

**“The greatest barrier for innovations in health care is the
”scared old men””**

- A study of actors’ interpretations of knowledge sharing and innovation processes

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Abstract

Is innovation and innovation transfer really hindered by conservative ‘scared old men’? And is innovation then fostered by the brave young ones? Both challenging this simplistic explanation, and at the same time showing how it has some relevance and pointing towards relational aspects of innovation processes, we address the issue of what facilitates or hinders knowledge sharing and transfer of innovations in complex organisations.

While much literature on knowledge and innovation treat innovations as stable entities, and knowledge as context free pieces of information residing in individuals’ heads, our study adds to the research on innovation and knowledge as highly relational and situated processes within and across ‘communities of practice’. With our three case studies of interactive innovation in the health care sector, we discuss the importance of power negotiations, networking, alignment and process knowledge for transfer of medical innovations and knowledge sharing.

Keywords: communities of practice, networks, transfer of innovations, power
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1. Introduction

Is the greatest barrier in medical technology innovation processes the conservative 'scared old men'? And is innovation fostered, then, by the brave young ones? Both challenging this simplistic explanation, and at the same time showing how it has some relevance, we address the issue of what facilitates or hinders knowledge sharing and transfer of innovations in complex organisations. Four explanations that often have been provided in the literature for success versus failure when it comes to transfer of medical technologies have been: technical inadequacies, mismatch with user needs, mismatch with political or managerial priorities in hospitals and economic inadequacies (Sætnan, 1995, p.3). According to Fennel and Warnecke (1988), health care institutions may find it beneficial to adapt a new technology because of the general competitive climate, to avoid malpractice's suits, which might develop if health care institutions fail to adapt technology or new procedures viewed as necessary, or to gain status. From an outside perspective cost-benefit consideration also seems to be the key issue, as well as medical conservatism. With this study we therefore aim at contributing with a more nuanced understanding of these processes.

Since the 1950s the public expectations of the health care services have risen dramatically, with demands that arise from the invention of new medical technologies from advances in diagnosis as well as therapies (Borum, 1999). Meanwhile many breakthroughs in technological and scientific knowledge fail to be transferred into practical use even though the efficiency and effectiveness of treatments and services could be drastically improved. These failures often occur because the new tools or methods cut across existing professional boundaries and established power structures (IKON). The established linear modes of organising the production of knowledge creates divisions between research, development and product marketing, and this poses barriers to knowledge integration (ibid). We have studied three innovation projects at Rikshospitalet University Hospital (hereafter abbreviated to RH), with the aim of contributing to the debates on the role of communities of practice for incremental and radical innovation. We will in this paper therefore investigate how innovation practices and knowledge sharing is influenced by relational and political matters, and analyse the role of 'process knowledge' (Newell et.al.2002b) for transfer of innovations.

The paper begins with a presentation of some theoretical perspectives, whereas the methodology is outlined in chapter 3. The following chapter describes some background on

Norwegian health care and laparoscopy, chapter 5 presents the three cases, before they are discussed in chapter 6. Finally, some final remarks on implications will be given in chapter 7.

2. Theoretical perspectives

Communities of practice and networks

The concept of “communities of practice” (Lave and Wenger, 1991; Brown and Duguid 1991; 2001a, b) has achieved a central position in discussions on how learning and innovation occurs. This perspective emphasises a view on learning that is practice-oriented, where learning implies both learning a profession and acquiring an identity in a community. Knowledge or knowing is passed on to newcomers through shared social practices, and a community of practice is defined as: *“a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice”* (Lave and Wenger, 1991, p.98). A central part of the situated activity of learning is a process that Lave and Wenger (1991) calls ‘legitimate peripheral participation’. As the beginner or newcomer moves from the periphery of a community to its centre, they become more active and engaged within the culture and hence assume the legitimate role of expert or old-timer. The novice begins on the outside of a community and after a while is allowed to participate in a legitimate way by assisting the more experienced members of the community, the peripheral position allows them to observe skilled practitioners practice, then copy and learn. This process implies, however, a time aspect that may be difficult in innovation projects where the lack of time can be a great challenge.

Meanwhile, the existence of different communities also creates boundaries, which are important as they connect communities and offer learning opportunities (Wenger, 2000, p.231-233). In cross-disciplinary projects multiple disciplines can collaborate, and “people confront problems that are outside the realm of their competence but that force them to negotiate their own competence with the competence of others” (ibid, p.238). Araujo`s (1998) agenda is to outline a view of knowing and learning embedded in concrete local practices which is constituted and connected to other practices within and across organisations. For this reason he advocate a network view of organisation, defined as *“a set of interlocking and shifting relations with porous and fluid boundaries”* (ibid, p.317), where socio-technical networks is the unit of analysis. To take a network view does also mean that the

`environment` is seen as *“made up of the same raw material as the organization”, namely “multiple interactions and relationships”* (ibid, p.328). These relationships are heterogeneous and interconnected, thus making the distinction between `organisation` and `environment` less useful. Araujo argues for a need to extend the notion of communities of practice beyond organisational boundaries, that *“locales are simply transient nodes and momentary interaction settings”* (ibid p.328). “Knowing and learning are seen as collective accomplishments residing in heterogeneous networks of relationships between the social and material world, which do not respect formal organisational boundaries.” (ibid p. 317). This aspect of learning has also been addressed by the concept of ‘networks of practice’ (Brown and Duguid, 2001). A central debate in the network of practice literature revolves around the knowledge sharing and creation activities performed by the various networks of practice. In some of the early literature, communities of practice have been positively linked to the creation of new knowledge through incremental improvements in local work practices in response to new problems (Brown and Duguid, 1991).

