

USING ACTOR-NETWORK THEORY TO PREDICT THE ORGANISATIONAL
SUCCESS OF A COMMUNICATIONS NETWORK

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Abstract

The success of a communication networks and its applications depends not only on its technical excellence, but also on its social acceptability. Examples such as the NHSNet suggest that communication applications may fail because of the social construction placed on them as, for example, being insecure, not useful or too expensive. An understanding of what influences social acceptability may be valuable in the design and management of a communications network. This paper overviews Actor-Network Theory (ANT) which is an approach to structuring and explaining the links between society and technology. The theory describes how actors with particular interests may be enrolled onto the use of a network. Using the example of a virtual maternity ward, ANT is used prescriptively to identify actions that are need to encourage the use of the network and its embedding in organisational processes and practice. Steps involving the identification and investigation of stakeholders and their interactions; the development of an actor-network model; the identification of irreversible technologies, promoters and inhibitors and the planning of activities is outlined. The purpose of these steps is to ensure that technical implementation is accompanied by social acceptance and the embedding of the technology into the social, organisational and human structures.

Introduction

Communication networks and the applications they support often fail to deliver the benefits that are expected and fail to gain acceptance within their target user community. The technical infrastructure may be good, the applications well-designed, and the economics viable, but still the take-up of the network services may not reach expectations. Examples abound of networks whose usage has not spread as expected and which have not become part of the organisational infrastructure.

In the UK, the NHSNet, launched in 1993, has not achieved its potential. Expectations of saving £10 million annually in telecommunications have not been realised. Between 1994 and 1995, concerns about security plagued NHSNet development and

damaged its reputation. Resistance to the NHSNet by the British Medical Association resulted in negative attitudes by general practitioners. In 1997, 4 years after its launch, only 189 general practices were connected to the NHSNet (Robinson, 1997). While the debate is more settled and there is some expectation that encryption issues will be resolved (Pouloudi, 1999), the development of the NHSNet as a major clinical support tool has not been realised. Some administrative functions such as the provision of returns for the Prescription Pricing Authority are carried out by most GPs over the network. Applications link GPs to hospitals for on-line referrals have been slow to take off. In some cases GPs have formed their own networks. Commercial companies have offered rival medical networks and the UK government is now allocating more resources to the NHSNet in a last attempt to make it a success.

The NHSNet is only one prominent example of the failure of communication networks to become established in user communities. Ciborra and Hanseth (1998) described the failure of a corporate network within Roche. Legare and Douzou (1996) explain how a Canadian network to support mental health issues in primary care failed to meet its expected goals. From inappropriate use to total failure, stories of the failure of network applications abound.

These failures and others suggest that the success of a networked communication system depends not only on the quality of its technical implementation, but also on its social and organisational acceptance. Technology is socially constructed. Its success and take-up within an organisation or group will not be determined solely by the availability of the technology. The social perception of the technology, the prevalence of messages such as 'everybody's using it', and the presence of a critical mass of users who support the network will determine its success. As people take a positive view of a communications technology, they begin to use it as part of their work and everyday lives and they recommend its use to friends and colleagues. Usage of the communication technology becomes the norm. The technology becomes socially accepted and embedded in the organisation or in society. People start using mobile phone, booking tickets over the Internet, using email, without exactly understanding how it happened. (Latour, 1987). If we are to implement new networks in society or in organisations, social acceptance is vital. We must understand how technology is socially constructed.

For communication systems to be successful in an organisation they must be socially embedded into the fabric of organisational culture and process. But how does that happen? Can we understand the process by which a technology becomes socially acceptable? More to the point, can we manipulate the environment or arrange the technology so that it is socially acceptable? Or are we at the mercy of unexplainable social forces which make the implementation of a communication network a matter of luck how ever technically competent we are?

What is needed is theory that can explain why networks are embedded in organisation and that can prescribe how to embed them. One potentially useful theory is Actor-Network Theory (ANT). This paper briefly explains what ANT is and suggests how it might be applied in a prescriptive way to enable successful social and organisational acceptance of a communications network. However, we are on shaky ground in taking a social theory and applying it prescriptively, particularly when apparently insignificant events may turn out to be of key importance and we may be subject to

unpredictable emergent effects. It may be that ANT can only be used as a sensitising device, to raise doubts in the minds of developers. Even this is useful, if the developers then ask questions concerning the social and cultural aspects of implementation.

