Tracing Success in the Voluntary Use of Open Technology in Organisational Setting

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Abstract. Explaining success and failure of IT initiatives is a subject with long traditions in the information system field. However, users' drivers and motivation of the adoption of voluntary open-ended technology has been understudied. It is not clear why users would choose to adopt a new voluntary technology and how and why its use options and possibility unfolds. In this paper these questions are examined through the analysis of a longitudinal case study (1994-2012) of telemedicine adoption in a northern Swedish county. The findings reveal that it is not sufficient to make an open voluntary technology available for its users, or passively demand them to use the technology. Successful use would occur through a continuous interplay between users' technology mental models and their organisational setting and work practices. When in contradiction with the latter, users would not consider the system and hence its use could fade away. Institutional entrepreneurs who have the ability to imagine new and different possibilities and encourage organisational members to experiment and explore possible use and benefit from the technology could influence the initial mental model.

Keywords: IS-success, IS-use, open technology, mental models, institutional setting, voluntary use, telemedicine

1. Introduction

The use of information systems in organisations presents one of the early signs of success. Most studies examined the use of systems in organisational setting where this use is mandatory. Mandatory use of systems means the practice of institutional pressure to channel employees to use the system. This could be done through consistently urging employees to use the system (Orlikowski, 1996), do

not accept work done outside the system, and/or penalise employees for not using the system (Elbanna, 2010). Examples of mandatory systems are ERP, CRM, Lotus Notes, and e-procurement. Little is known about the use of voluntary systems in organisational setting. Voluntary use of systems in organisational setting means that there is institutional acceptance that the system provides an alternative way to do the work and it is up to the employee to choose between alternatives. It is not clear why employees would voluntarily choose to use the system over alternative ways of working.

Information systems research has identified information systems along a continuum from closed systems to open systems (Petter, DeLone and McLean, 2008). Closed systems are systems that are presented to users with prescribed business processes and use cases such as functional systems (finance, marketing, accounting), Enterprise systems (ERP, CRM), and e-commerce systems. Users of closed systems cannot change the system configuration and use cases from their end as it requires significant systems re-configuration and programming. On the other hand, open systems come with generic technology in need of use cases and applications development. It is up to users to find use cases and follow them. Examples of open systems in organisational setting include teleconferencing, Lotus Notes, Intranet, Internet. Most of the studies that examined open systems did so in mandatory use organisational setting where users are constantly urged to use the system and standardisation between use cases are considered and required by the organisation (Bhattacherjee, 1998; Damsgaard and Scheepers, 2000). The use of open systems in voluntary use organisational setting has received less attention however it presents an interesting case of organisational investment waiting for possible development of application and use cases. Users' drivers and motivation of the adoption of open technology in voluntary organisational setting along with the adoption process have been understudied.

This study questions how and why users would choose to adopt a new voluntary technology and how and why its use options and possibility unfolds. It examines these questions through a longitudinal case study (1994-2012) of telemedicine adoption in a Swedish county that over the years became one of the most successful cases of telemedicine application in a Swedish county. Telemedicine presents an example of an open technology in a voluntary organisational setting. It comprises a video conferencing system to which different optical equipments could be connected. The applications of telemedicine for the daily practices of medical staff and administration are not pre-defined but rather depend on users and their local settings (Linderoth, 2002). Indeed, telemedicine can be regarded as a service in need of use cases (Ekeland, 2007). The study adapt Porac et al (1989) framework of the interaction between the cognitive and material elements.

The following sections of the paper are organized as follows. The second section - after the introduction- provides a brief review of literature. The third section presents the theoretical grounding of the paper and adapted framework. The fourth section outlines the research methods and case description. The fifth section

presents the research findings and the final section offers a discussion and conclusion of the study.

2. The Voluntary Use of Technology

Researchers have developed a number of models to explain IS success. Technology Acceptance Model stands as one of the well known models in this regard however it is argued that acceptance is not equivalent to success but a pre-condition of success (Petter, DeLone and McLean, 2006). Delone and Mclean's IS success model and its expansion stand as other well known models in this regard (DeLone and McLean, 1992) (DeLone and McLean, 2003). In these models, DeLone and McLean identified "use" as one of the factors that determine success. It should be noted that information systems use is considered a measure of success only "where use is voluntary" (Lucas, 1981, p. 14).

