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Title: **The Theory and Practice of the Virtual University: Working Through the Work of Making Work Mobile**

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The hype of our times is that we don't need to think about the work anymore[1]

Introduction

What does the recent application of information communication technologies (ICTs) in higher education, and particularly the emergence of digital, online or virtual universities hold for the future shape of established, campus-based universities? The increasingly popular answer is that these 'placeless' institutions have the potential to reshape traditional university geographies, as well as the methods, relationships, and perhaps even the 'ethos' of the academy. This prospect is perhaps captured best by Tom Abeles, who claims that '… students who once travelled great distances to listen to lectures of scholars, can now access this knowledge via the world of the internet'.[2] Presented in such language , it is easy to be seduced by the suggestion that we are nearing 'the end of campus based education',[3] or that the university's role in the creation, preservation and transmission of knowledge is to be usurped by telecommunications networks[4] -- in the process of which traditional institutions are destined to become 'dinosaurs'.[5]

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[1] Geoffrey Bowker and Susan Leigh Star, 'How things (actor-net)work: Classification, magic and the ubiquity of standards', Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign, (1996) found at http://weber.ucsd.edu/~gbowker/pubs.htm, no page numbers.

[2] Tom Abeles, 'The Academy in a Wired World', Futures, 30, 7, (1998), 606.

[3] Eli Noam, 'Electronics and the dim future of the university', Science, 270, 13, (1995), 247-249.

[4] Abeles, op. cit. note 2.

[5] Noam, op. cit. note 3.

For all that has been written, however, research suggests that corporate virtual institutions represent a tiny fraction of current higher education provision,[6] and that their significance lies not so much in their actual number or market share, but in the pressures that they bring to bear on the rest of the higher education sector to adopt their methods, strategies and technologies.[7] With such changes, albeit small scale, catching the imagination of policy-makers and managers,[8] it would seem that universities everywhere have plans to deliver established courses using new technologies and at a distance.[9] Indeed, such is the enthusiasm and activity that some suggest a 'blurring of the boundaries between distance education and on-

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[6] See the recent report, CVCP (2000), The Business of Borderless Education. London: CVCP; see also, Middlehurst, R, (2001), 'University Challenges: Borderless Higher Education, Today, and Tomorrow', Minerva, 39: 3-26. Even in the most developed market, the United States, new for-profit universities such as the University of Phoenix constitute 'only 2% of degree enrolments' and 'publicly-listed educational services companies constitute only 3% by value of the billions of dollars spent on education and training in the US'; Yoni Ryan, 'The Business of Borderless Education: US case studies and the HE response', paper presented to the CVCP conference ' The Business of Borderless Education', 28th March, 2000.

[7] For instance, in a recent and widely circulated letter by the Higher Education Funding Council for England (HEFCE) the dangers of such 'virtual and corporate universities' eating into the UK higher education market were spelt out. The letter invites universities to respond to this threat by contributing to a new 'e-University' project that will challenge these new entrants. The document can be found on HEFCE's website: http://www.hefce.ac.uk/Pubs/CircLets/2000/cl104_00.htm.

[8] See, for instance, Howard Newby, 'Higher Education in the 21st Century: Some Possible Futures', Discussion Paper, Committee of Vice Chancellors and Principals, London, March 1999.

[9] See, for instance, some of the projects mentioned in a special issue of Futures, Vol. 30, (7), (1998), or in a recent issue of Minerva, Vol. 39, (1), (2001).

campus teaching'.[10] However, given that much of the work of building ICTs into higher education is taking place in existing institutions, the question that requires answering is: 'how are universities attempting to come to terms with these new technologies?'

The literature on ICT projects in universities has often skated over this question of ICTs are actually being built into universities? [11] Much writing on this question assumes either a 'pro' or an 'anti' position, and tends to emphasise the differences between online and traditional provision.[12] We suggest a different and wider approach. For us, the notion of a virtual university is useful not as a depiction of a particular type of institution, nor as a simple choice between one form over another, but rather as a description of a series of projects that are currently being implemented in existing institutions.

What has struck us is the sheer volume of the work involved in constructing these virtual university projects. For this reason, our central focus -- one that is missing from much of the debate -- is 'work'. Using concepts from the sociology of technology, we stress not just the volume but also the

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[10] Johnston, S, (1999) 'Introducing and Supporting Change Towards More Flexible Teaching Approaches' in Alan Tait and Roger Mills (eds), The Convergence of Distance and Conventional Education, London: New York, p39.

