CHAPTER TWO

Actor-network theory and online university teaching: translation versus diffusion

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Abstract

The stories we tell each other about change and innovation in education are important. Much of the research literature concerned with change and innovation in education as in other fields has been strongly informed and influenced by the tenets of diffusion theory. This paper describes an alternative approach to the study of educational innovation and change which is based on a sociology of translation or actor-network theory (ANT). ANT rejects cause and effect or factor-based accounts of change and focuses on understanding how alliances and associations of people and things are made, strengthened and weakened.

Introduction

The resources being put into online teaching and learning in Australian universities as in other parts of the overdeveloped parts of the world, while difficult to quantify, is clearly significant. Robson (1999) has estimated that globally, the number of web-based

courses is doubling every eleven months[1]. It is not only
universities that are engaged in this new mode of education
delivery, many companies have developed web-based
teaching in competition with what some universities offer
as well as to support their own training needs. Just how
much of online course development and implementation can
be associated with university teaching is thus hard to
estimate[2]. Mapping any pattern of activity that is supported
by the web remains difficult[3] but what is apparent is that
there are a lot of resources being directed to the
development of web-based teaching[4]. How these innovations
are understood and studied is therefore critical. To date,
where they have been studied, research has been informed
by a theory of innovation diffusion which has severe
limitations and serves to largely disguise the interplay of
the wide range of influences and forces which shape
innovations of this kind in universities. Rather than
informing policy makers and practitioners, innovation
diffusion theory provides tautological accounts that preclude
a realistic consideration of online teaching and learning.
This paper describes an alternative approach which is not
limited in the manner of diffusion innovation theory and
which offers a more complete account of the interplay of
the various elements that must be brought together for an
innovation to be implemented successfully. This paper
reports the first case of a study of online teaching and
learning via this alternative approach.

The rapid growth in online work in universities may
seem unremarkable when considered in comparison with
other, rapid global engagements with the new computing
and communication technologies such as e-commerce.
However to see these developments as purely par for the
course or inevitable technical changes to university teaching
ignores the considerable implications that the adoption of

these technologies have for teaching, learning and related work in universities. For the initial purposes of this paper, the development and implementation of web-based teaching can be seen to have two components, the technical and that associated with teaching and learning or more broadly, the educational. How these are understood and theorised by practitioners is important. Decisions about development and implementation are inevitably informed by explicit or implicit theoretical sensibilities. An indication of these sensibilities can be found in some of the terms used to talk about an innovation. The common use of terms like *change agent* and *changing the culture of an organisation* in referring to both educational and technological change reflects, at least in part, the influence of particular ways of understanding how change occurs and how innovations are taken up or rejected. This paper examines a commonly used framing of educational and technological change and describes the characteristics and assumptions associated with its use. The paper then offers an introduction to a framing which posits an alternative approach to studying the development and implementation of an innovation or project and illustrates it with reference to current research into online teaching in universities.

To begin, then, in the study of both educational and technological change, a good deal of research has been directed at identifying patterns associated with change and the attributes of, for instance, the types of individuals involved in the change, the nature of the change and the context in which the change occurs. Thus, the literature refers to, among other things, change agents, change cultures, capacities, stages of concern about change, micro and macro influences and contexts of change. This research produces categories or factors that can, at least in theory, be used to support the planning and implementation of

future adoptions of innovations or perhaps provide an explanation for the failure of a particular innovation. Types of adopters, types of resisters and types of change or innovation are the kinds of factors identified in this kind of research. In the study of technological change the diffusion innovation theory of Everett Rogers (Rogers, 1962, 1983, 1995; Rogers & Shoemaker, 1971) has been influential in a broad range of studies concerned with the take-up or rejection of particular innovations. In education, interest in factors or categories-based research around change has a long tradition (see for example, Hargreaves, Leiberman, Fullan, & Hopkins, 1996) and the influence of Rogers' work is also to be found.

Innovation diffusion theory is considered here as representative of or largely consistent with most factor or category-based research in innovation. Its explicit application in education has not been common but the broad approach of framing research into educational change in terms of factors or influences has been and continues to be the predominant approach to studying change. For instance, the failure of many of the large curriculum projects of the 1960s and 1970s prompted research which drew on the work of Rogers among others to identify a range of factors that could be linked to the success or failure of these projects (for example, Huberman & Miles, 1984; Rudduck, 1973, 1990, 1991).

Innovation diffusion theory provides a way to model the manner in which a new idea, artefact or practice moves from its birth to its implementation or its failure to be implemented. Innovation diffusion posits that innovations are communicated through particular channels over time to the members of a social system. Of interest to innovation diffusion researchers are the particular characteristics of an innovation, the characteristics of the range of adopters (innovators; early adopters; early majority; late majority;

laggards), the type of decision making about the innovation (optional, collective or authority-based), the stages an innovation passes through (knowledge; persuasion; decision; implementation; confirmation), the type of communication channels (mass media, interpersonal), the roles of particular individuals in the adoption process (opinion leaders, change agents, change aides) and the degree of homophily between individuals in the social system.

