Any color you like, as long as it's Blackboard®

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Abstract: Learning management systems are ubiquitous in higher education, bringing many benefits to both learners and teachers. However, they have a darker side. Structure influences behavior, with the large and slow moving influencing the small and fast moving more than vice versa. In this paper it is argued that the structural and systemic features of Learning Management Systems and their uses in higher education may lead to the domination of the teacher and the learner by the system designers, the managers and the institution, an educational Fordism which may not always be in the best interests of the learner. Suggestions are made as to ways this dominance may be subverted and turned to advantage.

Introduction

One of the most fundamental issues in education is the level of control available to the learner (Dron 2005; Dron 2006). Sometimes we need to be in control of the activities we undertake to allow us to learn, sometimes we need to delegate our control to others. By definition, a learner does not know enough about a subject to be aware of the best path to take to achieving mastery, and (for most learning activities) must rely upon the expertise of others to show the way, both in process and content. Sometimes this control may be direct, sometimes indirect - mediated through books, films, computer programs and so on. This paper explores the potentially pernicious effects on control of a centrally managed Learning Management System (LMS), focusing on the ways that control may be taken away from both the learner and the teacher. It provides some suggestions for ways that control may be regained.

The hierarchical nature of systems

In virtually all systems, scale is an important factor in determining how they behave. It is far more common for the large to influence the small more than vice versa. Equally, it is the slow moving, slow-changing features that are more influential than the fast changing, fast moving. Structure influences behavior (Senge 1993). For example, a forest is affected more by the mountains on which it grows than vice versa. Trees provide the structural limitations for the beetles, beetles provide the environment for the bacteria that inhabit their guts (Jones 1999). Similarly, in cities, the shape of a road determines the potential varieties of building on it, the form of the building constrains the limits of the rooms, the rooms determine the internal décor and furnishings (Brand 1997). The small and rapidly changing have the boundaries of their potential defined by the large and slow. It is true that the combined behaviors of the small will often have a great effect on the large, sometimes quite rapidly – plagues of locusts spring to mind. However, the effect of a single locust or tree on the larger environment is usually negligible.

In educational systems we can see the effects of scale quite clearly, both in physical and organizational terms. The large, slow moving institution constrains the kinds of programs that may be run, the programs constrain the courses, the courses the lessons, the lessons the activities and so on down to the words that we use. Shapes of buildings constrain the forms of classrooms, which constrain the potential layout and furnishings, which constrain the kinds of teaching that may occur there. Management structures work much the same way – in the UK, government policies and legal frameworks dictate the forms of universities, which shape (in turn) the faculties, the schools, the divisions, the programs, the courses, the modules, the lessons, the learning activities. Control over an individual's learning trajectory shows the same patterns. A large decision, say to become a doctor, leads to smaller, more constrained decisions about a program and/or an institution, still smaller and more constrained decisions about

courses, yet smaller and more constrained decisions about classes, activities, right down to things that are so constrained that they are barely decisions at all – to listen to the next word that a lecturer utters, for example. It is notable that these hierarchies of constraint are often overlapping, leading to complex systemic interactions where the end result may be emergent, an evolutionary ecosystem more than an intentional design (Seely Brown and Duguid 2000).

As the scale gets smaller, the constraints get stronger. Choices seldom (if ever) vanish, otherwise change would never occur. However, the greater the constraints, the fewer the options we have. Each element of a hierarchy of control exerts steadily more constraint until the options become almost non-existent. It is important to note that size does not necessarily equate to significance: a small choice to make the next step while walking can have large consequences if it leads one off the edge of a cliff. By and large, we can say that, the smaller the scale, the more effort it takes to choose a different path, but this does not mean that the easiest path is the right one. Once we have made the decision to go to a lecture, it takes much more effort to choose to leave than it does to remain, whether or not we might wish to do so. This is one of the major benefits of face to face teaching, making motivation far less of an issue than in online learning.

