

**Methodological Issues in a study of Mobile Learning as a Disruptive  
Innovation**

**Actor Network Theory and Case Study Unit Analysis in a qualitative study  
of three mobile learning projects in UK Higher Education**

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## **Abstract**

In this paper, I present two possible methodological dilemmas with a study of mobile-learning as a disruptive innovation in UK Higher Education. The first issue concerns the use of Actor Network Theory as a theoretical lens when contrasted against the largely interpretivist approach to the field research. The second issue concerns the choice of unit of analysis in Case Study Methodology, a problem brought about by having a multi-institution project as one of the three chosen cases.

**Keywords:** Actor Network Theory, Interpretivism, Constructivism, Unit of Analysis

## **Introduction**

My PhD research project is looking at the impact of mobile learning (m-learning) on HE institutions. For the purpose of the study, 'm-Learning' is defined as 'using mobile and wireless technologies to support students in a blended learning environment' (JISC, 2005, p.7). The project is looking at the impact of m-learning on the university organization and business model and whether these are able to adapt to the challenges brought about by a discontinuous innovation (Rogers, 2005). The project is not investigating the impact on pedagogy that m-learning may bring, although the benefits of mobile technology to teachers and learners will have a major influence on the sustainability of the innovation. The research question is summarised as follows:

'How do university organizations (business models, modes of operation, people and processes) adapt to a disruptive innovation like m-learning and what factors and working practices support or hinder that adaptation?'

The principal feature of my research design is a comparative case study of three projects within HE institutions attempting to introduce and embed forms of mobile learning technology. In addition I am planning to use Actor Network Theory (ANT) as a 'lens' to interpret the results and identify strategies for embedding mobile learning that were more successful than others.

This paper discusses two specific issues which have a potential impact on the research design and resultant thesis:

1. I am employing an interpretative approach to how I view reality and am concerned about whether such a philosophy conflicts with using ANT. The authors of ANT have explicitly denied it has an underlying ontology or epistemology and as such, ANT has not and does not purport to offer a common set of methodological tools with which to conduct investigations. However, critics claim it does have its own philosophical stance and so this is an area which I need to account for and defend in presenting my thesis.
2. I am concerned about the comparative nature of my cases and whether this will present difficulties in presenting the findings. There are justifications for looking at three projects as each one represents a distinctive type within the initial field research I did and also existing innovation literature. However one of the projects actually involves five separate universities and even though it is centrally managed, there are differences in approach between the five project partners. Hence my analysis could be caught within a conflict between comparing three projects and comparing seven institutions.

### **My philosophical approach and Actor Network Theory**

The research question above enables me to consider the types of information that my research will elicit and thus define an appropriate methodology. I am looking to interpret how universities, as organizations, respond to a disruptive technical innovation through the people and processes that engage with it, namely, lecturers, students, administrators, business managers and IT service providers and all their associated policies and ways of working.

This has to be combined with my epistemological instinct, which is based on an interpretivist paradigm with a view that knowledge is socially constructed. I would see the main evidence as seeing a consistent pattern emerge in people's practical experience and opinions of m-learning technologies, what they see as the benefits of this technology and what are the drawbacks and how it intersects with their organization and impacts its people and processes. There are a wide variety of potential barriers to the 'translation' of m-learning into the university organization and it is difficult to propose a hypothesis which can provide the coverage of issues and elicit the depth of understanding. The research will be controlled by

the ideas discovered through the research process with my aim being to gather 'rich data from which ideas are induced' (Easterby-Smith et. al., 2002, p. 30). However, this non-positivist viewpoint doesn't necessarily mean that a qualitative approach of some form is a given, even though the 'nature of the phenomena' encourages it (Mason, 1996, p.11). The initial literature review has, through investigating innovation diffusion, actor-network theory and others, revealed a significant number of factors which could play a prominent role in the strategy for deployment of m-learning. All these factors, combined with the initial field research, generate research questions which in turn could be translated into a series of questions which could be measured via a questionnaire or survey. Thus a quantitative approach is not ruled out by the questions or the data they may elicit but it may prove difficult to create measures of acceptable external validity or reliability when dealing with a poorly understood phenomenon like m-learning diffusion (Edmondson and McManus, 2007).

