An Actor Network Theory Perspective on IT-projects: A Battle of Wills

Anneli Linde, MSc
Dept. of Building Economics
Chalmers University of Technology
SE-412 96 Göteborg, Sweden

Henrik Linderoth, PhD
Dept. of Management, Politics and Philosophy
Copenhagen Business School
Blaagaardsgade23b
2200 Copenhagen N, Denmark

Christine Räisänen, PhD
Dept. of Building Economics
Chalmers University of Technology
SE-412 96 Göteborg, Sweden

Abstract
Actor Network Theory is applied to the analysis of three IT-mediated change projects and their contexts. Results show that the interpretative flexibility of the technology gave rise to conflicting translations, causing continuous realignments of competing networks enacted through battles of wills and face-saving strategies. We argue that to understand and foresee the complex interactions between heterogeneous actor groups and drifting technologies, IT-mediated change processes need to be viewed through a socio-technical lens.

Key words: actor network theory; chains of translation; interpretative flexibility; IT-projects; organizational change; project management

1 Introduction

The management of IT-projects geared toward changes in organizational structures and work processes often become a nightmare for the parties involved (e.g. Lucas 1975, Lyytinen & Hirscheim 1987, Holmström & Stadler 2001). These IT-mediated change projects are usually ambiguous (Linde & Linderoth 2000) since it is difficult to clearly specify goals and set milestones during the planning stage. Consequently, goals are more likely to be viewed as visions that crystallize from the interactions and collaboration of the involved actors: humans as well as non-humans (the technology). Likewise, time constraints tend to be less rigid since it is difficult to predict the end point until it has been reached. Further, IT-mediated change projects tend to have a looser organization than do traditional, iterative development or implementation projects in that most of the project members are only engaged part time, while working in parallel on their regular duties. All these factors lend a certain fuzziness to these change projects, which is amplified by the interpretative flexibility (Orlikowski 1992:403) of the information-technology used to drive the organizational change. This flexibility in turn allows the users of the technology to discover new features to exploit (Rosenberg 1982, Rice & Rogers 1980), which causes technology drift, i.e. a shift in the contextual usage of the technology compared to the pre-defined objectives of the designers (Ciborra 1996:8). Bearing these uncertainties in mind, how do we as

researchers and practitioners analyze such complex projects so that we may avoid the aforementioned nightmares in the future?
In the traditional project-management literature, socio-technical phenomena such as the plurality and heterogeneity of actor groups, interpretative flexibility and technology drift are seldom taken into account. Therefore, viewing IT-mediated change projects from the perspective of the literature may result in gross miscalculations leading to costly delays or even the failure of the project. A complementary perspective on the management of IT-projects that includes both social and technical contingencies during the trajectory of the project is therefore warranted.

During the last decade Actor Network Theory, ANT, (e.g. Callon 1986, Law 1986, Latour 1987, 1999) has evolved as a promising approach for closer scrutiny of IT-mediated change processes and projects. ANT builds on the assumption that society is an interwoven socio-technical seamless web, consisting of heterogeneous, changing formations of actor networks, inscriptions, work practices and institutional and organizational arrangements (Hanseth & Monteiro 1997:185). The dominance of one network over another depends on the way in which a network of actors is able to mobilise its resources (human and non-human entities) and translate its ideas into convincing representations, and thus impose their desired structure/meaning upon other actor networks (Räisänen 1999:54).

Given this theoretical frame, we argue that an ANT approach to the analysis of IT-mediated change projects can provide a deeper understanding of the interrelationships of heterogeneous actor groups and of the mediating roles played by humans and the technology. ANT, we maintain, enables us to capture the complexity of these rather unique yet prevalent types of projects by providing us with tools to freeze and interpret instances in the kaleidoscope of network formations, where the technology and the context are sites of contention in a battle of wills. In this paper we explore the creation of networks through chains of translation and trace the trajectory of the visions and goals of two, on the surface very different types of change projects: two telemedicine projects and one management-system implementation project. We show how conflicting interpretations of the visions and goals give rise to competing programmes of action, resulting in new kaleidoscopic formations. Despite the contextual differences, we found interesting similarities in the implementation phases of the projects, which are rarely discussed in the management literature.

