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Using Actor-Network Theory to Research the Implementation of a B-B Portal for Regional SMEs in Melbourne, Australia

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Abstract

E-commerce portals come in all shapes and sizes, but they all have one thing in common: they all involve interactions between information technology and people. Information systems are complex socio-technical entities and research into their implementation needs to take account of this. This paper describes the research approach used in investigating the implementation of a business-to-business e-commerce portal for small to medium enterprises in the western region of Melbourne, Australia. The research approach is based on actor-network theory and innovation translation, and this paper shows how this approach can be usefully employed in socio-technical situations involving technological innovation.

1. Introduction

The discipline of information systems is, by its very nature, a socio-technical one. While researchers in computer science may choose to concentrate on a study of

aspects of computer hardware and software alone, the business of information systems is how *people* interact with and use *computer-based* systems. Information systems are complex socio-technical entities involving both human and non-human components. Systems analysts, designers, programmers, end-users, managers, PCs, mainframes, software, data and operating systems are only some of the many heterogeneous components of an information system. Research into the implementation and operation of information systems needs to take this heterogeneity into account and find a way to give due regard to both the human and non-human aspects of these systems.

As their use necessarily creates change, the implementation of a new information system, or the upgrading of an existing system, should be viewed in terms of technological innovation. The word 'innovation' is synonymous with 'newness' and 'change' (Dutch 1962), and an innovation can be described as an idea that is perceived to be new to a particular person or group of people (Rogers 1995). As almost all information systems implementations fit this description it is quite appropriate to make use of innovation theory when researching these systems. This paper describes a research approach, based on actor-network theory (Callon and Latour 1981; Latour 1986; Law and Callon 1988; Latour 1996), used to investigate a specific innovation: the design and implementation of a business-to-business (B-B) portal for small to medium enterprises (SME)¹ in a regional area of an Australian city.

2. 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 government grant for a project to set up a business-to-business portal. The project was to create a 'horizontal' portal², *Bizewest*, that would enable SMEs in Melbourne's west to engage in an increased number of e-commerce transactions with each other. The western region of Melbourne contains around 20,000 businesses and is regarded as the manufacturing, transport and distribution hub of south-eastern Australia.

¹ For the purposes of this paper, in the Australian context, SMEs are considered to be those businesses that have from 1-20 employees (small) and 21-50 employees (medium).

² We use the term *portal* to refer to a Web site devoted to relaying traffic to other sites (Phillips 1998). Portals offer a range of services including trading facilities as banks look to partner them (Internet.com 1999). Lynch (1998) suggests that portals can be described as *horizontal* when they are utilised by a broad base of users across a horizontal market, and *vertical* when their content is tightly focused toward a particular audience such as a specific industry or group of industries.



Figure 1: Bizwest Portal Site

Electronic commerce that is external to an organisation occurs mainly between three groups: business, government and consumers. In setting up the Bizwest Portal it was noted that the majority of electronic commerce activity currently occurs on a business-to-business level (Department of Industry 1998). It is estimated that transactions of this type comprises 80% of all electronic commerce (Conhaim 1999) and that this is likely to remain the case in the near future (Straub 1998) for reasons described by Viehland (1998) as follows:

- Businesses are generally more computerised and networked than homes.
- Many businesses only sell their goods and services to other businesses.
- The supply chain for many businesses goes from business-to-business (for instance: manufacturer to wholesaler to distributor to retailer to customer

The main objective of the Bizwest Portal project, in its initial stages, was to encourage small to medium enterprises 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. It was also intended to encourage and facilitate transactions between local government and small business. The initial plan was to gain the participation of

about three hundred SMEs from the local region in the use of the portal to facilitate their business-to-business and business to local government interactions. Another important project goal was youth involvement and students from the local high schools and colleges who were studying information technology (IT) related subjects, were to be given the opportunity to 'consult' with SMEs on a one-to-one basis in the development of their Web pages for the portal. When the Portal was launched, a payment gateway was not initially included. This meant that orders could be placed on the Portal but that full transaction processing functionality was not initially available. It was always intended that a payment gateway be added to the Portal as soon as this was practically possible, and this is likely to occur in June 2002.