In the initial ideas-gathering phase of the project, I eventually chose an interview approach and this was vindicated by uncovering a number of issues which were not anticipated by the literature review and thus were best elicited through structured open questions. An advantage of the interview approach is that it gave me the opportunity to explain my research to an interview subject in a much fuller sense than a written introduction to a questionnaire or survey (Oppenheim, 1992). From a practical point of view it also allowed me to feed back and validate the findings of my research to the interviewees who in turn have enabled further access for the more in-depth PhD study. All the evidence to date suggests that for this project a qualitative approach 'is much better suited than a quantitative one to the task of understanding how complex, highly context-sensitive processes unfold in organizations and how they impact on those involved' (King, 2000, p.590).

Having chosen an interpretative epistemology and identified interviews as the principal form of data gathering, how will I interpret the data and build theory with which to draw conclusions from the research? I was attracted to Actor Network Theory as a way of looking at the data and building some model as it focuses on the interactions within the project between people, processes and technology in a 'democratic' sense rather than the Rogers view of innovation diffusion which tends to place the innovation as central to the process.

Actor Network Theory (ANT) introduces the concept that 'agency' (Latour, 2005) resides both in people and objects such as technical innovations. Agency is usually thought of in

terms of humans making conscious decisions to exert influence but Actor Network Theory propose that for analytical purposes objects can also have agency, an example being a particular technology having influence (i.e. agency) over how humans perform certain tasks. ANT prescribes that all entities, both human and non-human, be subjected to the same process of social analysis (Law, 1994). ANT identifies the set of processes involved in projects of social ordering as networks and looks at the changes that take place in those networks through a project. ANT also provides a concept of translation whereby people, objects and processes have specific 'needs' which are translated into more general and unified needs, enabling all needs to be met by one solution. When a system is introduced it gets adopted by the users by translating it into their own context and reflecting their work tasks and situations (Latour, 2005). ANT also provides a concept of irreversibility where a network is established that can resist competing translations, making the change irreversible. Actor Network Theory may provide a useful model for looking at m-learning in higher education as the various actors (the university, teachers, students, IT services, the innovation itself etc.) could be viewed as undergoing a process of translation in order to find a stable way of working together. Notions of reversibility of current arrangements within universities, and the processes of translation orchestrated by those championing the introduction of m-learning, may enable important differences to be identified between universities that successfully and sustainably embrace and implement forms of m-learning and those that are unable to 'translate' irreversibly.

Whilst Actor Network Theory and its notions of networks and translations would seem to lend itself as a method of looking at how these barriers are overcome, another part of ANT is even more promising. Looking at project failure in the aircraft manufacturing industry, Law and Callon came up with the concept of local and global networks and the boundaries between the two (Law and Callon, 1992). They identify three factors which influence the success or failure of the project with the most significant being 'the capacity of the project to build and maintain a global network which will for a time provide resources of various kinds in the expectation of an ultimate return'. They also talk about obligatory points of passage between the two networks, which could be powerful individuals who exert influence over the global network or even powerful groups of people, such as strategy groups or committees. Applying this to my research I can imagine the local network as the mobile learning project itself and the global network as the university organization with sustainability and embedding of the mobile learning technology dependent on the ability of the local project to build links

with the 'global' university organization through some point of passage. As this aspect of ANT hasn't been applied before to this type of Information Technology project, it also represents an opportunity to make a contribution to knowledge.

But is Actor Network Theory consistent with the interpretivist paradigm I have adopted? This is a problematic discussion as the authors of ANT have specifically denied that it has an underlying ontology and epistemology most notably expressed in the comment by ANT's main proponent 'there are four things that do not work with actor theory; the word actor, the word network, the word theory and the hyphen' (Latour, 1999).