Category-based approaches to the study of innovation locate and label influences that are judged to have effects on the course of an innovation. Categories are determined by researcher(s) from research data and constitute the basis of explanation for the success or failure of a particular innovation or change. The key point about this approach to the study of change is that success or failure of an innovation is explained in terms of influences whose characteristics have been judged *retrospectively*. For instance, category-based analyses *find* that some innovations fail because of inherent flaws in the innovation or succeed because the innovators 'got it right' or were successful because a particular change agent proved to be highly effective. That an innovation had flaws or that the innovators managed to get it right are things that are determined *after* the event. The attributes of the innovation or the skills of the innovators are things that are, in innovation diffusion terms, predetermined but not evident until all of the influences impinging on an innovation have been mapped. In a sense, the attempt to bring the innovation forward is the means by which these characteristics are revealed. In its pursuit of a more predictive model for adoption of innovations, innovation diffusion further seeks to identify predictive characteristics of the categorised elements of a potential adoption, that is the attributes of early adopters, of change agents and so

on. Like most category-based forms of analysis the pursuit of fundamental properties, much like the quest for the ultimate particle in physics, can become one that is never ending. Thus innovation diffusion and related category-based approaches tend to category proliferation. When faced with features of the adoption of rejection of an innovation that can't be accommodated by the theory, the corrective measure is to add more categories or category types. This has effectively been the mode of development of innovation diffusion theory since the 60's.

Thus, from an innovation diffusion stand point, the development and implementation of web-based university teaching is framed in terms of the factors like those briefly described above. Such an approach has its appeal, particularly to administrators in that, at least theoretically, factors can be identified and presumably managed. But in the end, at least according to diffusion innovation, success will *only* come with the right combination of brilliant implementer/ developers (academics/course developers), clever adopters (students) and the most compelling technology (web pages and web authoring software). The only problem for administrators being that judgements about brilliance, cleverness and being compelling can only be made *after* the event. While the tautology in such accounts of innovation remains a problem, a more significant issue with category-based analyses of innovation and change is their reliance on a largely unchanging and unchangeable technology. The thing, idea, artefact or practice cannot alter much from its initial conceptualisation or material form during the process of implementation. Giving technologies an independence that is virtually unable to be negotiated by human action confers a measure of technological determinism on innovation diffusion analyses. This is consistent with the maintenance of a separation between things that are social or human and

things that are technical. Indeed, all category-based theories of change rely upon making distinctions or separations between things, or, as Bruno Latour suggests, of purification (Latour, 1993). The problem with making use of *fixed* categories for projects or innovations is that the very process of innovation is one which produces *new* arrangements. Forcing configurations of social and technical elements that are intended to be new and different into pre-existing categories seriously limits the reading of such change. As Latour (1996) argues,

> You can study anything with classical sociology—anything except the sciences and the technologies, anything except projects. They go too fast. they become too soft or too hard. For sociology, they are like an extended Michelson-Morley experiment. It is impossible to detect the ether in relation to which they displace themselves. To study them, you have to move from classical sociology to relativist sociology, and see in the former only a particular case, an approximation, a valuable one to be sure, but only when nothing more is moving, when projects have become objects, institutions.

In the early 2000's web-based teaching in universities is far from being institutionalised. What is of interest is if and in what ways teaching practices associated with the use of the Internet do become routinised in universities. As Latour suggests, a different approach to the study of things as they are being implemented and taking on new forms is necessary. One alternative to the largely tautological accounts produced by category-based approaches to innovation is offered by the sociology of translation or actor-network theory.

Actor-network theory

Actor-network theory (ANT) developed in studies of the sociology of technology and science. In recent years, it has come to be used in a growing number of other disciplinary

spaces. ANT can be characterised as a form of relational materialism (Law & Mol, 1995) in which networks develop from negotiations and trade-offs between a set of actors. In ANT, networks are constituted by actors which are both human (language-bearing) and non-human (non-language bearing) and the only pre-existing property in an actor is a capacity to negotiate roles in a potential assemblage. A network or assemblage of actors arises as a result of negotiations between actors. Roles and capacities are not pre-determined but emerge as a result of negotiation, trade-off and compromises between actors. Attributes such as agency or power are seen as properties of networks or assemblages not as qualities that inhere in particular actors. As Latour (2000) argues, ANT is interested in 'things'. Not things as non-living objects or things without language but things as quasi-objects, as heterogeneous networks or assemblies of humans and non-humans. In this way projects or innovations are seen in terms of a process of alliance formation or failure of negotiation and compromise of, in ANT terms, translation.

