface interpretation, and coping with producing electronic "education" is that the former attributes of electronic technologies are produced elsewhere in the system – by someone or something else. Education, on the other hand is a product of the teacher's professional identity and practice. A second difference between these architectural elements and online education is that the representation of education to be found on screen is "worlded" by becoming a virtual object in its own right, but it is also one that it is actively produced by the user. It is the "goal" of the software that it is used to produce "education", not merely to "represent" it statically. But because education is a production, and moreover, a production of and by the self, and not simply a reaction to something happening, the mechanisms of coping with the breaks and reconstructing sense invoked by trying to produce electronic education are distinct from those of trying to use an electronic system as a tool. Production of education makes a computer a cultural space, a place with its own virtual volume, upon which can be projected values and beliefs, actions and behaviours.

Breakdowns and malfunctions of material and quasi-material infrastructure are both unexpected and continually occurring as infrastructures are constantly modified and upgraded. They have the quality of Perrow's (1999) "normal accidents". They arise from systems and infrastructures of high complexity that are also "tightly coupled"; all parts are closely dependent on the simultaneous working of connected parts. But the consequence of normal accidents is incomprehension (Perrow 1999, p. 9; Weick 1995, p. 87). Perrow's solutions to "living with high risk systems" are projections; we could close systems down, attempt comprehensive modification or look for systems which required only modest improvement. Here he addresses normative solutions to systems problems, rather than asking about the rebuilding people do in the face of breakdowns.

Incomprehension appears to engender two common reactions: People stop using the technology or system – non use – or people turn to compensation (or coping) to deal with it. Rebuilding in the face of technical breakdowns of material infrastructure either does not occur or is poorly or marginally executed. Failing to cope with technological collapses and frustration with technology often turns into non use (e.g., Klein, Moon & Picard 2002). However, this type of non use is completely different from the type of non use postulated in the "instrumental" literature reviewed in Chapter One. Much of that literature posited that non use was a failure of knowledge transfer of some kind: By simple lack of knowledge, as in information literacy approaches; by being of the wrong demographic to absorb digital knowledge, as in digital immigrant theories; by personal resistance or rejection of technology as diffusion of innovation theory suggests; or by failing to understand pedagogy in digital environments, as a number of teaching oriented critiques have put forward. Moreover, it is not a matter of a “social group” rejecting a particular form of technology as Bijker’s SCOT theory suggests. Rather, it arises from the fact that the information and knowledge needed to repair and maintain physical and quasi material computer infrastructure is both “buried” – the province of experts and technical specialists, and designed to be buried.

I mentioned in Chapter Five, that the great change that allowed computers to become ubiquitous arose from the tests of usability with children, which resulted in the insight that people did not need to know how computers worked in order to use them. While this breakthrough clearly had a monumental impact on improving usability, it was at the cost of removing all options for personal redress when the computer or its infrastructure broke down. The problem was removed from the domain of personal responsibility and knowledge and placed in the domain of (arcane) technical expertise belonging to specialists. From the perspective of the user, it can be understood as a deliberately closed epistemic process. The result of such a closed process as I have noted in relation to interviewees and others’ reactions to complete stops of the system was that these stops also became instructor stops. People treated the system as non-negotiable. This termination of work was accompanied by strong emotional reactions such as “frustration”. This is precisely the outcome noted by Festinger in his theory of cognitive dissonance (Festinger 1962). When something that is necessary for the work that defines occupation should be working and stops working, and, moreover, the means of compensation are not available, this can be understood as inducing extreme cognitive dissonance. The reaction to cognitive dissonance is “aversive arousal” (Festinger 1962; Proulx, et al., 2012). Aversive arousal means that in attempting to avoid the occurrence of dissonance, people try to avoid making decisions “or even become incapable of making decisions” (Festinger 1962, p. 269). So it’s possible to conclude that faced with a sudden violation of expectations when a process or technical systems stops and a remedy is buried in a deliberately closed epistemic process, teachers become incapable of making decisions about how to proceed; instead they turn away from using the technology all together either temporarily, or given enough provocative experiences, permanently.

Compensation

A second effect of breakdowns of material or quasi material infrastructure is compensation. Compensation efforts are aimed at trying to maintain control and according to Proulx et al., (2012), most commonly entail some kind of "ego defense" where self esteem and identity have been threatened. This may explain the invocations of "they" as the people to blame by interviewees and others whom I have helped with computer problems. Sometimes a level of discomfort with computer interactions may be helpful. If transitory, discomforting events increase alertness and receptivity to new perspectives (Benford, Greenhalgh, Giannachi, Walker, Marshall & Rodden 2013). Violation of expectations for a positive outcome has to take place at just the right level as occurs with well composed music, which creates (limited) dissonance and follows with resolution (Levitin 2007). While planning for learning "use" during breakdowns is difficult, there may be some potential for utilising the discomfort of violated expectations as a teaching opportunity for dealing with ongoing interruptions to computer or software use. Compensation is more likely if the breakdown is not terminal. Slowdowns and unexpected occurrences of the kind noted above are interruptions rather than complete breakdowns and, so, are inherently more repairable.

