Implementation and Evaluation of Telemedicine - a Catch 22?

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Abstract

Problems to implement and evaluate telemedicine may not be a surprise if the technology itself is more closely examined. It can be claimed that problems to develop a comprehensive and integrated use is a consequence of the technology’s openness.

The analysis shows that we cannot speak about implementation in general, if telemedicine usage would have any impacts on organizational work routines. Instead, there is a need to view implementation of telemedicine as an implementation of different fields of application, which are resulting from a translation of generic features of telemedicine.

This will also have an impact on the evaluation of telemedicine implementation, and make the issue when an evaluation would be done and how the result would be interpreted, to an extremely complex and complicated matter. Hence, if there is a lack of understanding of consequences caused by the openness of technology, implementation and evaluation can end up in a catch 22.

1. Introduction

During the last decade there has been a growing interest in telemedicine and in the mid-1990s a boom could be witnessed with regard to the number of telemedicine-related articles that were published, and the projects planned to be implemented. However, is the growing interest just a fiction with regard to the actual impact the use of technology has had on healthcare operations? There are reports indicating that telemedicine usage has been a great concern for physicians with a passion for technology, and barriers still remain for a comprehensive and integrated use in the daily operations [1]. These problems may not be a surprise if the technology itself is more closely examined. It can be claimed that the problems to develop a comprehensive and integrated use is a consequence of the openness of the technology, which means that fields of application are not clearly defined from the outset. An example of this is that the basic technology - different video conferencing systems - is not specifically designed at the outset for usage in healthcare settings [2]. The openness of the technology implies further that it has a tendency to drift. By drifting we mean the difficulties in forecasting the role and function in concrete situations of usage, which the technology is called to play, compared to the planned, pre-defined and assigned objectives and requirements, irrespective of who plans or defines them [3]. Thus, it will be problematical, or even irrelevant, to evaluate the implementation of telemedicine against some pre-defined goals. Christensen and Kreiner [4] strengthen this argument further, when they argue for the ineligibility of defining goals for some projects at an early stage, while the available information is limited. One expression for the limited information at early stages in the implementation process is the fact that organizational members will learn more about the technology’s features and its fields of application over time, and it is impossible for technology designers to predict how a complex technology will be used [5,6].

Hence, before implementation and evaluation can be discussed, there is a need to be more specific about what we mean with implementation. The point of departure in this paper, is that implementation is seen as all activities and processes that are carried out in order to institutionalize the technology as a stable part of the organization [7,8,9]. It can, however, be problematic to distinguish between the implementation and the subsequent routinization [10]. But how can the evaluation of implementation be approached? Due to impacts of technology implementation, organizational activities are expected to be influenced to varying degrees as a result of the implementation [11]. The expected impacts are then the targets for the evaluation of the implementation, which can be accomplished after a number of dimensions, e.g. individual and organizational efficiency [12]. However, it is outside the scope of this paper to discuss the evaluation itself. Instead,
of this paper to discuss the evaluation itself. Instead, the focus will be on how implementation of an open technology like telemedicine can be understood, in order to increase the knowledge about the process and its impacts on management and evaluation of the implementation of telemedicine.

Due to the openness of the technology, we might not know what is to be implemented and what will happen, more than the technology is to be used in order to achieve some expected impacts on organizational activities. But what frame of reference can be used in order to investigate the process? A promising approach to understand processes that occur when IT is introduced in health care organizations, seems to be that of Actor Network Theory [2,13,14,15], which offers concepts that can be helpful as analytical tools. By using concepts from ANT, we can now be more specific about implementation and see it as a process of translation [16]267.

"The spread in time and space of anything - claims, orders, artifacts, goods - is in the hands of people; each of these people may act in many different ways, letting the token drop, or modifying it, or deflecting it, or betraying it, or adding to it, or appropriating it"

Thus, whether there would be any impacts from the implementation depends on what happens when technology come into the hands of the potential adopters. In the following section a frame of reference will be developed in order to build a ground for an increased understanding of the implementation process.