[11] However, see the article by Phil Agre, 'Infrastructure and Institutional Change in the Networked University ', Information, Communication and Society, 3 (4), (2000), 494-507.

[12] Several advocates have been mentioned. Some critics include David Noble, 'Digital Diploma Mills: the Automation of Higher Education', Science as Culture, 7, (3), (1998), 355-368 and Langdon Winner's description of the 'Automatic Professor Machine' (1998) (available from http://www.rpi.edu/~winner/apm1.html, downloaded 6 June 1999).

heterogeneity of this effort.[13] We present three case studies, each of which discusses the tensions that arise once technologies attempt to complement or replace work that existing organisational and institutional structures currently undertake.[14] This paper focuses on just one university, which we shall call 'North Campus'. Our choice was influenced by its institutional commitment to the application of the Internet and other Web-based technologies. However, our work on other institutions lead us to think that things are not different in kind (although perhaps in degree) elsewhere.

The Virtual University as Mobile Work

What is a virtual university? How might it differ from a non-virtual or traditional university? Stuart Cunningham and his collaborators have described it thus:

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[13] For a description of the actor network approach, see Michel Callon, 'Some elements of a sociology of translation: domestication of the scallops and the fishermen of St. Brieuc Bay,' in John Law (ed.), Power, Action and Belief: a New Sociology of Knowledge? (Sociological Review Monograph, Routledge, London 1986); Bruno Latour, Science in Action (Cambridge, Massachusetts, Harvard University Press, 1987); John Law, Organising Modernity (Oxford, Blackwell, 1994).

[14] This article forms part of a wider research programme of research carried in a number of different higher education institutions in the North East of England over the past four years see James Cornford, 'The Virtual University is… the university made concrete', Information, Communication and Society, 3, (4), (2000), 508-525; Neil Pollock, 'The Virtual University as "accurate and timely information"', Information, Communication and Society, 3, (3), (2000), 349-365; James Cornford and Neil Pollock, 'The university campus as a "resourceful constraint": process and practice in the construction of the virtual university' in Mary R Lea and Kathy Nicoll (eds) Understanding Distributed Learning (London, Routledge, 2001), 170-181; Neil Pollock and James Cornford, 'The Theory and Practice of the Virtual University', Ariadne, 24, (2000) available from http://www.ariadne.ac.uk /issue24/virtual-universities/intro.html.

> Picture a future in which students never meet a lecturer face to face in a class room, never physically visit the on-campus library; in fact, never set foot on the campus or into an institutional lecture-room or learning centre. Such is the future proposed by the virtual university scenario.[15]

The defining feature of this university is an 'absence' -- that is, the lack of physical co-presence (and thus the specialised site for such co-presence, the campus). From this point of view, the virtual university is 'without walls'. This cannot be taken too literally. The people who make up a university still have to be someplace, but what is significant is that they no longer need to be in the same place. The virtual university is thus the 'distributed university'.

What makes this distribution possible? At one level, information and communications technologies. Yet, this does not get to the root of the matter. The mere presence of communications technologies does not change the university. The key point is that the technologies are used to move the work of the university around. It is this capacity which enables work to be transferred between different locations, linking students, lecturers, researchers, administrators, technicians, evaluators and assessors, without the need for co-presence. But the virtual university also promises to redistribute work tasks. Work can be shifted around in time as well as space, and materials made accessible around the clock. New divisions of labour become possible: work can be shifted from staff to students, and between academic and

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[15] S. Cunningham, S. Tapsall, Y. Ryan, L. Stedman, L., et al., New Media and Borderless Education: A Review of the Convergence between Global Media Networks and Higher Education Provision, Australian Government, Department of Employment, Education, Training and Youth Affairs, Evaluations and Investigations Programme, Higher Education Division, (1998) (http://www.deetya.gov.au/highered/eippubs/eip97-22/eip9722.pdf), 179.

administrative staff.[16] Moreover, a new division of labour emerges between people and machines, as computers take on the laborious work of compilation, storage and distribution. The virtual university becomes a new social, technical, temporal and spatial division of labour in higher education – it is work made mobile.

The Work of Making Work Mobile

The mere presence of ICT does not make work mobile. Rather, work must be transposed into a format that is compatible with technologies in use. It must be untangled from its local constraints. Theodore Porter points to this link between information, space and scale.