3. Methodology

After some initial delays due to difficulties in getting the portal software to operate as required the Bizewest Portal went on-line in June 2001, and the data that forms the basis of this paper was collected later that year. The research project to investigate adoption of the Portal consisted of three stages. This paper relates only to the first of these stages:

- Stage 1 (Second half of 2001) began with interviews of the 'business champions' identified by WREDO. This was followed by further interviews resulting from the first set of interviews.
- Stage 2 (Second half of 2002) will involve returning to the businesses interviewed earlier and checking whether things are progressing as they thought they would.
- Stage 3 (First half of 2003) will check these same businesses to see if any change in the way they do business has resulted from their use of the Portal.

Qualitative data collection techniques are important tools of investigation for the actor-network researcher. Particularly, focus groups and interviews allow the researcher to explore the formation and development of networks and examine the alliances built along the way. In this particular research project interviews were used as they provided the opportunity for feedback in clarifying questions, allowing the interviewer to probe for a clearer response (or more deeply), allowing a lengthier period of questioning (when compared to surveys) and generally affording a much higher response rate (Zikmund, 2000; Leedy, 1997). Interviews are now a well-established means of qualitative data collection in the information systems field (Myers, 1999).

4. Actor-Network Theory as a Research Framework

While many approaches to research in technological areas treat the social and the technical in entirely different ways, actor-network theory (ANT) proposes instead a socio-technical account in which neither social nor technical positions are privileged. ANT deals with the social-technical divide by denying that purely technical or purely social relations are possible, and considers the world to be full of hybrid entities (Latour 1993) containing both human and non-human elements. Actor-network theory developed around problems associated with attempts to handle socio-technical 'imbroglios' (Latour 1993) like electric cars (Callon 1986a), supersonic aircraft (Law and Callon 1988), Kodak and the mass market for amateur photography (Latour 1991) and a new railway system in Paris (Latour 1996) by regarding the world as heterogeneous (Chagani 1998). The utilisation of heterogeneous entities (Bijker, Hughes and Pinch 1987) then avoids questions of: 'is it social?' or 'is it technical?' as missing the point, which should be: "is this association stronger or weaker than that one?" (Latour 1988 :27).

ANT offers this notion of heterogeneity to describe projects such as the Portal Project discussed in this paper in which a local semi-government organisation has engaged an Internet service provider (ISP) and a computer software company to build a business-to-business e-commerce portal for use by SMEs within a regional area. The project involves not just these entities, but also non-human entities such as computers, modems, telephone lines, Web development tools, and human entities including local business proprietors from small and medium-sized enterprises, customers, programmers, development managers, and local government staff.

An information systems researcher using an actor-network approach in an investigation like this would concentrate on issues of network formation, investigating the human and non-human actors and the alliances and networks they build up (Tatnall and Gilding 1999; Tatnall 2000). This researcher would concentrate on the negotiations that allow the network to be configured by the enrolment of both human and non-human allies, and would consider any supposed characteristics of the technology only as network effects resulting from association.

An actor is seen not just as a 'point object' but rather as an association of heterogeneous elements, themselves constituting a network. Each actor is thus itself also a simplified network (Law 1992). In actor-network theory interactions and associations between actors and networks are the important thing, and actors are seen only as the sum of their interactions with other actors and networks.

Some examples of the use of actor-network theory in the information systems field are in investigating the adoption of Visual Basic as a programming language by a major Australian university (Tatnall 2000), the adoption and use of Internet technologies by older people (Tatnall and Lepa 2001), the adoption of a particular approach to systems analysis by a local council in the UK (McMaster, Vidgen and Wastell 1997) and to a car parking system (Vidgen and McMaster 1996). An example of its use in the small business field is given by Tatnall (2001; 2002).

4.1 Actor-Network Theory and Essentialism

A simplistic view of the e-commerce Portal would have it that businesses make their adoption decisions primarily because of the Portal's characteristics, and would miss other influences due to inter-business interactions and the backgrounds of the people involved. This is the type of approach that would be used if framing the research through innovation diffusion (Rogers 1995), which is based on the following elements: characteristics of the innovation itself, the nature of the communication channels, the passage of time, and the social system. Using an essentialist approach like this to the research, the researcher may begin by outlining all the characteristics of e-commerce portals and all the advantages and problems associated with their use, and then go on to suggest that the adoption, or rejection, of this technology by the local businesses was due largely to these characteristics. While this is likely to be partially true, it is unlikely to provide a complete explanation.