However, most information systems use studies focus on the mandatory use of systems in organisational setting. Mandatory use is typically assumed to be in organisational setting where institutional power, enforcement, and user resistance exist. In this mandatory use setting, employees do not have the privilege of choosing whether to use the information systems available or not and rarely have the opportunity to selecting the information systems applications they use (Karahanna and Straub, 1999). When voluntary use is considered, the majority of studies focus nearly exclusively on the individual use of systems as a recent literature survey on the state of ICT research shows (Tscherning and Damsgaard, 2008). The study of the voluntarily use of systems in organisational setting has been overlooked as research has implicitly or explicitly assumed that voluntarily use exists on personal and individual levels and rarely on organisational setting.

As figure 1 shows, there is a spectrum of systems that could be classified under the mandatory-voluntary and open-closed categories. In mandatory open systems, users are required to use the system to conduct business processes and their adoption is monitored. Non-adopters are warned against conducting business processes outside the system and strongly channelled to use the system. Orlikowski (1996) for example observed that the introduction of an open systems –in this case a call tracking system for the customer support department at Zeta Corporation - was surrounded by "ongoing urging by managers" for users to use the system (Orlikowski, 1996, p.72). She also reported that the use of the systems was monitored by managers who emphasised to users that "keeping process documentation up to date [through the use of the system] was ...as just as critical or even more important than problem solving [which was the employees daily tasks in answering clients calls and dealing with their technical problems or enquiries]" (ibid, p.75). On the contrary, in voluntary open systems, the organisation installs the generic system/technology in the hope that users will find applications and use cases for it and use them. There is no particular blue print or prescription for use

and there is less urging and monitoring for use since use itself is based on users developing use cases and applications.

Regarding the use of open systems in mandatory organisational setting, research has shown that open-ended technology such as Intranet, e-mail, Lotus Notes, and other groupware technology are malleable at the users end. Its use in the organisation is characterised by high degree of improvisation and sense-making that challenges the traditional rational and planned technology adoption frameworks (Ciborra, 1996; Orlikowski, 1996; Orlikowski and Hofman, 1995). The study of mandatory open systems provided a fresh look at what has been then new types of technology. Today, newer understanding of use of technology emerged in organisation where organisations are willing to offer open technology to users in order to explore, develop applications, and use cases on voluntary basis. This new type of use should be of interest to IS research if the IT and its use to be taken seriously (Orlikowski and Iacono, 2001).

In the following section, we argue that in voluntary setting, a cognitive sense making approach needs to be complemented by an explicit account of the organisational context.

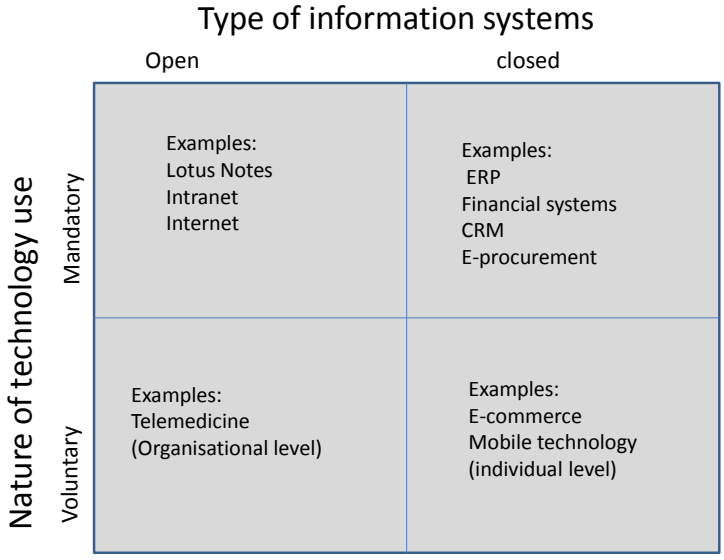
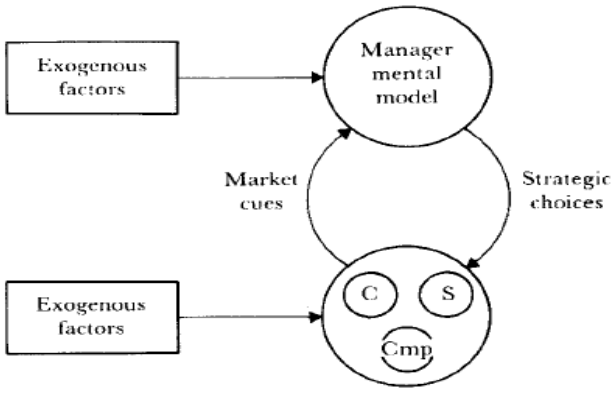