> The creation and use of information needs to be understood first of all as a problem of space and of scale, of getting beyond what is local, personal or intimate and creating knowledge that is, so far as possible, neutral and well standardised. The ideal, in short, is to go beyond perspective, to turn a view from somewhere into a 'view from nowhere'.

[16] For instance, a number of universities around the world are currently working with computer system suppliers to build administrative systems that offer 'self-service' access to students. See Neil Pollock and James Cornford, 'ERP Systems and the University as an 'Unique' Organisation', paper presented to the Critical Management Studies Conference, UMIST, Manchester, UK, July 2001, available in Electronic Journal of Radical Organisation Theory at http://www.mngt.waikato.ac.nz/ejrot/cmsconference/2001/papers_education.asp

> Businesses and governments, as organizations spreading over large territories, depend on this. So also do scientists and for identical reasons.[17]

We might say that the virtual university turns work into information, and thus makes it mobile.

The resource required is enormous -- whether we are talking about administrative systems, systems to support teaching and learning, library catalogues or specialist research facilities.[18] But what are these resources required for? First, for hardware and software. The technical configuration of systems and the re-coding of existing materials into machine-readable form are also required. However, the working of systems and software demands other activities, the scale of which is not easily appreciated. Typically, such factors are difficult to investigate.

The notion of 'network building' is useful here. Bruno Latour and his colleagues have painted a picture of the scientific and technological process as one where central 'actors' are treated not simply as scientists or technologists, but as multifaceted entrepreneurs or 'heterogeneous engineers'.[19] These 'actors' engage not only in practices typically thought of as 'scientific' or 'technological', but also in a wide range of political, sociological and economic activities. To understand just how scientific knowledge is constructed or a technology becomes a success, we must follow and observe them as they enrol others into 'networks'.

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[17] T. M. Porter, 'Information, power and the view from nowhere', in Lisa Bud-Friedman, (ed.), Information Acumen: The Understanding and Use of Knowledge in Modern Business. (London, Routledge, 1994), 217-230.

[18] CVCP, op. cit. note 6.

[19] Latour, op. cit. note 13., Law, op. cit. note 13.

The metaphor of the network is also useful for describing the typically invisible processes, objects and actors that wrestle with the inertia of existing organisations, infrastructures, and practices. The actor network approach focuses on change -- the introduction of new networks -- and has developed concepts (such as interressement, translation and enrolment) to describe this process. It is not simply the agency of an innovator, but the skills of an 'heterogeneous engineer' that move a network in the direction that innovation requires.

Building the 'Virtual University' into the 'Traditional University'

In the Learning Development Services (LDS) department of a University near to our own -- 'North Campus' -- we followed and observed the activities of Tom, who had been working in LDS as a Telematics Development Officer for some years. Tom's official role was to 'enrich the existing teaching and learning provision given to students through increasing the use of ICTs among academic staff'. In one of our first meetings, Tom told us how there had been a number of important changes to his remit, and how these stemmed from the re-orientation of North Campus more generally:

> What's really interesting is that there has been a massive shift really in what [my boss] and the Vice Chancellor want us to try and achieve now. My main job as Telematics Development Officer has been enrichment up until now, where I have worked with a lecturer, trying to put some telematics into their web materials, or move a little bit of their traditional teaching onto the web. About two months ago, [my boss] came down with a directive from above saying that she wants us to get the old print based [courses] that are working well out there in the field and convert them to run on the web, entirely telematically, so that people can log in on one of the browsers like Netscape, run it from anywhere and be completely stand alone so that they can operate at a distance from the University.

This conversion of the ‘old print based’ courses (what Tom calls a ‘conversion job’) was only one facet of the planned re-orientation.

> In the last 18 months or so, there’s been another big push in the University as we’ve changed here again, and we’re looking to try and find markets outside the University where we can deal direct with the student. So the students [are] a bit like … Open University students with us -- we interface with them on a one-to-one basis but mediated through the technologies. So we’ve all been trying -- several lecturers in the Computing Department, a few staff in LDS, and one or two other keen individuals dotted around the University -- to come up with a model of a package that the student could reasonably be expected to sit down in front of and plough away on his or her own and self-study all the way through.