The Concepts of Actor Network Theory

ANT is an approach to structuring and explaining the links between society and technology. It offers explanations of how technology becomes acceptable and is taken up by groups in society. It suggests how technology is socially constructed. For example: How do mobile phones become widely accepted? Why does MS-Windows dominate the PC market? How is Linux becoming popular? Why does the same information system fail in one organisation and succeed in another? How do case mix systems get established in hospitals (Bloomfield et al, 1992)? How are EDI networks and standards established (Monteiro and Hanseth, 1996)? ANT provides a fine-grained approach to analysing the mechanism by which social action shapes technology and technology shapes social action. The primary focus is on stakeholders (actors) and how they are involved in the shaping of technology.

Actors are both human and non-human stakeholders who pursue *interests* which may encourage or constrain technology (Monteiro and Hanseth, 1996; Walsham, 1997). Many actors make up a *network* of interests which becomes *stable* as they are *aligned* to the technology. This alignment is achieved through the *translation* of interests and the *enrolment* of actors into the network. Translating involves showing how an actor's non-aligned interests may become aligned. Skills, practices, organisational arrangements and contracts may all be part of the process of alignment.

Alignment is established in *inscriptions* which give a particular viewpoint precedence. For example, business processes may be established through managerial rhetoric, contracts, historical context and so on. These business processes are then the basis for software which acts as an inscription of the organisational process, which becomes more fixed and indeed may become *irreversible*. It may be impossible to go back to a point where there were alternative possibilities.

A communications network, the organisations and people using the network, the commercial and public bodies with an interest in the network and the information technology itself form an actor-network. The network standards are part of the inscription, giving a particular viewpoint on how the network should be organised and run. Once the standards are used, people become locked-in to the network. This reinforces its spread. Once established and spread, the network standards become irreversible. It is then impossible to go back and start again. Thus the standards inscribe the use of the network. They may be so deeply embedded in the system that they become *black-boxes* whose use is accepted without questioning how it works, or whether it represents the best way to do things.

The design of a network and the applications and information resources it supports involves decisions on who will use it, how they will use it and what business processes will be involved. The design of the network will also define the roles to be played by users and how they will behave. However, the inscription of processes and roles on the technology does not mean that the human actors and social institutions

will use the network according to the inscription. There may be a mismatch between the technical network and the actor network which results in unintended use, misuse or none-use.

Application of Actor-Network Theory

Consider the following network application: In order to support home births, it is planned to have a network in place which will link expectant mothers with their midwives. The network will provide a means of direct communication to allay pregnant mothers concerns during the course of the pregnancy. During birth, when the midwife is at the mother's home, the network will provide a direct, real-time link with the hospital maternity ward, using a video link as well as a text-based link to enable advice to be provided by the obstetrician should complications arise. After the birth, the link will support the delivery of post-natal services. The network will also be accessible by GPs and by health visitors who take over care from the midwives. The network will constitute a virtual maternity ward, where midwives attending home births will be linked to the hospital throughout labour.

The technical implementation of such a network is fairly straightforward. Internet connections may be used and technical considerations will centre around speed and reliability. The success of such a network is more dependent on its social acceptability and whether it becomes embedded in midwifery practice. The social interests, networks, power structures and attitudes will affect the use of the network and shape the technology. However, the technology may also shape social action: the use of a virtual maternity ward may reduce worries about the safety of home births and the availability of home births, thus increasing the acceptance of home births as an option. Our concern in this paper is to consider how we can use ACT as an analytical tool to identify actions which may speed the social embedding of the technology and the successful take-up of the system.

The following outlines the steps needed to apply ACT.

