Preface

ABSTRACT

This preface traces my own personal journey through the discovery and use of actor-network theory (ANT) for information systems research. It begins with my introduction to ANT in a small way during my research Master of Arts degree in the early 1990s and continues with the use of ANT to frame my PhD. Next it looks at how I was able to make use of ANT, and in particular Innovation Translation, with my research students and in my own research on technological innovation in business organisations. Although, in my view, Innovation Translation provides a better framework for investigation technological innovation than either Innovation Diffusion or the Technology Acceptance Model, I have been quite prepared to supervise doctoral students using either of these other approaches as well as those using my preferred approach. This preface discusses examples of these various research projects.

DISCOVERING ACTOR-NETWORK THEORY: A PERSONAL RESEARCH JOURNEY

The first developments of actor-network theory (ANT) occurred over 25 years ago, but for at least its first five or ten years ANT was regarded by many in the Information Systems (IS) community as little more than a curiosity. In the late 1990s, however, ANT began to be taken seriously by IS researchers concerned with a holistic approach to socio-technical research (Tatnall & Gilding, 1999). Today much research of this type makes use of an ANT framework. This chapter traces my personal journey of discovery with actor-network theory from my first use of ANT, through use of ANT with my research students to its current prominent place in my research.

BEGINNINGS

My first encounter with actor-network theory was in the early 1990s when I was completing a Master of Arts by research at Deakin University, Australia. I was investigating the beginnings and evolution of university-level Information Systems curriculum in Australia, and needed a way to look at the influence of both humans and technology in this development. My research supervisor was Dr Chris Bigum who has had a longstanding interest in both ANT and ICT (Information and Communications Technologies)
Research in Education. Although now partly retired, Chris is maintaining his interest in ANT as an Associate Editor of the *Journal of Actor-Network Theory and Technological Innovation*.

Beginning in the early 1960s, it might innocently be thought that university studies in Information Systems (IS) simply diverged from those in Computer Science (CS), which had been around for several years at this time. This is, however, certainly not the case. Australia made its move into electronic digital computing quite early with the CSIR Mk1 (CSIRAC) built in the late 1940s. CSIRAC was Australia’s first internally stored program computer, and (depending on what machines you count) the world’s fourth (McCann & Thorne, 2000). From 1948-1956 CSIRAC was located in the University of Sydney and in 1956 it moved to the University of Melbourne where it remained in service until 1964 (Pearcey, 1988), leading the way into the introduction of computing courses (Computer Science) in the Universities of Sydney and Melbourne. (CSIRAC is now on display in the Melbourne Museum – the only first generation computer intact and on display in the world (McCann & Thorne, 2000).)

In the 1960s the Australian Commonwealth Government had a need for large numbers of computer professionals to staff its rapidly developing administrative computing projects in the Department of Defence and in the Postmaster General’s Department (PMG, now broken up into Telstra and Australia Post). This was a major factor in getting business computing underway in Australia. These government computing projects created a huge need for trained IT professionals in analysis, design and programming, but such people were not to be found and had to be trained. This training was initially supplied by the Commonwealth Government in the form of *Programmer in Training* (PIT) courses run by the Commonwealth Public Service Board. These PIT courses provided the impetus for university-level courses in business computing (- then know as Automatic Data Processing) as they soon moved to the Colleges of Advanced Education (later to be merged into universities) and then evolved into what we now know as Information Systems curriculum (Tatnall, 2006).

In this research project (Tatnall, 1993) I interviewed current and former academics and those who had been involved in this innovation. One of my interview subjects was Gerry Maynard who had been an inspector in the PMG and Public Service Board and been involved in the delivery of the PIT courses (Maynard, 1965, 1971). My research methodology was Curriculum History (Goodson, 1988; Goodson & Ball, 1984) which offers an ethnographic approach to the study of the evolution of curriculum. What curriculum history does *not* provide, however, is a useful approach to the consideration of the non-human entities that are an essential part of any curriculum involving technology, and this is where ANT came in. Rather than subject this data to a full actor-network analysis however, I found it more useful to draw on some aspects of ANT to help describe the socio-technical interactions which took place in the evolution of business computing. I started by looking at the non-human actors and outlining the evolution of the machines and the methods employed by the human actors in using these machines. This is where my interest in actor-network theory began.