The difference between helpful and hindering reactions to interruptions lies in the intensity of the breakdown and the kinds of coping mechanisms to which the experiencer has access. Weick (2001d) identifies two possible consequences from an interruption:

> The autonomic activity triggered by an interruption focuses attention on two things, both of which consume considerable information processing capacity. Attention is focussed on the interruption event, and if is not altered, on the internal autonomic activation (the internal systems which arouse stress) itself. When autonomic arousal consumes scarce information processing capacity this reduces the number of cues that can be processed from the activity that was underway at the time of the interruption. (p. 131)

As a consequence, argues Weick, people fall back on well-rehearsed habits: What " they learned first and most fully" (2001d, p.130). Furthermore: "[t]he more general implication of the disruptive effects of regression is that more recently learned complex rationales and complex collective responses are all more vulnerable to disruption than are older, simpler, more overlearned cultural and individual responses" (2001d, p.130). For instructors trying to master educational technology, the "simpler" and "more overlearned" system is face-to-face teaching, which not only seems more desirable in the face of breakdowns and interruptions to technology, but is also the strategy drawn on at minimum by analogy, but sometimes in fact, to cope with technological problems when the technology is more or less ”working”.

Why "genres of use" are useful

A final adaptive reaction concerns building up "genres of use". The idea that technological use can be broken into uses which resemble genres can help us to look behind the oft levelled complaint about academic educators using Blackboard – that they are unimaginatively reproducing forms that predate the introduction of course management systems and are doing so with no attention to pedagogy. First, the forms they generate in Blackboard can be compared with other historical genre generating moments as metaphors. Second, the idea of genres is itself a metaphorical expression of a mechanism of cultural change.

The simple uses academics make of Blackboard, to reproduce lecture notes, to store texts and to sometimes using it to communicate with students has been considered a puzzle. This is the more so given the extent to which they are dedicated face to face teachers who understand the difficulties of inspiring students. But this use of Blackboard makes more sense when moving education is considered as a major cultural change in the tools of managing knowledge analogous to that which Ong (1982), describes as occurring at the change from "orality" to literacy. In that case the initial reaction was to draw from the earlier form to shape the later one. Consider the way that the Gutenberg printing press was first used. Its immediate use was to reproduce works that were popular and already hand scribed – a Latin grammar, *Donatus*, printed "indulgences", the Sibylline prophesies,and the *Gutenberg Bible* (Man 2002, p. 140).

The early printing press is a well-known example of content unoriginality, the reproduction of existing forms, and failure to appreciate the informational and creative potential of a new technology. It occurs at a similar frame of reference to that of academics using Blackboard. It was also a springboard to the development of genres of printed works covering all manner of human pursuits, and eventually, concepts unimagined at its inception like "the novel", a genre itself breaking into genres like the romance and the detective novel. This fact was known to Marshall McLuhan (2001)who argued that the "content of any medium is always another medium. The content of writing is speech, just as the written word is the content of print and print is the content of the telegraph" (p. 8). This helps to explain why so many academics reproduce the lecture in digital form both as content and as a pedagogical hierarchy.

Yet, the idea of genres of use of Blackboard also assists in understanding the processes of cultural change. First, it is slow and lags far behind the technological change that can be seen retrospectively to have shaped it in concert with other social and economic changes. It is made slower by the difficulties of mimesis. The cultural product of a technology such as Blackboard can be seen, at least by the people who are let in to see it. However, in universities these people usually do not include academics who are not teaching the same subject. Moreover, while the products are difficult to copy, the processes of production are all but invisible, as standing looking over the shoulder of someone creating a Blackboard course, watching their hands at work, and which gestures and pathways they choose, while asking for their reasoning, is well nigh impossible. This makes all the harder the adoption of shared genres of use as frameworks for sensemaking. Instead, the common knowledge of how things might be done must seep through indirect channels such as university policies, training sessions and "help" menus. Second, the concept of genres of use describes a form of social change that while capturing and isolating forms does so in a momentary and processual fashion. Genres are never still, but constantly in the process of becoming other genres, singly or by breaking up or merging with other forms. They have weak boundaries and are difficult to define; even their "core" transmutes over time and in the hands of each instantiator. Last, they are culturally and cognitively anchored. The cultural anchor is through the metaphorical relationship with familiar things - face to face teaching techniques and the shared cultural attribution of particular properties (replication, information, communication, immersive experience) to a computer and the Internet. Thus begins the slow process of restructuring consciousness (Ong 1982, pp. 77–81).

Imagining the forms of academic productions of education through Blackboard as "genres of use" is an idea that fits with the ideas of social change as a process as espoused by Heidegger, Weick, and Bourdieu and with the networks of relations imagined by actor-network theorists. However, it can also encompass the sensemaking idea of the epistemic break caused by having to re-imagine what an old form is, when it must be reworked for a new technological site.

THESIS CONCLUSION

Summary

This thesis is about what constitutes technology use in general and what the use of an educational technology like Blackboard looks like in particular. The use of educational technology requires practice and know-how and perhaps entire perspectives and cultures that are substantially different from that required to teach face-to-face. A good number of current explanations of the use and non use of educational technology, however, offer accounts of "use" framed as a story of deficit.

At the simplest level people's use of technology is treated as a lack of knowledge of steps to use it, which is remedied by an approach I have called "cookbooky" after Herbert Simon's use of this term. This consists largely of listing those steps with the assumption that the user already knows what he or she is trying to achieve. A second approach, also dependent on an idea that users simply lack knowledge, deploys an "information literacy" frame. This focuses on personal characteristics of the user as a searcher for, and user of computer-based information. As with the cookbooky approach, those who have developed the information literacy perspective tend to ignore the purpose and the context. In these approaches the deficit is simply that people don't know the "correct steps".