Communities of practice and power relations

The possibilities for learning are formed by the social structure of the practice and the power relations surrounding it. *“Conflicts are experienced and worked out through a shared everyday practice in which different viewpoints and common stakes are in interplay”* (Lave and Wenger, 1991:116). Since the concept of ‘communities of practice’ is left largely as an intuitive concept, a more rigorous treatment is needed. *“In particular unequal relations of power must be included more systematically in our analysis”* (ibid, p.42). Contu and Willmott (2000; 2003) and Fox (2000) are critical to how the concept of communities of practice gradually has changed towards a managerial focus on how to control and manipulate these communities, see e.g. Wenger et.al. (2002). Swan et.al. (2002:9) point to how also Brown and Duguid (2002) *“neglect the implications of the different forms of social practice in which different organizational groups (including management) are engaged”*. In line with this, and in line with Scarbrough and Swan (2002), power, and thus truth, is in this paper viewed as relational characteristics, not as commodities possessed by one group over another, resembling the Foucauldian perspective on power (see e.g. Foucault, 1984). What counts as valid knowledge (truth) is therefore contested as more or less powerful groups of professionals will try to sustain control over their knowledge and practices (Freidson, 1970;

Abbott, 1988). Hence, knowing and innovating needs to be seen as non-linear and political processes, and as collective and situated achievements of a rather precarious nature.

Innovation

Innovation theory's original stage-wise models (see e.g. Rogers, 1995) have been criticised for being too simplistic. Several researchers, including Lundvall (1992), Van de Ven et. al. (1999), Akrich et al (2002) and others have found that innovation certainly not can be described as linear and predictable. Their works have thus focussed on developing analytic frameworks and tools to analyse innovation as complex, non-linear and relational/interactive processes. We follow Robertson et al. (2002) and Van de Ven (1986, p. 591) who define innovation as: *"the development, diffusion and implementation of new ideas by people who over time engage in transactions with others in an institutional context"*. The innovation process consists of different episodes (rather than stages) to reflect *"the sporadic, iterative, recursive and sometimes discontinuous nature of innovation processes"* (Van de Ven, 1986 in Newell et.al., 2002, p.145). Most innovations create small incremental improvements to existing products, processes or routines. Other innovations are radical in that they create entirely new product categories, require new competencies and can render existing ideas and make existing techniques obsolete. A general view in the diffusion literature (Rogers, 1995) is to consider the innovators as rational and individualistic actors, and that there is a strict divide between individual decisions (adoption) and social diffusion of innovations. But instead we suggest, in line with Van de Ven et al (1999), that innovation is an increasingly collective phenomenon which is characterized by a degree of uncertainty and complexity that makes 'rationality' an impossible a priori assumption about the process. Innovation and its transfer are characterized by *"multiple, parallel, and interdependent paths of activities"* (Van de Ven et. al. 1999, p.10), resembling what we might call a practice perspective on innovation.

Communities of practice and innovation

Learning and innovating will, according to Brown and Duguid (1991, p.51) often occur in communities of practice where individuals and groups can be freer from 'received wisdom' and hence more innovative. Since these communities constantly improvise, and adapt their behaviours in order to traverse the limitations of formal organization and canonical practice (Scarbrough and Swan, 2002; Swan et.al., 2002) they are important arenas for local invention. Brown and Duguid (1991, p.53) state that *"the process of innovating involves*

actively constructing a conceptual framework imposing it on the environment, and reflecting on their interaction”, and thus *“communities of practice exert a crucial influence on the integration of knowledge required within innovation processes because they both emerge from, and shape, network relations”* (Scarborough and Swan, 2002, p.6). This again is regarded as critical to innovation since they allow local knowledge of particular groups to be accessible to others. In a hospital case study of a project on treatment of prostate cancer with brachytherapy, Scarborough and Swan (2002) found the ability of a project team to integrate disparate knowledge bases as critical in the innovation process.

However, whilst networks of practice encourage the flow of knowledge within the network, they may simultaneously constrain the flow of knowledge across networks (ibid). This implies, as Knorr-Cettina (1999) has shown, that whilst scientists within disciplines can communicate and collaborate with colleagues globally, they may fail to collaborate across disciplines at a local level (Scarborough and Swan, 2002). Few studies, with Swan et.al. (2002) as an exception, addresses the role of communities of practice for radical innovation. When the role of communities of practice for innovation has been discussed, the focus has been on relationships within communities, incremental innovations, and accordingly these communities as having a positive effect on innovation (ibid). Although the communities and networks of practice perspectives have had great impact of our contemporary understanding of innovation, learning and knowing, the weaknesses in their analysis of power relations and of radical innovation processes have made us see if the ‘sociology of translation’, or actor-network theory, might help to develop this analytical perspective further.

Innovation as translation

As mentioned, much of the literature treats innovation as a stable entity that remains the same throughout the process of diffusion. Hence, research has generally focused on the question of adoption or rejection in organisational settings. We argue in line with Newell et.al, (2002, p.149) that innovation should not be seen as a *“fixed entity and definable parameters that can be simply inserted into different organizational contexts”*. A different approach would therefore be to focus on the transformations of innovations when they change location in time and space. Akrich, Callon & Latour (2002 a, b) argue that the interactive process throughout the whole development process is of greater importance than the initial idea and its originator. They explain innovation as collective and complex processes of enrolling and aligning

different elements and actors into the project to make the innovation materialize. Hence, every little decision along the way might influence the direction of the project, and every controversy brings with it a potential for bringing the project either to failure, or a little closer to success. This emerging web of actors and associated elements gradually become interdependent, and the shape and development of the innovation is fully contingent upon its relations to the different actors and elements in the web. Accordingly, innovation should rather be explained as processes of transformations and translations. No entity stays the same when it is put into a new web of relationships, because it is defined through these relationships; its characteristics, capacities, status, etc., all are dependent upon the local situation (Latour 1988). The fundamental logic, then, of the transfer of innovation is not the traditional approach of the diffusion model, with its sharp division between the ones developing the innovation and the ones using it. This ends up with the 'innovators' taking a 'take it or leave it' attitude towards the potential users. On the contrary, this process should be seen as logic of continuous *adaptations*, negotiations, and trial and error learning.