Fig. 1. Types of information systems and nature of use

3. Theoretical Grounding: Technology Enactment

Studies of organisational evolvement and learning have highlighted the importance of cognition and action in organisational change (Weick, 1982; Weick, 1995). The concept of enactment was developed in an attempt to understand how shared perceptions come to being through constant feedback loop between the cognition and action where both impact each other. It follows an interpretive approach to understand organisational activities. Porac et. al. (1989) succinctly summarise the four assumptions upon which this interpretive approach rests as: (1) activities and structures of organisations are assumed to be determined in part by the micro-momentary actions of their members; (2) this action is based on an information-processing sequence where individuals attend to cues in the environment, interpret the meaning of these cues, then externalise these interpretations via concrete activities; (3) that individuals construct actively an interpretation by linking received cues with well-learned and/or developing cognitive structures; (4) individuals are assumed to have a reflective capability and ability to verbalise their interpretations (Porac, Thomas and Baden-Fuller, 1989, p.398). Porac et al (1989) study the community of Scottish knitwear makers in Hawek and how they enact their strategic competitive position. They showed that decision-makers construct a mental model of the competitive environment through processes of induction, problem-solving, and reasoning, which consists minimally of two types of beliefs: beliefs about the identity of the firm, its competitors, suppliers and customers, and causal beliefs about what it takes to compete successfully within the environment which has been identified. Figure 2 exhibits this framework.



Note: C = Customers
S = Suppliers
Cmp = Competitors

Fig. 2. Reciprocal influence of the technical and cognitive levels of analysis [Source: Porac et al., 1989, p.399]

While shows that cognition and action reinforces each other, it also shows that mental models are influenced by information exogenous to this transactional network. Just as mental models are determined by cues from transactions within the value chain, such transactions are also determined by the cognitive construction of organisational decision-makers. This figure shows that the material and cognitive aspects of an organisation are linked together in a loosely coupled 'enactment' process where each is determined partly by the other. In this sense, "what human perceivers do is to take whatever scraps they can extract from the stimulus input and if those conform to expectancy, to read the rest from the model in the head" (Bruner, 1986, p.146).

As social theorists invite a view of structure and institutional practices as both process and form (Giddens, 1976; Strauss, 1978), the existing institutional practices as forms could be explicitly included in this framework. Figure 3 shows the study adapted framework that explicitly account for both the users mental models and their institutional setting. This is in line with Jensen et al. (2009) argument of the need to complement sensemaking with elements of the institutional theory to better account for people in their organisation setting.

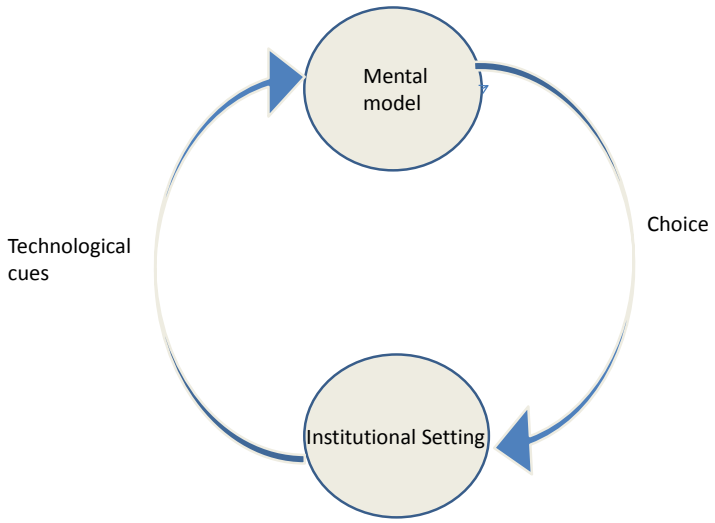


Fig. 3. Technology enactment in organisational setting

The concept of enactment has been applied in information systems research (Fountain, 2001; Orlikowski, 1996; Orlikowski, 2000). These studies showed that the organisational push of compulsory information systems could cut through the existing institutional arrangement and urge users to act –positively or negatively- which is a necessary component for the enactment process. However, the question remains why users would change their mental models and enact a different institutional arrangement on a voluntarily basis?