Hierarchies of constraint in learning management systems

The same kind of dynamic of control pervades our virtual environments. It is widely recognized that the effective implementation of a virtual learning environment requires institutional commitment and, more importantly, that proper integration of such technologies entails a cultural change in the organization (Lisewski 2004). Regrettably, this is not necessarily the kind of transformation that will be of most benefit to learners. For instance, Clegg et al (2003) claim "A critical issue for lecturers in Higher Education is who has control over curricula and teaching methodology. Traditionally these have been in the control of the individual scholar so choices to innovate using any media have been hers/his." Unfortunately, they go on to observe that the LMS can be a vehicle for managerialism, a means of wresting control from the teacher and hence, still more, from the learner.

In fact, the situation may be far worse than Clegg et al suggest: managerialism may be an inevitable result of the system, the easiest and most natural path for a centrally managed LMS to take. The facilities provided by an LMS determine what can be done there. From a naïve perspective, the potential cornucopia of choice that could be provided by the LMS offers the promise that, rather than dictating the mode of delivery, the software can liberate, allowing the learner or teacher to choose the methods and technologies that are most appropriate in a given situation. Sadly, this idyllic perception is somewhat at odds with the reality. The computer is both tool and medium, and the environment that contains the tools for its own creation. This recursive nature has significant impact from a systems perspective. It embeds process as well as form. There is a structural hierarchy that differs from that of a face-to-face classroom. Most significantly, the teachers and above all the learners are at the bottom of this hierarchy. In the next section, this is illustrated with some examples.

LMS use at the University of Brighton

The rise of the LMS at the author's institution, the University of Brighton, closely follows the pattern observed by Jenkins et al (2005) following a tendency to centralization in strategy and support, with consolidation of previously disparate systems. Throughout the nineties an assortment of intranet-based systems, home-built virtual learning environments, off-the-shelf products and customized groupware solutions were developed by different schools and faculties at the university, each separately managed, with different but often overlapping functionality. As staff left or funding dried up, many of these systems were set adrift, unsupported and often unsupportable without the technical knowledge of those who had left. Though often very well tailored to the needs of the learners and teachers, many of the systems were unreliable and poorly maintained, leading to student dissatisfaction and impacting badly on learning. Often springing from research initiatives, they were sometimes quirky and inconsistent, with interfaces that ranged from the inspired to the abysmal (sometimes both). Few integrated with central management systems, leading to the maintenance of duplicate user databases with their inevitable inconsistencies and disparities. At best, users had to remember several passwords, at worst they were denied access or caused a large administrative burden on support staff. If e-learning were to be used effectively, it was considered essential that a more sustainable and managed approach should be used.

After several years of consultation, pilot projects and evaluation, Blackboard® was implemented at an institutional level in 2001. It was given significant funding and a prominent place in the institution's learning and teaching strategy. The system was branded as *studentcentral* and users were encouraged to avoid calling it 'Blackboard', to emphasize the intention that Blackboard was not, and increasingly would cease to be, its sole component. However, in its original (and current) form that was by far the most prominent public-facing element.

Supported by a small but highly skilled team of experts, a wide-ranging educational program and a strong marketing campaign, *studentcentral* has been a success. Heavily promoted and well-supported, its role embedded in institutional strategy, the system quickly sucked in most of the smaller initiatives and was taken up with enthusiasm. A virtuous circle began, kick-started from above then led by bottom-up demand from students. Students were pleased to have an easy means of accessing course notes and timetables, despite the extra cost incurred for printing them. Once they had experienced the LMS in one context, they demanded it for all of their modules and courses. Currently there are 7634 'courses' on the system (including individual areas for schools, faculties, research and so on), supporting over 30,000 users. Every taught module (equivalent to a course in some institutions) at the University of Brighton has at least some presence on the system, though not all are equally actively maintained. By most measures, including the university's own plans, *studentcentral* has been a success. However, this success comes at a price, paid for in control.

Who is in control?