In conclusion, we will therefore study the practices in innovation projects within networks of communities, with an emphasis on the situated, political and relational nature of the process.

3. Methods

This paper is based on three case studies from the Interventional Centre (hereafter abbreviated IVC), at RH in Oslo, Norway. Since the phenomenon of interest should be explored in its natural setting and the boundaries between the phenomenon and its context were unclear (Yin, 1994; Eisenhardt, 1989), we found this approach the most appropriate. The unit of analysis is the innovation process and the practices involved in it. Our case study site offers us the opportunity to study the development, refinement, diffusion and implementation of new medical procedures in relation to one location. Normally this process would have been characterised by activities that were separated both in time and space. Secondly, we may observe how the locally produced knowledge and practices may be challenged as they are transferred and meet other communities. Thirdly, the case study site is unique in a Norwegian setting with its cross-disciplinary composition and the focus on organisational, medical and technological innovations. Many previous studies have tended to separate the different aspects of an innovation and to focus on discrete episodes (i.e. design, diffusion or implementation) (Robertson et.al. 2004:3). In contrast to this, and in line with the

study of Robertson et.al (2004), we are able to follow the whole innovation process, in our case: three laparoscopy projects. All had the same project leader, represented novel techniques (nationally), and were cross-disciplinary. We selected one project that had been difficult to transfer out of the R&D setting, one with a smoother transfer history, and one with an intermediate level of difficulties in transfer.

Our main source of data has been participant observation, as three of the authors have been linked to the centre for several years (BEM from 2000-2005, MA from 1998-2001, and BE from 1996-2005). The two first authors have been there as PhD students, and have been involved in various research projects, whereas the latter actor has worked as a senior gastro surgeon. Since it is impossible to follow all activities at the centre, it was important to get first hand information from the projects, and we therefore collaborated closely with the surgeon, used him as a key informant and discussed the material with him. However, still it was not possible to participate in all the activities and capture what the project participants thought about the innovation processes, and we therefore did several interviews as well. 9 of them were directly related to these projects, but they have also been mentioned in some of the over 20 other interviews we have done at IVC. We also studied documents from the centre. Writing the three case studies was an iterative process, and we therefore had to revisit and our data several times, as well as have informal talks with some of the informants. On the basis of this process certain themes emerged that seemed more relevant than others, which is an experience that is common for researchers doing inductive studies (Newell et.al. 2002).

4. Background

The ability of the health care system to use its resources efficiently has in the recent years been heavily discussed by the public (Borum, 1999, p.13), and hospital reforms have become an epidemic (Byrkjeflot and Neby, 2004, p.7) that includes quality reforms, patient reforms and budgeting reforms in order to become more efficient and to increase patient satisfaction. In 2002 the Norwegian government launched a reform that shifted the ownership of the hospitals from the counties to the Government, and five regional health enterprises with substantial autonomy replaced the former five health regions. This had led to an unprecedented degree of economic demands to the hospitals and individual hospital departments. Consequently, the search for cost-effective treatment methods has become important, and one of the promising areas is the field of laparoscopy. In recent years

laparoscopic techniques have to an increasing extent been used in Norwegian hospitals. Laparoscopy is a surgical method where a laparoscope (with light and a video camera) is entered into the abdominal cavity through a small incision (see picture below). Organs can be examined and surgical procedures can be performed, and thus laparoscopic surgery, also called “keyhole surgery”, has become an alternative to traditional open surgery for a steadily increasing number of procedures. The benefits of this surgical technique is, according to the proponents, that the patient experience lesser pain and trauma, and the recovery time, including the hospital stay is much shorter than with traditional open surgery. IVC has been a central contributor in this field as they have had many innovation projects within laparoscopy.



This picture is from a laparoscopic procedure at the Interventional Centre. Notice how the actors look at the screen during the operation, instead of looking directly at the area that is operated. This is a common feature for image-guided surgery. There was also an anaesthesia nurse present to look after the patient, but she was placed to the left of the surgeons.

5. Three innovation projects within the field of laparoscopy at IVC

IVC was established as an independent R&D department at RH in 1996 as a testing ground for new interventional and diagnostic procedures before they were put into clinical practice, so that time-consuming and risky procedures could be developed and tested outside of the ordinary hospital departments. The personnel consist of doctors and nurses from several different disciplines, as well as non-medically trained scientists within engineering, mathematics and physics. During the years 1996-2003 the clinical departments introduced 20 new procedures by way of IVC, filed 12 patent applications and produced 112 scientific publications. Six PhD projects were finished in 2002-2004, and currently the Centre has 27 ongoing PhD projects. At IVC laparoscopic techniques have been a central part of the

activities since the centre was established. The total number of projects linked to the centre has been approximately 160, and out of these projects over 20 have been within laparoscopy. At the time that they have been developed and refined these techniques at the centre, they were in many cases neither used in any Norwegian nor Scandinavian hospitals. As mentioned in the methods section, we have studied three of these innovation projects, and will turn to this now.



