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How to cite:

Jones, Chris (2009). A context for collaboration: The institutional selection of an infrastructure for learning. In: 8th International Conference on Computer Supported Collaborative Learnings, 8-13 June 2009, University of the Aegean, Rhodes, Greece.

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Version: Accepted Manuscript

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## A context for collaboration: Institutions and the infrastructure for learning

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**Abstract:** This paper discusses the role of institutional issues in the deployment of infrastructures for learning and the ways in which they can impact on the range of choices and opportunities for collaboration in university education. The paper is based on interviews with 12 key informants selected from relevant staff categories during the deployment of a new institutional infrastructure in a large UK based distance learning university. It is supplemented by participant observation by the author who was part of a group of advisors tasked with working with the project team developing and deploying the new infrastructure. The paper investigates the development and deployment of the infrastructure as a meso level phenomena and relates this feature to the discussion of emergence and supervenience as features of social interactions in education.

### Introduction

This paper reports how the Open University (UK) deployed a new socio-technological platform, the Open University Virtual Learning Environment as an infrastructure to support teaching and learning. The classic conception of an infrastructure is something that is ready-to-use and completely transparent such as the electricity supply, the mail services and in more recent years the Internet. This understanding of infrastructure focuses on the objects, the elements that are built and maintained but then become relatively invisible by fading into the background. In some ways this is exactly the kind of infrastructure that is required in an educational setting, something just working, supporting learning activities and communicative practices. With the emergence of the Internet and Web it has become increasingly difficult to think of the technological infrastructure as a set of free standing artifacts because the overall form of the infrastructure and the forms of the artifacts themselves are an emergent property of social practices and technical systems. In this paper we draw on the notion of *infrastructures for learning* (Guribye, 2005) to deal with the interconnectedness of artifacts and of how in infrastructures artifacts are intermeshed with other technological, institutional and social arrangements into particular assemblages.

Edwards (2003) describes infrastructures as socio-technical systems, which though they are often viewed in terms of physical hardware are reliant on complex organizational practices both for maintenance and to make the infrastructure meaningful. Edwards also makes the point that the 'background' nature of infrastructures is in some sense definitional for an infrastructure. "Our civilizations fundamentally depend on them, yet we notice them mainly when they fail ... in short, these systems have become infrastructures." (Edwards 2003 p 186). Star and Ruhleder have criticized the notion of 'sinking into the background' because they viewed infrastructure as a relational concept and did not accept the commonsense view of an infrastructure as the substrate upon which other things ran. Star & Ruhleder argue that an infrastructure occurs when the tension between local and global is resolved, when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion (Star and Ruhleder 1996 p.114).

Hanseth and Lundberg examined what they called information infrastructures in the context of complex work organizations. Information infrastructures are shared as opposed to private standalone applications. They rely on standardized interfaces between components which allow the different elements to combine to provide an integrated whole. Infrastructures are open and heterogeneous in the sense that they are theoretically open to any number of users, components or computer systems linking to them and in this way infrastructural systems resemble the Internet and Web rather than closed systems. Hanseth and Lundberg go on to distinguish between work oriented infrastructures and what they term 'universal service infrastructures' intended for the use of all citizens (Hanseth and Lundberg 2001 p365). In higher education we generally deal with some kind of combination of the local infrastructures oriented specifically to learning and wider infrastructures that impact heavily on learning.

The understanding of infrastructure found in Bielaczyc (2006) and Lakkala et al (2008) takes a different stance to that found in this paper on the design of aspects of infrastructure, specifically social infrastructure (Bielaczyc 2006). Lakkala et al. take this further and add notions of technical, epistemological and cognitive infrastructures (Lakkala et al. 2008). The location of the infrastructures discussed by these authors is at a local and micro level of design. By contrast the concept of infrastructure used here is situated at the macro and meso levels in which infrastructures take the form of being given in terms of local design and not a part of the day-to-day design process (Jones et al 2006). This implies a relationship between design and learning in which infrastructures for learning aren't directly designed by the academic staff who are then involved in the more detailed pedagogic design of courses and programs.