4. Research Methods and Setting

4.1 Research Methods

This research belongs to the interpretive tradition of information systems research (Lee and Baskerville, 2003; Walsham, 1995a; Walsham, 1995b). It applies a case study approach to understand the use of telemedicine application over time (Eisenhardt, 1989). Longitudinal data was collected by the corresponding author over a period of 18 years between 1994 and 2012 over three phases. It was based on formal and informal semi-structured interviews, participant observation of project meetings and meetings between project management and equipment suppliers, examination of use records, documents review, and collection of news items. The phases of data collection and methods used are as follows.

The *first phase* took place between 1994 and 1999. In this phase, 62 interviews were carried out with 32 respondents namely; physicians, politicians and managing directors of hospitals. Interviews were carried out on four occasions: in 1996, 1997, 1998 and 1999. Observations of project meetings and also meetings between project management and suppliers started in 1994 before the equipments were purchased and installed in August 1996 and continued throughout this phase. The aim of data collection at this phase was to understand the different expectations of the involved actors' regarding the future deployment of telemedicine technology and how the technology was deployed.

The *Second phase* took place between 2003 and 2006. In this phase, seven formal follow up interviews with physicians and the managers for the telemedicine support unit were undertaken in addition to a number of informal interviews and conversations with teams. In addition, an access to telemedicine use records was obtained and records were examined. The use records contained data from 1650 occasions between June 2003 and January 2006 of telemedicine use. Each time the system was used, the party initiating the interaction needed to fill in some data before s/he could log off the system. Data registered encompassed: date, time, host (who initiate the interaction), connected (who has been contacted), duration of contact, comments and person initiating the contact.

The third phase of data collection took place between 2006 and 2012. It consists of follow up conversations and informal visits in addition to the collection of news items regarding the progress of the use of telemedicine in the County.

4.2 Research Setting

The studied case presents one of the most successful cases of telemedicine application in a Sweden county. It began in the early 1990 when few physicians in the county became interested in the telemedicine technology and in 1994 a group consisting of physicians and a technical director started to identify medical specialties that could be suitable for telemedicine. In autumn 1994, they identified dermatology (skin diseases), orthopaedics, otorhinolaryngology (ear, nose and throat diseases), radiology, pathology, cytology, surgery and gynaecology as appropriate specialties. However, in spring 1995 radiology was dropped out because another project regarding the digitalization of the radiology departments in the county started. During 1995 it was decided that telemedicine equipments should be installed at two remote health centres, at the departments in the university hospital and at two county hospitals and the funding was approved by the county board.

The chosen technical platform was a standalone video conferencing system that could be connected with optical medical equipments. By the connection of optical equipments to the video conferencing system, it was possible for general practitioners to examine patients and transmit pictures, e.g. the ear, or the skin of patients, live or frozen to the specialists. It was also possible to connect a microscope to the equipments for the examination of frozen sections. For example, the microscope that was located at a county hospital could be remotely operated and maneuvered by a pathologist at the university hospital.

Two groups were formed in the implementation phase; general telemedicine group and tele-pathology group. The general telemedicine group (GTE) aimed to develop and test communication between general practitioners at two health centres and specialists at the county hospital, and at the university hospital. The specialties involved were dermatology, orthopaedic, and ENT (ear, nose and throat). The specialists were located at the university hospital, except for the orthopaedists who were located both at the university and a county hospital. The tele-pathology group (PAT) identified two applications namely video conferencing and remote analysis of specimen and aimed to develop and test equipments between health centres, county hospital and university hospital. However project's participants had expected a higher number of consultations, the project was considered successful by the County as it continued to invest in telemedicine equipments. As a result, 40 units of telemedicine equipment were installed at hospital clinics and health centres. As the telemedicine infrastructure was expanded, a support department, named the TeleMedLab, was established in 1999. In January 2006 the telemedicine infrastructure installed in the counties health centres and hospitals has expanded to approximately 70 units and in September 2007 this number went up to over 100 units. In 2012, the county was considered to be the Swedish county with the most developed use of telemedicine by representative from other Swedish counties.