2 Theoretical frame: Cycles of implementation as chains of translations

Today, processes of change and renewal in organizations are mostly carried out as projects (Lundin & Söderholm 1995), which invariably include IT implementation (Boddy & Buchanan 1992, Henfridson 1999). The traditional representation of a project is a standardized stage-gate model (e.g. Duncan 1996, Gunnarson et al. 2000) with a rational and straightforward life-cycle divided into predefined phases e.g. pre-study, feasibility, execution, and conclusion. These sources advocate a formal specification of goals, time/cost frames, and predetermined implementation plans for the entire project already in the feasibility phase. It is interesting to note that the project-management literature as well as IS research have tended to blame IT-change project failures on the lack of clearly defined goals or a poor implementation plan (e.g. Thompson & Ang 2001, Maylor 1996).

A pre-determined, formalized approach to project management, however, may be counter-productive for diverse IT-mediated change projects. Instead, to understand these types of projects, we need to view the deployment of activities against the heterogeneous background of institutional and individual power positions, political and material ideologies, and other established and evolving socio-technical networks of practices. In view of the special nature of IT-mediated projects, with their inherent interpretative flexibility and drift tendencies, we argue that the project phases should be analyzed as cycles of implementation (Christensen & Kreiner 1997, Linderoth 1997), in which goals are formulated as visions to be re-assessed, modified and revised during the project trajectory as the need arises. Each movement of revision needs to be translated i.e actors' various and contradictory interests need to be modified, displaced and transformed (Latour 1999), so that it mobilizes the appropriate allies and generates the desired action. These chains of translation consist of ongoing interactions between human and non-human actors not only within the confines of the project, but are also deployed *outside its boundaries* in order to enroll influential actors and their networks.

As Latour (1986:267) points out, the destiny of an idea (e.g. the vision of a project) is in the hands of its potential "users," who have the power to appropriate, ignore, modify, or betray the idea. Therefore, if actors are to realize an idea, for example ensuring that their embryo of an IT-project reaches maturity, a forum, e.g. a core network, for ongoing translations of the project vision needs to be established. Callon (1986:203ff) has shown that imposing this vision on others and thus expanding the forum requires a successful translation strategy deployed over time and space and consisting of four interwoven stages: problematization, interessement, enrolment, and mobilization of allies.

At the *problematization* stage, the vision is defined as a question-raising issue by a group of actors, e.g. why start this IT-mediated change project at all? Dealing with this issue requires the identification and involvement of a number of actors whose roles and relationships configure an initial problem-solving network. However, these actors may have different objectives for participating in the network. Thus, it is crucial to formulate a question the answer of which will be of common interest for the identified actors despite their different agendas and goals. This formulation is called an Obligatory Passage Point (OPP), which allows the actors to recognize that they will reap benefits from their involvement in the issue (Callon 1986:205ff). This implies that the vision of the IT-mediated project has to be broad enough to be interpreted by a diversity of actors as the solution to a range of problems (see Christiansen & Kreiner 1997 for similar views on project goals).

When a problem has been defined and new actors and their tentative roles are identified, the network has to be stabilized. Callon (1986:207ff) calls this step interessement: "the group of actions in which an entity attempts to impose and stabilize the identity of the other actors it defines through its problematization." It is important to emphasize that the actors' formulations of visions and mutual roles develop in the ongoing action. At this stage the new actors' links with the network need to be strengthened. Through interessement the developing network creates sufficient incitement to both lock actors into fixed places – so that they participate in the project – and to weaken the influence of other entities that may jeopardize the developing network.

In the third stage, roles in the network are delineated and coordinated through "multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them

[actors] to succeed" Callon (1986:211). In this crucial step, the set of interrelated roles are defined and attributed to the actors, which means that the problem/issue formulated as the OPP has to be translated into a series of clear and persuasive statements. In this step the vision of the project must be divided into more specific sub-goals, which must be accepted and fulfilled by the actors.

Actor groups in networks are generally represented by spokespersons that speak for the group. It is therefore important for a developing network to ensure that the spokespersons are indeed authorized to speak legitimately for the rest of the collective that they represent so that they are not contested? A critical point in the destiny of a project vision, therefore, is to "silence" actors in whose names the spokesperson speaks.

If the process of translation of a vision has succeeded, a contained network of relationships will have been built and room for individual maneuver will have been limited for the entities concerned (Callon 1986:214ff). This network of tightly linked relationships is also an expression of a black box, defined as a situation where many elements are brought together and act as one (Latour 1987:131), or where things put in the black box no longer have to be questioned and tested (Callon & Latour 1981). For example, when a specific IT system becomes so prevalent in an organization that it becomes difficult to question, we can say that it has been black-boxed.