2. Implementation, a process of network building

A usual explanation to failures of IT-implementations has been that there is a misfit between the new technology and the functioning organization [17]. But this view is too simplified while a process of adaptation is necessary because a technology almost never fits perfectly into the user environment [18]. Nevertheless, even if a mutual adaptation of technology and organization occurs, it is of crucial importance to reveal this process if an increased understanding of the implementation should be reached. One essential key to understand the process on the overall level is to recognize the necessity for management of the process to create a commitment for the changes required, if the implementation would have some impacts on organizational activities [19].

However, before a further inquiry is made into the commitment building, it is necessary to investigate how the implementation process can be framed. Researchers describing the process conceptualize it either as different interwoven stages [20,21], a number of parallel stages [10], or as different processes, depending on what would be implemented [22]. Thus, which kind of approach may be convenient in order to understand implementation of telemedicine? A so-called administrative approach [23,24] regards implementation as a two-stage process dividing implementation into planning and action elements. The explanations for failure are sought in nonexistent or unclear goals, inappropriate formal structure, or actors who do not fit into the structure [22]. To be provocative, it can be claimed that, from the outset, an administrative approach on the implementation of telemedicine, will be a guarantee for an implementation failure. The obvious reason for this is the openness of the technology and its tendency to drift, which implies that “everything” can’t be planned. A more promising approach seems to be that of regarding the implementation as a process of building networks. The network approach interprets the implementation process as occasions where actors are coupled together, and regard the pre-existing and developing relations between them as determining the process [22]. This approach, however, does not result in any significant input from the future users or their representatives in the user community [22]. However, by bringing in elements from Actor Network Theory (ANT), it will be possible to extend the network approach suggested by Borum & Christiansen [22], and even understand whether future potential users are enrolled into the network or not. A further strength of ANT is also the way in which the technology is considered that gives new perspectives of its role in the implementation process.

ANT has its origins in studies of science and technology. It is grounded in a fairly simple observation, which social science and humanities had ignored until the 1970s. Namely, how science actually is done – not how it normatively is supposed to be carried out, and, the way technological artifacts actually are designed and deployed – not how textbooks in engineering instruct us [25]. By using ANT we can further get some methodological insights of how we can study the process. Latour [26] is arguing that if we would understand how science is created, we have to study the creation of science and Callon [27] advocates that we have to follow the actors in order to understand the process of translation.

When the implementation process is regarded as occasions where actors are coupled together into a network, and it is analyzed from the perspective of ANT, not only social actors are to be taken into consideration [28:93]:

"...the actor-network is reducible neither to an actor nor a network. Like networks it is composed of a series of heterogeneous elements, animate and inanimate, that have been linked to one another for a certain period of time... the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network."

In order to mobilize the network, indispensable actors and their roles have to be identified and defined [27]. But to mobilize the actors needed, their interests have to be...
translated into an interest that is common for all actors in the network [29:279]:

“Whenever an actor speaks of ‘us’, s/he is translating other actors into a single will, of which s/he becomes spirit and spokesman. S/he begins to act for several, no longer for one alone. S/he becomes stronger. S/he grows.”

2.1. The technology as actor

In ANT the technology is also regarded as an actor. Latour [30] is arguing that artifacts can take human form and shape human action by replacing humans. The artifacts can also be seen as actors who act in a given context on the behalf of actors at a distance [31]. Nevertheless, even if the artifacts would act on the behalf of actors at a distance, the technology can trait its assigner and act on its own, even if it has no intentions [32]. This can also be seen as an example of the technology’s tendency to drift.

Whether the technology can be seen as a traitor, or it drifts away from someone’s original intentions, depends partially upon the inscriptions in the technological artifacts. Inscriptions can be related to patterns of action or programs of action that are inscribed in a technological artifact and their origins are described as follows [33:208]:

“Designers thus define actors with specific tastes, competencies, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways. A large part of the work of innovators is that of ‘inscribing’ this vision of (or prediction about) the world in the technical content of the new object....The technical realization of the innovator’s beliefs about the relationship between an object and its surrounding actors is thus an attempt to predetermine the settings that users are asked to imagine.”