Picture from a laparoscopic procedure at IVC

5.1 Laparoscopic prostatectomy – “the difficult project”

Radical prostatectomy, which means that the prostate is surgically removed due to cancer, has been used as a medical procedure for over thirty years. The opinions from the medical communities on this technique have however changed over time, and hence other methods, such as heat treatment, hormonal treatment and brachytherapy have been used as alternative methods. In the recent eight to nine years there has however been an upturn in the use of radical prostatectomy in Norway, and most of them have been done as open surgery. When a group of French surgeons showed good results with laparoscopic prostatectomy in 1996-1997, nobody in Norway used this technique. In September 1999 a course in various laparoscopic techniques was held in France, and a gastro surgeon from the Interventional Centre (from now on the Project Leader) and some of his colleagues from RH, and a gastro surgeon from another Norwegian hospital (Hospital A) discussed whether laparoscopic prostatectomy could be used in Norway, and they arrived at the conclusion that they wanted to start developing and refining this method.

A few days later the same group operated their first patient at IVC, and due to the complexity of the procedure and the lack of experience with this new procedure, the operation lasted somewhere between nine and ten hours (some informants claim twelve). Since this operation method was radically different from the conventional method, the Project Leader collaborated closely with a gastro surgeon from Hospital A, a couple of urologists from RH, the operation nurses, an anesthesiologist and the anesthesiology nurses during the operation, so that they could have an ongoing discussion on what to do. Normally prostate cancer is operated by urologists, whereas here the team was very cross-disciplinary, and had no prior experience with this technique (i.e. laparoscopic rather than open removal of prostate).

“Prior to the operation we (the gastro surgeons and a couple of urologists) had seen several movies on laparoscopic prostatectomy, but the operations that these movies were based on lasted four to five hours, whereas the movies were edited down to maximum ten minutes, and hence they were not too illustrative (the informant laughs), but we got to know the main ideas. What was fantastic though was that even though the first patient was in narcosis for almost ten hours, and the operation was completed on Friday afternoon 5 PM, the patient was up and walking the next day, and was leaving the hospital on Monday morning. This really gives you an ‘a-ha feeling’, and for a surgeon this is a fantastic experience! (...) Normally the patient would have to stay for six to seven days at the hospital with great pain, whereas our patient did almost not experience any pain at all” (Project Leader).

However, as neither RH nor Hospital A had a significant number of patients that needed this treatment, they contacted Hospital B, which had a large urology department, so that they could further refine this technique under ‘optimal settings’, as our informants called it. The intention was to refine the technique and then to transfer it to Hospital B. The group that had done the first operation at IVC thereafter operated four or five patients together with an urologist from Hospital B. The operation time was drastically reduced in this period, as they gained more knowledge. This collaboration was unfortunately problematic due to different viewpoints from the Project Leader and the urologist from Hospital B. The problem was that these differences were not explicated in the operation theatre during the procedures, and instead the urologist discussed his views with his superior instead of saying anything about them to the Project Leader, and only later did this difference in opinions become evident. As mentioned earlier the Project Leader was not an urologist, but a gastro surgeon, and this had not (and still does not) constituted a problem neither at other hospitals in Norway, nor at hospitals in Denmark, Italy, Great Britain or Russia.

In 2000 important changes in the institutional context also appeared, and this may help us understand why that there were also other reasons for the problematic collaboration, and why the project never was transferred directly from IVC to Hospital B. At the time that the project was going on, Hospital B was in a position where they were trying to establish themselves as an important hospital, and to find areas where they could get recognition and control the 'patient flow'. At the same time there also came a directive from the ministry of health that we should establish a "prostate bridge"¹ to France, and that all the laparoscopic procedures should be performed there. This was due to the fact that they had operated more than 100 patients with this method there, and Norway should send some of the surgeons from Hospital B down there to acquire the necessary skills. Thus, the *"innovation project at the Interventional Centre was ended, and we did not get the chance to refine and develop this technique any further in our department, even though the mandate for the centre is to develop and refine methods. When we confronted the ministry of health with this, they were not listening at all"* (Surgeon). In the same period a journalist in a large Norwegian newspaper (Aftenposten) was criticising Norwegian doctors for being arrogant, and for not being interested in relevant knowledge from other countries, which was a critique that *"suited the government at the time well"* (Surgeon).

5.2 Laparoscopic adrenalectomy – "the normal project"

When patients get tumours that produce hormones that give too high blood pressure, too much cortisone or adrenalin, it is normal to surgically remove the tumour and the adrenal gland. If only one of the adrenal glands is removed this will not create any problems for the patient, as the other gland will do all the work. The gastro surgeon from IVC, and some of his colleagues from the Surgical Department (transplant surgeons), used this method for the first time at RH in 1997. Prior to this, the gastro surgeon had tried this technique at a hospital in Trondheim, Bergen and a hospital in the Oslo-area. However, there was room for further refinements and they therefore started a new project. The first operation at RH was very successful, and the patient recovered very fast, in contrast to the normal procedure where the

¹ This was part of a heavily debated political decision that meant that patients would be sent to foreign hospitals to get treatment (the state spent 1 billion in total for such treatments), and the argument was that Norwegian hospitals neither had the capacity nor the skills to treat these patients. However, as was early shown, hospitals did actually have the capacity and competence to do many of these procedures in Norway, it would have been much more cost-efficient and the patients would have preferred to stay closer to their home. The decision was not changed.

patient would have to stay for one week at RH and then a couple of days at the local hospital.

As the procedure was totally new, the group discussed how to do this:

“It was a big discussion between the Project Leader, the transplant surgeons and the anaesthesiologist about what to do with the right adrenal gland because it is very close to the large vein, and if you cut a hole on it, you will create a heavy bleeding that is very dangerous for the patient... The vein is also the one that diffuse things from the tumour and into the blood system... What we did not think about, however, was that when you do open surgery on the patient, he/she is laying on their back, whereas when you do a laparoscopic procedure the patient is positioned differently, so that you get direct access to the vein that we were so afraid of. Hence, the difference from doing this as open surgery was enormous! Even though the operation of the right adrenal was the most risky, it was actually technically speaking the easiest. Thus this method was very soon accepted” (Informant).