Two other approaches treat computer use as essentially developmental, although the constituents of the stages of development are understood very differently. The "novice/expert" literature envisages the acquisition of computer knowledge and use as something akin to the developmental stages from childhood to adulthood as competencies are mastered. By contrast, the "digital native/digital immigrant" divide, while specifically addressing the context of educational use of technology, inverts the idea of learning as progressing with age and instead, essentialises the "era" of the user's first encounter with digital technology, postulating that those growing up with technology are permanently better placed to use it. Subsequent research has shown this to reveal a more nuanced understanding of competencies, even though the "digital native/digital immigrant" divide is itself a spurious generalisation. These two explanations treat lack of use as a developmental learning deficit.

These explanations are agentically neutral, and point to something outside the user's control, like lack of knowledge, or incorrect positioning on a developmental or demographic curve. However, other explanations theorise a more active user agent and integrate ideas of choice and motivation into explanations of use.

Rogers' (1962/2003) highly influential diffusion of innovation model of technology adoption has spawned a large literature of similar models, most of which try to refine the sequence of technology adoption that Rogers first espoused. Rogers understands adoption to be a "decision" based on reasoning. Thus users make decisions based on characteristics of the software compared to other solutions, which are matters of rational choice. Straying from the path of use as set down by the software design is for Rogers, "reinvention", a somewhat fraught enterprise that might lead users away from the intentions of designers or the intentions of the organisation that installed the software as their preferred solution. Users themselves are classed by their willingness to co-operate with technological innovation. "Change agents" who show "willingness to adopt" are at the top of Rogers' hierarchy, whereas "laggards" are at the bottom. Here users are defined by a single relation with technology, based on their own personal motivational capability or deficit.

If these approaches emphasise the individual user, other literature takes the organisation introducing the technology as the proper focus of technology use. From that perspective, non-use is transformed from a passive into an active impediment. Descriptions of technology use, or lack of it, resemble a form of the sociological binary of "agency" and "structure". The agents in this case are intrinsic technology "resisters" who actively fail to comply with organisational imperatives, but extrinsic "structural" impediments are also identified in the form of organisational "barriers" to adoption. The job of management is to remove or smooth over both types of impediment. Whether or not the approach is sympathetic and understands resistance to be to a perceived threat, for example, or treats it as a more purely instrumental problem depends on the point of view of a particular analyst.

The final and most structural of the explanations holds that the problem is to be found in the technology. Somewhat surprisingly, the actual type and difficulty of the educational or other technology to be adopted or used rarely finds its way into the discussions discussed above. While some literature focuses on the technical and functional capture of what it is that users do on a computer, other literature takes more seriously the experiential aspect of "user experience" and attempts to understand, phenomenologically, the nature of "engagement" and how "interaction" takes place. This latter marks a fundamental shift in investigatory approach, from treating the user as an object of study to treating the user as a subject with a subjectivity.

Very few studies take the perspective of the user as central to an analysis of use. Of these, Howard's (1994) study stands out in that he depicts the fragile and doubly constituted relationship that people have with mediating technology. On the one hand, it throws up emotions and questions of identity and self-efficacy. On the other, as people trust it, it becomes an extension of self. Yet, as this process occurs it is accompanied by measuring oneself against the virtues of the computer, a disquieting experience that the user may reject along with the technology.

Other more autobiographical studies also focus on moments of change and the experience of using technology. West et al., (2007) make the key point that reconsidering one's own practice and building technological use by changing practice is a difficult process. Ge et al., (2010) conclude that this involves a trade-off between flexibility and control. Control is a characteristic of the technology but is also in the attitude of the user. Perceptions of confidence and competence are closely allied to perceptions of the utility of the technology. Woods (2004) and Veletsianos et al., (2013) both point out the variability in features of educational technology actually used by teachers, and their differing understanding of what it was 'for' – learning, educational administration or student management being the key alternatives.

In thinking about this body of work I came to conclude that describing "non-use" as some form of deficit skates over important complexities such as who is defining "use", what the context is in each case, why the same people using the same technology come up with different uses, whether "use" is always "good", and what the experience of use is like. To understand more fully how academics come to either consider a particular practice as "use" or to avoid or rail against the technology in part or entirely, I turned three bodies of theory – sensemaking, as predominantly espoused by Weick, (1995); the practice-theory of Bourdieu, Giddens and Schatzki, among others; and the socio-technical theories of Bijker and Pinch on the one hand, and Callon, Latour and Law on the other. Each has some kind of relationship to the work of Heidegger.Heidegger (1977) sets up a reflexive relationship between ourselves and our technology and this not only draws attention to the way that technology change draws in our sense of self and identity, our command of competencies and expertise, but asks a central question about the disruptive nature of social change and the role played by technology as a cause or source of such change.

Each of these theories has strengths that illuminate some aspect, unspoken or pushed to the background by others. Sensemaking theory takes a highly pragmatic stance on cognition, understanding the making of sense to occur as a result of betrayed expectations and a gap in the otherwise smooth continuum of meaning we spin for ourselves. In so doing it does not privilege rationality over intuition; rather, it takes the position that we use the thinking we have available for heuristic decision-making. Weick does not speak of “society” or even to any great degree of “culture” as a whole, preferring to situate his analysis inside organisations; nor does he, apart from a few essays, centralise the role of technology.