**THE ADOPTION OF VISUAL BASIC AS A UNIVERSITY CURRICULUM INNOVATION**

After completing the research masters degree I commenced work on my PhD, also with Chris Bigum as research supervisor. Promotion resulted in Chris soon moving to the University of Central Queensland (CQU), and this meant that I then moved my PhD to CQU also. A suitable research topic was easy to find as in the early 1990s a colleague at RMIT University and I had recently discovered Visual Basic
(VB) and we soon each began, in a small way, teaching VB to our Information Systems students. This innovation was not, however, without some controversy in our universities. Questions were asked along the lines of: was VB an appropriate language to teach in an IS course? What about Pascal, wasn’t Pascal a better language than a version of Basic to teach students about structured programming? But VB offered a much more interesting approach to programming in a graphical or Windows environment, was this not worthwhile?

These discussions suggested a suitable topic for my PhD as investigating *Innovation and Change in the Information Systems Curriculum of an Australian University* (Tatnall, 2000). My supervisor and I decided that the study would investigate the introduction of Visual Basic at RMIT University in Melbourne, and that what was needed was an approach that offered a suitable socio-technical perspective. The research approach would need to take account of the human but also the non-human (technological) actors involved. Clearly actor-network theory was seen to provide an appropriate framework.

Little of the literature on curriculum innovation at that time dealt with university curriculum, and most reported work focussed on research, development and diffusion studies of the adoption, or otherwise, of centrally developed curriculum innovations in primary and secondary schools (Nordvall, 1982). The innovation described in my thesis was of a different order, being developed initially by a single university lecturer in one of the subjects for which he had responsibility. It was important primarily because it examined something that did not appear to have been reported on before: the negotiations and alliances that allowed new material, in this case the programming language Visual Basic, to enter individual subjects of a university curriculum, and to obtain a durable place there (Tatnall, 2000).

The research investigated this single instance of innovation, and traced the associations between various human and non-human entities including Visual Basic, the university, the student laboratories, the Course Advisory Committee, and the various academic staff that made this happen. It followed the formation of alliances and complex networks of associations and how their interplay resulted in the curriculum change that allowed Visual Basic to enter the Information Systems curriculum and to fend off challenges from other programming languages in order to retain its place there. The study did this by ‘interviewing’ the human and non-human actors and collecting and analysing relevant documents.

As writing up progressed it became apparent that the complete study was too large to subject all parts of the thesis to an actor-network analysis. I decided instead to identify a number of key moments; particular events which seemed, to the actors, to be crucial in the formation of the actor-networks of interest, and to make use of an actor-network approach to describe just these moments. Although the role of the researcher in deciding which key moments to include must be acknowledged the choice was not arbitrary. In identifying these key moments I made every effort to allow the actors themselves to identify what they saw as pivotal and important. The research showed that in this curriculum innovation no pre-planned path was followed and that representations of events like this as being straightforward or well planned hides the complexity of what actually takes place. The study revealed the complex set of negotiations and compromises made by both human and non-human actors in allowing Visual Basic to enter the curriculum. The analysis mapped the progress of Visual Basic from novelty to ‘obvious choice’ in this university’s Information Systems curriculum (Tatnall, 2007b).

The study also showed me the value of using innovation translation to describe partial adoptions, as for several of the subjects in which VB gained a place in the curriculum it was only some aspects of VB that had been of interest. For example, in the early 1990s an introductory IS subject involved use of a screen prototyping tool in one topic (Tatnall, 2010b; Tatnall & Davey, 2001). This topic had always been hard to teach because the university did not have a suitable prototyping tool that could easily be
used in the MS-DOS student labs, meaning that this topic could not readily be handled practically. The academic who acted as heterogeneous engineer in the introduction of VB, we will call him Fred, wondered whether some aspects of the MS-DOS version of VB could do the job. For this subject he was not interested in the programming features of VB, just those using in its screen design and this was his problematisation (Callon, 1986) of VB for this subject. Fred could only use VB in this way by translating (Callon, 1986) it from a ‘programming language and visual programming environment’ into a ‘screen prototyping tool’. He could do this by selecting just some features of VB while ignoring others. In further examples other IS subjects at the university required translations of VB to become: ‘Visual Basic: the language for Windows operating systems programming’, ‘Visual Basic: the Graphical User Interface programming language’, and ‘Visual Basic: a language for introducing object-oriented programming’. These partial adoptions would have been difficult to explain using Innovation Diffusion (Rogers, 1995) or the Technology Acceptance Model (TAM) (Davis, 1989).