Thus for an innovation, the initial idea barely amounts to anything, it certainly does not have any inherent inertia or momentum that propels it into a social system. If it progresses at all it only does so by interesting other actors and forming an alliance with them. This typically means offering a solution to a problem. For this move to be successful at least two translations need to occur. One to move the interests of the group or actor so that the idea is seen as a solution to a problem and the other and in doing so to move the innovation a lot, a little or very occasionally not at all. In other words, in order to effect the recruitment of new allies, the innovation has to change. This is an approach to tracing educational change which is fundamentally at odds with how innovations have been

studied in the past. The following account illustrates this approach to the study of educational innovation.

A translation account of the development of a web-based system[5]

This is a study of the development in a Computer Science Department in an Australian university of a web-based authoring system, called 'the webster' for the purposes of this paper. This account traces the institutional and extra-institutional influences associated with the development of the webster, another paper in this collection[6] describes the use of this software in teaching an online course. In ANT terms, the development of this software is seen in terms of translation, that is of a series of movements in which the webster changes in order to make alliances with other actors for whom the webster has become a potential solution to one or more of their problems. The webster begins as an idea of a young computer scientist and then via a series of translations attaches people and things to it and in some key instances fails to attach some allies. In order to attach other actors, the webster is translated, it moves to become something that is different to what it was prior to the recruitment. Equally, the actors who are successfully recruited are also translated. In effect, the webster has to redefine their problem so that the webster becomes a solution to it. This is not an account in which one actor or another dominates but in which recruitment occurs through mutual negotiation of roles.

The developer of the webster, Daniel, had been experimenting with aspects of online teaching well before web-based teaching became vogue. Daniel was strongly of the view that given the changing and changeable nature of online systems that any web-based delivery software would

need to be easily changed and adaptable by and for users. To this end he opted to employ an open source software approach for the development of the webster. Open source software is developed, tested and enhanced through collaboratively sharing with others. Operating systems like Unix and Linux whose source code is freely available to non-profit users are examples of open source software. By committing to publicly available source code and making additional code needed for the package similarly available, Daniel translated the webster so that it was available to a broad international community of open access software supporters and specifically to those in that community with interests in web-based delivery of university teaching. In one case, he developed a partnership with a colleague in Europe and together they wrote a text concerned with web-based teaching which drew heavily on Daniel's development and use of the webster. The book was published by a major international publisher and remains popular among web developers. The translation of the webster into an implementation made of open source software was successful in recruiting a significant number of academics in Australia and overseas with similar interests. They formed an alliance broadly around the approach and in a number of cases specifically around the webster.

In his own institution things were different. In the early 1990s there was some scepticism about the role and significance of online teaching and learning. The Director of the unit responsible for distance education publicly declaring that he thought IT would have little impact on distance education. The institution, like others with a significant proportion of students studying at a distance had committed heavily to a delivery system in which print was the predominant medium. There was little institutional direction *vis-à-vis* online teaching and learning at the time.

Daniel began by taking the units he was currently teaching at a distance and put them online. He translated the webster so that it provided course materials and a range of interactive options for his distance students. The webster's source code was developed in concert with Daniel's online teaching. Recruiting students to working in this new way, even IT students, proved to be no simple matter and considerable negotiation between students, equipment, software and lecturer occurred (see Rowan this collection).

Daniel's success in recruiting students to use the webster was not matched by his attempts to recruit colleagues. Daniel had been unable to attract any institutional resources for the production of the webster and relied on student project labour in the main to develop components of the software. Some of his colleagues in the IT department found the interface difficult to use and were not persuaded to take it up. While Daniel was prepared to translate the webster to make it easier to use, he was unable to attract funds adequate for that purpose. There was however interest in other Schools of the institution but, here too, in the end, recruitment proved difficult.

The technical staff in the Business School had shown interest in the webster during a consideration of different web-based delivery systems for teaching in the School. The staff had found Daniel's book to be particularly useful in developing and designing their initial forays into web-based teaching. They were keen to get an evaluation done of currently available systems and informally approached Daniel to do the evaluation. The Dean of the Faculty was unsympathetic to having an academic with a perceived vested interest conduct the evaluation and encouraged staff to examine commercially available options. One of these options arose in connection with the adoption of a textbook which offered on-line availability. It was supported by a

commercial product, Xweb. If the text was adopted, students could access a site in the USA and carry out support exercises in the text using Xweb for no cost. The School went down that path. Lecturers set up a customised home page for the unit and enrolled all the students so they could access the resource online. Online access to the host computer proved unreliable and there was almost no support to help with problems in using the resources. Nevertheless, the School was persuaded by what was possible and saw the solutions to their access and implementation problems in the university acquiring a license for Xweb so that it could be managed and offered locally.