3 Case descriptions

3.1 The management-model implementation project

One of the consequences of today's projectified society (Lundin & Söderholm 1998) is a trend towards a standardization of project activities by means of formalized, generic Project Management Models, PMMs, (Gunnarson et al. 2000). The rationale behind this development seems to be a quest for a common conceptual platform and work method for all projects. Typical of such models is that the project workflow is subdivided into a predetermined set of sequential phases (stages), with stipulated formal managerial decisions as boundaries. This "stage-gate" or "toll-gate" metaphor is the core of a PMM (Cooper 1991).

One of today's well-known commercially available IT-based PMMs, PROPS, was originally developed by the telecom company Ericsson and applied in Ericsson subsidiaries world-wide. The model is comprehensive, covering the single-project perspective as well as the organization's business interests, including leadership and organizational long-term strategies. PROPS is not only intended as a guide for project members; it is also a monitoring and control tool for managers at different levels in the organization (Räisänen & Linde 2001). PROPS describes what to do and when to do it, but not how to do it. This means that the model has to be adapted to new settings e.g. documents, tools and best practice have to be tailored for the needs of specific organizations.

The goal of the management-change project studied here was the re-design and implementation of PROPS at the Swedish Customs Authority between 1999 and early 2002. The case study has focused on the project group, the model and some major local settings and large projects. Twenty semi-structured interviews, as well as numerous informal discussions and mail conversations

with top-management, members of the project office, project managers and members of the project group have been carried out. Project-specific documentation and the PROPS model were analyzed. In addition, on-site observations at the project office, four local offices and five project-group meetings were carried out.

In 1999 a decision was made to "projectify" the Customs Authority i.e. to create an effective multi-project organization. To fulfill this goal, a project group, consisting of representatives from head-office, local offices, and the IT department was formed. The project manager was a top manager from the development department. The vision of this group was that the PROPS model would function as the intermediary by which the organization would govern all its projects, support its project managers, and increase knowledge about handling project portfolios. As one of the initiators put it: PROPS would "bring order to their project organization." Thus the project task was to implement PROPS in the organization.

Already in the early stage of the project, the goal and task shifted focus from a straightforward implementation of the model to its adaptation to the new context. To facilitate the task, a new network, a project office, was created and incorporated into the core project group. The project office became responsible for the implementation of PROPS and, as advocated by PROPS, was to function as support unit for the projects in the organization's transformation to multi-project management. This new goal was added to the initial vision.

The new vision resulted in wide-ranging changes to the model enacted through multiple negotiations and realignments of spokespersons for and against it. To gain support for the PROPS project and increase project-management knowledge, PROPS courses were offered to relevant actors at all levels of the organization.

Despite painstaking efforts to prepare for the organizational change and to adapt the model to its new context, the actual implementation of PROPS generated many problems and caused enormous delays. At the beginning of 2002 a tentative model was finally launched on the intranet. To date the new multi-project-management approach has only partly been implemented in the organization and the model has yet to be used in many projects.

3.2 The telemedicine projects in the Swedish healthcare sector

Telemedicine consists of IT-applications supporting health-care services via electronic transmission of information or expertise to improve effectiveness of resource utilization and allocation (Bashshur 1995). Generally telemedicine is based on different video conferencing systems to which optical medical equipment can be connected in order to transmit live frozen pictures.

Telemedicine technology gained currency in the early 90s, and in 1994 concrete general goals were identified for projects. The general goals were to: increase value for patients through access to medical specialists irrespective of location; support the development of competence in the organization; decrease the costs of the county council; investigate the long term effects telemedicine may have on the structure of health care in the county.

A project group was formed consisting of physicians and personnel from the department of medical technology. Their main task was to find the adequate equipment and to plan for the

introduction of the technology, e.g. the physical location, need for education. In August 1996 the telemedicine equipment was purchased and installed.

The two telemedicine projects studied, general telemedicine (GTE) and telepathology (PAT), were distributed at different sites in a north Swedish County. The methods used were semi-structured interviews and participant observation during 1994 to 1999. The results reported here are based on interviews with medical specialists, general practitioners, hospital managers, and politicians. On-site observation consisted of 18 meetings of the project group, ten of which took place before the installation of the systems. In both projects, the technical platform was a video-conferencing system that could be connected to medical equipment.