During our research, we observed examples of each theme**.** First, as part of curriculum enrichment, there was to be a 'virtual seminar' as part of a Photography course. Video-conferencing technologies were to be used to connect researchers and students in the UK and other parts of Europe, to present ideas and receive feedback, much like a traditional seminar. In terms of transferring print-based courses to the Internet, there was an 'Information Skills' module that had been used every year to familiarise over three hundred, first-year students with the technologies, practices and procedures of the Library. Previously run by Library staff, this was to be developed into an online self-study module, available anywhere on campus via the university network. Finally, to attract new students from a distance, a ‘Cyber Culture’, module was to make course material available outside the institution.

To see how these projects worked out in practice, we followed the progress of Tom and his team. Month after month we sat in on technical sessions and planning meetings as the material was gathered, the technology was developed, and the initiatives took shape. Staff and students were enrolled as participants. However, several months after everything had been put in place, all three projects ‘stalled’. The immediate reasons for this are varied: one partner pulled out of the video-conferencing project complaining of high

telecommunication costs; the library staff could not be convinced that the online version of their Information Skills course was better than its existing methods; and, despite managerial enthusiasm, only one student had enrolled to study the 'Cyber Culture' course at a distance.

These failures maybe explained in different ways.[20] But we are interested in the way they highlight the work demanded before new networks can be knitted into existing arrangements. In the process of making things 'virtual', the University had to 'rework' and rethink much of what it does, and reconfigure its relationships with many of the actors and entities on which it currently depends.[21] However, it was only when the attempts were made, that the need for all this effort became visible. And with this came a realisation of the costs and complexities of compensating for work that various networks already discretely undertake on behalf of the University. To understand these points, we need to look at each initiative in greater detail.

The 'Virtual University' Only Partly Exists

The great appeal of communication technologies is that they connect places that have never been connected.[22] The virtual seminar involved four institutions in three countries. It included staff and postgraduates as well as a more 'passive' undergraduate audience. The 'official' history of the seminar, as told by those involved in its conception, said they simply wanted to use video-conferencing to establish 'connections' with other universities; the detailed format and rationale for the project would come later.

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[20] We certainly do not want to be critical of the staff in the Learning Development Services Department who, despite limited resources, often showed remarkably ingenuity and resourcefulness during their work.

[21] See the paper by Phil Agre for a detailed elaboration of this point; Agre, op. cit. note 11.

[22] Agre, op. cit. note 11.

The seminar took place on several occasions during the academic year and a number of outcomes emerged. It was thought that, once links were established with other institutions, it might be possible to share expertise. What really excited participants, was the prospect the technology might give practice-orientated British students access to theory-orientated European academics.

> We did a pilot this year, and it was about a year in brewing it up. The [Belgian partner] suggested a module of study to follow, and then everyone threw in different papers…. They took it in turns to present their papers … each person giving presentations, and the students from all four universities sat in and listened to those talks. There was about five minutes at the end of each talk for the students to ask genuine questions to the lecturer who had just spoken. So in a way, we have got a way of sharing specialists in that subject.

It was also thought that presentations might be useful 'learning material' for undergraduates:

> … that was the video conferencing bit, but the web bit is that the lecturers then put the stuff up on the Web. For example, Sergio put his paper up there. The students could dip into it and read it. And then, the last bit – most important bit, I always think – is the seminar part. What they did here is that the students were allowed to go and email, quite long emails, into a giant email box that everybody else can see. So it is like a live open forum. And the students can start to follow things up. [The emails] get quite long. There were really quite considered contributions.

The compelling aspect of this story is that mundane technologies such as email and video-conferencing seem to make the 'virtual university' possible. Actors and institutions who have never co-operated are allied to produce novel forms of education; work is moved between staff; and students can draw on expertise from outside their own institutions.

From the beginning, the seminar had been an extra module for North Campus students. Such was its apparent success, that it was decided to make it a compulsory aspect of the degree course. Yet, just a

short time before the new academic year started, we were told that it had been decided to 'temporarily' postpone the seminar, the partners in the Netherlands having pulled out because the organisation allowing them to use a video conferencing suite had decided to charge them the equivalent of £50 an hour for its use.