The concept of inscription does not advocate technological determinism, while actors in the setting where the artifacts are introduced are already following their own programs of action [34]. Instead, inscribed programs of action can in turn be strong / inflexible, or weak / flexible. An example of an artifact with weak inscriptions is the hammer, while the assembly line in Chaplin’s movie “Modern times” is an example of an artifact with strong inscriptions [14]. Nevertheless, the strength of an inscription is not apparent on beforehand. Latour [34] describes how an inscription can be strengthened, and exemplifies this with a managing director of a hotel who wants the guests to follow a desired program of action. They should bring back the keys to the doors, instead of following an anti-program (keeping the keys in the pockets). If the ANT approach is applied to the implementation of telemedicine two claims can be made. First, the generic feature of telemedicine, transmission of sound and pictures, have to be translated into fields of applications which are appropriate in situations where a physician has a need for information which is “hidden” in a picture. Second, while programs of action inscribed in the technology seems to be flexible, due to the openness of technology, these have be strengthened in order to achieve a routinized use of the technology.

3. Case description and data analysis

The two case studies have been conducted in a north Swedish County Council at five sites: two health centers, two county hospitals, and one university hospital. The telemedicine technology had engaged a few people in the county council since the beginning of the 1990s. But it was not until August 1996 that telemedicine equipment was purchased and installed. In autumn 1994, concrete ideas were formed about various medical specialties that could be appropriate for participation in the telemedicine project. The specialties were dermatology (skin diseases), orthopedics, otorhinolaryngology (ear, nose and throat diseases), radiology, pathology, cytology, surgery and gynecology. Radiology was, however, dropped in spring 1995, while an investigation of digitalization of the radiology departments in the county council was started.

In both cases the technical platform was a video conferencing system that could be connected with optical medical equipment. The first case, called general telemedicine (GTE-project), concerned communication between general practitioners at health centers and specialists at the county hospital, or at the university hospital. The specialties involved were dermatology (skin diseases), orthopedic, ear, nose and throat diseases. The specialists were located at the university hospital, except for the orthopedists who were located both at the university and county hospitals. By the connection of optical equipment to the video conferencing system it was possible for general practitioners to examine, e.g. the ear, or the skin, of patients and transmit pictures, live or frozen, to the specialists.

The second case, telepathology (PAT-project) concerned communication between medical specialists. Gynecologists and surgeons at a county hospital could communicate with pathologists and cytologists at the university hospital. In this case, a microscope that could be maneuvered by the pathologists and cytologists at the university hospital was located at the county hospital. The microscope was connected with the video conferencing system and was used for examination of frozen sections, or cytological sections [35,36]. The standard question from the gynecologists and surgeons was whether a section con-
tained cancer or not. During an operation, a surgeon finds something that he or she thinks is cancer. To confirm an operation strategy, or obtain information for a decision about operation strategy, the surgeon takes out a section from the suspect area, sends it to the laboratory where a laboratory assistant is always on stand-by to prepare the section and establish the connection with the pathologist or cytologist at the university hospital. After 20-30 minutes, the surgeon or gynecologist receives confirmation on whether there is cancer or not. The operating physician thereby knows how to continue the operation, and in some cases a second operation of the patient can be avoided.

The data collection has been accomplished through semi-structured interviews and participant observation during the period 1994 to 1999. In total 63 interviews with 30 individuals (general practitioners, medical specialists, politicians and hospital CEO’s) have been carried out. The interviews lasted on average 40 minutes and all interviews were tape-recorded and transcribed. Three hospital managers and three politicians were interviewed one time each. Interviews with medical specialists and general practitioners were carried out on four occasions between 1996 and 1999 at the sites where the systems were used. The first interview round was undertaken four months before the telemedicine systems were implemented in the organizations. The second interview round was undertaken half a year after the systems were implemented, the third round after one and a half years, and the fourth round two-and-a-half years after the implementation of the system. The overall aim of the first interview round with the physicians was to reveal their expectations on potential benefits and fields applications for the technology, and potential obstacles in the organization that could occur. The questions prepared were based on theoretical knowledge about IT-mediated change processes and knowledge about the projects studied. The overall aim with interview round two to four was to reveal what had happened since the last interview. Topics that were discussed was: what they actually had done with the telemedicine, had they discovered some new fields of application, why or why not consultations and conferences could be accomplished, changed work practices, needs for adaptation of routines, changing attitudes among colleagues, engagement among politicians and hospital CEO’s, how telemedicine was regarded compared with other medical technologies, how the physicians viewed their roles etc.