“Another problem was that certain chromosomes that produces adrenalin can easily be released, which will produce increased blood pressure and hemodynamic instability. We therefore discussed with the anaesthesiologists how to avoid this... After seven operations we published the first paper where we compared this method with nine open operations that were done from 1990-96. The results showed that we had the same operation time as open surgery (1.5 hours on the first operation), and that the hemodynamic changes were significantly smaller than with open surgery” (Informant).

In 1997 the Project Leader presented the results from this study at a large surgical meeting in Norway, and a senior surgeon from Hospital C became very interested in this method. This senior surgeon was sitting in the same board as the Project Leader in the Thoracoscopic Union, so they already knew each other before this meeting, but did not have any collaboration projects. Two years later (in 1999) they started a project with laparoscopic adrenalectomy, where they would surgically remove tumours that were not too hormonally active as daytime-surgery². During the following 12 months these two surgeons did 13 operations together (the Project Leader did 11 of them) with very good results.

“When we started doing this procedure it had not been described as daytime-surgery before, except from one paper from the US which showed that this was possible. The idea was to show that you by doing a laparoscopic procedure reduced the hospital stay from 1-2 weeks to one day. This was a combination of the surgical technique and progress within anaesthesiology. To me this was very convincing, and it had to convince others as well, when you could see that the patient was discharged seven hours after the operation with a smile on his face, the technique had to be better!”

The whole process of developing and refining this technique was done at the IVC, and the knowledge from the different participants from IVC and Hospital C was crucial for succeeding with this innovation. The decision about when the procedure should be transferred from the

IVC to the other hospital was done by the Project Leader and his partner at the receiving hospital. At this point in time Hospital C already had 4-5 years experience with daytime surgery, so that the anaesthesiologists from RH did not participate in the first procedures at Hospital C, neither did any of the nurses.

The procedure has not in any significant way been changed since it was moved to Hospital C, and the median operation time for the 25-30 patients that have been operated is now 38 minutes, in contrast to 90 minutes as was the case with the first operation. Hence “this was a fantastic application of this procedure!” (Project Leader).

5.3 Laparoscopic treatment of colorectal diseases – “the ideal project”

Laparoscopic colon surgery started in the early 1990's, but mainly on benign (not cancer) tumours. The reason for the latter is partly the fact that the surgery in itself is difficult and time-consuming, but the main reason is a study published in 1993, which showed that there were metastases (spread of cancer cells) to the incisions (instrument ports) on the 12-15 patients that had been operated so far. This led many in the medical community to become very critical to this technique. Meanwhile some large randomised multi-centre studies of this method were initiated, but under the condition that if they found any metastases the study would be ended. However, these studies showed that the chances of getting any metastases were not significantly higher with this method than with open surgery, and instead one therefore started to study why one did get metastases in the first place.

“Now, there are studies with patients group of 500, 1000, 1500, and a study from 2002 showed that patients with advanced colon cancer operated with laparoscopic technique had longer survival time than patients that had been operated with open surgery. The hypothesis is that this is due to the fact the immune system is less influenced, and if this is the case, then this will be the operating technique of the future” (Project Leader).

The project at IVC started when a senior surgeon from Hospital A was working at the IVC. Two of his colleagues were also interested in the activities at IVC, as one of them had been involved in establishing IVC in 1996, and as they were interested in the opportunities that laparoscopy could offer. A meeting was arranged with three surgeons from Hospital A, two of their operation nurses, head of department at IVC and several actors from IVC and the project was started fall 2002. The plan was to perform the first 2-3 operations at the centre and then 10-12 at the local hospital. The technique was however heavily discussed on a large

² The so-called day-time surgery is administratively a category in between outpatient clinic surgery and

surgical meeting in Norway, and the Project Leader received letters from other surgeons on how he should do the procedure.

“I remember that my strongest argument was that if we did it my way this would be the easiest way laparoscopically speaking, and it would also be a good oncological principle. I was the only one with so much laparoscopic experience... as this was a challenging procedure it has been very interesting for me to develop and refine this technique. Very critical voices were heard in Norway, and we have the attitude that we should wait for everyone else. This is however not the attitude at IVC, but we do not do it reckless and can be much more in front instead of being ten-fifteen years behind. The study with the good results was very well done, and was published in Lancet, which is very well regarded journal” (Project Leader).

This project was done “the ideal way” (informant) where the receiving hospital brought their surgeons and operation nurses to IVC, they discussed the different aspects of the technique, and made some instruction movies. All involved actors from IVC were also involved in the whole process:

“This was the best meetings and project that I have been involved in! We were fully informed about what was going to happen, and the whole process was much more interesting. It was taken for granted that we should be involved... We also discussed the procedure with the anesthesia nurses from Hospital A, so they knew how to do the procedure” (nurse).

Hospital A was very keen on starting to use the procedure as soon as possible, and was very motivated as they took the initiative to the project and at the same time the “respected the culture at IVC” (nurse). Meanwhile when the procedure was moved to Hospital A it took much longer time to refine and develop the technique there than what they had expected, which partly may be explained with the fact that they did not appoint one actor at their hospital that should be responsible for the project, and the one surgeon that was best qualified for doing the procedure did not have the time to do it. Hence, the Project Leader had to do many of the operations.

Later this study has become a multi-centre study with two other hospitals (Hospital D and E) with patients randomised to undergo either open surgery or laparoscopic surgery (the total is over 100 patients). At Hospital D a surgeon that the Project Leader has operated with on several occasions works, whereas on Hospital E they have done much laparoscopy, but not on colon. However, they have been able to acquire the necessary skills to do so on their own.

ordinary surgery on admitted patients.

