Actor-Network Theory Applied to Information Systems Research

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INTRODUCTION

Building an information system is a difficult task, partly due to the problem of ascertaining the requirements of the intended users, but also because of the complexity of the large number of human-machine interactions (Tatnall & Davey, 2005). This complexity is reflected in the difficulty of building these systems to operate free from error and to perform as intended. The dictionary defines innovation as "the alteration of what is established; something newly introduced" (Macquarie Library, 1981 p. 914). As the introduction or improvement of an information system in an organisation *necessarily* involves change, information systems research often involves research into technological innovation.

BACKGROUND: INFORMATION SYSTEMS AS A SOCIO-TECHNICAL DISCIPLINE

The discipline of information systems (IS) is concerned with the ways people build and use computer-based systems to produce useful information and so has to deal with issues involving both people and machines; with the multitude of human and non-human entities that comprise an information system (Tatnall, 2003). Information systems is neither merely a technical discipline nor a social one, but one that is truly socio-technical. Researchers in information systems face the problem of how to handle complexities due to interconnected combinations of computers, peripherals, procedures, operating systems, programming languages, software, data and many other inanimate objects; how they all relate to humans and human organisations, and how humans relate to them (Longenecker, Feinstein, Couger, Davis, & Gorgone, 1994).

This paper will outline a socio-technical approach, based on actor-network theory (ANT), to researching how people interact with and use information systems (Tatnall & Gilding, 1999; Tatnall 2003; Tatnall & Pliaskin, 2005). In actor-network theory the key is in using an approach that is neither purely social nor purely technical, but socio-technical.

Qualitative Research Traditions in Information Systems

Each field of academic inquiry is characterised by its own preferred and commonly used research approaches and traditions. In information systems research Myers (1997) outlines four qualitative traditions as being particularly significant: case study research, ethnography, grounded theory and action research.

Case study research is the most commonly used qualitative approach in information systems. As IS research topics commonly involve the study of organisational systems, a case study approach is often appropriate. Ethnography has grown in prominence as a suitable approach to information systems research after work such as that undertaken by Suchman (1987) and Zuboff (1988). It has been used especially in research where the emphasis is upon design, computer-supported cooperative work, studies of Internet and virtual communities, and information-related policies (Star, 1995). Grounded theory is an "an inductive, theory discovery methodology" (Martin & Turner, 1986) that seeks to develop theory that is grounded in data that is systematically gathered and analysed and involves "continuous interplay" between data and analysis (Myers, 1997). Orlikowski (1993) argues that in information systems research situations involving organisational change, a grounded theory approach can be useful as it allows a focus on "contextual and processual" elements as well as on the actions of key players.

Action research has been described as proceeding in a spiral of steps where each step consists of planning, action and evaluation of the result of the action. It is seen as aiming "... to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework." (Rapoport, 1970, p. 499). A variant of action research that is slowly gaining acceptance in information systems is soft systems methodology (SSM), developed by Peter Checkland and his colleagues (Checkland & Scholes, 1991). SSM attempts to give due recognition to both the human and technological aspects of a system. It acknowledges both human and non-human aspects of IS, but considers these to be entirely separate types of entities.

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ANT AND SOCIO-TECHNICAL RESEARCH

Actor-network theory considers both social and technical determinism to be flawed and proposes instead a socio-technical account (Latour, 1996) in which nothing is purely social and nothing is purely technical (Law, 1991). ANT deals with the social-technical divide by denying that purely technical or purely social relations are possible.

To see better how this works, suppose that an IS researcher was investigating the uptake of a business-to-business eCommerce portal developed by a local government authority for use within a regional area, with an Internet service provider (ISP) and a software company engaged to build the portal, and a bank to provide a payment gateway (Pliaskin, 2004; Pliaskin & Tatnall, 2005). ANT asserts that the world is full of hybrid entities (Latour, 1991) containing both human and non-human elements and offers the notion of heterogeneity to describe projects such as this. The project will involve not just the entities mentioned above, but also non-human entities such as computers, computer programs, data storage devices, modems and telephone lines, and human entities including local business proprietors from small and large businesses, customers, programmers and local council staff. The utilisation of heterogeneous entities (Bijker, Hughes, & 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, 1991).

Information systems researchers using an ANT approach would concentrate on issues of network formation, investigating the human and non-human alliances and networks built up by the actors involved. They would concentrate on the negotiations that allow the network to be configured by the enrolment of both human and non-human allies. Interactions and associations between actors and networks are all important, and actors are seen simply as the sum of their interactions with other actors and networks.

In the case of the portal an actor-network researcher would begin by identifying some of the important actors, starting perhaps with the local government portal project manager. An interview with the project manager would reveal why the project was instigated and identify some of the other actors. The main advice on method suggested by the proponents of actor-network theory is to "follow the actors" (Latour, 1996) and let them set the framework and limits of the study themselves, and one line of inquiry resulting from the interview with the project manager might be to approach the portal software designer and programmers. Another set of actors is the proprietors of the local businesses themselves, and the project manager may suggest some "business champions" to interview first. At least some of these business people might then point to the influence exerted by the computer hardware or software as a significant factor, so identifying some non-human actors. Negotiations between actors must be carefully investigated. Apart from the obvious human to human kind of negotiation, also included must be 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 be most suitable for their own business purposes. The process of adopting and implementing the portal can now be seen as the complex set of interactions that it is, and not just the inevitable result of the innate characteristics of this technology.

How Actor-Network Theory Handles Complexity

Longenecker et al. (1994) suggest that computer-based information systems should be regarded as complex socio-technical entities, begging the question of how this complexity should be handled. A common method of handling complexity in all subject areas lies in simplification, but the danger with simplification is that it runs the risk of removing just those things that constitute a useful description of the phenomenon under investigation by concealing the parts played by many of the actors (Suchman, 1987). The question here is which details to include and which to leave out, and who is to decide. In this respect, an appropriate research approach needs to ensure that complexities are not lost "in the process of labelling" (Law, 1991).

In actor-network theory the extent of a network is determined by actors that are able to make their presence *individually felt* by other actors. The definition of an actor requires this and means that, in practice, actors limit their associations to affect only a relatively small number of entities whose attributes are well defined within the network. An actor is not just a "point object" but an association of heterogeneous elements, themselves constituting a network. An actor can, however, in many ways also be considered as a "black box" (Callon, 1986), and when we open the lid of the box to look inside it will be seen to constitute a whole network of other, perhaps complex, associations. In many cases details of what constitutes an actor—details of its network—are a complication we can avoid having to deal with all the time.

When investigating the e-commerce portal it might be convenient, most of the time, to consider both the ISP and the portal software to constitute a black box. This would mean that this aspect of the technology could then be considered as just a single actor; the portal, and its interactions with other actors investigated on this basis. At other times it might be 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 it contains. The advantage of black-boxing though is that most of the time however, the portal can be regarded as just another actor. The important thing to note about the use of black-

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