Bijker as a proponent of “social construction of technology” has his focus set on both technology and society and regards himself as exploring, “both the social shaping of technology and the technical shaping of society” (Bijker 1987, p.3). In this respect, similar to proponents of practice-theory, he regards the whole of society as his palette, and describes socio-technical change as a matter of cultures – “relevant social groups” – coming to conclusions about the purpose of a technology. Unlike practice theories, Bijker sources the instigation of change to a property inherent in technology – interpretive flexibility.

Actor-network theory by contrast to sensemaking tries to eliminate cognition, and by contrast with social construction of technology, tries to eliminate or at least defray the “social” as the predominant explanatory device. Instead, it reconstitutes the field of enquiry by arguing that “society” and “technology” are not separate. In this rendering, technology or its objects are as much actors (or “actants”, as Latour says) as are the humans that use them. Together they form networks of arrangements. It is the work of theorists to trace the lines of these networks. Sacrificed by this approach, along with cognition, is a robust theory of change. Unlike sensemaking theory, in which changes and disruptions are central to the making of new meaning, actor-network theory proceeds along smooth, evolutionary lines along which “alteration of the traces” (Callon & Latour 1992, p.351) is the only mark of change. Actor-network theory does come fully to grips with the artefact as a socio-material entity, however. Only lately has practice-theory come to this incorporation.

Practice-theory as exemplified by Bourdieu and Schatzki goes to considerable lengths to eliminate the kind of Cartesian dualism embodied in the “agency/structure” debate. Schatzki begins to remedy, as he sees it, the under representation of material objects in social theory, arguing that objects including the body must be incorporated into an idea of practice as ongoing actions from which orders emerge (“arrangements”), and that likewise shape the actions. In doing so he does not take the firm position of actor-network theory in almost obliterating the boundaries between objects and humans, preferring instead to argue that some sites (like the science laboratories studied by Latour) are more “centred” on objects than others. This allows him to rescue a residual humanism from the overall project of producing sociologies that do not separate objects and sociality into different realms. The concept of change remains problematic, however. In practice-theory as in actor-network theory there is no actual mechanism of novelty beyond a gesture to the idea that sometimes people do things differently. Nor is there a consequence of breaks and interruptions to practices – intrusions into the continuity of old meanings – for the production of new meaning. Indeed, some argue that meanings are always continuous and breaks are impossible. This creates something of a conundrum for elaborating how new uses of technology arise and how people make a decision about what a technology is “for”.

In order to clarify this question, I took a close look at the technology of the learning-management system, “Blackboard” and at how academics charged with using it approached such educational technology. To explore how academics use such educational technology, I spent time with them, sitting with them as they worked on Blackboard on their computer screens, and listening to them talk about what they are trying to achieve, and what did not make sense to them as they created an online simulacra of aspects of their face-to-face teaching.

For universities, Blackboard has become an “ordinary” technology, part of the everyday structure of academic teaching life. One of the most dominant technologies in online education, Blackboard can be understood in at least three ways. It can be understood as “a technology”, a set of relatively stable software propositions for teaching, to be researched by reading the design, much as an anthropologist might "read" a weapon or a pot from a long-dead society. It can be understood as a "medium" apprehended through its "screen world", a more uncertain interpretive environment, or it can be understood from the perspective and work of the people who designed it and implemented it within the University.

University managers have controlled the "arrangements" that provide the context for Blackboard, the changes to which make a history of adoption and rationale for adoption. In fact, Blackboard is defined by multiple points of view. However, all of these definitions are destabilised by the capacity for transformation of form arising from the capacity to easily rewrite the artefact that is educational technology, and either as a particular program of teaching or as a computer program as a whole. Moreover, when understood as a medium of representation, (in Blackboard's case, of "education") that which it represents is also fluid and subject to multiple interpretations. As a digital artefact, Blackboard has lost the stability a physical artefact may once have enjoyed. Neither the technology nor that which it is used to represent is a stable social form. Instead, these confront the user with a constant need for reworking meaning.

Nevertheless, Blackboard also proposes a meaning of its own, about how it should "work" and about what "teaching" means. The functions it provides are analogous to a vocabulary and the navigation rules used for moving around and acting in it are analogous to a grammar. It proposes that teaching is composed of a number of discrete largely administrative management activities amidst which the teacher is positioned at the top of a hierarchy of users, with students at the "bottom". It has been accused of instantiating an "instructivist" pedagogy. Teaching documents themselves are static artefacts with little facility provided for collaboration or feedback. As a whole it is analogous to a "process-line" view of teaching. The proprietary definition of it justifies it as providing a specialised work flow and extensive levels of control – especially higher up a hierarchy at the top of which is University management. Use is also limited by the grammar of navigation. In many cases only one sequence of moves will lead to a desired result. While understanding teaching in Blackboard may be mastered by a metaphorical transfer of meaning, understanding navigation is a skill requiring a good deal of use of short-term memory. "Not working" here means that it is experienced as too hard, given the resulting cognitive overload.

From an organisational perspective, the history of the introduction of Blackboard into the university I studied shows how Blackboard was inscribed onto, and incorporated into the university in such a way that they both modified and ramified each other as “organisations”. Organisationally, Blackboard was constituted through a series of policy documents, reviews, research reports, and development plans that all tried to marry, with varying emphasis, the two imperatives of aligning the technology with the pre-existing and overarching control system of the university, the “enterprise resource planning” system, and also aligning it with somewhat contested university-wide teaching and learning objectives. Underpinning the first was a financial crisis for the University, which coincided with the time of introduction; underpinning the second was an often unstated belief that the introduction of Blackboard technology would of itself resolve some of the definitional and implementation difficulties of improving teaching and learning.