Infrastructure, in the sense used here has been applied to learning: “ An infrastructure for learning is a set of resources and arrangements – social, institutional, technical – that are designed to and / or assigned to support a learning practice.” (Guribye and Lindström 2009 forthcoming). This focus on infrastructures ‘designed to and/or assigned to’ takes the idea of work oriented infrastructure and applies it to learning. Guribye distinguishes between the notion of work oriented infrastructure and infrastructures for learning by pointing out that infrastructures for learning do not necessarily have to be designed by the users and might commonly be designed by a variety of actors (Guribye 2005 pp 63 and 64). However we must still be cautious in the use of this revised approach because it explicitly excludes those parts of the infrastructures that are both not designed to, nor assigned to support a learning practice, but which are routinely included in learning practices.

An example are those services such as Google and Facebook which have a relationship to educational institutions and student learning practices but lie outside institutional control. One way such areas impact on institutional provision is by providing comparators for the tools supplied by the university. All universities need to consider what they need to supply in terms of their institutional infrastructure and particularly the infrastructure they provide for learning. The university cannot easily rely on external systems that depend on decisions taken elsewhere because systems can be withdrawn or they may not comply with university regulations, such as those in relation to access for students and staff with disabilities. The need for an institutional ‘backbone’ is related to the core function of a university which is to provide credentials and to stand behind those credentials by having warranted procedures (Brown and Duguid 2000). The university even in times of rapid technological change stands for a certain kind of institutional security.

### Background to the study

The Open University VLE project, which began in 2004, aimed at the development and deployment of new tools and technologies and the integration of a range of existing tools and technologies into a recognizable and unified whole. OU courses are generally large and the university operates on an industrial scale. The university works within two main constraints, those of working at a distance and at scale. The Open University developed some of its own tools and technologies and adapted externally provided systems, such as FirstClass computer conferencing which still provides much of the online provision (for a fuller description of the OU VLE program see Weller 2007 pp 129 – 135 and Sclater 2008). The OU VLE project set out to position the OU as an innovative, high profile and high quality e-learning provider in both UK, and overseas markets. It also aimed to increase the value of the online learning experience to the learner, facilitate partnerships and enable OU staff to rapidly and efficiently deliver pedagogically appropriate e-learning that directly enhanced distance students' learning (Open University VLE Project Phase 1 Final Report December 2004).

The VLE project was developed into a coherent VLE program that began work in 2005 and a fixed term post for Director was appointed in October 2005. The aims of the OU VLE were clearly institutional in form, speaking about the university’s aims and interests and positioning the University as a supplier able to ‘deliver’ learning processes. The OU VLE is then a good example of an institutional approach to developing an infrastructure for learning.

As part of the process of preparing for this large cross institution project an audit of current systems and projects was undertaken (Weller 2007 p131). Part of the intention behind the OU VLE project was to draw together the different strands of development, related to particular course or program needs into a more uniform approach that integrated the various elements into a single system. The original aim was to take the current systems and services and to integrate them into an open architecture based on interoperability. In the event a decision was taken during the course of the project for ‘practical considerations’ to adopt Moodle as a compromise between an in-house solution and a commercial solution (Weller 2007 p135).

### The Research

The author of this paper was tasked to coordinate a group of academic advisors to the OU VLE program for its full duration (October 2005 – July 2008). During this period the author had regular meetings with the VLE program Director and occasional meetings with other members of the program team. The author also undertook a number of tasks related to the VLE program, including running a short course to introduce the VLE to central academic staff and evaluating a course which had been run to introduce Associate Lecturers to the VLE. The research is also based on 12 key informant interviews with Open University staff who were engaged with the VLE in a variety of roles and positions. The interviewees responses are used to examine how institutional and infrastructural issues played out during the process of the OU VLE project. The sample consisted of:

Table 1: Key informants interviews

Work location	Position	Number of interviews
University management	Senior Manager	1
VLE program	Senior Manager	2