While we do not discount this financial story, we want to add a further aspect. Typically, we understand technologies in terms of what they give us. Thus it could be suggested that the connections provided by the video-conferencing equipment and email that allowed the project to get off the ground; and since other universities with the same technology were assumed to have a similar interest, the project flourished. Yet, the virtual seminar was entirely technology-led -- based on a desire to use video-conferencing within the University. Innovation, however, involves not simply a requirement to contend with the 'technological' specifics of the artefact, but also to resolve simultaneous political, sociological and economic difficulties. What the seminar lacked was this wider context into which it could be inserted. The goal of connection appeared a 'good' and 'necessary' thing in itself, without a need for this elaboration.

Perhaps it was no surprise, then, that when the seminar had to jump a minor financial hurdle, collaborators in other universities withdrew. The seminar then had no context to draw upon.[23] Tom describes how, in a meeting with European partners to discuss potential for collaboration, the partners

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[23] For instance, see Sarah Green and Penny Harvey's account of the different senses of 'connection' as it is typically discussed by technology advocates and, in contrast, how it might be understood elsewhere (as in anthropology or actor network theory). The upshot of their argument is that, while technology can be effective at maintaining existing connections or relations between actors, it is less good at building new ones. Sarah Green and Penny Harvey, 'Scaling Place and Networks: an ethnography of ICT 'innovation' in Manchester', Paper Presented to the Internet and Ethnography Conference, University of Hull, UK, 13-14 December 1999. For a similar argument, see also John Seeley Brown and Paul Duguid, The Social Life of Information, (Boston, Harvard Business School Press 2000), chapter 8.

decided that the seminar ‘wasn't worthwhile’. Shortly after this meeting, Tom’s institution also began to question the benefits of further video-conferencing projects. Tom again: ‘It's funny, at the same time [as the European partners pulled out of the project] in my University I've always had a £3,000 budget to spend on anyone who wants to do video-conferencing from my room, and my budgets been cut on that as well’. Indeed, as far as Tom was concerned, just a few months after technology had seemingly brought these actors together, video-conferencing within his university had ‘come and gone’.

In retrospect, the seminar was not fully integrated into the University, and this meant that the project was conceived and remained simply a ‘technical project’. But, a technology only becomes a success when a sufficient network has been built for it. Indeed, as Rudinow Saetnan points out, without such connections, a technology can be said to only ‘partially exist’.[24] New technologies demand rethinking and reworking of basic and essential concepts. [25] Finding a way of re-conceptualising virtual projects was also an issue in our second case, the Information Skills course.

What is a course?

The idea behind the Information Skills course was to convert print-based material to the Web. The course could thus be increasingly stand alone and accessible at a distance from the University. What became apparent during this ‘conversion job’, however, was the extent to which tensions were created within North Campus. Seemingly, established concepts and practices were not capable of supporting the role that advanced technologies asked of them.

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[24] A. Rudinow Saetnan, ‘Rigid Politics and Technological Flexibility’, Science, Technology, & Human Values, 16, (4), (1991), 419-447.

[25] S. Kiesler, and L. Sproull, Computing and Change on Campus, (Cambridge, Cambridge University Press, 1987).

We can elaborate on what this means by a description of one meeting where Tom and Sonia, a programmer from LDS, demonstrated the new on-line version of the Information Skills course to an assistant director of the Library, Helen. Helen was responsible for the existing course, and it she who would decide whether the on-line version would go ahead. While we were waiting for Helen to arrive, Sonia described how she had spent the summer turning the Information Skills material into something that could be put on the web, and that now she had reached the most crucial stage: the coding work was complete and she and Tom were ready to demonstrate it to Helen. Until recently, Helen was supportive, but in recent weeks, she had been less forthcoming.

Towards the end of the demonstration, Helen concluded that she liked the package, but was not sure how to proceed with it. Tom's suggestion was to test the package with students. However, no trial could take place until the University had validated the course. What followed was a lengthy discussion about the need for validation. Sonia argued that there was no need to put the package through the validation process as, despite modifications, she believed that it was, in essence, the 'same course'. Helen disagreed: anything that has 'substantial modifications' has to be re-evaluated. For Sonia, it was the same course. The discussion continued for some time. Indeed, there was some ambiguity about what a course, actually is: and whether this was a traditional course, a traditional course just put onto the web, or something completely new.

The problem appeared to be that the project team were not willing to describe the course in too novel terms. If completely 'new', the course would have to be re-validated, but procedures for validating an on-line course would, themselves, have to be created. At the same time, if they used a concept that was too conventional, then the Library staff would not make the effort to implement an on-line version of what they already had. Thus, the project team had to deploy a notion of a course that was simultaneously old and new: both traditional and virtual. Before the question was resolved, the meeting broke up. Tom was

disappointed.[26]. Perhaps the module would never be launched. Such confrontations we found were commonplace.