Despite the introduction of Blackboard and the exhortations and policy requirements to convince academics use it, uptake lagged. A University study that looked into this found that staff reluctance to take up Blackboard related to pedagogy, reliability, aesthetics, “clunkiness” and the linear design of Blackboard. Other reasons were reluctance to change, lack of professional development, administration unreliability, and lack of ownership of the Blackboard “shell” or course area. The idea of Blackboard “working” for the university had a vastly different meaning from the concept of it “working”’ used by academics. Two phenomenal systems had produced two logics of practice.

An inescapable aspect of building a new practice is to the reliance on previous practice as a guide (Weick 1995). This makes necessary a description of the parameters of previous practice found in face-to-face teaching and other academic predispositions. Distance education, which has a much longer heritage in higher education than online education forms a precursor to the latter and thus shares orientations with it. Both begin with print or print analogues and thereafter, move to other more technologised forms of communication and representation. Distance education itself, especially in its early years depended on resources almost indistinguishable from those used in the lecture room – textbooks, some audiovisual materials and a study guide. While for less technologised forms of online or distance teaching these provided a reliable metaphor, no such guide existed for newer forms of technological communication.

Disciplinarity has long been considered an academic organising principle. Snow (1959) and Bourdieu (1988) both used it as a cornerstone of their arguments about academic organisation. However, Becher and Trowler (1989; 2001; 2011) increasingly found that social influences such as globalisation, massification of student intake and marketisation of universities were diluting and making more fluid the influence of disciplinarity. Other recent studies have found that organisational roles are overtaking disciplinarity in influence on internal university cultural divisions. Thus, disciplinarity is waning as reference point for developing uses for educational technology.

Some other parts of academic practice persist, however, as relatively solid influences on attitudes to teaching with digital technology. These include: the importance of print as a metaphor; the reliance on a physical (not digital) library as a starting point for research; the differences of research collaboration practices between the sciences and the humanities, which has implications for digital collaboration in teaching as well as research; the use of digital tools for research, which may modify academics attitude to digital use in total; and the practices of research communication and dissemination, which could also be expected to have implications for understanding the communicative properties of digital technology for teaching.

The third significant arena of prior practice is academic epistemology. Academic knowledge has traditionally been abstract, generalist and objectivist, while applied knowledge has been characterised as concrete, contextualised and relative. Abstract knowledge is far more easily mediated and conveyed via digital technologies than concrete, situated knowledge. In this respect, academic prior practice assists the development of digital use.

Using the experience of those academics whom I interviewed, I began by showing what, about trying to educate online, might make meaning and sense collapse, and then went on to show how it might be rebuilt. As the Blackboard technology was continually being modified or upgraded, even for continuing users the experience was one of using a new or modified technology. Thus the potential for experiencing disruption was great. The forms that this disruption to meaning and use could take were fourfold. The first is breakdown of the technology itself. This might be hardware or software. These breakdowns take the forms of sudden stops or slowdowns, or inactivity where activity was expected or the obverse, activity where inactivity was expected. These both challenged academics' mental models of what was happening and this induced stress, stemming from an apprehension that they, the academic, would be blamed for what they felt were circumstances beyond their control. Reactions to this form of disruption by academics are frequently psychosocial, such as non-logical fears and projection and personalisation of blame to the machine or to the 'they' that are assumed to run it.

An explanation of the development of the gap in meaning comes from Weick (1990, p.16). He postulates that there are relatively few points at which the user's mental representation of what is happening within the machine or software can be checked against and corrected by observing the process. Thus the actual process and the users' mental representation of it slowly diverge and become decoupled, leading to further misunderstandings. Such dissonances can evoke strong aversive arousal. Moreover, because computers are designed to be workable without the user understanding how they work, redress for "breakdowns" of any sort is beyond the agency of the user and in the hands of technical experts. So, violated expectations that the technological hardware and software will work as one supposes engender cognitive dissonance accompanied by aversive arousal and because the problem solution is closed off from user intervention by the level of expertise needed to understand it, teachers find themselves incapable of making decisions about how to proceed and either temporarily or permanently cease to use it. Compensation is more likely if the breakdown is incomplete or the response to it is well-learned and semi-automatic; both of these do not make as great a demand on cognitive resources as does total failure to "work" accompanied by lack of a user repertoire of "work-arounds".

A second kind of disruption is that associated with navigation around a program and with understanding the interface. Computer navigation involves the construction of a symbolic world around the metaphor of the journey and understanding an interface means understanding small fictive tool representations designed to "do something". A screen consists, therefore, of a surface to be moved around and a surface to be "read". Here a screen becomes an opening to a cybernetic life world and a techno-cultural space. This perspective changes the nature of the problems that might be encountered from those discussed above. Contributing factors to collapse of meaning can arise from the user not knowing the words for actions, so explanations make no sense, or instructions being ambiguous or violating real-word actions or metaphors, such as, “You have to copy to move”. The name “Blackboard” is itself a metaphor suggesting various functions should be available.