The GTE-project concerned communication between general practitioners at health centers and specialists at the county or university hospitals. The specialties involved were dermatology, orthopedics, and otolaryngology. The specialists were located at the university hospital, except for the orthopedists, who were located both at the university and county hospitals. By connecting optical equipment to the video conferencing system it was possible for general practitioners to examine, e.g. the ear or the skin of patient and transmit pictures, live or still, to the specialists. These could thus advise the general practitioners about the further treatment of the patient, and whether the patient should be hospitalized.

The PAT-project concerned communication between medical specialists, i.e. gynecologists and surgeons at a county hospital could communicate with pathologists and cytologists at the university hospital. In this case there were two major applications: remote examination of frozen sections and of cytological sections. A microscope placed at the county hospital could be maneuvered by the pathologists and cytologists at the university hospital. The microscope, connected to a video system, was used to examine the sections. The standard question from county hospital physicians was whether a section was malignant.

A second application was pathology conferences aimed at gathering further information concerning the section samples sent from the county hospital for expert consultation. When additional information was required, the pathologist at the university hospital could mobilize appropriate specialists and set up a video-conference.

The use of telemedicine in Swedish hospitals today is still in its first stages of development and can vary significantly from setting to setting. However, the extent to which the technology has become a part of local praxis among certain hospital networks has largely depended on the efforts of one or a few key actors, who have influenced and enthused colleagues and staff to develop and use the resources offered by the technology. The important role played by these fiery spirits can clearly be seen among the dermatologists and gynecologists in these cases.

4 Case analysis and discussion

4.1 Mobilizing support for the IT-mediated change projects

In all three projects, the change initiative came from a few actors, who formed embryo project groups. To gather support to accomplish their visions, these actors needed to mobilize strong

networks of influential actors and decision-makers. They had to select their allies and translate their visions to create interessement for key-actors in the organization. Therefore, to enroll decision makers to support their ideas, these initial actors appointed themselves the spokespersons of the collective. In the telemedicine case, the physicians in the embryo project group took on the role of spokespersons for colleagues and patients. In the PROPS project group, the CEO spoke for colleagues and customers (the public). These self-appointed spokespersons had high visibility and authority in the organizations, which gave them legitimacy to silence their fellow actors.
The formulated goals for starting the change projects e.g. creating a more effective organization, enhancing competence, effective handling of resources, coordinating projects, formed the first OPPs in the translation process. In the PROPS case, the initial network and its loosely formulated OPP – "to improve the project situation" – were readily accepted by the few actors involved at this stage. However, in the telemedicine projects, a conflicting translation of telemedicine as "toys for boys" was spread, but remained too weak to mobilize a sufficiently strong network to oust the developing telemedicine-project network. The reason for the failure was that the telemedicine advocates had aligned themselves with powerful technologically oriented networks inside and outside the organization. Two managing directors of hospitals commented that it is always easier to obtain funding for "hot" technologies in health-care organizations. This fascination for new technology, in combination with the current IT-trend in society, strengthened the project-actor network in both the telemedicine cases and the PROPS case.

Another advantageous contextual factor for the telemedicine projects was the fact that organizations in the health-care sector tend to have a "follow the leader" philosophy, as expressed by a hospital CEO: "The county councils are very sensitive to different trends. It doesn't matter if you drive into the ditch, as long as the other county councils do the same." There seems to be an inherent tendency to follow a dominant trend or powerful network. In these cases the "leaders" were represented by the Swedish county councils' plans to introduce telemedicine projects; moreover the goals for these projects tallied with expected goals and effects of telemedicine forecasted in the relevant literature (e.g. Olsson 1992, Gammon 1993).

In the PROPS case the aforementioned projectification trend (Lundin 1998, Ekstedt et.al 1999) and the growing popularity of generic project-management models (Gunnarson et. al 2000) were movements that generated strong networks and had persuasive force for supporters of the project group. The choice of project-management model and the way in which it was promoted at the Customs Authority witness the importance of a strong actor-network to lend support to a decision. A member of the project group expressed it as: "Ericsson is a large and successful company so it is important that their logo remains on the revised model when it is put on our intranet." Thus the Ericsson network lends symbolic value and legitimacy to the model.

A further interessement feature of the three projects was the loose formulations of goals – more like visions. Such formulations would be more likely to enrol a majority of actors, who would also be able to interpret them as potential solutions to many problems. However, an important question is whether these formulations were sufficiently convincing to make all the actors want to negotiate the OPP that the visions represented? As mentioned earlier, interpretations are flexible and from the act of identifying with a vision to actually take part in its implementation is a long journey. For example how telemedicine is deployed and how PROPS is adapted and whether these measures would in fact solve the original organizational problems and fulfil the visions is

dependent on the contexts-of-use and the interactions of both human and non-human actors in those contexts. These interactions may either be collaborative or generate contentions leading to obstructive battles of wills, as the rest of this paper will show.