There are three main principles of ANT which touch on ontology and epistemology namely agnosticism, generalised symmetry and free association (Callon, 1986). Agnosticism means that the researcher has to be impartial towards all actors in the network be they human or non-human (technology in my case). Symmetry refers to the creation of networks where actors and non-human actors have equally significant roles and the conflicting viewpoints of these different actors can be explained in an abstract and neutral vocabulary that works in the same way for all actors, be they human or technology. Finally the idea of free association means that there can be no assumed distinctions between the technological and the social worlds in coming to an understanding of the phenomenon being researched.

Interpretivism has a constructivist ontology in that realities about the world are made sense of by the researcher. As such an understanding is constructed by the researcher which implies some control over the findings - a selection of the truth. But ANT has a much more open ontology which dictates that the actors speak for themselves thus challenging a constructivist approach. ANT proposes that forces in the interplay amongst actors themselves define, constitute and construct this interplay (Law, 1999). The argument is that my interpretivist position is imposing some structure on the data I am gathering rather than 'allowing' the actors to construct their own reality. However even if one is purporting to use ANT as an all embracing research approach, if you choose to interview people then clearly your questions are going to play a part in constructing the responses you receive - in other words the actors may be speaking for themselves but only within your 'script' and thus some constructivism is inevitably at work.

Clearly there is a possible conflict here between my chosen epistemology and ANT, yet there are many IS researchers who have adopted interpretivism and ANT. They are taking the position of ANT that it is a lens on reality rather than a fundamental ontology (Walsham, 1997; Wynn, 2001).

I have already identified that Law and Callon's global/local model and its points of passage is the main reason for selecting ANT and so in effect I am already focusing on a sub-set of the whole Actor Network theory. Thus I can defend its use as a lens in this instance even if there may be some potential conflict in epistemological terms. My methodology has however been influenced by Actor Network Theory in that looking for points of passage between m-learning projects (the 'local') and the university organization (the 'global') has caused me to add appropriate questions to my interview scripts. Thus although my research design might be interpretivist led it has certainly been adjusted by ANT in some aspects.

## **Case Studies**

In selecting cases for my field research, I started with referencing my research question. The research question should dictate the type of organization to approach (i.e. universities) and the type of data to be gathered (Eisenhardt, 1989). Furthermore it may help define the number of organizations and perhaps indicate timescales. My research question:

“How do university organizations (business models, modes of operation, people, processes) adapt to a disruptive innovation like m-learning and what factors and working practices support or hinder that adaptation?”

In my initial field research I looked at mobile learning in ten different UK universities and identified three types of project: those funded by research grant, those funded by the university and those initiated by loan innovators (tutors) who applied some mobile technology to their own courses without any explicit institutional support and perhaps even some disapproval. The innovation literature suggested this might be a significant categorization in that difficulties in embedding might be least expected for projects that the university is already financially supporting and might be greatest in so-called 'maverick'

projects which appear to have no management approval. In other words, the origin of a project might be a significant factor.

From my case study methodology I identified each mobile learning project as a unit of analysis (Yin, 2009) and thus my aim was to have three units of analysis comprising each of the three types of project outlined above. In Yin's terms I have adopted a form of theoretical sampling, each unit of analysis being chosen to contrast differences in origin of mobile learning projects and chosen to expect potentially different outcomes.

If each of the projects constituted a single university then I would appear to have a classic design which should stand up to scrutiny. However, one of these cases is actually a project which is being trialled across five separate universities working in a collaborative partnership. Although I can treat this as a single project there are likely to be differences between these five universities in how this technology is embedded and sustained.

My original logic is choosing cases based on the project origin – funded, unfunded and maverick - but it is possible that the more striking difference may be the university organization themselves and what structure they have in place to develop these projects beyond some initial limited trial. Hence my research may flip from contrasting three projects to contrasting seven universities. How does this compare with the principles of good case study methodology?

Yin (2009) defines four types of case study design which essentially have the two variants of single or multiple cases with the added variation of embedded units of analysis where an individual case involves more than one unit of analysis. For example, an organization might be a single case but individual departments might be embedded units of analysis. Applying this logic to my design would appear to map satisfactorily in that two of my cases map to single units of analysis i.e. project equals university. However one case would appear to have five embedded units of analysis in that the project spans five universities so does this question the validity in that it doesn't completely match Yin's designs? In other words I have a multiple-case design consisting of three cases, one of which has distinct embedded units of analysis.