Navigation brings with it particular problems, not the least of which is constructing a mental map of possible movements within the program and the load on short-term memory of remembering necessary sequences of steps. Disruptions are disruptions to spatial thinking and associated with disorientation and a feeling of being lost. Competence at navigation can constitute people’s central definition of competence at using computers, but mimesis of the moves necessary to navigate are occluded in a computer environment, and are available only second-hand through texts – screen tips and user manuals. Thrift (2005) explains these phenomena as arising from a new machine reality, whereby screens present a “new sensorium”, a kind of quasi-physical environment that requires a particular form of attention and a special form of sensing. The forms of sensing that may apply best are to use sensemaking and wayfinding together, the first to decode the meanings presented by screen semiotics, the second to decode the spatiality represented on screen. Interpretation and navigation of interfaces is an ongoing accomplishment that must constantly be brought to front of mind.

Using a screen, the artefact disappears in favour of an absorbed engagement with representations, the third site of disruption and rebuilding. Education as delivered by Blackboard could be understood as an enframed practice, a “representation” of education as displayed (and confined) by the mechanisms of the technology of Blackboard and the skills they require to operate them. The introduction of Blackboard as a teaching technology to previously untechnologised sites, I argue, “breaks” or disrupts two properties of “enframement”. It disrupts the frame or form of education by imposing a particular design structure on how it is presented, and it disrupts the representation of education, understood as the professional understanding or philosophy of education that teachers have developed as part of their general academic practice (as discussed at the general academic practice section), by taking it from a face-to-face and largely oral mode to a technologised and textualised mode of delivery. But it also imposes its own hierarchical and management-oriented educational design. Academics react to this by either avoiding or escaping these impositions, or by (usually uncertainly) finding a use for Blackboard to deliver some form of education. An adaptive form of this was to build “genres of use”. These may on the outside look like clunky and malformed renderings of education, but no more so than a horseless carriage looks like a malformed horsed carriage. In time they will be refined and will divide and coalesce until they have become a (temporary) new thing in themselves, which people can anchor more clearly to their ideas of what constitutes education. So it is that self expression calls forth new social orders.

The fourth site of disruption and rebuilding is organisational. It is the job of organisations to maintain a form of “epistemic infrastructure” (Hedstrom & King 2006). Not exclusive to the libraries and archives examined by Hedstrom and King, organisational epistemic infrastructure can include the various textual channels, emails, policy documents, meeting minutes, discussion papers and web pages used to maintain organisational social relations and to codify and archive knowledge used for the communication and the passing on of practice. Organisations are at heart institutionalised practice systems, especially when they uncritically reproduce practices (Geiger 2009).

However, the introduction of online learning systems destabilises and threatens institutionalisation. The entire exercise of bringing online learning to university teaching is to some degree a case of the unimaginable. Predictions of decontextualisation, universalisation, “flexibility”, greater managerialism and poorer quality of education go back to the earliest introduction of broad-based online teaching and learning (Cunningham 1997). Most of the literature on the adoption of online learning is an exercise in attempting to imagine the hitherto unimaginable – how or to what degree it will take over teaching within and between universities. At the level of organisational existence, the introduction of online learning technology threatens the organisation’s purpose and meaning. The organisation coped with this potential threat by reconfiguring around Blackboard. It instituted training and policy measures to bring academics “on board”. But some of these measures themselves caused disruption. The constraints may have been rightly or wrongly interpreted but they had the effect of pressuring academic staff to change practices. At the level of administrative infrastructure, such disruption becomes manifest as a contest between the demands of administrators, management, peers and students, and the experience of various frustrations and lack of comprehension on the part of users. These, in turn, generated equivocal accounts of what it meant “to use” Blackboard. It is certainly possible to argue that the largest example of incompatible accounts is that of the designers and University management envisaging Blackboard, at least initially, as "learning management" software and not "teaching" software, in contradistinction to academics views. Yet, there are multiple sources of divergent or conflicting accounts of what it means to use Blackboard. In addition to university administrators and technicians, channels of potential cross purposes of meaning include peers, who may influence the shape of courses and use of Blackboard by discussing the courses they run, academic juniors delegated to run courses, and students, through various channels available for feedback. Yet truly "shared meaning" on use is hard to find.

Theories of practice of various kinds rely on some concept of "shared meaning" or sociality as a vector to pass on practices, in addition to passive cues from technology design but using Blackboard is a solitary experience for most academics. Computer skills and specific Blackboard skills are largely self-taught – a product of informal learning – and are also generally acquired as a solitary pursuit. Lack of an easily accessed, proximate social reference point or points for technological sense, because of very limited possibilities for physical or visual contact or exchange of ideas, means in order to use Blackboard people are thrown back on tacit understanding rather than explicit exchange.

The most significant and constructive sensemaking activities involved the assemblage of genres of use. "Genres of use" are drawn from previous academic practice, translated into technological form and modified in the process, then adopted as a (probably subconscious) prompt as to what to do in that technology, by using it as a metaphor and facilitating a modification. By this means, the act of educating is processed and reassembled back into a simulacrum of itself, and it resembles the original the way reconstituted orange juice resembles fresh – the same but not the same. The development of genres of use allows users to meld together and shape to their own ends the multiple imperatives of their own intra-subjective values and beliefs about education – the inter-subjective professional understanding of teaching which derives from peers, the "generic" professionalised and organised position of the university on education and the affordances and cues about what education should technically be, as built into Blackboard. In great part this is possible because "textualisation", the process that has led to the development of literary and other mediated genres has now come to education.