There is a strong argument to be made that small business research should be practical (Burgess 2001). Innovation diffusion theory, in examining the characteristics of technologies, is not necessarily suited to explaining the manner in which small businesses adopt information technology. In many instances the small business proprietors will adopt information technology because a friend is using it, or they know a competitor is using it, or because a son or daughter uses it at school (Burgess 2002). The nature and size of each SME, the inter-business interactions in which they currently engage, the vigour and persuasiveness with which the local government authority advocated the Portal, and the backgrounds and interests of particular individuals in each of the small or medium businesses are also likely to have had an important affect that would, most likely, be ignored by the essentialist approach of innovation diffusion. Actor-network theory, in examining alliances and networks, provides a solid foundation from which small business adoption and use of information technology can be researched.

4.2 Actors, Networks and Black Boxes

The main advice on method suggested by the proponents of actor-network theory is to "follow the actors" (Callon 1986a; Callon 1991; Latour 1996) and to let them set the framework and limits of the study themselves. Latour (1996) likens this to a murder mystery novel in which questions are asked of each of the actors, and any subsequent directions and leads that may emerge from these initial questions are followed up by the detective. Some of these leads will, of course, be to other actors who will suggest yet other actors, and so the process continues.

In actor-network theory an actor is a human or non-human entity that is able to make its presence *individually felt* (Law 1987) by the other actors. An actor can, however, in many ways also be thought of as a 'black box' (Callon 1986a), the contents of which we can choose not to worry about. The details of its composition

are then just a complication we can avoid having to deal with. We can consider this entity just as an actor, but when doing so it must be remembered that behind each actor there hide other actors that it has, more or less effectively, drawn together, or 'black-boxed' (Callon 1987). When the time comes to open the lid of the black box and look inside, it will be seen to constitute a whole network of other, perhaps complex, associations. A network can similarly be 'punctualised' (Law 1992) to look like a single point actor, and when this happens it is replaced by the action itself and the "seemingly simple author of that action." (Law 1992 :385).

4.3 Innovation Translation

It is often the case that a small business which is considering some technological innovation is interested in *only some aspects* of this innovation and not others (Tatnall 2001). In actor-network terms it needs to *translate* (Callon 1986b) this piece of technology into a form where it can be adopted. This may mean choosing some elements of the technology and leaving out others, resulting in what is finally adopted not being the innovation in its original form, but a translation of it into a form that is suitable for use by the recipient small business (Tatnall 2002).

Callon (1986b) outlines the process of translation as having four 'moments' the first of which he calls *problematization*, or 'how to become indispensable', in which one or more key actors attempts to define the nature of the problem and the roles of other actors to fit the solution proposed. The problem is re-defined in terms of solutions offered by these actors who then attempt to establish themselves as an 'obligatory passage point' (Callon 1986b) which must be negotiated as part of its solution.

The second moment is *interessement*, or 'how allies are locked in place', and is a series of processes which attempt to impose the identities and roles defined in the problematisation on the other actors. It means interesting and attracting an actor by coming between it and some other actor (Law 1986).

The third moment, *enrolment* or 'how to define and coordinate the roles', will then follow, leading to the establishment of a stable network of alliances. For enrolment to be successful however, it requires more than just one set of actors imposing their will on others; it also requires these others to yield (Singleton and Michael 1993). Finally, *mobilisation* or 'are the spokespersons representative?' occurs as the proposed solution gains wider acceptance (McMaster, Vidgen et al. 1997) and an even larger network of absent entities is created (Grint and Woolgar 1997) through some actors acting as spokespersons for others.

5. Identification of Actors and Networks in the Bizewest Project

In the case of the business-to-business Portal the actor-network research began by identifying some of the important actors, starting with the Portal project manager. The interview with the project manager revealed why the project was instigated, and identified some of the other actors. One line of inquiry resulting from the interview with the project manager 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 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 was also human to non-human interactions such as the business people trying to work out how the portal operates, 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.