I have used a theoretical sampling method to select my three cases each one selected to contrast the three types of project, a form of ‘contrary replication’ (Eisenhardt and Graebner 2007). The fact that one of these cases consist of five organizations potentially enriches the design. It is also worth stating that the choice of cases available to a researcher (especially a PhD researcher) is usually limited so it might be wrong to discard this five university case on the basis of not neatly fitting into the mapping of project equals university (Eisenhardt, 1989). Also this specific case is easily the largest mobile learning project in UK Higher Education so represents a particular strong example of the category of funded project.

It may well be that the original decision to use categories based on project type may be proved to be less significant than the variations between individual universities themselves and indeed early indications from the field data would suggest this may be the situation. Therefore the fact that I will have data from seven universities strengthens the potential findings rather than weakens them. Multiple cases create more robust theories ‘because the propositions are more deeply grounded in varied empirical evidence’ (Eisenhardt and Graebner, 2007, p. 27).

## **Summary**

This paper has looked at two methodological issues in my research design: the epistemology of Actor Network Theory and the logic I have used to select appropriate cases. Whilst both situations would appear to be defensible, the author is interested to gain the academy’s input before continuing into the writing up year of my PhD program.

## **Bibliography**

- Callon, M. (1986) ‘Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fisherman of St Briec Bay’ in *Power, Action and Belief. A new Sociology of Knowledge?* (Law, J. (ed.)), pp. 196-229, London: Routledge & Kegan Paul
- Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002) *Management Research An Introduction*, 2<sup>nd</sup> edition, London: Sage

- Edmondson, A. and McManus, S. (2007) 'Methodological Fit in Management Field Research', *Academy of Management Review*, Vol. 32, no. 4, pp. 1155-1179
- Eisenhardt, K. (1989) 'Building Theories from Case Study Research', *The Academy of Management Review*, Vol. 14, no. 4, pp. 532-550
- Eisenhardt, K. and Graebner, M. (2007) 'Theory Building from Cases: Opportunities and Challenges', *Academy of Management Journal*, Vol. 50, no. 1, pp. 25-32
- JISC. (2005) *Innovative Practice with e-Learning: A good practice guide to embedding mobile and wireless technologies into everyday practice*, Bristol: JISC Development Group
- King, N. (2000) 'Commentary-Making Ourselves Heard: The challenges facing advocates of qualitative research in work and organizational psychology', *European Journal of Work and Organizational Psychology*, Vol. 9, no. 4, pp. 589-596
- Latour, B. (1999) 'On Recalling ANT' in *Actor Network Theory and After* (Law, J. And Hassard, J. (Eds.)), pp. 15-25, Oxford: Blackwell
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford: Oxford University Press
- Law, J. (1994) *Organizing Modernity*, Cambridge: Blackwell
- Law, J. and Callon, M. (1992) 'The life and death of an aircraft: a network analysis of technical change in *Shaping Technology/Building Society: Studies in Sociotechnical change* (Bijker, WE and Law, J. (eds)), pp.21-52, Cambridge MA: MIT Press
- Mason, J. (1996) *Qualitative Researching*, London: Sage
- Oppenheim, A (1992) *Questionnaire Design, Interviewing and Attitude Measurement*, London: Continuum
- Rogers, E. (2005) *Diffusion of Innovations*, New York: The Free Press
- Walsham, G. (1997) 'Actor-Network Theory and IS Research: Current Status & Future Prospects' in *Information Systems and Qualitative Research* (Lee, A., Liebenau, J. And DeGross, J. (Eds.)), pp. 466-480. London: Chapman and Hall
- Wynn, E. (2001) 'Möbius Transitions in the Dilemma of Legitimacy' in *Qualitative Research in IS: Issues and Trends* (Trauth, E (ed.)), pp. 20-44, Hershey PA: Idea Group Publishing
- Yin, R. (2009) *Case Study Research: Design and Methods 4<sup>th</sup> Edition*, Thousand Oaks: Sage