Software control

Software design can lead to decisions that are driven by the needs of some can affect everyone. For example, Blackboard's security model is somewhat inflexible. This can make it difficult to provide free guest access to parts of a site, unless such access is the system-wide default. Though currently under review, when the system was created, this option was deemed unacceptable to some and therefore was not enabled. Because many teachers still cling to the belief that their content is of value in itself, or are too ashamed to show what they have done, the easiest route for the administrator is to block access to everyone who is not registered with the institution. As a consequence, learning resources that were once available freely on the Web are increasingly disappearing behind password-protected spaces, leaving those who wish to share content and ideas to look elsewhere. A small and steadily dwindling number still run separate sites, but the extra effort involved and administration required make this more and more difficult to justify. The process is driven by a positive feedback loop: as students' expectations to find all of their needs catered to by *studentcentral*, exceptions to the rule are often considered to be an inconvenience. Even when links are provided from within *studentcentral* to other sites, the differences between the system in design and interaction confuse students who have grown used to the Blackboard Way. The mavericks who manage their own environments eventually find themselves marginalized and increasingly at odds with the demands of their students. Some try to maintain two sites, but this means significant duplication of effort. And so the public becomes private. The technical constraints caused by the software design, combined with the systemic problems of centralized control, have changed the way that tutors interact with the wider world of academia.

Moving from a cottage industry to a factory model

The author runs a blended program for diverse students who are geographically dispersed. The program had previously been delivered through a home-built server which was highly evolved to the needs of the students, several of whom who had contributed extensively to its ongoing design and development. Development funding then dried up, so the server became largely unmanaged and unsustainable, so it was reluctantly decided to move the course on to *studentcentral*. The transfer involved a great deal of restructuring and creative use of Blackboard's restrictive course model. The students shared online teaching but attended face to face events at different institutions, each of which had distinctive needs and interests. The original site had given a customized view which amalgamated site, program and registered courses according to student needs, reflecting the structure of the course in the system's design. Blackboard 's single-level course model was unable to cope with this, so separate course areas were created to cater for local and program needs, rather than integrating them to follow the structure of the program. This meant that previously integrated functions now moved into different areas. Because students tend to focus on the tasks that immediately present themselves, this led to the program and site areas being little used. The cohesive program environment was replaced with the top level of the Blackboard hierarchy, representing the whole university. This caused problems. Students were constantly irritated by advertisements for on-campus events and

generalized announcements that assumed a traditional mode of study – office hours for paper hand-ins, library times, building-work announcements and so on. The need for *studentcentral* to cater for the whole institution meant that its form and content catered for the majority. In principle, special groups might have been created to ensure that the exceptions could be catered for, but the effort required to deal with 0.001% of the university's enrolled students was not deemed worthwhile and the solution would only have been partial.

The technical constraints of the Blackboard system also contributed to a shift in ethos for the program. Collaborative activities that had been embedded in the original environment were curtailed due to restrictive security permissions. The collaborative and rapid evolution of new or tailored technologies that resulted from the old system's development process came to a halt as the administrators of the system were rightly reluctant to experiment with untried and potentially unstable components on a system designed to support over 30,000 users. At the same time, the conflicting demands of different needs and contexts were increasingly resolved through centralized initiatives, such as providing standardized items in every course area, and a centrally chosen corporate look and feel.

Gradually, the large, slower moving, controlling influence of the institution, itself partially shaped by the learning environment's constraints, began to shape the program in ways that were no longer driven by the specific local needs of tutors and students. Demands for consistency from other students, led to uniformity across the university for some aspects, and across the school for others. The course had already developed its own templates and rules for consistency, based on a close collaboration with the students themselves, who had a strong say in identifying requirements and preferences, and had contributed to its development. As the course was absorbed into the larger whole, this control was taken away and the distinctive identity of the learning environment was absorbed by the larger scale elements of the hierarchy.

Systemic control

Announcements play an important role in many an LMS, allowing tutors to communicate with students directly, whether for pedagogical, entertainment or administrative purposes. There are many legitimate reasons for ensuring that announcements are the first thing that a student sees when entering a course area, and it may well be the best choice in many scenarios. On the other hand, it is not the only way to structure a learning environment, and not everyone might choose this structure if they were to think about it for a while. For instance, one-way announcements immediately emphasize the tutor's control over the learning space as announcements may only be made by one with a role of authority within the system. Alternatively, there may be more important things that a tutor might wish to make more prominent.