INITIAL DOCTORAL RESEARCH STUDENTS

My first two PhD students were academic staff from my own Department. The first was Jerzy, whose topic involved an investigation of the growing use of the Internet by retired people. Jerzy decided to make use of an ethnographic approach to this study and proceeded to speak with and attempt to become involved with retired people making use of computers. Although he made no direct use of ANT in his thesis we did write a joint journal article re-interpreting his data using an ANT framework (Lepa & Tatnall, 2006). In this article we noted that one reason often given by older people for adopting Internet technologies (Bosler, 2001; Gross, 1998) is, quite simply, so that the world does not pass them by and so that they won’t be left out of things and seen as irrelevant by their grandchildren. The means of social interaction is increasingly moving away from posted letters to e-mail, and those not using e-mail are finding it harder to keep in touch. A growing number of older people are finding that an e-mail address has become essential (Perry, 2000). These, and related reasons for adoption of Internet technologies such as “All my friends use e-mail and I’ll be left out if I don’t” (Council on the Ageing, 2000) suggest that characteristics of the technology have less to do with things than do social interactions and the creation and maintenance of interpersonal networks. This makes ANT and innovation translation a useful framework for modelling this adoption and use.

The research of the other student, Tas, involved modelling the use of ICT to assist students with learning disabilities (Learning Disabilities Association of Canada, 2002; NJCLD, 1994). From the start Tas adopted an ANT approach to investigation of the networks of associations between the human and non-human actors involved. He made use of ethnographic and case study techniques to collect his data from observations at two Special Schools in Melbourne that cater for students with mild learning difficulties and also from a case study of a single student. Tas quickly identified a number of important human actors in each school including the School Principal, the teacher in charge of ICT, various other teachers, the School Council, parents and of course the students themselves. Had an actor-network approach not been used he would probably have missed the important influence of the many non-human actors involved including the school computers, the software, the laboratories and buildings they were housed in, the Internet, Education Department policy and ICT infrastructure (Adam, 2010; Adam, Rignoni, & Tatnall, 2006; Adam & Tatnall, 2007, 2008). The interactions and associations formed by these actors proved crucial to understanding how ICT can best be used to assist these students (Adam, 2010).
TECHNOLOGICAL INNOVATION AND SOCIO-TECHNICAL BUSINESS RESEARCH

Much of my research, and that of my doctoral students, has related to adoption of some form of new technology by a business organisation. As described in a later chapter of this book (Tatnall, 2010a), the process of technological innovation involves getting new ideas accepted or new technologies adopted and used (Tatnall, 2005a). The development of a new technology does not mean that this will automatically be adopted by its potential users, and this adoption (or failure to adopt) a new technology is what this research is about.

Models of Technological Innovation

The later chapter referred to above describes and compares three of the main approaches to theorising technological innovation: Innovation Translation (Callon, 1986; Latour, 1996; Law, 1987), Innovation Diffusion (Rogers, 1995, 2003) and the Technology Acceptance Model (TAM) (Davis, 1986, 1989; Davis, Bagozzi, & Warshaw, 1989) and also makes brief mention of several other approaches. Although I much prefer innovation translation as a research approach, I am prepared to work with either one of the other approaches if one of my students chose this. In this case I often also write a journal article with them re-interpreting their data using an innovation translation approach. In the sections that follow I will describe some of my research, and that of my students, that investigates technological innovation.

The Bizewest Portal

In June 2000 the Western Region Economic Development Organisation (WREDO), a not-for-profit organisation sponsored by the six municipalities that make up the western region of Melbourne, Australia, received a State Government grant for a project to set up a business-to-business portal. The project was to create a horizontal portal; Bizewest, that would enable small to medium enterprises (SMEs) in Melbourne’s west to engage in an increased number of e-commerce transactions with each other (Tatnall & Burgess, 2002). The main objective of the Bizewest Portal project, in its initial stages, was to encourage SMEs in Melbourne’s west to be more aggressive in their up-take of e-commerce business opportunities, and to encourage them to work with other local enterprises in the region also using the Portal. The project was to create a true business-to-business portal on which on-line trading was to occur (Tatnall, 2007a; Tatnall & Burgess, 2002).