After the first interview round the questions were also individualized to some extent, depending on what respondent had told in the previous interview round. Additional data collection was also accomplished by participant observation during 18 meetings with project group. Ten of these meetings were held before the installation of the systems.

### 3.1. The organization of Swedish health care

To obtain an understanding of the further description of the cases under study, it is important to acquire a brief background of how the Swedish health care system is organized. Health care in Sweden is organized at three different levels. When a patient cannot get adequate treatment at one level, he/she is sent to the next level. At the local level are the health centers, 953 in total, where GPs are available. The next level is the county level having 26 county hospitals and 53 district hospitals. In these hospitals most medical specialities are available. At the highest level are the regional hospitals which also serve as teaching hospitals. In total there are 6 regions with 9 regional hospitals in Sweden. Regional health care is based on cooperation between the county councils in a region. Most Swedish health care is financed via taxes, and only 3.1% are financed via direct patient charges. [37]

### 4. Installing the equipment is not implementation

Until the decision was made to start the project, a series of translations were done, which resulted in a formulation of goals for the projects. The goals can be seen as a translation of the technology’s generic features into desired impacts of technology usage. Further, the goals were also a translation of telemedicine into interests of actors needed to be mobilized (physicians, patients, politicians and hospital administrators). Accordingly, the goals of the projects were as follows:

- Increase value for patients through access to medical specialists without travels.
- Support the development of competence in the organization.
- Decrease the costs of the county council.
- Investigate the long term effects telemedicine may have on the structure of health care in the county council.

However, if the implementation of telemedicine would come to have an impact on the routines in the local settings where the technology was available, the goals had to be further translated into fields of application, which also could be seen as delivery of proofs of the usefulness of telemedicine. These proofs would convince the actors to be mobilized when needs for mobilization of the networks occurred. The proofs would e.g. state that telemedicine supports the development of competence and improve patient service. But to make these statements, further translations of the technology’s generic features had to be done in order to realize how competence development could be supported and how patient service could be increased. To realize this, the necessity of mobilizing a functioning actor network was implicitly recognized by some
of the physicians. One physician expressed this condition very clearly:

"First, the technology should function. Then it is necessary to get the people who manage this [telemedicine], to become committed and use it. It depends on the local physicians here [at health centers]. I think the patients will join in. Then it also depends on the people on the other side [at the hospital]. Do they have physicians who will join in?"

But, only a sporadic mobilization of the network would not imply an institutionalization of the technology as a stable part of the organization. The project manager for the GTE-project recognized after some period of technology usage that the process would have to follow two parallel lines of development, if telemedicine usage would have some impact:

"In the continuation I think that the development will follow two parallel lines. First the documented and accepted; the kinds of patients this [telemedicine] is appropriate for. And, parallel there must be a searching and developing process where one tries to find new fields of application."

The development of fields of application can, due to the openness of the technology, be seen as one of two basic conditions if telemedicine usage would become an institutionalized part in the daily operations. But it order to develop fields of application, someone had to feel a responsibility for this activity. The politicians and the hospital CEO’s saw this activity as a concern for the physicians, and some of the hospital CEO’s saw it as part of the physicians’ ordinary development activities. This put special demands on the physicians, which some of them were aware of. A general practitioner in the GTE-project expressed this in the following way:

"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...You must always take into consideration when you can do a consultation"

However, not all actors involved in the projects had this fantasy and power of imagination. What appeared at the sites studied was the importance of “fiery spirits”, who come to play a vital role for the development of fields of application. A fiery spirit can be seen as an actor who is a螃蟹ment in order to see how this [telemedicine] can be used. If you do everything as before, you do not see any advantages...You must always take into consideration when you can do a consultation"

Another GP who also served by the same health center also stated that the lack of time was constraining the possibilities to use telemedicine, and especially if they didn’t know if there was any specialist available at the receiver’s side. This fact was in turn related to the choice of technology and its inscriptions that came to have an impact on how telemedicine activities could be organized. As stated earlier, the inscriptions in the technological artifact didn’t from the outset prescribe any programs action in a strong mode, e.g. which tasks would be accomplished. But the absence of a “store and forward function” prescribed from the outset the necessity of a mutual presence of the actors when consultation should be done.