It was not just the competition of other software that worked against the recruitment of the Business School but ironically a view that the local software was too fragile in that it was largely Daniel's project and fears were expressed about a scenarios in which Daniel either left the institution or was otherwise unable to continue to support the project. This view was strongly held despite the fact that the webster's source code was open and accessible to any competent computer programmer. This is in sharp contrast to Xweb and other commercial packages in which source code is unavailable to users.

The implementation of the Business School's online teaching was carried out by the university's distance education facility using Xweb. The results enjoyed mixed endorsement by the School. In the meantime the webster was examined by other groups in other Schools of the university. In once case a School installed the software and invested considerable time in moving the Faculty's online resources onto the webster. The interface, still largely unchanged from its early development due to lack of resources proved the major sticking point and the software was eventually removed from the School's web server. The

webster remained in use for some IT courses and Daniel was able to persuade the School to adopt the software for the School's web pages as well as securing resources to improve the interface and further develop the software. Elsewhere in the university a mix of commercial packages and home-grown approaches to web-based delivery continued.

More recently, the institution decided to purchase software to provide integrated support for the management of student records, finance and many of the universities administrative needs. This new, ambitious system is potentially, in ANT terms, a large network encompassing many human and non-human actors. It's significance for the further development of web-based systems lies in the possibility of interfacing student records data with the delivery system, thereby automating the processes associated with setting up and managing student accounts for online delivery. The translations that are necessary to bring about an alliance with any of the web systems in use in the university have yet to occur. The administrative system uses proprietary encryption protocols which the manufacturer is loathe to make available to other software system vendors. While the matter remains unresolved, proponents of competing systems are making claims about the compatibility of their systems and the incompatibility of competing systems. Clearly, the recruitment of such a large ally as the administrative system by any web-based system would make it difficult to disassemble would make any web-based system with Institutionally, the move to a single software system to support administrative functions is consistent with a move to a single system to support web-based teaching or at least to systems which are compatible with the new administrative system. The ongoing recruitment of students, lecturers, hardware and other software systems as allies for different web-based delivery

systems continues and ensures that the institutionalisation
of web-based teaching at the university appears still some
time away.

Conclusion

From an ANT perspective, the development of the
webster has been a series of translations, some successful,
other not in the recruitment of allies. It's implementation
in the IT School appears to have been partially stabilised
but elsewhere in the university it still struggles to compete
with alternative systems and its and the compatibility of
other systems with the new administrative system is likely
to be highly significant. Unlike a diffusion innovation
account, this ANT account did not retrospectively attribute
properties to actors but, instead, traced the moves and
counter-moves made by all of the actors as they pursued
their interests. It focussed on the highly-situated often
routine translations that were part of the formation of actor-
networks associated with the webster. All accounts of social
phenomena are necessarily political but an ANT account
self-consciously traces the politics of all actors avoiding the
establishment of simple associations of cause and effect
(McMaster, Vidgen, & Wastell, 1997).

Attractive as causal models of innovations might be
generating abstractions and generalisations about
attempted implementations have proven to be of little
practical value in guiding policy makers or practitioners.
That implementations of innovations are messy, always
involve compromise and translation and are fundamentally
political (see for instance, Hargreaves, 1996, 282) clearly
indicates an approach to research which is predisposed to
dealing with irrationality, untidiness and contingency.
Rather than producing neatly categorised, sanitised

accounts, ANT provides a robust, parsimonious framework with which to trace the novel assemblages of people and things that Latour prefers to call quasi-objects. What is important is how these assemblages are formed, how particular associations are strengthened and weakened and how some assemblages are made resilient over time and eventually become something not regarded as technical but as routine or "normal".

The long history of research concerned with educational change and reform has demonstrated the limited capacity of category-based frameworks. ANT offers this important field a means by which to address the complete set of influences and forces that any innovation must successfully negotiate in order for it to become a reality, and, as is clearly the case with the webster, the pursuit of reality is an ongoing process.

> But anything can become more or less real, depending on the continuous chains of translation. It's essential to continue to generate interest, to seduce, to translate interests. You can't ever stop becoming more real. (Latour, 1996, 85)

Endnotes

1   Cited in Jones (2000).

2   The definition of what is a university in the on-line world is also unclear.

3   A novel approach to developing an understanding of web structure and usage can be found in the Xerox Parc User Interface Research Group s work on webology : http://www.parc.xerox.com/istl/groups/uir/projects/Webology.html

4   See for instance: http://www.fit.qut.edu.au/EOT/AustUni.html which details the adoption by Australian universities of web authoring systems.

5   References to software, people and institutions have been anonymised.

6   See Leonie Rowan s: Cautiously Optimistic: the work associated with on-line university teaching.

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