VLE program	Business Project Leader (BPL)	3
Learning and Teaching Solutions (Media production unit)	Senior Managers	2
AACS (Computing Services)	Senior Managers	2
Institute of Educational Technology (IET)	Faculty advisors	2

The interviews were semi-structured and conversational in form and they lasted from between 30 minutes and 1 hour with the average duration being between 40 and 45 minutes. All interviews were conducted using a semi-structured interview schedule to allow comparison to be made between the different interviews, but the interviews had a conversational form and the questions only provided a general framework and not a strict guide. The interviewer had a standard list of areas to ask the interviewee about but the order of questions was flexible and the questions themselves built upon the previous comments made by the interviewee. The interviews were recorded and later transcribed before analysis. The analysis consisted of listening to the audio recordings and reading the interview transcripts to discern common themes and variations amongst the responses.

## Findings

A distinctive aspect of the VLE program was the way it stood alongside but somewhat independent of the standard organizational structures of the OU.

The management of it it's strange. There's never been anything quite like this where it's a separate organisation. I'm not saying it's not working, I'm just saying where one set of people obtaining the requirements, and then sort of having to bid against each other to get the pot of resources. (BPL)

The separation allowed the VLE program some independence of the more established units such as Learning and Teaching Solutions (LTS) the media production centre for the University or Computer Services (AACS). An important feature of the development of the OU VLE illustrated in the interviews was the temporal nature of the decision making process. What had initially been envisaged as a service oriented architecture for the new OU VLE became altered so that the Open University adopted Moodle as the basis for the new VLE. The OU like many large organizations was not in the position of developing a 'green field' site, it had to deal with the inheritance, not only of a tradition and a set of practices, such as that of 'hand crafting' each individual course's technological provision, but of having a stable and relatively successful organizational system and a set of technological solutions in place prior to the new developments.

A second feature of the temporal development was the shift from the VLE Project into the development phase of the VLE program. This was accompanied by the appointment of a temporary Director prior to the appointment of the full VLE Director for a fixed term linked to the VLE program. It was in the period when the temporary Director was in place that the shift toward the adoption of Moodle took place. Moodle was largely selected prior to the appointment of the new Director, although the final decision took place at a Steering Group in the first week after his arrival. A key figure in making this decision was another new appointment to the University. University staff who were exposed to Moodle as an alternative system were exposed to it because the University happened to appoint someone with prior experience and knowledge of Moodle. The new appointee who held a senior position in the university had installed Moodle in another university before taking up his job at the OU.

The point being made here is not critical of the process being described, it simply illustrates how contingent the decision making process was, even when the logic of the final decision was strong. Not one of the interviewees queried the decision to adopt Moodle, even though some saw strengths and weaknesses in it. However the actual decision took place in a less than systematic way. The infrastructure the OU has developed has arisen both out of a structured decision making process and the day to day contingencies of organisational life - appointments, internal politics etc. The contingent process of decision making taking place over an extended period of time can appear rational and logical on the surface but the interviews show a characteristic pattern of decision making following a logic related to immediate circumstances and unforeseen events as well as long-term planning.

At the end of the interviews the respondents were asked if there were items that hadn't been covered in the interviews that they wanted to add. The most common point that was raised was about the question of boundaries within the OU and how these either affected the VLE or were affected by the VLE program. It is clear when reading the full interviews that this was an important concern for the majority of those that were

interviewed. The issue arose in two distinct forms, a concern with how existing institutional arrangements were impacting on the VLE program and secondly a concern with the ways in which the VLE program would impact on or undermine the existing divisions of labor or current institutional arrangements.

Different units or silos within the university had different standpoints and slightly different views on what was important in terms of the VLE. Two significant groupings within the Open University were Learning and Teaching Solutions (LTS) the media production centre for the University and Computer Services (AACS) which provides and supports all central IT services and it is responsible for the University's Technical Infrastructure. A sense of the way in which the tasks surrounding the VLE were perceived by LTS and AACS staff can be found in the following two quotes.