As Hofstadter and Sander (2013) argue, categorisation is an attempt to put a concept into a box. In their view this process always fails. Concepts spill over and refuse to be neatly assigned. But in the case of academics using Blackboard, not only are those concepts carried over from face-to-face teaching heterogeneous, the box of the technology within whose compartments they must be realised also play a slippery part. What does it mean to 'use' Blackboard? What is it 'for'? The technology does not provide an answer; but rather, several ambiguous but nevertheless stiff and resistant categorical possibilities. It is an act of interpretation to decide on what the boxes mean and what can be done with them. Before this can occur, enough must be *known* about the workings and mechanisms of the computer and the Blackboard interface to be able to take some action that is coherent and consistent with realising goals, and sufficient should be *unknown* about 'how it works', so as to avoid paralysing overload or endless modification. Use can be constructed in multiple ways.

The idea of genre also provides a mechanism for conceptualising social change. Genres are “social orders” which permit the passing on of meaning and practice. But genres are unstable and process oriented. As Orlikowski argues “every engagement with a technology is temporally and contextually stabilized-for-now, and thus there is, in every use, always the possibility of a different structure being enacted” (Orlikowski 2008, p.273). The journey to create a new, textualised cultural form – “teaching online” – is, on the one hand, a small and relatively trivial social order– just the application of good pedagogy to a digital format – but on the other, it is monumental, part of the long transition from oral to textual and digital cultures.

While this thesis has focussed on one particularly universal but unsympathetic technology, Blackboard, a future challenge will be to trace this cultural re-ordering through its manifestations when the technology is diverse and mobile and is itself part of the genre of use. In addition, it is challenging to think about the sorts of genres of use and new orders that will develop when people start seriously designing pedagogy models into software. What sorts of collaboration between which kinds of people (teachers, learners, technicians, publishers, freelancers, technology designers and self-help or “crowdsourcing” groups), and different kinds of education (combinations, perhaps, of autodidactic, automated and teacher supported learning) structuring and arguing over what forms of epistemology in a collapsed or perhaps renewed university will produce the orders of the future?

Epilogue on implications for policy and practice.

In this thesis I argue, using sociological theory and references to prior academic practice, as well as through the research itself, that the sort of "uses" academics arrive at are not primarily intentional in any great sense of consciously arrived at practice. Nor are they a matter of whim arising from "disposition", or any other unexplained matter of personal character. Rather I am concerned to argue that prior practice and prior beliefs and values are more or less unconsciously incorporated into "uses" unless academics are forced to think about what they are doing by some form of break or cognitive dissonance. Prior practice, beliefs and values moreover, show up in a degree of social organisation, shared by academics, universities and by the software itself, and therefore are readable, and can be analysed into a variety of specific influences which pertain to the eventual shape of "use".

I am somewhat cautious in making any recommendations arising from this analysis as I mainly intend it to influence how academics experience of Learning Management Systems is understood and interpreted. I am asking mainly for a reconceptualisation of "poor use" as perhaps nothing of the kind, but instead, the seeking out of a proto-use, by adapting to electronic, educational and organisational conditions as they are understood. Especially that behaviour characterised as "resistance" or "laggardly" uptake, when closely examined, turns out to have many nuanced components, some quite surprising. Nevertheless I have some theoretical and practical observations to make.

First I want to draw attention to the idea that theorising that practices, arrangements and action as explanations of "the social" does not necessarily exclude cognitivism or "culturalist mentalism" (Reckwitz, 2002, p 244). They only do so if, in an attempt to escape an excluding foundationalism, the functions of the mind are considered solely as an alternative site of explanation of the social, rather than as a complimentary addition to the formation of action. However, Weick offers a pathway out of this dilemma by showing that actions and practices can be influenced, or indeed constructed by surrounding context, (others' practice; technological action) but only if this is knowable. If it is not – and this can take a number of forms - then imagined constructions that accord with prevailing conditions to the degree that they can, in conditions of occlusion, then substitute for the knowable, and support whatever actions are taken.

Understanding that technology is "dual", occurring both in the head and on the ground, and that these dualities can significantly separate by virtue of the inaccessibility of the one side from access by the other, has practical consequences for technology design and for institutional support. For designers, it suggests that technological problems need some form of associated transparency to show what has gone wrong; easier said than done where what has gone wrong is the violation of an expectation. For those charged with assisting people to use technology it suggests that tear-away constructs constitute the imaginative background to anything new that might be introduced by way of training or assistance, and therefore should be clearly understood as a precursor to intervention. This tearing away from designed-in interpretations is also potentially a rich source of novelty and reconstruction. Tracing them as practitioners understand them, so as to make them explicit and clear to practitioners, designers and trainers has merit.

Second I want to make the point that moving from one kind of practice (for instance teaching before the LMS) to another kind of practice (teaching after the LMS) is not simply a matter of continuity consisting of recreating a stream of action based on what has gone before but adding progressive adaptive twists. Change can occur through this kind of adaptation, but change to practice can also result from breaks of several different descriptions. As Gross (2009) has noted, the main way people solve problems is through habit, but when habit fails, (as it must when breaks to conventional understanding occur) people must actively dream up creative solutions, solutions that are later integrated into "their stocks of habit for use on subsequent occasions" (2009, p.366). This observation and the one above modify practice theory to make it more useful for technological analysis.