The Cyber Culture Course is <u>too</u> Virtual

The third case we considered was the 'Cyber Culture' module. Here, we also witnessed a need for 'bridging' between universities as they are now, and as they might become. In some respects, the 'Cyber Culture' module comes closest to a truly virtual university: it is a completely new course that takes North Campus in a very different direction by targeting new groups of students, outside the institution.

The course failed to attract 'large' numbers, but this is not to say that the course was not used. As well as being a package sold on the Internet, it also became a compulsory module in the European Studies degree programme taken by campus-based students. This was to encourage staff from other departments to develop their own such online courses. Yet, before the module could enrol these staff in the wider process of developing online courses, it must first enrol students. How would students, accustomed to traditional forms of teaching and learning, react to a fully on-line course? The fear was that the Cyber Culture module would be <u>too virtual</u> for these students. Tom, in conversation with two of the University's graphic designers, puts the issue thus,.

> In terms of a fully online course, it will never happen. We will never go electronic. So, we have come to this kind of moment when we feel that we have to try and market -- sort of market in inverted commas, but really market without the inverted commas -- these materials. Internally for ourselves we have got to persuade students -- I think that is the best word, it's not too strong a

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[26] Of course, what Tom is referring to as the 'centre' is among other things the tradition within universities of 'rule by committee'. For a good description of the workings of the committee system, see, G. Lockwood and J. Davies (eds), <u>Universities: The Management Challenge</u>, (Windsor, NFER-Nelson Publishing, 1985).

> word -- persuade students that this is a good route to choose while there is still a choice between using the printed versions and the web versions.

To gain access to the online course, the procedure was simply to issue each student with a World Wide Web address (URL), a username and a password. However, the project team feared that a slip of paper, or an email, with the information required to access the course would fail adequately symbolise the work which the team and the institution had put into developing the course. This would lead students to undervalue both the course and North Campus's role in creating it. The issue, then, was a matter both of persuading students of the benefits of technology and of this package. Considerable effort was put into finding a suitable way of making the course distinct and significant. The outcome was the creation of an elaborately packaged floppy disk which prominently displayed the University's logo. Tom explained his logic:

> It's so difficult you see, because [the on-line courses] don't exist. I can't bring any to show you. And that is what we want the print [material] to do, to turn them into 'things'. And that is why we slipped back to this idea of at least giving them a diskette for the first one, and then we can have students coming along to LDS and we can give them a disk out over the table, over our reception desk.

Ironically, the success of the 'virtual' depended upon a functionally redundant physical 'object' -- the carefully packaged floppy disk.

We began our research with the notion that the university – the campus – was a barrier, something to be overcome. This image appears commonly within the discourse of virtuality. This may not imply a complete escape from the constraints of geography, but rather an escape from a particular spatial

configuration: to paraphrase David Harvey, annihilating space and time through a new 'spatial fix'.[27] We assumed that the university could become 'dis-embedded' from the campus, but only by becoming re-embedded in some other configuration of places.

However, we moved increasingly away from this image of dis-embedding and re-embedding, as we were made aware of the ways in which 'place' -- the physical world of the campus -- far from being simply a constraint on the activities of the university and its staff and students, actually performed a number of important, if unacknowledged, functions. This is well captured by Phil Agre's description of a 'meta-place' that provides all the other 'places' of the university with physical plant and symbolic resource.[28] It is only when attempts were made to abstract a course from the campus that this role became visible, and with it, an awareness of the complexity of seeking to replace the work that the campus discretely undertakes.[29]

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[27] David Harvey, The Condition of Postmodernity: An enquiry into the Origins of Cultural Change, (Oxford: Basil Blackwell, 1987).

[28] Phil Agre, 'Imagining the Wired University', Paper presented at the Symposium on the Future of the University, University of Newcastle, September 2000.

[29] See Cornford and Pollock, 'The university campus as resourceful constraint' for an extended discussion of this point, op. cit. note 14.