4.2 The birth of new networks to effectuate change

To translate and realize visions of changes in organizational structures and work processes, new networks need to be mobilized, stabilized and expanded. In the three projects described, these processes turned out to be complex and frustrating; far from the straightforward implementation processes anticipated by the managements.

As described earlier, the visions embedded in the projects were aligned to strong trends and powerful networks in the surrounding context. This enabled actors to describe the visions in terms of black boxes in the organizations, thereby eliminating the alternative option: not to implement the IT-management change project or the telemedicine projects. However, after decisions were made to initiate the projects, the influential networks seemed to have been decoupled from the project groups. Actors started to demand proof for the claims reflected in the OPPs. The burden of proof came to lie on the programs of action in the local contexts where the projects were implemented.

The programs of action that the project visions gave rise to needed to be carried out in the local settings to be realized. These programs of action generated through the use of the new technology resulted in actor roles and relations needing to be identified, modified, tested, agreed upon and, in most cases, documented. Some of the programs of action inscribed in the technological artifacts were fixed: actors' had to accept the roles assigned them. Other programs of action were open, meaning that actor roles and relations were formed in the interaction with the technology and other actors. In the telemedicine projects for example, the co-presence of the relevant actors during a virtual consultation was fixed since no storage function for pictures existed in the equipment. On the other hand, whether and when to use the technology was an open issue since its purpose was to enable transmission of pictures and sound in real time and its use was optional.

In the PROPS project, a prerequisite for access to the model was a computer, which most people in the organization possessed. However, the project group could choose to use the technology to control the use of the model, for example by having prescribed project-document templates that can only be accessed through the model. Thus the artifact provided the possibility to force employees to use the model. It also enabled management to steer the way employees navigated through the model, providing complete access for some categories, while blocking paths for others. On the other hand, the intended users in their local settings could contest the programs of action. Thus the local settings, where the IT projects were to be implemented, became the locus for confrontations between the old programs and new programs of action. The old programs could either support or contest the new ones.

4.3 Competing networks: battles of wills

In the PROPS project confrontations between programs of action took place in the adaptation and implementation stages. For example, in the project-group seminars, aimed at re-designing the PROPS model for its new context, conflicts arose concerning the interpretative flexibility of the fundamental term "project." A contesting actor managed to mobilize a network around her

definition, giving rise to a battle of wills between the two networks. The outcome was divergent definitions that had negative consequences for the organisation.

In one of the telemedicine projects competing networks recurred. One occurrence was caused by the fact that the new technology permitted actors to circumvent procedures in a well-established, often hierarchical chain of events. One such side-stepped procedure may be referral of a patient and/or sample to an expert. Despite the time, cost and resource benefits accrued from using the new technology, some actors were still so entrenched in their old paradigm that they openly contested the modified procedures. The underlying reasons for these kinds of conflicts are complex since they emanate from human beings' inherent fear of change and have to do with people's perceptions of their professional identity, status and hierarchical order in the organization. The conflicts are critical for two reasons: they are often unexpected since little consideration is usually paid to "soft" issues in IT-projects and, once they have arisen they can very quickly become infected and destroy the project.

Another reason, related to the one above, for the emergence of competing networks is the re-definition of actor roles and relations that the new technology invariably necessitates. For example, some specialists contested virtual examination of a patient and the fact that they had to rely on their fellow general practitioners' expertise when establishing a diagnosis. Since the use of the technology was optional, the outcome of this conflict was the development of two legitimate networks: one adhering to the old program of action with face-to-face consultation, and the other carrying out the new program of action with virtual consultations mediated by general practitioners. No clashes occurred between the two networks due to a decision in the project group that only pre-planned consultations could be conducted virtually; a decision that was strongly supported by the dermatologists. On one occasion a general practitioner had challenged the old network and requested an emergency consultation to which a secretary answered "our physicians do not do that [emergency consultations]". This can be seen as an example of a prevailing network being mobilized by one actor, the secretary, who appoints herself the spokesperson for the network. The spokesperson thus blocks the possibility of mobilizing a new network that would permit emergency consultations.