The choice of the equipment was also a further translation of the criteria the members of the project group had put on the equipment that should be chosen. These criteria had the following priority: quality of pictures and sound transmitted, control functions and user interface. The chosen equipment satisfied the criteria, but it wasn’t possible to store and forward pictures. The translation done, which resulted in the chosen equipment, had a relatively high degree of irreversibility, with regard to how consultations could be organized. The irreversibility of an translation means to which degree it is possible to go back to a point where the translation was one among others, and to which degree the translation influences future translations [39]. Thus, the inscription that prescribed a mutual presence of actors implied that they not always could be mobilized in the telemedicine network that would accomplish a task, while they were already tied to prevailing networks in their local settings.

4.1. Routinization of fields of application

The analysis of the GTE-project has shown that the first step in the implementation of telemedicine, after installation of the equipment, was to develop appropriate fields of application, even if the programs of action inscribed in the technology caused difficulties to mobilize the actor network. The second basic condition was to integrate the developed fields of application into organizational work routines, if the implementation would have any impact.

In the PAT-project some fields of application were known from the outset, which removed some of the obstacles that occurred in the GTE-project. The two fields of application that were well known were pathology conferences and examination of frozen sections. What was new in this case was the medium through which the interaction
between the actors occurred. Most of the actors involved were familiar with the old way of organizing the activities and the project manager was well aware of which new activities were required if the process would function. Thus, the new activities needed were first an education of the laboratory personnel at county hospital who should prepare the frozen sections. Second, a written schedule was also developed for the roles the different actors had to perform during the process, which further underscored that it was a traditional implementation process. However, even if parts of the process seemed to be a “simple planning and acting” process, problems occurred which constrained the routinization of fields of application.

These problems were, at the first glance, mainly rooted in the fact that the development of the remote control for the microscope at the county hospital was delayed more than one year. Except for these problems the system was functioning satisfactory, but the project manager for the PAT-project wanted to do a scientific validation of the system before it was promoted to other hospitals. The absence of the scientific validation became the origin of the problems to routinize the field of application. This turned out to be obvious when the surgeons at county hospital motivated why they did not use the system to a larger extent for remote examinations of frozen sections, with the motivation: “we don’t know if we can trust the answers, while the system is not scientifically validated”. This argument was not surprising, notwithstanding if the surgeons had other motives for not using the system. The scientific study can be seen as an institutional phenomenon among physicians, that to a large extent is guiding their behavior. A new phenomenon, which is not well known in the profession, will have difficulties to be accepted, unless there is a scientific study that shows the reliability of the method. Thus, a positive result of a scientific validation of a new method of treatment will legitimize the use of the new method, or facilitate the mobilization of the indispensable actors. Against this background it was quite understandable that the project manager waited to do the scientific validation until all parts of the system were developed. A negative validation of a half-completed system had probably led to a setback for the whole project.

Interestingly, another argument on the theme of scientific validation was also used, but in this case the physicians were not so sure: We don’t know how the patients will react if they get the answer “cancer”, half an hour after a section has been taken. However, this argument was a bit contradictory. When a patient comes to the hospital for further testing of specimens. Then the question is, why the process is significantly slowed down, when there are possibilities to get an answer whether a section contains cancer or not. One can speculate if the argument for the patient’s best was rooted in the fact that the physicians need some time to be mentally prepared to tell the patient that she has cancer?

Even if more fields of applications were known in the PAT-project, these were never tested and implemented during the first years of technology usage. The reason for this could be found in the absence of fiery sprits in the local settings, who worked for a mobilization of the network. The field of application concerned urgent answers for tumor sections taken inside the body. The benefit of getting an urgent answer was obvious, while about 25% of the sections taken were not representative, so the cytologist, or pathologist could not make a diagnosis, and the patient had to return for further tests. The physicians involved were aware of this field of application, but they meant that it would require a re-organization of activities at the departments involved. While there had been many re-organizations during the last time they didn’t want another one at the moment. However, some other physicians meant that it was just a lack of personal initiatives that was the biggest obstacle for the modification of activities required.