6. Discussion

In contrast to many previous studies of communities of practice we have in this paper focused on how innovation practices are influenced by relational and political matters. While the need for developing these aspects has been recognised in the literature (Contu and Willmott, 2000; 2003; Gherardi et.al. 1998), there still is a need for empirical studies of how these processes unfold in practice. Power issues became in our study visible e.g. in discussions of ownership of procedures and of what should be considered as valuable knowledge in the different projects. Furthermore, we found relational aspects to be of great influence on the opportunities for both initiating and transferring innovation projects, to an extent where organisational and institutional boundaries sometimes disappears as useful characteristics of the actual emerging practices.

Going back to the initial accusation of ‘the scared old men’ as the main barriers to innovation in health care, we interpret this as an expression of collective identities present at the Interventional Centre. But identity, as such, is not the main point here. It is rather the effects of discursive productions of identities we are after. According to Gherardi et al. (1998), identity is a product of both where you belong, and of where you do not (want to) belong – the others. Hence, this combination of belonging (relational) and positioning (political) also influences and reproduces these ‘others’.

Below, we will structure the discussion around four particular issues that might explain important aspects of knowledge sharing and innovation transfer in practice, and provoke some theoretical development through four different, but yet closely related issues: the relationship between ‘masters’ and ‘apprentices’ in and across communities of practice, how networks of practices enable and constrain action, the relationship between politics, practice and power and how new communities of practices are (re)established.

6.1 The relationship between master(s) and apprentice(s)

With the situated approach to learning participation in complex and changing environments is captured and the focus is shifted to the social relations and situations in which an individual is involved. Lave and Wenger (1991) broaden the traditional connotations of apprenticeship from a master-apprentice to one of changing participation and identity transformation in a community of practice with the term legitimate peripheral participation. The traditional

relationship between master-apprentice within the medical community has been identified as still playing a significant part for how doctors learn medical practice (Akre, 2003). However, in the typical master-apprentice situation there is a clear asymmetrical relationship between these two actors, whereas in our case studies this was not the case. Instead we observed how two different communities met, and where experts negotiated on whom the master and the apprentice really was. We therefore argue that the master-apprentice relationship may also continue to play an important part of medical practice, but in also in a different shape where it is unclear who the master is and where lack of time may be of great importance, illustrated with the Project Leader from IVC. Being aware of the problems related with crossing professional boundaries and doing innovative procedures, he therefore stated on several occasions in the prostatectomy project that *“I am not an urologist, but a laparoscopist, and would like to help you refining this technique as it is so beneficial for the patient”*. This statement seems to have been enough for convincing the urologists from RH and several other hospitals, whereas in the case of Hospital B this was more challenging. Different communities represent different epistemic cultures (Knorr-Cettina, 1999). But this finding should however not come as a surprise, as: *“Professionals involved in the development of innovations tend to be acutely aware of the implications for their control over particular knowledge domains – especially in relation to other professional groups – and may thus become an important locus of resistance and conflict”* (Scarbrough and Swan, 2002,. p.10).

Lave and Wenger (1991, p.116) underscore that: *“Conflicts are experienced and worked out through a shared everyday practice in which different viewpoints and common stakes are in interplay”*. In radical innovation projects there may not exist any shared everyday practices, as this is what they are trying to achieve. Thus, at the local level these groups were not able to collaborate, whereas on a global level the Project Leader could collaborate with urologists at other hospitals in Norway, in Denmark, Russia and Great Britain, a finding that is in line with Knorr-Cettina (1999). In the other projects the relationship between the different communities and masters that represented these were not that challenging, as the partners could early see great improvements in the recovery time of the patients, the operation time and the economic advantages as in the case of daytime-surgery.

Another important factor in these projects is the time aspect. Thus the relationship between the master and apprentice was also influenced by the skills (lack of skills) of the apprentice, and for an experienced surgeon to get into the role of an apprentice again was not easy:

“As an experienced surgeon you don’t want to be an apprentice. They want to do it on their own, and ‘invent the wheel again’ instead of asking for help. They have been fighting for so long to get a position...” (Informant).

“It’s impossible to tell a surgeon that you’re not able to do this. That would be like telling them that you can’t drive your car anymore. They would strongly dislike hearing that! Instead one has to be very diplomatic, but you never know... actors may be very good in acquiring the necessary skills, but then again, with limited time you will not have that time. Thus, you need to involve actors that learn the procedure fast, and then they can teach others” (Informant).

Doing laparoscopic procedures is a very open and visible way to do surgery, and it is impossible to make mistakes without anyone else or to be more precise, any experienced actors, noticing this, and thus it is a dangerous domain for anyone that is afraid of losing status. The most important skill is to be able to apprehend the room three-dimensional, and to use both of your hands at the same time. A study showed that only four out of ten surgeons could become laparoscopic surgeons, and generally speaking older surgeons find it more difficult to learn laparoscopy. A distinction is often drawn between those that were ‘open to learning and innovation’ as opposed to a few ‘others’ (some of the old doctors, and even some younger ones) who are not open to learning, referred to as ‘the scared old men’. It is performing an informal version of hierarchy, where a little group of staff become outsiders, and in that way support the dominant group to establish their discourse. However, this view was modified when we asked more about it:

“We talked about the old conservative, but I am not that convinced that the old are the always the conservative. We probably also have young conservative people. Say surgeons that have got their position, perhaps coming into University hospitals, achieved a career and got their PhD within open surgery relatively fast. They might be a larger barrier than the old ones sitting there. Because then you come in with a new technique [laparoscopy], and they are in an age where they might not be able to learn it, then you become a larger threat for them, because they have many years left where they are supposed to work within their niche, and thus they come with every possible argument for doing open surgery” (informant).