4.4 Key-actors and strong wills

Implementing changes in organizations and eliciting acceptance for new technology and routines can be a long and difficult process, as we have shown. For the process to advance there has to be strong and enthusiastic driving forces whose programs of action can mobilize powerful actor networks. These forces or key-actors have the will and legitimacy to drive the project and take on the role of spokespersons. They are usually experts, who, over time have acquired deep knowledge of the organization and its interdependencies. They are therefore adept at translating the project visions into programs of action that speak to the different groups they address. Key-actors are crucial to the success of a project in that they are the ones to build interessement for the project by blocking the old or contesting programs. However, in this process key-actors may have key-opponents, i.e. equally strong spokespersons, but for competing programs. Therefore it is not surprising that clashes between these powerful actors arise and develop into full-blown battles of wills.

In the PROPS case, the project group's task was to adapt the model to its new context-of-use, which meant not only a comprehensive re-designing of the model, but also a re-evaluation of the

context-of-use. The group had to school new projects to organize according to the philosophy of the model while simultaneously ensuring that the model was in fact viable for the types of projects initiated in the organization. For all these layers to function in parallel, the project group needed to enrol key-actors – project managers for the projects, managers at the local departments, and top-managers at head-office. The key-actors that were mobilized were incorporated into the project network and the implicit assumption was that they possessed the same understanding of the projects' sub-goals as did the initial actors. However, in the ongoing translation some of these key-actors became key-opponent and developed competing networks.

Even the core project group in due course became the site of a fierce battle of wills when two competing networks were developed concerning the actual use of the re-designed model. In this case the project office became the arena for the battle, which, even if it was not visible in the organization, had a negative influence on the PROPS-project in that it had a disrupting effect on the actors involved.

In the telemedicine projects numerous equipment was purchased and installed in a few local settings, where key-actors were localized. These actors were assigned responsibility for the development of fields of application for the new technology. However, the actors had varying interpretations of what that responsibility entailed. One of the actors expressed this responsibility very clearly: "You must have fantasy and power of imagination in order to see how this [telemedicine] can be used. If you do everything as you did before, you cannot see the advantages." The crucial role of key-actors becomes evident when we consider that 75% of the consultations in the telemedicine project were carried out in a small health center mainly due to the presence of such an enthusiastic key-actor. At a large health center the actors had the will to use the technology, but they perceived the obstacles in the local setting as too strong for them to confront.

Although many actors were willing to use the technology, an absence of enthusiastic key-actors in the local settings dampened their motivation. One GP stated that both lack of time and the uncertainty of the availability of a specialist for the virtual consultation limited the possibilities of using telemedicine. A similar situation could also be seen in the PROPS project where a couple of key-actors at the project office tried to persuade a local unit to test the usability of the new model, but did not succeed due to lack of interest and knowledge at the unit. It can be claimed that the spokesperson for the model failed to translate the goals of the project into programs of action that would create interessement for those actors. However, it can also be questioned whether the spokesperson had the resources necessary for developing programs of action that would have been perceived as more beneficial than the prevailing ones, which was a complaint voiced by some of the actors in the PROPS case. Moreover, the programs of action that were presented may not have taken into consideration the social implications of the model, and therefore may have given rise to as many perceived problems as it professed to solve.

In all three cases we identified key-actors that were more successful than others at mobilizing strong networks. These were enthusiastic actors with high positions in the organizational hierarchy. Their power positions provided them with legitimacy to experiment and develop the technology as well as prescribe routines that supported the new systems. They could also grant similar privileges to their colleagues. Such a key-actor was one of the top-managers in the Custom Authority's IT department, who was also an occasional member of the project group. He

saw to it that the IT department started to develop work procedures and a support system for the new PMM even before the IT-department was given full access to the model.

An example of a powerful key-actor in the telemedicine project was the chief physician of the otolaryngology department, who had advocated a program of action to facilitate the management of consultations already prior to the introduction of telemedicine at the hospital. In this program, the specialist on duty was also responsible for consultations. It became natural therefore to place the telemedicine equipment in the room of the specialist on duty. In this case it can be claimed that the existing consultation routine facilitated the use of telemedicine in the department; in other words it could be seen as a supporting program of action.