5. Research Findings

In this section a few different applications will be described. The purpose of choosing these applications is to illustrate how the established institutional logic and technology mental models were challenged and how new technology mental models found its way through and were later institutionalised.

5.1 The Need for Institutional Entrepreneurs

The core team of medical specialists who was enthusiastic to implement telemedicine technology was involved with the technical team during the implementation. However once the system went live, it became down to departments to decide whether they can use it and in which cases. The implementation team view was that departments should identify some ideas of initial use in order to get the equipment installed in their clinics. This view was expressed as:

> *"…if this [telemedicine] should function, there need to be a demand from the organization, we need to feel that we get something out of it"*

The GTE group members realised that telemedicine is not a technology that comes with a prescribed use. It is down to users to either use it or not. Even if they decide to use it, users still need to define and construct their use cases. A general practitioner, who was one of the enthusiasts of telemedicine implementation, expressed this view as follows:

> *"You must have fantasy and power of imagination in order to see how this [telemedicine] can be used. If you do everything as before, you do not see any advantages"*

The need to find people with imagination and spirit to experiment was, implicitly, recognized by politicians and the managing directors at the hospitals. The managing director at the university hospital stated that development of applications and how to organize the daily activities were matters for the users.

5.2 Institutional Entrepreneur and the Evolvement of Technology Mental Model

In the dermatology department, there was initially no demand for the system as users could not see a reason for using it, but some dermatologist had to use it due to their involvement in the project. Hence, Dermatology did not initially have a

telemedicine unit at their clinic. Instead, if they decided to use it, they had to walk through the hospital to the video conferencing studio.

Dermatologist considered their direct contact with patients to be an integral part of their professional identity (Chreim, Williams and Hinings, 2007). This enacted view was expressed by a dermatologist as follows:

> *"We should not be like a radiologist, just looking at a flat picture….you need to touch, feel and smell".*

The necessity of interacting with patients was supported and enforced by the existing institutional financial arrangement that compensate specialists on the basis of the number of patients visiting the practice. The concern of the possible financial loss contributed to the enforcement of the existing mental model that advocates direct interaction with patients. Also the career path including performance evaluation and promotion of physicians was dependant on their research output. Dermatologists viewed research to be dependent on the continuous flow of patients visiting the clinic. Hence they feared that if the numbers of visiting patients drops as a result of using telemedicine, their research will be negatively impacted and hence their performance evaluation and career.

The existing institutional arrangement supported the view that patience had to be seen face-to-face. Hence the initial mental model of most Dermatologist towards telemedicine was that there is no use for such a technology. Another medical specialist claimed that the importance of the presence of patients in consultations is overestimated, but preferred not to express this opinion in public. Thus, he was not willing to risk contradicting the institutional professional identity and arrangement.

The understanding of how the technology could be used at the department of dermatology changed slowly as a new dermatologist joined the team. She saw the available telemedicine equipment and became interested in exploring how they could benefit the department. So she started an initiative to experiment with finding possible use cases for the telemedicine equipments. The initiated experiment identified classes of patients and consultations that could be done over the system.

At that time, there was a shortage of staff at the dermatology clinic at a district hospital 140 km away from the university hospital. This shortage of staff required that university hospital staff had to rotate between them a weekly visit to the district hospital. This weekly visit was considered to be a tiring trip and undesired task. It required a member of staff from the university hospital dermatology department to take the bus at the very early morning for a two-hours journey to the district hospital once a week to meet and examine patients the whole day and in the late afternoon spend another two hours by the bus in his/her way back journey. However this duty was rotating among dermatologists and was also compensated with one day off, it was not popular task. The dermatologist who soon became the head of the department presented the findings of the experiment to other

dermatologists as a possible solution that could save them the long bus journey to the district hospital. This solution was then welcomed by dermatologists the team as could ease the burden of waking up at 4.30 in the morning to take the bus. Dermatologists became involved in the discussion regarding what kind of patients was appropriate for telemedicine examinations and the possible procedures to be followed when using the equipments. It was agreed that the nurse at the district hospital could take photos of the patients' skin, send them to the university hospital where the dermatologist examines the photos while the nurse is with the patient.