Prior to the VLE effectively all e-learning that we did was hand-crafted, and for hand-crafted read horribly expensive... they were cripplingly expensive to produce... I think the VLE was an attempt to move away from having lots of separate systems, to having a single system or a single set of integrated systems that actually made it more straightforward to do the things that we wanted to do (LTS Manager)

my focus is on helping to build systems to meet certain areas of functionality, and in one respect that's what the VLE is, and I guess what I'm trying to say is, I think so far we haven't actually got very far beyond where we were before we started on this process, because a lot of the functionality that currently sits within Moodle previously existed within Promises or other facilities that were made available. (AACS Manager)

The quotes illustrate that there is no single 'university' setting out requirements and the way that these divisions colored the views of what were the most significant tasks for the program. From one perspective the aim was integration with a sharp eye on costs, from the other it was the development of functionality. In many ways these two outlooks were not just divergent they were contradictory because a desire for integration and reduced costs meant that at times compromises had to be made in terms of the development of functionality.

The introduction of the OU VLE has had a recognized impact on the existing division of labor within units and the division of work and responsibility between units in the University. One way in which this was described in the interviews was in the way the new technology suggested that the current pattern of production and presentation might be disrupted. The effects of the change in technologies could have significant impacts on the process of work and the flow of work through the institution. The current division of labor envisages a relatively clean break between course production and presentation, yet the technology enables and may even encourage the reconnection of these two activities.

## Discussion and Conclusions

Path dependency has recently been defined as "the "lock-in" effects of choices among competing technologies." (Edwards et al. 2007 p17). Edwards goes on to identify social investment (e.g. time to train), positive network effects and individual habits and organizational routines as providing resistance to change. There are a number of points in the interviews when path dependent effects can be identified. In the way that an earlier conferencing FirstClass remains in use and colors the use and appreciation of Forums in the Moodle based OU VLE. In the way that previous tools developed in house set levels of expectation about the new tools in the VLE. In the way that decisions taken at particular points in the process of the VLE project and program had impacts that 'locked-in' later outcomes. There is nothing new or necessarily negative about path dependency, indeed positive path dependency occurs when effective new practices build on and emerge from old practices. Path dependency is however an issue that needs to be explicitly addressed in infrastructure development processes such as the OU VLE.

The literature in CSCL has seen a development of concerns with larger scale phenomena and a move away from a simple focus on small scale group settings (see for example the proceedings of CSCL 2007 e.g. Kapur et al.). It is tempting in this context to deploy the idea of emergence as an explanatory tool for understanding a range of issues. Often the form of the argument about emergence takes the form of individual agent and collective system.

The concept of emergent behavior is, however, rather paradoxical. On the one hand, it arises from the interactions between agents in a system, e.g., individuals in a collective. On the other hand, it constrains subsequent interactions between agents ... It becomes fundamentally important to understand *how* macro-level behaviors emerge from and constrain micro-level interactions of individual agents. (Kapur et.al. 2007)

The research presented in this paper fundamentally questions this position by suggesting that agents are not simply individuals but are often acting in roles assigned by their positions in an historical and ongoing pattern of events. Arguably this is a standard sociological understanding that is particularly applicable in education. Patterns of emergence in such contexts take place mediated by emergent forms that already have a long history and that can supervene in the interactions between agents, having a causal role independent of the individual agents identified above.

The evidence of path dependency shows how agents in universities are positioned within a field of interaction with a distinct temporal dimension. The reflexive development of software systems shows how the software carries with it earlier histories of its development (in this case Moodle was a course based system), but it also demonstrates how the developers in a university can amend and vary the characteristics of the software to incorporate new features and different metaphors for teaching and learning (such as an organization around programs or persons rather than courses). All of these features point to a need to understand meso level factors that stand somewhere between top down and bottom up processes. In part the evidence presented here can be seen as suggesting a need to understand the missing middle in CSCL.

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## Acknowledgments

The research for this paper was undertaken as part of the advisory role undertaken by the author as a member of the Institute of Educational technology at the Open University (UK). I would like to acknowledge the assistance I had throughout this work from the OU VLE program team, in particular the Program Director and the helpfulness of all the staff interviewed.