Another interesting phenomenon that occurred in these case studies was the existence of enthusiastic, but isolated, actors who in spite of commitment to the project nevertheless did not manage to contribute to the expansion of the network. At one of the county hospitals an orthopedist and appointed key-actor did not only use telemedicine, he also spent much effort exploring and developing it. Nevertheless he failed to mobilize other actors. Several similar cases could be seen in the PROPS project. One example was the project manager, who, despite his efforts to promote the model, was not given the resources to explore possibilities of use or expand the network. This situation seemed to occur as a consequence of power games, where the actors in the project group, or the organization, failed, or were afraid to give these enthusiastic actors the necessary resources or legitimacy to further develop the project and expand the network. Many of these examples suggest that the hierarchical structures in both organizations studied were strong obstructions for the implementation of the new technologies. In the telemedicine cases, for example, it seemed easier to break down organizational boundaries than it was to budge hierarchical structures.

5 Concluding remarks: Collaboration to solve battles of wills

In ambiguous projects such as the ones described in this paper, the project managers and the project groups of the IT-mediated change projects had to handle asynchronous translation processes. That is each implementation process in the three cases went through different stages, at different sites, at the same time. To fulfill the project vision the actors had to nurture collaboration not only between the project members, but also between the anticipated users. During this process the IT-project managers' influence decreased and strategic key-actors started to play increasingly important roles, especially in the confrontation of the intended programs of action and prevailing programs. However, there was always a risk that a key-actor would become a contender, advocating a conflicting interpretation of the project and the technology. These conflicts need not be articulated, noisy, or even visible, but remain a threat to the success of the project. As mentioned, opponent-actors and conflicting programs of action could increase the risk of failure of the IT projects and give rise to disruptions in the organization. It is therefore important that these conflicting programs be "nipped in the bud" before they are allowed to develop into fully blown battles of wills.

A competing network could, despite its support to the initial project vision, and despite strong support from top-management, arise from the fact that actors in a prevailing network meet a program of action in the project that they find impossible to accept. Due to the openness of the

technology implemented by the project, there is a certain amount of interpretative flexibility in terms of the development and use of the IT-systems. This may give rise to emerging and contradictory programs of action, resulting in two scenarios: 1. the contesting program of action is not sufficiently strong to mobilize a network, but instead generates a group of silent non-users, 2. the contesting program grows stronger and mobilizes other actors to support a new OPP. The carefully planned establishment of an IT black box is prevented from reaching closure, which can eventually lead to a complete failure of the project.

A preventative strategy against failure would be to analyze the project risks using a socio-technical approach as suggested in this paper. It is important to raise actors' awareness of the psychosocial and cultural implications of an IT implementation since these factors play a crucial role for the outcome of the project. In IT-mediated change processes there is a tendency to focus almost entirely on the implementation of the technology to the detriment of the management-change that the technology is supposed to facilitate. For example, at the outset of an IT-project implementation, some crucial questions need to be asked, and preferably answered, such as: How will people fit into the IT-design? How will the IT-solution affect power relationships among different actor-networks in the organization? How will it fit with people's values and beliefs? How will it affect the tone and operating style of the organization?

Using an ANT approach to the analysis of the three projects described in this paper has foregrounded the importance of understanding the relationships that obtain at the interface between the technology that is being implemented and its context of use. This requires both "hard" knowledge concerning the technology and "soft" knowledge concerning human and social interaction. We have shown that IT-project groups need to explore possible issues that may block the intressement that they are trying to create throughout the project cycles of implementation. They need to reflect over ways in which to counter these blocks so that they do not give rise to contending programs of action. They need to ensure that they understand and can monitor the potential chains of translation that arise along the project trajectory. They also need to be open to compromises with powerful key opponents. It is our belief that an ANT approach to the analysis of IT-projects – ongoing, completed or future – will provide better insight into the complexities of both human and non-human behaviour. We also believe that ANT can be used to forecast outcomes of project scenarios, before the nightmare becomes a fact.

References

Bashshur, R.L. (1995) On the definition and evaluation of telemedicine. *Telemedicine Journal,* 2(1), 19-30.

Boddy, D and Buchanan, D. (1992) *The Expertise of the Change Agent,* Great Britain: Prentice Hall.

Callon, M. (1986) Some elements of a sociology of translation: domestication of the scallops and the fisherman of St Brieuc Bay. In: Law, J. (ed.). *Power, action and belief. A new sociology of knowledge?* London: Routledge.

Callon, M. and Latour, B. (1981) Unscrewing the big Leviathan, or how actors macro-structure reality and how sociologists help them to do so. In: Knorr-Cetina, K. & Cicourel, A. (eds.). *Advances in social theory and methodology: toward an integration of micro and macro sociologies.* London: Routledge & Kegan Paul. 277-303.