1. Identify Stakeholders. A list of stakeholders in the virtual maternity ward is developed. A stakeholder is 'any human or non-human organisation unit that can affect as well as be affected by a human or non-human organisation unit's policies or policies' (Vidgen and McMaster, 1995) The stakeholder groups for the virtual maternity ward must be identified. They will include GPs, health visitors, midwives, obstetricians, mothers, hospital authorities, and Internet service providers amongst others. ACT also considers technology such as the communication lines, and the videoconferencing technology to be stakeholders and part of the actor-network.
2. Investigate stakeholders. For each stakeholder, through interviews with representatives of the groups, analysis of documentation and reflection, interests, attitudes, relationships, roles, power and influence and involvement in the historical context are examined. Looking at interests involves an examination of the stakeholders' rational, organisational and individual interests. Rational interests concern their logical interests and the objective view they take of the proposed network. Organisational interests concern their political and social interests arising from their job roles in the organisation. Individual interests concern personal interests, for example, status, career progress and job security.

3. Identify stakeholder interactions. Relationships between stakeholders in terms of extent of communication, power, trust, resource control and influence must be investigated.

4. Build actor-network model. The identification of links between stakeholders will help in the development of an actor-network model of the virtual maternity ward. The actor network will contain both strong and weak connections; for example strong connections between the mother and the midwife and the midwife and the obstetrician; but weak connections, during pregnancy and labour between the mother and the GP. The strength of connections will influence enrolment strategies. The complexity of the actor-network can be then assessed. This will have an influence on strategies for aligning the actor-network with the desired outcomes of a virtual maternity ward. Alignment may involve simplifying the actor-network since the more complex the actor-network, the more difficult it is to align (Monteiro and Hanseth, 1996).

5. Identify irreversibility. We need to understand to what extent the technology, organisational structure and attitudes are fixed and are going to be difficult to change. This will require an understanding of the events which have led up to the current people, processes, technology and organisational structure. Adaptation of the proposed communication technology may be required where things cannot be changed for practical, political or economic reasons. Questions need to be asked such as: How was the current technology procured? Who decided to go with this technology? How are midwives trained? An understanding of past events, the history, culture and politics of the organisations and people will be important since these elements will have significant effects on network acceptance.

6. Identify inhibitors and promoters. Understanding drawn from the above steps will enable potential inhibitors and promoter of the social acceptance of a networked application such as the virtual maternity ward to be examined. Actions may be planned to influence the inhibitors and promoters. The inhibiting and promoting factors may arise from the technology, for example, inadequate available video-conferencing technology; the attitudes of stakeholders, for example, resistance from opinion leaders such as obstetricians; and external effects such government policy and funding. A variety of directions may be explored, arising from interviews and reflection on the information gathered. Black-boxes in the actor-network will need to be identified and their presence and use questioned. Lock-in to current technology may act as an inhibitor. Organisations may be locked into IT infrastructures which may inhibit the adoption of new communication infrastructure.

7. Identify actions. The ACT analysis will lead to a list of activities designed to promote the alignment of the actor network. This may involve marketing the idea to groups and organisations, training individuals, designing diversions around irreversible blocks of resistance whether human or technical, developing strategies for enrolling actors on to the actor-network, changing or modifying the technology to promote social acceptance (possibly through simplification or standardisation), and replacing black-boxes by more transparent technology.

Conclusion

The entire purpose of this process is to incorporate management strategies into the implementation plan in order to ensure that technical implementation is accompanied by social acceptance and the embedding of the technology into the social, organisational and human structures.

To return to the virtual maternity ward, the technology must be acceptable to mothers, it must suit midwives attitudes and understanding, it must be championed by the opinion formers such as obstetricians and it must be seen as economically valuable by health managers. All these require enrolment strategies which address attitudes, power and politics. Our aim is to promote lock in, in which the technology becomes socially acceptable, has a positive social construction placed on it and becomes socially embedded such that people use it without being aware that it is new technology or indeed without being aware of the underlying technology at all.

ACT analysis must start at the local level since complex heterogeneous networks are embedded in local practice. Furthermore, it must be specific to the organisation, or organisations, and the application. There will be no generic success factors. The success of a communications infrastructure depends on the nature of the specific actor-network. An understanding of the specific context, culture and processes is required. We will need to understand the power structure of the specific environment in which we are trying to embed the communication network and application.

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