"Breaks" that occur in an online environment can result from interruptions such as machine failures, or unexpected requirements presented by the program. Equally they can arise from a disjuncture between the actual workings of the machine or the software, and the imagined process. Such breaks may be an incentive for the user to give up, because the problem is just too hard to bridge, or it may invoke creative problem solving or workarounds. Either way, at some level, the reaction is adaptive, when seen from the perspective of the user. Some adaptations move the user away from the technology and some produce responses which seem mysterious or “poor” but when judged over time, may give rise to new forms of creative use.

Thus, the third point is that adoption of technology and use of technology should be considered separate entities. Adoption is broadly constituted. It means doing something with technology that is more or less in line with the intentions of the designers and deployers of the technology. “Use” is a more fine-grained thing. One adoption may entail many uses. To examine use, one must take seriously the formulations of use that are serious to users, rather than understanding differing forms of adoption as instances of “poor use” or “better use”. One way to make these uses distinct is to conceptualise of “genres of use”.

However I do not suggest that these are indicative of personal or psychological development. “Genres of use” are collective uses, rather than idiosyncratic personal uses. They are recognisable after the fact, because they represent patterns of use that appear repeatedly amongst a number of users. Thus the bemoaning of many writers about how academics simply use Blackboard to reproduce the activities they once did face to face (eg Veletsianos 2013) is a recognition of a pattern of use. That is to say, genres of use begin life not just retrospectively but socially. However, as genres are conventionalities of form, instantiated by repeated enactment and defined by arguments about boundaries as are most categories, they transmute or disappear over time with variations of use and definition, but rather that they are social groupings that represent proto –genres. The regular appearances of similar kinds of “poor use” suggests that there may be something developmental going on, particularly as the more adaptive types of use can also be found both in this study and in other studies which refer to patterns of use. Reconceptualising the replication of lecture notes as a proto – genre of use opens up the possibilities of considering how to usefully extend for educational purposes, the idea of using static information presentation asynchronously. It does not mean that this form of affordance will necessarily be superseded by more dynamic or appropriate uses, since the appearance of one genre does not preclude invention or noticing the existence of others. This is much as the romantic novel does not preclude crime fiction, difficult though it is to see both as genre developments stemming from Gutenberg’s first printing of the Bible (see Ong)

When someone uses an LMS, for instance, to reproduce an activity such as handing out lecture notes electronically, they are neither “not using” the LMS, nor are they being deliberately obtuse. Instead they are taking advantage of one of the underlying metaphors of computers, the capacity to make information permanently available, asynchronously and to communicate without the necessity for physical presence. They are seeing these features because they have already a picture of what must be done in order to deliver as specific part of general education which enables them to pick out those readings of the technology that allow them to do it. For those charged with design or training, understanding this as proto development of genres of use rather than errors and misappropriations means such use is itself indicative of a change of orientation by practitioners in understanding technology use.

A consequence includes identifying “genres of use” as potential building blocks for elaboration into more sophisticated, but separate effective uses of educational technology. A proto use such as “putting lecture notes online” can become for instance, in one guise, a “flipped classroom”. This however is not the only potential use that may be derived from considering this proto-use use not so much a mistake but an expression of a developing practice. Stephen Downes “connectivism” also derives from the same concept, considering the use of educational technology as a way of distributing educational resources. In his conceptualisation, though the metaphor is extended to all the information and people on the internet. The base concept in such a use is “making the material available”. But the actual practice of doing so online is completely divorced from the face to face practice. Its only commonality is conceptual.

There are many base metaphors available, more than are listed in this thesis, as they are limited only by what people cast back to as “like” the experience they have in front of a computer while using an LMS. Harking back to Murray, a computer may be considered a medium of transmission, a medium of representation or a medium of (self) expression. In addition to these orientations, practitioners also understood it as a medium of storage, or a repository, and as a medium of shared experience, while designers and organisational technologists understood it as a medium of management organisation. Each of these is elaborating a different base concept, a more holistic sense of the purpose of Blackboard technology than the idea of “affordances”, allows by focussing on the selecting out of specific functions. Moreover none of these base concepts is mutually exclusive of any other. Practitioners may, under the right conditions, engage in elaboration of any one of them to build up a suite of uses. Each begins with a relatively simple expression, one that looks like a replication of something in the face to face world that has gone before. To effectively use and extend genres of use however entails a sensitivity to detecting their appearance, as they are easily mistaken for errors or misappropriations, and an equally sensitive creative process for making the most of them. Every user is in this sense an author. Every technology and its organisational and social context, is a wellspring of cues to be recruited into genres of use. Every genre of use, once detected and validated as a legitimate use, is an unexplored territory of possibilities. If this is to be a useful observation, the focus of practitioners and those who wish to assist them should be on bringing what are effectively a set of implicit "use" metaphors with face to face interaction to the surface for conscious examination and exploration.

Where the trouble lies is where one set of expectations, derived from face to face teaching clashes with another set of expectations, derived from an idea of an LMS as "educational management", or to be used only as a "common depository for static artefacts" as the design assumes. These are fundamentally incommensurate base metaphors or different logics of practice, if they are used for overall control or limitation of use. At stake here is the power to define the value and worth of different genres of use, not their creation. However since the trajectory of any given genre of use, even one formed within the constraints of a technology that is not designed for it, is not knowable in advance, a last consideration for practical consequences is to treat new uses as incubation space, rather than as illegitimate deviance.

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