4.2. Prevailing routines as facilitators

The presence of fiery sprits who act as spokesmen for the technology in the local settings and the development of routines that support technology usage were two important factors for the routinization of technology usage. But before reaching this stage actors had to be convinced about the eventual benefits of technology usage. In the case of pathology conferences, this was achieved by some test conferences organized by the project manager. But, the conference activities developed differently at the departments involved. Among surgeons, conferences were organized sporadically when there were enough interesting cases to discuss, and there were often problems with the rate of participation. On the contrary, at the department of gynecology, the conference activities were after a while incorporated in the ordinary activities at the department. The main reasons were that the head of the department saw the conferences as a mean to provide better services to the patients and routines were developed for collecting cases for the conferences. But another important factor that facilitated the routinization of conferences was an already available routine at the department. A special time was set aside for competence development, and this time was now used for the conference activities. The conferences were further always organized at the same time, which implied that the physicians did not plan other activities on these occasions. But if the conference activities would become a part of the routine activities, not only had the gynecologists to play their roles by reporting interesting cases for the conference. Also the pathologist had to play his role by studying the cases and engaging other specialists who could contribute with appropriate knowledge to the conference.
Prevailing routines were also facilitating technology usage in the GTE-project. Some consulting physicians had complained about the unwillingness among orthopedists to go to the equipment. One reason for this unwillingness was the low frequency of use, which implied that they perceived the situation as uncomfortable since they didn't know how to handle the equipment. To solve this problem a well-known routine was transferred from the operation room, namely, someone who is helping the medical specialist with practical matters. A nurse was educated in operating the equipment, and is now always assisting the orthopedists by consultations.

The communication between the health centers and the ear, nose and throat specialist functioned well from the beginning, thanks to how some of the prevailing activities were organized. The doctor on duty who normally was an experienced specialist managed questions that were coming from health centers, or the department. This physician also got the responsibility to answer telemedicine consultations, and the telemedicine equipment was located in the room of the doctor on duty. In this case the available routine, a highly skilled specialist who was answering urgent questions, facilitated an integrated use of telemedicine in the department, while the role as doctor on duty was rotating among the skilled specialists.

Nevertheless, the prevailing routines these facilitated usage of telemedicine at the departments of orthopedics and ear, nose and throat, do not guarantee a comprehensive and integrated use of the technology. There was still a need for someone who initiated the consultations and yet there are not any specific fields of applications managed via telemedicine in a routinized mode. It is true that the fiery spirits at the health centers used the technology in a routinized mode, as soon as they needed some advice from health centers, or the department. This physician gave an example and said that they would have reached far when a medical specialist receives a letter of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of referral and sends it back to the referring physician with.

The analysis has also showed when implementation of telemedicine is discussed, that we cannot speak about implementation in general, if telemedicine usage would have any impacts on organizational work routines. Instead, there is a need to speak about the implementation of different fields of application. This perspective is close to Gutek et al [40] who claim that advanced IT consists of “a set of loosely bounded capabilities that can be implemented in different ways”. However, the difference is that a discussion about implementation of fields of application is more precise, while we know what would be implemented. In the case of telemedicine it could, for example, be different kinds of diagnoses and patients’ re-visits that would be managed via telemedicine. When we discuss implementation on this relatively detailed level, it might also be easier to regard the process as an administrative process, but the prerequisite is that we have knowledge enough of the activities needed. Thus, the implementation process for telemedicine can be illustrated as multiple processes of implementation of fields of application (figure 1) [41].

5. Implications for implementation and evaluation

The analysis of the projects studied has showed that a discussion about implementation of telemedicine with regard to the traditional definition given in section one, will cause problems originating from the openness of the technology. The first question when implementation of telemedicine is discussed is: What will be implemented? The equipment, the use of the equipment, or something else? While implementation of a technology is aiming at an impact on organizational activities, we have to analyze how this impact can be reached. The analysis shows the need for a development of fields of applications for the technology if some impacts would be reached. But if changes in the daily operations would persist, the fields of applications have to be integrated into the daily operations.