The remote examination of dermatology patients was successful as dermatologist in the university hospital announced that they will never commute again to the district hospital. As the nurse at the district hospital who was involved at the experiment retired few years later, the new nurse considered telemedicine consultations to be part of the definition of her role and the routine regarding how patients should be treated. Thus, the mental model regarding telemedicine use changed at the dermatology clinic from being very sceptical of telemedicine consultations in the first few years to be one of the enthusiasts of using the technology. Dermatology became one of the heaviest users 10 years later.

5.3 Contradiction Between the Technology Mental Model and the Institutional Practices

In the GTE group, there was low number of ad hoc consultations from health centres to university hospitals. Initially the health centre saw telemedicine as an opportunity to get hold of university specialists on ad hoc basis. However soon, GPs at the health centres found out that despite the technical possibility of telemedicine to connect with university hospital, the institutional arrangements at the university hospitals made it difficult to find specialists on ad hoc basis. They also found out that ad hoc consultation does not mean instant consultation as university hospitals' specialists still need time to operate the equipments.
This view was expressed by a general practitioner at the health centre as follows:

> *"It is the accessibility [of clinical specialists] that makes it complicated, the system is not complicated….If I should try to reach someone who is not accessible, s/he should be searched for, and then they cannot handle the equipment and do not know what to, suddenly an hour is gone"*

The health centres mental model regarding using telemedicine as a mean for immediate access to medical specialists contradicted the institutional barriers between university hospitals and health centres and the professional status of university hospitals specialists and hence was met with cynicism from university hospitals specialists. This view was expressed by a general practitioner as follows:

"Suddenly is the primary care is coming and putting demands on the hospital care, to for example develop routines for managing incoming consultations from the primary care….or to develop services for the primary care"

5.4 Enacting Existing Organizational Routines

Contrary to the GTE-project, laboratory specialists involved in the PAT project had in mind from the beginning one application which was to organise clinical conferences via telemedicine between the clinic of gynaecology at the district hospitals and pathologists and oncologists at the university hospital. The clinical conferences application became - over the years - the major application of telemedicine in the county.

The practice of having a weekly professional meeting for specialists at university hospitals is a well established professional and institutional practice. It aims to provide weekly encounters for all levels of specialist doctors and students to discuss and learn from different cases. The organisational routines of university hospitals provided mechanisms for these meetings to take place on regular basis as it is considered an important weekly event for mentorship and competency development and part of what make a university hospital. So when introduced to telemedicine, Pathologists at the university hospital immediately found a use case that is in line with the existing practices, professional convention and organisational routine –namely clinical conferences. They approached the use of telemedicine clinical conferences as an extension of the current practices and routine that ensure providing quality learning environment. This provided the participating gynaecologists at the district hospitals with perceived value of participating in these conferences.

While Pathologists at the university hospital used the conferences as competencies development opportunity for gynaecologists, gynaecologists' mental model of pathology conferences evolved from being a mean for competence development to an integrated part of their operations and decision making. Gynaecologists' mental model evolved to consider it an opportunity to discuss patients' cases with pathologists and take decisions accordingly. It became common to hear gynaecologists discussing a patient case saying: "*Let's wait to the conference until we decide on further treatment*", the head of the gynaecology department said. Specialist found these conferences as a way to diagnose difficult cases where a patient diagnosis could be changed during a conference due to additional information that was coming up.

Telemedicine clinical conferences soon became part of the routine activities, and the application was adopted at another county hospital. The organisational routine and arrangement for preparing and conducting clinical conferences was adopted and extended to telemedicine application. For example, conferences were

held at the same time and same day every week, and detailed routines were set up for how to report a case that should be discussed at the conference.