In common with many other learning management systems, Blackboard's default page for every course shows the announcements for that course. The default may quite easily be changed to a different page or tool, but the system is mainly used by those who have neither the technical knowledge nor the enthusiasm to delve into the system's inner workings, so most of the time it is left with its default settings. Within the University of Brighton, 99.15% of all modules' entry points are left with this default. Of the remaining 0.85% of modules, nearly half are the author's responsibility.

To explore the extent to which this was a result of the structural and systemic features of the Blackboard, a survey of 33 tutors using *studentcentral* within the author's own school (Computing, Mathematical and Information Sciences) was conducted by email. It revealed that 26 did not even know that this was an option, despite some years of familiarity with the system and a greater than average familiarity with computer applications in general. When asked if they would consider changing the default, 17 said that they might and 5 said that they definitely would. Tellingly, one who would not change the default gave as a reason that he was not trying to use *studentcentral* to teach – it was merely an information repository. Another said that 'life is too short', reflecting the opinions of two others for whom the issue did not arise because *studentcentral* was peripheral to their teaching.

The two commonest reasons given for not changing the default were that tutors did not wish students to miss announcements, and the perceived need to provide a consistent experience for the students. While the former reason shows some thought has gone into making a free and informed choice about pedagogic needs, the latter deserves some examination. Nielsen claims that consistency is one of the most powerful usability principles (Nielsen 2004). There are clearly benefits for students in a consistent interface. With up to twelve modules each year, as well as areas for courses, schools, programs and other places to visit, radically different interfaces may be

off-putting and might result in reduced efficiency and, worse, insecurity and uncertainty, hence lack of control. Consistent navigation, links that perform in expected ways, familiar signposts and so on are a vital element of keeping users happy and in control, as well as encouraging them to stay.

The problem with the consistency argument is the fact that the rules of behavior are not set by the tutors themselves, nor even the administrators or the university, but by the designers of the program. A pedagogical decision that would once have been taken by the teacher is now strongly influenced by the system. Those choosing to accept defaults for reasons of consistency are therefore either putting the need for usability above the pedagogical needs of the learners, or believe that the content speaks for itself, and the way that it is presented is not important. Neither position seems particularly tenable. Charitably, it might be argued that usability is a necessary part of pedagogy, but there are other ways to achieve consistency than to make every course area behave identically.

Discussion

A teacher in the non-virtual world is used to constraints and accepts them as inevitable: the design decisions that led to the physical construction of the buildings and rooms, as well as timetabling, standards and so on may be just as constraining as the restrictions of an LMS. However, physical spaces are generally richer in potential, for most of the reasons that face to face dialogue is richer than texting, full of sights, sounds, things to interact with and touch, real people and real smells. A virtual environment is, at least currently, a simplification and abstraction of processes and structures. It can do interesting things and it can do them differently, but it lacks the richness of reality. On the other hand, constraints in physical spaces are limited by the laws of physics: a virtual environment does not have to be that way – in a sense, it creates its own physics.

Many of the decisions about the configuration and style of a centrally managed system such as *studentcentral* are not made by tutors engaged in dialogue with students. True, a collaborative process and consultative approach was taken to the initial design, involving many experts, which led to many of the features of the system. Since then, through (mostly) indirect feedback, the learners and teachers themselves play a very small part in negotiating control within the environment. The greatest control at a large scale is supplied by administrators and academic members of the team that develops and manages the site. No matter how well-meaning and enlightened these individuals might be (and they are both) the constraints that they exert on the system inevitably play a role in shaping the processes that go on within it, which may be less than ideal for local needs.