Hence, one concern for the management of telemedicine is to identify fiery spirits in the local settings where the technology will be available and who have a will to develop fields of applications. But, if fields of application would be developed, the fiery spirits must also be given resources in the form of time to test the limits of the technology. A symbolic support from politicians and hospital CEOs and heads of the departments is not enough. Instead, these groups need first to understand that an open technology requires that special time must be set aside for the development of technology usage. But they also have to be active and exercise their power if someone is trying to work in the old mode, building a competing actor network.

A physician gave an example and said that they would have reached far when a medical specialist receives a letter of referral and sends it back to the referring physician with the motivation that: We have decided to manage this kind of tasks via telemedicine. Thus, the management of different levels have to support actors who are working for the progress of technology usage, and prevent other actors from building competing networks, where telemedicine is not included, if it should have any impact. But if the active exercise of power would be possible, the management must realize that use of a new technology requires that new programs of action are to be established. They further need some insights as to what these programs look like, if they should be able to take some action that facilitates the routinization of technology usage.

The analysis also showed when implementation of telemedicine is discussed, that we cannot speak about implementation in general, if telemedicine usage would have any impacts on organizational work routines. Instead, there is a need to speak about the implementation of different fields of application. This perspective is close to Gutek et al [40] who claim that advanced IT consists of “a set of loosely bounded capabilities that can be implemented in different ways”. However, the difference is that a discussion about implementation of fields of application is more precise, while we know what would be implemented. In the case of telemedicine it could, for example, be different kinds of diagnoses and patients’ re-visits that would be managed via telemedicine. When we discuss implementation on this relatively detailed level, it might also be easier to regard the process as an administrative process, but the prerequisite is that we have knowledge enough of the activities needed. Thus, the implementation process for telemedicine can be illustrated as multiple processes of implementation of fields of application (figure 1) [41].
Figure 1 is a further development of Kwon & Zmud’s [20] and Cooper & Zmud’s [21] stage model of the implementation process consisting of the stages: initiation, adoption, adaption, acceptance, routinization and infusion. The authors claimed that all stages did not occur in a sequence. Instead, at least the four last stages could occur in parallel. According to the model, it can be seen that the stages adoption, adaption, acceptance, and routinization are described in this paper. As we have seen it can be claimed that the stages are repeated during the process of implementation (see figure 1). In the figure the implementation process is illustrated for fields of application that are going through the stages. In the adoption stage someone, probably a fiery spirit, sees the appropriateness of a field of application, but s/he might also realize the changes required if the application would be accepted and routinized. In order to reach an acceptance and routinization level, different proofs for the appropriateness have to be delivered. For example, a scientific study can be made or the enrolment of a significant actor [42] who is supporting and conducting the activity. The dotted lines in figure 1 illustrate that a field of application do not have to be wholly implemented before the following one. For example, can a scientific study that shows that transferred pictures have a satisfactory quality, lead to an implementation of other fields of application. Or, during the implementation of one field of application, users learn more about the technology and discover further fields of application [see 6].

The proposed model of implementation gives us new insights into the process compared to models that view the process as stages or parallel processes. Even if these models underpin important aspects of the process, they still seem to consider the process as more or less straightforward. This might be correct for less open technologies, but in the case of open technologies, or general-purpose technologies, a process of learning has to occur if fields of application are to be developed and deployed at all. Though, by viewing the implementations process as in the proposed model, it can be realized that actors will gradually learn more about the technologies opportunities and constraints, when they start to use the technology in order to accomplish tasks. This implies that a stepwise implementation of fields of applications can occur, which in turn creates opportunities for an integration of technology usage in the organizations daily work processes.

Thus, if the implementation process of telemedicine develops as illustrated in figure 1, it will not only impact the way this implementation could be managed. This will also have an impact on the evaluation of telemedicine implementation, and make the issue when an evaluation would be done and how the result would be interpreted, to an extremely complex and complicated matter. Is for example the deployment of three fields of application after one year a satisfying result? But, on the other hand, if we are trying to simplify the question and define some detailed goals from the outset against which the evaluation would be conducted, these goals might then be obsolete when it is time for evaluation and it could also hinder the process of finding new fields of application. Hence, if there is a lack of understanding of the consequences caused by the openness of the telemedicine technology, the implementation and evaluation can end up in a catch 22. This addresses a need for a more flexible and open-minded way of both managing and evaluating telemedicine projects.

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6. References