Ciborra, C.U. (1996) Introduction: What does groupware mean for the organizations hosting it? I: Ciborra, C.U. (eds.). *Groupware and teamwork.* Chichester: John Wiley & Sons. 1-19.

Christensen, S. and Kreiner, K. (1997) *Projektledning- Att leda och lära i en ofullkomlig värld.* Academia Adacta AB

Cooper B., (1991) New Product Processes at Leading Industrial Firms. *Industrial Marketing Management* Vol 2 137-147

Duncan, W.R. (1996) *A Guide to Project Management Body of Knowledge* PMI Standards Committee. Upper Darby. P.A.: Project Management Institue.

Ekstedt, E., Lundin, R.A., Söderholm, A., Wirdenius H., (1999) *Neo-industrial organizing: Renewal by action and knowledge formation in a project intensive economy*. London; Rutledge.

Gammon, D. (1993) Restraining and facilitating factors in the diffusion of telemedicine - A interview study. *Telektronikk,* (1), , 78-84.

Gunnarsson, S., Linde, A., & Loid, D., (2000) Is standardization applicable to project managers of multi-project companies? In: *Paradoxes of project collaboration in the global economy: Interdependence, complexity and ambiguity. IRNOP IV*. Sydney: University of Technology, 136-146.

Hanseth, O. and Monteiro, E. (1997) Inscribing behavior in information infrastructure standards. *Accounting, Management & Information Technology,* 7(4), 183-211.

Henfridsson, O. (1999) *IT adapting as sensemaking.* Department of Informatics; Umeå University, Umeå.

Holmström, J. and Stadler, F. (2001) Drifting technologies and multi-purpose networks: the case of the Swedish cash card. *Information and organization*, 11(3), 187-206.

Latour, B. (1986) The powers of assosiation. In: Law, J. (ed.). *Power, action and belief: A new sociology of knowledge.* London: Routledge.

Latour, B. (1987) *Science in action*. Cambridge, Mass. Harward University Press.

Latour, B. (1999) *Pandora's hope.* Cambridge MA: Harvard University Press

Law, J. (1986) On methods of long distance control: Vessels, navigation and the Portuguese route to India. In: Law, J. (ed.). *Power, action and belief. A new sociology of knowledge?* London: Routlege. 196-233.

Linde, A. & Linderoth, H. (2000) Remove the blinkers and discover the conflicting programs of action: A dynamic perspective on management of "fuzzy" projects. In: Slevin, D.P., Cleland, D.I., & Pinto, J.K. (eds.). *Project Management Research at the Turn of the Millenium - Proceedings of PMI Research Conference 2000, 21 - 24 June 2000 Paris, France.* Newtown Square, Penn. Project Management Institute (PMI). 357-368.

Linderoth, H. (1997) Information technology infusion-Beyond information technology implementation?! In: Braa, K. & Monteiro, E. (eds.). *Proceedings of IRIS 20, Social informatics.* Oslo: Department of informatics, Oslo University. 61-76.

Lucas Jr, H.C. (1975) *Why information systems fail*. New York: Columbia University Press.

Lundin, A. R. and Söderholm, A. (1995) A Theory of the Temporary Organization. *Scandinavian Journal of Management,* Vol.11 (4) 437-455

Lyytinen, K. and Hirschheim, R. (1987) *Information systems failure – a survey and classification of the empirical literature.* Oxford: Oxford University Press.

Maylor, H. (1996) *Project Management.* London: Pitman Publishing.

Olsson, S. (1993) Telemedicin: En översikt och sammanfattning. In: SPRI, *Telemedicin, SPRI tryck 247.* Stockholm: SPRI Förlag.

Orlikowski, W.J. (1992) The duality of technology: Rethinking the concept of technology in organizations. *Organization Science,* 3(3), 398-427.

Rice, R.E. and Roger, E.M. (1980) Reinvention in the innovation process. *Knowledge,* 1(4), 488-514.

Rosenberg, N. (1982) *Inside the black box.* Technology and economics. Cambridge: Cambridge University press.

Räisänen C (1999) *The conference forum as a system of genres*. Gothenburg: Acta Universitatis Gothoburgensis.

Räisänen C & Linde A (2001) The social construction of project management; a critical analysis perspective on project management models. Paper presented at 17:th EGOS Colloquium, "The odyssey of organizing", Lyon, France, 5-7 July 2001.

Thompson, S. H. T. and Ang, J. S. K. (2001) An examination of major IS planning problems. *International Journal of Information Management* 21, 457-470.