5.5 Contesting the Existing Mental Model of Time

The PAT project management suggested from the beginning another application for telemedicine which was tele-pathology meaning the immediate analysis and reply on frozen specimen/sections. In this application, a microscope for the examination of the frozen sections was located at the county hospital but was manoeuvred by the pathologists and cytologists at the university hospital. The aim of the application is to speed up the analysis and give surgeons a reply within few minutes regarding the nature of the sample. This application was not put in any significant use and soon faded away.

Surgeons at the county hospital who should use the technology for urgent answers on frozen section were sceptical if they could trust the results because the method was not scientifically validated. The method was later scientifically validated by the management of the PAT-project and the findings showed that there were no significant differences between the traditional way of diagnosing frozen sections and diagnosing via tele-pathology. However, surgeons continued to be disinterested in this application. The speed of receiving the reply back was in sharp contrast with the previous routine of sending a sample of suspicious tumour while operating to the lab and receiving the results days after the operation. Surgeons probably found it difficult to mentally prepare in such a short period to convey a serious message to a patient that could confirm the existence of cancer in his/her body. They also found it inconvenient to know the results of analysis while operating and preferred to continue to leave the results to a later stage following the current professional practices. Concerns were also raised about how the patients would react if they were given the answer "cancer" half an hour after a section had been taken. The surgeons felt ambivalent towards the speed of results that this application provided which was in sharp contradiction with professional practices and also the procedures of giving patients feedback.

6. Discussion and Conclusion

This paper questioned why would users choose to adopt a new voluntary technology and how and why does its use options and possibility unfolds? To answer these question a longitudinal case study (1994-2012) of one of the most successful counties' in Sweden in its use of telemedicine systems was examined.

The findings show that in the voluntary use of open technology, users' initial mental model develops based on the existing institutional arrangements, routines, and definition of professional identity (institutional logic for short). This is in line with other studies on technology frames, sense making and mental models

(Davidson, 2002; Davidson and Pai, 2004; Orlikowski and Gash, 1994). If the technology is found to be in line with the latter users will be likely to develop a positive mental model regarding the technology. They would readily incorporate it into the current organisational fabric and include it in the existing organisational routine. This was the case with clinical conferences. The practice of clinical conferences and providing weekly opportunity for professional development constituted part of the existing professional identity of specialists at university hospitals. They were also aligned to the existing routine of scheduling and preparing for these events. So university staff readily developed a positive technology mental model and used it to conduct clinical conferences with the health centres following the existing institutional arrangement and routine. For district hospital staff, this was considered a good learning opportunity that brought them up to the university hospital practices and hence developed a positive mental model and were eager to adopt similar organisational routine and arrangement.

In addition, the study shows that on a voluntary use basis when the technology is perceived to be in contradiction with the institutional arrangements, routines, and existing definition of professional identity, users would not show much interest in the technology and might exclude it from the outset as an alternative to do their work. The use of technology could then fad away. In this case, the existence of an institutional entrepreneur could help users to imagine new possibilities and other ways of working. Institutional entrepreneurs can also contextualise the use of the new technology and help users to find use cases.

The study also shows that institutional entrepreneurs present an exogenous factor that could influence the users' technology mental model through imagining, suggesting, and inviting the thinking of new possibilities and ways of working. This is in line with previous research on organisation studies that suggest that institutional entrepreneurs have the capacity to imagine alternative possibilities and the ability to contextualise past habits with the contingencies of the moment (Emirbayer and Mische, 1998; Garud, Hardy and Maguire, 2007). This was the case with the dermatologists. The new dermatologist initiated an experiment to explore the possibility to diagnose patients of the district hospitals. As users became involved, they identified patients with chronic disease to be suitable for telemedicine interaction. Organizational routine and new procedures had to be developed to align with the shift of dermatologists' mental model. With the change in staff, the new mental model became an organizational reality and an established way of dealing with patients with chronic disease.