When investigating the e-commerce Portal it was convenient, most of the time, to consider both the Internet service provider (ISP) and the Portal software to constitute a black box. This meant that this aspect of the technology could then be considered as just a single actor. The Portal, and its interactions with other actors was investigated on this basis. At other times it was necessary to lift the lid of the black box and investigate the enclosed network of the ISP, telephone lines, computers, data storage, programmers and interface designers that it contained. The advantage of black-boxing is that most of the time the Portal can be regarded as just another actor.

In actor-network terms the Portal 'needed' to negotiate with each individual SME to determine how it could best be implemented by them. In other terms this could be seen as the Portal's proponents negotiating with the SME proprietors, but it is really rather more than this as at this point we needed to look inside the Portal's black box to see what was happening there. Inside its black box the Portal contained not only its local government authority proponents, but also the ISP, the Portal software, the computers in the small business used to access the Portal, and many other components. When, in ANT terms we say that the SMEs negotiated with the Portal we really mean that they engaged in interactions with all of these entities. It is just easier to speak of the Portal as a single actor than the complex network it really is.

5.1 Problematisation, Interesement, Enrolment and Mobilisation

In the Portal project the problematisation proposed by its instigators and designers is that business-to-business interactions are best performed as e-commerce transactions. For the project to be successful the Portal needed to be seen by the proprietors of the SMEs as an obligatory passage point to e-commerce and business-to-business transactions. In the case of the Portal, proprietors of the SMEs needed to be convinced that this technology was more worthwhile and offered them better business prospects than the approaches they had previously used (interesement). It needed to convince them to stop sending orders by post or fax and instead to use the Portal.

For enrolment to be successful however, it required more than just one set of actors imposing their will on others; it also required these others to yield. It is not enough for those promoting the Portal to eloquently espouse its benefits, the SMEs must also give up (at least some of) their old methods of business-to-business transactions. In relation to mobilisation, the Portal could be judged to be truly successful when SME proprietors began advocating its advantages to each other. At the time this paper was written this had not yet occurred.

6. Summary of Early Results

In summary, the first set of interviews showed that most businesses adopting the Portal did so because it seemed to them to be 'a good idea' rather than because they had any clear idea of its benefits. Few had looked objectively at the characteristics of Portal technology or B-B e-commerce. Common reason for adoption included: "if other businesses adopt it and we don't we will be left behind", "all the talk is about e-commerce and how it is the way of the future", "it doesn't look too hard to make it work and we have little to loose" and "my kids tell me that everyone will be on the Internet soon and we had better be too".

When looked at in this way the process of adopting, or choosing not to adopt the Portal begins to be seen in its true complexity, not just as a yes/no decision, but as a complex set of negotiations between a number of human and non-human actors. The use of an actor-network approach like this makes the complexity apparent.

An innovation diffusion approach (Rogers 1995) to investigating the Portal project would, on the other hand, have looked for explanations of up-take primarily in the Portal's characteristics and properties. It would not have considered as important many of the human and non-human interactions we have described and so, we contend, would largely have missed the point. Even based on the small amount of data we have so far collected in this research project we would argue it is clear that such an approach is unlikely to provide a good explanation of the adoption process.

7. Conclusion

An actor-network approach to researching a business information systems innovation such as the Bizewest business-to-business Portal described in this paper details the construction of networks and alliances to support and embed the changes it produces in order to make them durable. It does not look for simple answers involving reliance on properties of the technology to see why one technological innovation was taken up while another was not. Instead it looks for an explanation of the much more complex interactions and negotiations that take place between human and non-human actors.

In a research project such as this a researcher who concentrated on the technology as the driving force, or one who ignored the affects of the technology and concentrated on the human and social interactions involved, would produce a very unbalanced account. In socio-technical situations like this where the contributions of both human and non-human actors are equally important, an approach like that offered by actor-network theory has, we contend, much to offer. As the research progresses into its next stages we will be in a better position to document the advantages, and any problems, arising from use of an actor-network approach.

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