Because most learning management systems have evolved out of pragmatic needs and observations of interesting practices in e-learning, most (if not all) embody a particular world view or pedagogy, assumptions about their intended uses, biases that determine what is available and how easy it is to manipulate (Dunn 2003). Blackboard is no exception. Its pedagogic roots are firmly embedded in traditional American college soil, with a predominantly instructor-led pedagogical model. Indeed, the standard organizational unit within the system is the 'course,' a name that the system will not allow to be changed or diversified to reflect the hierarchy of course and module commonly found in UK universities. This is not just a minor irritation, as to cater for it requires a subtle but significant institutional move, an alignment with the software rather than vice versa. Although other systems (such as Moodle™) avoid this trap, even the best of the monolithic LMS systems will to some extent dictate behavior when taken up at an institutional level – the larger will influence the smaller. For any monolithic and centrally managed system, whether it is of the traditional style or the latest and greatest piece of social software, the designers and maintainers of the system will influence those that use it through the choices that they make. This is even true when systems are developed in-house.

Social software such as blogs, wikis, link sharing systems, recommender systems and so on are a little better. In such systems, the group is a first class object (Allen 2004), an entity with emergent properties quite distinct from the individuals of which it is composed. Control in such systems is different: the structures that develop arise from the interactions of participants, so each individual is both controlled by and the controller of the environment (Dron 2006). Some systems already have this kind of functionality embedded, but even behemoths like Blackboard and WebCT® (or, since WebCT's acquisition, perhaps this should be 'BlackCT') can be extended this way, or to some extent, integrated with other standalone tools. When integrated as components of larger systems, social software may succumb to the now-familiar pressures of the larger, slower moving parts, but if it is given sufficient prominence and students are allowed to become familiar and comfortable with a decentralized way of working, it can help to generate a powerful, bottom-up dynamic. Unfortunately this is not a perfect, or at least not a

complete, solution for every pedagogy and every subject. Tutor control may often be valuable, and systems that take away this capacity will not suit everyone.

An obvious solution might be to provide as much of everything as possible, but this is just as bad as taking excessive control. Too many choices can give as little control as too few unless we have the power to exercise that control. A bewildering array of possibilities will only benefit those who understand how to use them, taking control away from those who do not have the expertise to make informed choices.

Alternative technologies

There are technical solutions to this problem. Some adaptive hypermedia systems provide sophisticated approaches to tailoring the environment to learner needs (Brusilovsky 2001), though virtually all of these work at the level of the lesson or course, rather than providing a complete LMS, and many (e.g. (de Bra and Ruiter 2003)) move the decision-making process to the system rather than a tutor. Although some provide control over the levels of adaptation available (Kay 2006) and others offer control over the level of granularity of adaptation (Cristea and Verschoor 2004) none, as yet, provide adaptive levels of control.

To break free of the unintended constraints of an LMS requires adaptability, not adaptivity. Many learning management systems offer some customization of the interface, and almost all filter the view that any individual gets according to their needs, whether expressed or imposed upon them. However, at some level, all impose a structural hierarchy of constraint. The tools that are provided allow and encourage some things and prevent or discourage others. Those decisions have been made by the designers, not the people that will use them. Even were it possible to design a tool (say a discussion board) that embraced every known possibility, that very wealth of options would itself be a constraint.

There needs to be a middle way, something that allows tutors to make pedagogic choices without the constraints of a monolithic system or the chaotic and unsettling wealth of choices provided by a do-it-yourself system, something that gives local control, but without losing the benefits of central management. The most promising technologies at present appear to be those that allow assembly of components from an assortment of smaller pieces. The leading initiatives in this field are the Open Knowledge Initiative (OKI, http://www.okiproject.org/), which provides a standardized architecture to which components may be written (Eduworks Corporation 2002)., and ELF (E-Learning Framework, http://www.elframework.org/) which offers a far more flexible service-oriented approach (JISC 2004).

Initiatives such as OKI and ELF provide the means to create larger environments from smaller systems that may be commercial, home-grown or supplied by others. The benefits of being able to pick and choose the relevant components are great. Although most of the larger LMS environments may be extended in a modular fashion, these modules still run within a constraining framework of the host system. Both OKI and ELF are still undergoing rapid development and successful large scale deployments are thin on the ground. Often, they result in systems such as Sakai, a worthy competitor for BlackCT, but this is frequently implemented as another centrally managed system.