The effort of substituting the work of the campus turns on its head the assumption that universities, as they deploy and use ICTs, will necessarily become more virtual. Rather, the task of building new ICT components into the university is often dependent on giving them greater material presence.[30]

Conclusion

What is particular about our account of these projects, and why they 'stalled'? Three reasons are put commonly forward to explain failed attempts to introduce such innovations: 1) the technology doesn't work (or does not work as expected); 2) staff, in particular teaching staff, resist the introduction of any technology that threatens their autonomy; and 3) the costs of technology development are simply too high, certainly when not spread across very large numbers. In the case of these projects, we would argue that each of these arguments is superficial. In none of the cases did the technology fail. There was no overt staff resistance. Finally, while the issue of cost did emerge, it was the cost of (re)configuring the institution, rather than the technology, that was most significant.

We would argue that each of these three reasons can be seen as simply the surface manifestation of deeper tensions between the old and the new -- between new technological configurations and the contexts in which they are deployed; between staff in established university networks and the networks of the 'on-line' university; and, between conventionally-accounted costs of course construction, and the revealed costs of virtual courses. The underlying problem is the sheer volume and complexity of the work required to configure people, machines, objects, texts, and money.

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[30] See the article by Wakeford who makes a similar point in relation to a cyber-café; Nina Wakeford, 'Gender and the Landscapes of Computing in an Internet Café' in M Crang, P Crang, and J May (eds), Virtual Geographies: Bodies, Space and Relations, (London, Routledge, 1999).

What form will the 'virtual' university take? It is unlikely that there will be an overnight transformation of the traditional university -- its core role and functions cannot simply be shifted on-line; physical places, like campuses, are seen as increasingly relevant, rather the reverse; and there is little evidence to suggest that learners find fully online courses or electronic study resources wholly appropriate to their needs[31]. On the other hand, staff and students are increasingly reliant on information systems, the Internet, and other online technologies. [32] Indeed, the nature of academic work increasingly requires scholars to use more, not less, technology.[33]

The picture we have seen at North Campus is ambivalent Once the projects left the close confines of what Law and Callon have called a 'negotiation space', [34] they 'stalled'. They demanded the rethinking, and more significantly a reworking, of relationships.

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[31] See, for example, Noriko Hara and Rob Kling, 'Student distress in Web-based distance education' Information, Communication & Society, 3, (4), (2000), 557-579; K. Stephens, 'Notes from the Margins: Library Experiences of Postgraduate Distance-Learning Students' in Alan Tait and Roger Mills (eds), The Convergence of Distance and Conventional Education, (London, Routledge, 1999).

[32] John P Walsh and Todd Bayma, 'Computer networks and scientific work', Social Studies of Science, 26, (1996), 661-703.

[33] Susan Leigh Star and Karen Ruhleder, 'Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces', Information Systems Research, 7 (1), (1996), 111- 134.

[34] John Law and Michel Callon, 'Engineering and Sociology in a Military Aircraft Project: A Network Analysis of Technological Change' in Susan Leigh Star (ed.), Ecologies of Knowledge: Work and Politics in Science and Technology, (Albany, State University of New York Press, 1995).

Whatever form(s) of university may emerge, the 'work' of building the virtual university into the traditional university will be critical. In this process, the project team will have a central role.[35] They will be required to oversee the continuous movement back and forth between the existing institution and the (often mismatched) requirements of the new technologies – a process slow, complex and prone to failure. Universities, like most institutions, have a large number of networks, infrastructures and routines that are not easily recognised or changed.[36] The problem can be seen as a choice between exploring new technological possibilities and the exploitation of old certainties.[37] The choice facing universities concerns which aspects of the traditional institution they should continue to exploit, and which of the promises of the new technologies they should begin to acquire.

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[35] Latour, op. cit. note 13.

[36] Agre, op. cit. note 28.

[37] J. March, 'Exploration and Exploitation in Organizational Learning', Organizational Science, 2, (1), (1989), 71-87.

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Abstract:

The coming of new Information Communication Technologies (ICTs) has prompted much controversy in higher education. Scholars and administrators have been excited by the potential -- perhaps the threat -- of the ‘virtual’ university. But whilst much has written about ‘virtual higher education’, less has been said about the actual ‘work’ involved. Drawing upon insights from the sociology of technology, this paper reports on the attempts of one university to reconcile ideas about ‘virtuality’ with the more established networks and infrastructures of traditional university life, highlighting the hybrid nature of the work required. This research is based upon a participant-observation study carried out in the UK.

Keywords: virtual university, actor network; intermediation work; campus as resource; mobile work