The aim of the research project was to investigate why some SMEs in this region were keen to adopt the portal while others were not. The research methodology involved a series of case studies with SMEs and interviews with the portal’s designers and the WREDO project managers, informed by actor-network theory and innovation translation. The research began by identifying some of the important actors, starting with the WREDO portal project manager. This interview revealed why the project was instigated and identified some of the other actors. One line of inquiry resulting from this interview was to approach the portal software designer and programmers. It was determined that another set of actors consisted of the proprietors of the local businesses themselves, and the project manager suggested some ‘business champions’ to interview first to find out why they had adopted the portal and what had influenced them in doing so. Some of these business people then pointed to the influence exerted by the computer hardware or software as a negative significant factor, so identifying some non-human actors. From this point on
the key was to follow the actors, both human and non-human, searching out interactions, negotiations, alliances and networks. Negotiations between actors needed to be carefully investigated. Apart from the obvious human to human kind of negotiation, there were also human to non-human interactions such as those of the business people trying to work out how the portal operated and how to adapt this technology to their own business purposes. They ‘negotiated’ with the portal software to see what it could do for them, and it ‘negotiated’ with them to convince them to adopt its way of doing business. The process of adopting and implementing the portal could now be seen as the complex set of interactions that it was, and not just the inevitable result of the innate characteristics of this technology as innovation diffusion theory would suggest (Tatnall & Burgess, 2002). This study is further described in a later chapter of this book (Tatnall, 2010a).

A spin off from this research project was that it increased my interest in investigating other examples of portal technology and indeed of the technology of portals themselves. After producing several conference papers relating to portals (Lepa & Tatnall, 2002, 2004; Tatnall, Burgess, & Singh, 2004; Tatnall & Pliaskin, 2005), this interest resulted in the publication of the edited book: Web Portals: the New Gateways to Internet Information and Services (Tatnall, 2005b) and the Encyclopedia of Portal Technology and Applications (Tatnall, 2007c).

Rural Medical General Practitioners and the Adoption of ICT

This project was the result of a successful ARC (Australian Research Council) grant to sponsor a PhD student, Patricia, to investigate the Adoption of Information and Communication Technologies by Rural General Practitioners. The goal of the project was to identify and model the socio-technical factors that acted to enable or to inhibit the uptake and use of ICT and to compare two different theoretical approaches to the adoption of technological innovations: innovation diffusion and innovation translation (Deering, 2008).

The research method involved case studies of several rural medical general practices within the Central Highland Division of General Practice, to the north-west of Melbourne (Wenn, Tatnall, Sellitto, Darbyshire, & Burgess, 2002). As the study involved a comparison of two different models for theorising ICT adoption it was important from the beginning to ensure that the approach used did not privilege one of these models to the detriment of the other, and Patricia kept this in mind while collecting the data. For each of the general practices considered, Patricia identified key moments in the adoption (or non-adoption) of ICT and considered these in terms of innovation diffusion, before also applying an innovation translation analysis.

In some cases the two approaches each produced plausible explanations, but then one example showed the limitations of innovation diffusion. Initially some of the medical practices were in a position to adopt or reject the use of ICT and they chose to reject. One of the case studies points to factors that explain this (Deering & Tatnall, 2008). In this particular case the reason for non-adoption of ICT had nothing to do with the technology itself, but was because the present Practice Principal’s father was not comfortable with ICT. He was not far off retirement but still practicing at the time, and no one wanted to make him feel uncomfortable by introducing technology with which he was unfamiliar as he was a strong part of the Practice. The Practice Manager said this was never articulated openly but all knew that it was so (Deering, 2008). Innovation diffusion’s reliance on the characteristics of the technology is of no value as an explanation here and while it might attempt to use the characteristics of opinion leaders to explain the non-adoption this does not fully account for this type of barrier to adoption. An ANT analysis of the
association between actors proved to provide a better explanation. (This study is further described in a later chapter of this book (Tatnall, 2010a)). This, and other similar examples, meant that Patricia was soon convinced of the value of innovation translation as an explanatory framework and she went on to conclude that in situations like this, translation offered more plausible explanations than did diffusion.