Component-based systems are a solution if we are to regain control of our learning environments, but this must be tempered with a note of caution. Embedding such systems in a large institution may often mean that control is again delegated to a centralized team. This brings benefits in terms of economies of scale, effective management, reliability and sustainability, but centralized management will, albeit with the best of intentions, almost certainly exert control in ways that reduce the control of those who are actually teaching and learning. Any large educational institution will have diverse users with conflicting needs. The vital remaining piece of the puzzle is that modular systems should be supported and maintained centrally, but implemented and built locally, with technology specialists working in close participation with teachers, subject specialists and students. Skills and manpower for such approaches are considerably lower than those required for a custom-built solution.

Making do with what is there

While component-based systems may be the way of the future, by far the majority of existing institutions worldwide make use of a small range of proprietary systems. In the UK, Blackboard and WebCT alone account for

around 80% of managed learning environments in higher education institutions (Jenkins, Browne et al. 2005). The position elsewhere is similar. Despite adhering somewhat to some standards, moving content, users, processes and so on to a different platform is a major undertaking which institutions will be very reluctant to take. Blackboard's frame-based layout is in most respects an abomination that reduces usability and accessibility while constantly re-emphasizing the controlling nature of the system. However, it has one saving grace: that the contents of the main frame may be extracted from its frameset. One effective solution is therefore to extract these pages and to embed them in custom-designed framesets, thus inverting the hierarchical balance of the system. This approach can be effective when used with simple, static HTML container pages. It is even more effective when embedded in another dynamic system. The author's Dwellings system (Dron 2005) is well adapted to this kind of use, allowing the rigid LMS pages to become part of a different, far more collaborative environment which is co-created by learners and teachers and which embodies communication processes, both tacit and explicit, in every element.

If none of the technical solutions to the problems are available or practical to implement, it is still possible to take steps to subvert the pernicious effects of the hierarchy. Most of these steps are common sense and simply require an awareness of the potential ways that the environment can dictate behavior. For example:

- *Signposts*: Headings, icons, images, fonts and colors that stand out, may act as signposts. These can help the learner to navigate more effectively and give more informed choices of where it might be interesting to go, without having to try especially hard. With care and ingenuity, these signposts can be designed to overwhelm the surrounding environment

- *Simplification*: Getting rid of as much of the chaff as possible may help learners to make more informed and autonomous choices, drawing attention to things that are important. All courses that make up the author's own program have the discussion forum as the entry point. This emphasizes the perceived significance of discussion in the learning process, and creates a manageable hierarchy that is at least partly dependent on the students themselves. Another two courses use student blogs for the same purpose.

- *Training*: Helping learners to understand what is important and what is not, ways of interacting, expectations and norms is vital when introducing a large, centralized system, much of which will be of little interest or benefit to them. Training sessions matter, less because of the need to learn the (generally simple) technologies, more because of the need to feel at home and in control.

- *Monitoring*: Although the sophisticated management systems of the typical LMS are strongly focused on the needs of a tutor to control, the monitoring features that it provides can give valuable clues as to how the students are interacting with the environment. As a result, it enables tutors to reorganize, rearrange and selectively emphasize parts that are under- or over-used.

- *Intentional behavior*: Above all, it is important not to accept the defaults without questioning the reasons that they are there. Lack of expertise or time leads many naïve tutors to take the easiest path. Despite the extensive training and considerable expertise and experience available at the University of Brighton, most tutors are in this position. It is significant that the survey described earlier was conducted among lecturers from the most technologically adept school in the university, yet a simple and fundamental choice provided by the system was unknown to around three quarters of respondents. Although the majority of tutors were happy with the default, until the point of the survey, because of ignorance they had no control whatsoever over that aspect of the system. For a word processor, such ignorance is only a mild irritation. For a learning environment, its potential impact on teaching and learning may be catastrophic.