While Porac et al. (1989) framework has been used in another research (Elbanna, 2012), it is the explicit consideration of the role of institutional elements in the development and enactment of users' technology mental models that presents one of the contributions of this study. Figure 4 shows that in the use of open technology in voluntary organisational setting, the enactment of technology mental models and organisations routines feeds into each other; a change in one would trigger changes in the others. By drawing on the mental model, perceived current problems and what is done in other use cases, the institutional entrepreneur

provides initial possibilities to apply the technology in the organisational context and infuse an experimentation spirit around it. The choice of applying the technology is then tested against other mental models originating from institutional logics and routines in the users' contexts. In case where chosen applications of the technology are well aligned with the institutional logic and routines in the user's context, technology use becomes an integrated part of the mental model. i.e. prevailing mental models are challenged to a very low degree. If the application chosen challenge the mental models and interfere with an established institutional logic, technology use will be seen as something that causing problems more than solving problems in the users' context. However the existence of other use cases and peers approval could send cues that change the mental model

As users perceive that the use of the new technology is solving a problem or improving practices, users will shift to the new mental model where technology becomes an integral part of what they do. Therefore, managers and practitioners need to chase the changes through changes in organisational routine and procedures. As the medical profession is highly regulated by strict code of practice and protocols, new procedures need to be developed and written once changes of understanding occur (Linderoth, 2002).

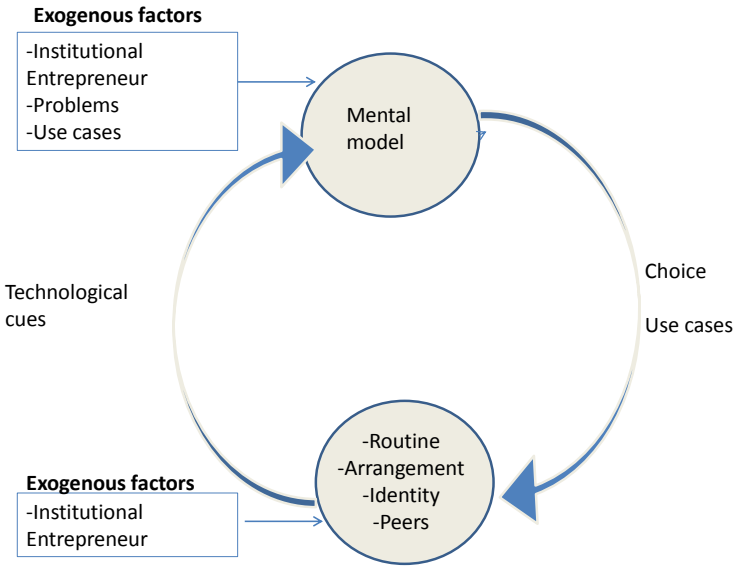


Fig. 4. The cycle of enacting open technology in voluntary organisational setting

In mandatory use organisational setting, users could be under pressure and significant stress (Wastell and Newman, 1993). In contrast, in voluntary use organisational setting users are invited to explore and experiment without pre-conceived ideas or blueprint for use. Users need to imagine new possibilities for doing the work and ways to use the technology is particularly important in open voluntary technology. Urquhart (1997) in her study regarding users-developer interactions during requirements determination had also identified imagination as a pattern of interaction tactics (Urquhart, 1997). The role of imagination and how it could be infused is in need of further investigation. Researchers are invited to follow up from this study to examine it in-depth.

Contrary to the existence of a window of opportunity for users to change the implemented systems after which the system will be stabilised (Tyre and Orlikowski, 1991), in the voluntary use organisational setting, finding use cases and applications is an on-going process of innovation. It requires imagination and thinking of possibilities and is triggered by the availability of equipment.

The nature of systems use in their organisational setting and where its use could be located in the possible voluntary - mandatory continuum has been largely overlooked (Petter et al., 2008). Indeed, studies that examined voluntary use did so through studying university students or making the participation of the study itself voluntary (Moez, Hirt and Cheung, 2007; Weill and Olson, 1989). This study presented a case study of voluntary use in its organisational setting. In doing so, it contributes to the understanding of voluntary technology in organisational setting.

In conclusion, it is not sufficient to make an open-ended voluntary technology available for its users, or passively demand them to use the technology. Successful use would occur through a continuous interplay between mental models, actions and organisational elements. Hence ideas of use could be suggested to understand initial impediments that management need to reduce, institutional entrepreneurs need to actively find use cases, compare experiences, and initiate debate while experimentation and exploration are invited and encouraged.

7. References

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