OTHER ANT STUDIES

Lily is undertaking a PhD to investigate: *The e-learning experience in first-year introductory accounting and its impact on learning outcomes*. She is particularly interested in determining an appropriate balance between on-line and face-to-face teaching (Wong & Tatnall, 2009, 2010). This research was started quite recently and Lily has not yet made a decision on the use of ANT, but in a recent journal article (Wong & Tatnall, 2010) we explored innovation translation as a possible approach to this research. At Victoria University the actors involved in this case include: the Bachelor of Business Course Coordinator, the Accounting Subject Coordinator, Subject Lecturers, Subject Tutors, Sessional Tutors, other lecturers, the Faculty Dean and the University Administration, the Head of the School of Accounting, University Policy, University Infrastructure, Technical Staff from Information Technology Services, students, computers, screens, computer laboratories, e-learning infrastructure (including remote access), competing technologies and the Blackboard e-learning environment itself. Each of these actors potentially has an influence on how or whether the adoption occurs and the balance between an online and a face-to-face approach.

Fernando has also just recently commenced his PhD research and is investigating *The impacts and challenges as a result of introducing and using ICT in schools for Mapuche students in Chile*. He is making use of ANT to identify the relevant human and non-human actors and intending then to use an innovation translation approach to shed light on how this adoption is taking place. One aspect of particular interest in this study is the changing role of the Mapuche elders who traditionally act as a library and vehicle for the dissemination of information and wisdom. What effect will students having access to ICT and the Internet have on this?

STUDIES USING TAM OR INNOVATION DIFFUSION

As mentioned earlier, I am quite prepared to allow my PhD students to make use of other approaches to technological innovation, as long as they have investigated the alternatives. In most cases a student wants to use Innovation Diffusion or TAM simply because they have heard of these approaches or been advised by a friend of colleague to use one of them. In these cases it is unlikely that the students have even heard of innovation translation.

One of these PhD students, Napaporn, investigated *Internet Usage by Academics within Thai Business Schools*, making use of a modified Technology Acceptance Model (Kripanont, 2007). Salim also used a modified form of TAM to study *Internet Technology Adoption in the Banking Industry* (Al-Hajri, 2005) that involved a comparison of Internet adoption in banks in Oman and Australia. In his DBA, Puripat looked into *Using the Technology Acceptance Model to investigate knowledge conversion in Thai public organisations* (Charnkit, 2010). Singha, on the other hand, made use in Innovation Diffusion in his PhD study of *The Determinants of the Adoption and Application of Business Intelligence from an ERP perspective* (Chaveesuk, 2010).
In each case, although these students were making use of different approaches to technological innovation I made sure that they were also introduced to ANT and innovation translation during their studies. In some cases we produced a joint journal article making use of the data they had collected, but using an innovation translation frame instead of TAM or innovation diffusion.

CONCLUSION

Over the last 15 or so years, actor-network theory has grown to become a fundamental part of my approach to socio-technical academic research. This chapter has outlined how I came to an appreciation of ANT and then used it in my own research and encouraged its use by my doctoral students. I have come to see considerations of human and non-human actors and of associations and interactions between actors as an important part of research analysis and have written quite a number of conference papers, book chapters and journal articles using ANT. In 2008 I was approached to become Editor-in-Chief of the new International Journal of Actor-Network Theory and Technological Innovation that would go into publication in 2009, hopefully bringing the value of ANT in socio-technical research projects to the attention of a wider audience.

Two of my colleagues have come to an understanding of ANT by writing joint papers with me that have used an innovation translation framework (Tatnall & Burgess, 2004; Tatnall & Davey, 2002a, 2002b, 2003). They have not studied ANT but have learned enough from writing these papers to see its value. One of the problems often mentioned by those trying to learn about actor-network theory is its jargon: they find terms like obligatory passage point, interessement and heterogeneous engineer hard to come to grips with. While it is possible to write a good socio-technical article using ANT by making good use of a large amount of ANT jargon, it is also usually possible to write just as good an article either using very little ANT jargon, or at least explaining the jargon as the article progresses. I suggest that it is incumbent on ANT researchers to make ANT accessible to others. I suggest that it is incumbent on them to use ANT as an analytical framework and to explain its benefits to others as clearly and simply as possible.

But what of the future of what we call actor-network theory? Should we change its name to something more accurately descriptive? What of the various suggestions that ANT has run its course and needs to change fundamentally? There will always be those who make suggestions like these, but for most of us it is more important to make use of a little or a lot of ANT in our research, and to mould and shape ANT to our own needs and taste. It is important to introduce ANT to our students, but not to force it down their unwilling throats. I see no problem in letting students look at and even use other approaches to technological innovation, as long as they know that there is an alternative in innovation translation.

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REFERENCES