Here we see how people from the in-group are not without understanding for why these people are reluctant to learning initiatives and innovative procedures, individuals who have built their careers with great effort over long time, thus feeling their future position and career prospects threatened. Furthermore, they also understand why they were sceptical to new

procedures as long as they had not been developed and refined enough yet, and as long as they could imply risks for the patients. Hospitals are today bombarded with new technologies on an ongoing basis, and hence to be sceptical to the clinical use of these technologies is necessary.

6.2 How networks of practice enable and constrain action

In common for all of the projects we see how innovations in medical practice to a large extent is driven by the interests of individual actors, and not first and foremost in a top down manner dictated by politicians or a hospital management group. Through personal contacts abroad new knowledge was drawn into use in projects. In the first project the Project Leader wanted to collaborate on developing and refining the technique with an urologist he knew from Hospital B, but for various reasons this was not possible. In the adrenalectomy project the collaboration with Hospital C was initiated through informal talks at a surgical meeting with a colleague from Hospital C. Also in the third project we see how the group of senior surgeons from Hospital A contacted IVC as a consequence of former contact. Thus, we see how professional networks are important arenas for learning and innovation (Swan et.al., 2002; Scarbrough and Swan 2002). In these networks they share practices and the wish to develop new practices bring actors together, and enable them in our cases to develop, refine and later transfer new medical technologies. Hence, the local knowledge and skills that was developed at the centre was transferred to other locations as a result of the networks that had been established. These networks of practices were established as a result of informal talks at meetings, conferences and so forth.

Meanwhile, as Scarbrough and Swan (2002) point out, networks of practice may have constraining effects on innovation when knowledge across networks are to be integrated, and in our cases we saw how the networks within one discipline could collaborate through networks, whereas collaboration with other networks was not possible. Knowledge sharing across communities was, which could alter the existing practices was not possible in the case of laparoscopic prostatectomy. But as Fox states: *“communities of practice theory tell us nothing about how, in concrete practice, members of a community change their practice or innovate”* (Fox, 2000, p.860). In our cases this was achieved through various strategies, which we will outline in the next section.

6.3 Politics, practice and power

Medicine being at once both a science and a technical practice has been studied in many different ways. In chapter 2 we pointed at how much of the literature on diffusion of innovations have been criticized for being too stage-wise and static in their understanding of innovation processes. Thus a more fruitful approach for understanding these processes is to regard them as transformations and translations of practices that often imply a redefinition of their configurations related to relations of influence and power, access to resources, the meaning and importance of different forms of knowledge and so forth (Sætnan, 1995, p.14).

In the case of laparoscopic prostatectomy it should be evident that the interactive innovation process was more important than the initial idea about what the innovation was about (Akrich et.al.2002). Innovation was in this project initiated by a group of surgeons and urologists from RH and Hospital A that collaborated well, but when they tried to enroll actors from another hospital to materialize the new procedure, the process became much more complicated. Looking back at this process the Project Leader therefore said: *“It would have been much better if Hospital B had requested this procedure, as their motivation would have been much better. Instead they were drawn into the project without really wanting to be part of it”*. It is, according to several of the informants, likely that the project history would have been different if a more positive urologist from Hospital B had been involved. These actors had been recruited into the network on the basis of some minimal, ultimately insufficient, common interest. Over time these interests were so different that they could not retain the network. As we recall, larger things were also at stake here, such as positioning the hospital as a leading in Norway. The problem was therefore that the some of greatest opponents to this innovation project were not enrolled, but instead were on the outside, and looking for things to criticize. When the political decision to send patients to France was made, this enabled them to end the collaboration and instead establish new networks of practice across national boundaries. We may therefore explain the failure in this project with pointing at the controversies that were not solved, and how they failed to reach closure (Bijker, 1995) or in other words to translate them into the projects, which is in line with Sætnan (1995).

This was on the other hand different in the colon project where Hospital A was involved in the whole process, and were they also involved both nurses and surgeons from the first meeting. The decision to involve all actors both from IVC and Hospital C was therefore important for getting acceptance for doing this procedure both internally and externally. This latter point

also brings us to another important issue, namely whether these projects were aligned with the other activities at RH or the other hospitals. In the first project the problem was related both to ownership of the procedure as such, but also to ownership of patients as this had economical consequences. Hence the negotiations between the actors were more difficult than in the two other projects. In the colon project these negotiations were formalized, with a fixed sum for the whole package, and where they agreed on which days the Project Leader should be at Hospital C. In the adrenalectomy project this was less clear, and thus it was difficult to have time dedicated to this project and at the same time being involved in the daily activities at the hospital.

In these cases we also see how politics may suddenly become an important part of the picture, and how a political decision from the top level was important for the fate of the first project. In project number two the actors were able to align their projects well with existing politics where patient satisfaction, efficiency and cost-effectiveness is seen as crucial factors. By emphasizing how patients can come to the hospital, get treatment and go home the same day, it was not difficult to get acceptance, according to the Project Leader.

6.4 (Re-) establishing new communities of practice

When an innovation project or its outcome (e.g. a new procedure or technology) is sought transferred, how does it happen? If we analyse the situation as an attempt to establish a new community of practice (or to change an existing one) for handling a new procedure or technology, what barriers and facilitators for transfer have we found in these innovation projects? In the following paragraphs we will discuss three challenges that were particularly important for transfer of innovation: process knowledge, the 'problem of optimal setting' and changes in related practices.