Conclusions

Many good things will come from the use of any learning technology: the renewed focus on how we teach, not what we teach, the increased sense of unity, the inventive and creative ways that the systems may be used by many teachers, the improvements in administrative systems that used to be papered over by informal processes and so on. *Studentcentral*, for example, is well-liked by students.

Within a conventional face to face teaching environment, the draconian constraints that we live with relatively equably have evolved through a rich combination of factors, many of which are related to the necessity of bringing people together in a single physical space. While it is natural to transfer similar ways of working into our virtual spaces, it is unnecessary and possibly harmful, especially where it unthinkingly transfers the same constraints or introduces new ones as a result of systemic pressures.

The end the age of the LMS dinosaur may be in sight. The cottage industry approach that was popular with enthusiasts in the mid to late nineties gave way to this industrial, possibly Fordist approach ('you can have any learning management system you like, as long as it's Blackboard'). Initiatives such as OKI or ELF might enable more post-industrial processes, taking parts that are needed, when they are needed, granting control when and where it is needed. Similarly, increasing use of social software and informal instant communication technologies may distribute control more evenly through the system. By blending the strengths of centralized administration of technologies with the local management of the learning environment, we may combine the benefits of the cottage and the factory. For those who do not have these options, an awareness of the ways that learning environments can insidiously constrain our teaching is the first, best weapon at our disposal.

References

Allen, C. (2004). "Tracing the evolution of social software." Retrieved 29th December 2005, from http://www.lifewithalacrity.com/2004/10/tracing_the_evo.html.

Brand, S. (1997). How buildings learn. London, Phoenix Illustrated.

Brusilovsky, P. (2001). "Adaptive Hypermedia." User Modeling and User-Adapted Interaction(11): 87-110.

Clegg, S., A. Hudson, et al. (2003). "The Emperor's New Clothes: globalisation and e-learning in Higher Education." British Journal of Sociology of Education **24**(1): 39-53.

Cristea, A. and M. Verschoor (2004). The LAG Grammar for Authoring the Adaptive Web International Conference on Information Technology: Coding and Computing (ITCC'04), Las Vegas, USA, IEEE.

de Bra, P. and J.-P. Ruiter (2003). AHA! Adaptive Hypermedia for All. WebNet 2001, Orlando, Florida, AACE.

Dron, J. (2005). A Succession of Eyes: Building an E-learning City. E-Learn 2005, Vancouver, AACE.

Dron, J. (2005). "E-learning and the building habits of termites." Journal of Educational Multimedia and Hypermedia **14**(4): 321-342.

Dron, J. (2006). Social Software and the Emergence of Control ICALT 2006, Kerkrade, Netherlands, IEEE.

Dunn, S. (2003). "Return to SENDA? Implementing accessibility for disabled students in virtual learning environments in UK further and higher education." Retrieved 29th December 2005, 2005, from http://www.saradunn.net/VLEreport/index.html.

Eduworks Corporation (2002). What is the Open Knowledge Initiative(TM)? Massachusetts Massachusetts Institute of Technology

Jenkins, M., T. Browne, et al. (2005). VLE Surveys: A longitudinal perspective between March 2001, March 2003 and March 2005 for higher education in the United Kingdom. Oxford, Universities and Colleges Information Systems Association.

JISC (2004). The e-Learning Framework (ELF)– Summary Joint Information Systems Committee.

Jones, S. (1999). Almost Like a Whale. London, Doubleday.

Kay, J. (2006). Scrutable Adaptation: Because We Can and Must. AH 2006, Dublin, Ireland, Springer.

Lisewski, B. (2004). "Implementing a learning technology strategy: top-down strategy meets bottom-up culture." ALT-J **12**(2): 175-188.

Nielsen, J. (2004). "Top ten mistakes in web design." Retrieved 25th April 2006, 2006, from http://www.useit.com/alertbox/9605.html.

Seely Brown, J. and P. Duguid (2000). The Social Life of Information. Boston, Massachusetts, Harvard Business School Press.

Senge, P. M. (1993). The Fifth Discipline- the art and practice of the learning organisation. Chatham, Century Business.