Innovations are developed within local and social practices, and are supposed to be re-established within new practices at new locations. Newell et al (2002b) argue strongly for the need of transferring knowledge about the process through which the innovation came into being together with the innovation. Hence, process knowledge might provide crucial information on what it takes to get the innovation to work. In our study, we relate this to two crucial areas. Firstly, it is interesting to see who is involved in the different projects. All of the three projects are characterised as 'cross-disciplinary', but in practice, this varied. For

example nurses were only fully included in the transfer of one of the projects, namely the most successful one. Secondly, how early and how much 'receiving end' were involved in the project varied. It seems that the earlier in the project partners are involved the better, both because they then get to know how the innovation is developed, and because their concerns are better represented among the innovators. Ultimately, both these arguments boil down to a question of knowledge: What knowledge is considered relevant for innovation transfer, and thus, what knowledge is transferred? *"What kind of knowledge that is important when something is moved? Well, it has to be a kind of 'total knowledge', where all the groups contribute actively"* (Nurse). Still, this was not always practiced, exemplified with how established knowledge might become obsolete due to the innovation process: *"The surgeon don't want us to give the patient too much pain killer. According to him, the patient has no pain, but he cannot decide if the patient is in pain or not. If the patient says that he has pain, we have to take it seriously, if not it turns into torture. So, if he wants to take part in decisions, he has to know what he is doing."*

But the question of innovation transfer is not only a question of *whom*; it is also a question of what, in other words, *the setting* for the practice. On several occasion the informants referred to the term "optimal settings" as a necessary and attractive condition for innovating, referring to the cross-professional, well equipped and devotedness of the personnel at IVC. However, it is a dilemma that it is (perceived as) necessary to develop these procedures under conditions that are utopian for most other hospital departments. Few other units have anything close to it, making cross-professional collaboration, training and facilitation a lot more challenging than in the original setting. The assumption of 'optimal settings' might well be perfectly true, but nevertheless, it might mislead both practitioners and the researchers studying them to believe that transfer of knowledge and innovations simply is movement. But we argue that it never is, it is also transformed on its way; destructed or translated and adapted. We could re-phrase the question: how are innovations made *mobile*? Translating innovations into new settings involves mobilising not only the procedure (or other objects) in itself, but also how it was developed, and how it is seen from different viewpoints. This means that the innovation either needs to be shaped in a way suitable for adaptation to local settings different from the IVC, or be accompanied by aligning and organising the receiving unit for handling the demands of the new practice.

To complicate this picture even more, we found interaction between related practices to be important for the innovation and transfer processes. In the above mentioned example of interaction between anaesthetic and laparoscopic practices, this had some important implications. On the one hand, developing laparoscopy for increasingly complicated surgeries demands a corresponding development of anaesthetic treatment (pain killers) adapted to the different new procedures, as pointed at by an informant: *“Larger and larger things are being done with laparoscopy, where the point is that the patient can go home as fast as possible, but this doesn’t mean that the patients should be forced to go through hell after the surgery just because they are supposed to wake up fast. It has to be some sensible balance here.”*

We would however like to emphasise that this quote was not about the patients in the projects that we followed.

But alongside the laparoscopic projects investigated in this paper there have been radical innovations on the anaesthetic domain too. The ways pain killers are infused have been changed, resulting in smaller doses and shorter duration, and new and more effective drugs have been introduced. *“But we have little knowledge on the process after surgery. Thus, it is up to those at the post-operative unit to find out about these things”* (Nurse). For laparoscopic practices, this means both a support for the development, or expansion, of the technique, and a need for attention to the patient’s post-operative comfort. Complicated surgery means more pain, and effective pain killers during surgery means less effect of the drugs afterwards, and we saw how the surgeons not always were aware of these problems, they even thought everything were better than before. But nurses noticed it: *“It was because I was in contact with the post-operative unit, and then they asked why our patients had much more pain than they used to.”*

This is another relational effect, that developments and expansions of a practice demands developments and expansions of related practices, and that those involved in the projects not always are aware of this themselves. So, the set of knowledge and practices to transfer together with the innovation increases, strengthening the argument for understanding innovation transfer not as diffusion or movement, but rather as translation and transformation.

7. Final remarks

We argue that our study contributes to an important but under-researched issue within the field of innovation and knowledge sharing. Empirically, the health care sector in Norway is

under heavy pressure for efficiency and patient satisfaction, leading to requirements for innovation. To understand the micro-processes of how innovation and its implementation in daily practice in hospitals should therefore be of high interest to anyone involved in this sector. Theoretically, the complexity, interdependencies, the social interests involved, and the continuous adaptation of the focal object to its associated network of elements, all calls for in-depth qualitative studies to further our understanding and theorising of the processes of knowing and innovating. With this paper we therefore aim at contributing to debates on the role of communities of practice for innovation, and to studies of innovation processes. We have argued that in order to understand these processes in Norwegian health care, it is important to see how different communities of practice shape practices in hospitals, and how they can collaborate to facilitate “interactive innovations” (IKON).

Our findings implicate, among other things, that in order to understand whether a new technology was successful or not, it was of great importance to focus on how meetings of different communities of practices both hamper and enable radical innovation. Furthermore, in contrast to many previous studies of communities of practice we have focused on how power structures, represented by what one of our informants called “the scared old men”, can severely hamper changes in practice. Power issues became visible in discussions of ownership of procedures, patients and what should be considered as truth. On the enabling side, we have studied how this cross-disciplinary department manages to facilitate innovation in the interstices between different professional communities, through dedicated staff, and through time and resources for exploration and testing. At the same time these ‘optimal settings’ made it more difficult to translate the innovation to others. Throughout the process, new procedures had to be designed and redesigned ‘user-friendly’ and adaptable to local settings to align well with existing practices and politics. This proved to be complex processes with significant impact on the innovation practices itself as well as on the degree of success or failure. Moreover, not only does this degree of user-involvement matter, also the way in which the knowledge of different professional groups within the innovation project were included or excluded seemed to affect the innovation and its outcome.

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