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# Staying Under The Radar: Innovation Strategy In Information Infrastructures For Health

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## **STAYING UNDER THE RADAR: INNOVATION STRATEGY IN INFORMATION INFRASTRUCTURES FOR HEALTH**

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### **Abstract**

*This paper presents an empirical study of the design, development, and initial use of a platform for patient-health provider communication in Norway. This is a bottom up initiative started in 2005 by a small project team within the IT department of a large hospital in Norway. The project team has managed to stay “under the radar” in order to survive in a quite dynamic environment characterized by mergers, reorganizations and reforms as well as of large, costly and unsuccessful ICT projects in the same hospital. In this paper, we see this project as a case of infrastructural innovation and, adopting an institutional entrepreneurship approach, we investigate how the project team managed to ‘survive’ aiming to understand the strategy they implemented.*

*Keywords: Information Infrastructure, Innovation, Institutional Entrepreneurship, patient-centred*

## 1 Introduction

This paper addresses innovation strategies for Information Infrastructures (II) in the healthcare environment. It reports from a case study on the design, development and implementation of a web-based platform for patients in Norway, named My Health Record (MHR). This platform supports patient-oriented care by offering on line services to patients such as changing appointments, secure email messages, pre-visit on-line forms, forms for reporting of special diets and medicine use. While Norwegian policy documents strongly advocate patient-centred care, in practice several initiatives, including the one reported in this study, have struggled to take off and innovate existing practices. MHR is designed by a small team from the IT department of a large hospital located in Oslo. The initiative remained a rather small project with a limited user base for several years, and faced legal, financial, and institutional challenges. At present, after about 7 years from its initiation, the platform keeps evolving, experimenting, and gradually diversifying its service offer to a growing user base of patients and health providers.

We study the design, development and implementation of this platform as a case of information infrastructure changing process (Hanseth and Lyytinen 2010). Studies have shown how II design, development and implementation processes are characterised by non linear dynamics such as unintended effects and drift (Ciborra et Al. 2000; Hanseth et Al. 2006), complex risk (Hanseth and Ciborra 2007), reflexive standardization (Hanseth et al. 2006), and multiple interdependencies (Aanestad et al. 2009). Thus, in dealing with IIs, planning and interventions should be approached as ongoing endeavours reflecting the changing environments (with which organizations interact). In this context, striving for innovation and change is a complex undertake. For instance, Hanseth and Aanestad have identified the strategy of bootstrapping to start up innovation processes of IIs by triggering network effects (Hanseth and Aanestad 2003). Hanseth and Lyytinen point to building of coalitions by persuasive tactics as a core activity in IIs growth (Hanseth and Lyytinen 2010). Aanestad and Jensen discuss design and development of II when dealing with large collectives of actors in a highly complex and politicized environment (healthcare in Denmark and Norway). They argue that *“modular solutions allow modular implementation strategies where persuasive tactics maybe easier to deploy than for comprehensive, integrated solutions”* (Aanestad and Jensen 2011).

Our study similarly looks at managing stakeholders, alliances and interdependencies in II innovation, however it takes the view of a non-dominant actor (MHR team) that intentionally kept its project “under the radar” as a strategy for surviving in a highly complex and troubled environment. To analyse the agency and interests of II designers in the innovation process, we adopt the conceptual lens of institutional entrepreneurship. MHR designers are entrepreneurs engaged in the innovation of the existing institution of patient-doctor communication. Institutions are conceptualized as the product of past decisions that engender a certain way of doing things and develop a taken-for-granted character (North 1990). In our case, MHR advocates an active role for patients, and it envisions an effective and efficient mode of communication with health providers enabling a shift from provider- to patient-centred care. Thus, we study a process of institutional change enabled by the design, development, and implementation of a novel technology. Specifically, in the analysis of the case we focus on the strategy enacted by the MHR team in their institutional change effort.

The remaining of the paper is as follows. First, we describe our conceptual framework based on institutional entrepreneurship. We then introduce the case study and our methods of data collection and approach to data analysis. In section 5, we describe the historical evolution of MHR in three main phases, and in section 6, we analyse the case in the light of institutional entrepreneurship. Discussion and conclusion follow.

## 2 Conceptual framework

Institutional entrepreneurship refers to “the activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institution or to transform existing ones (page 657, Maguire et Al. 2004). Entrepreneurs can be organizations, or groups of organizations, individuals or groups of individuals (Battilana et Al. 2009). In contrast to traditional institutional analysis emphasising how continuity and conformity are reinforced in the context of organizations, institutional entrepreneurship focus on the creative forces driving change and innovation processes. Thus, institutional entrepreneurship reintroduces interests, agency, and power into institutional analysis of organizations (Garud et Al. 2007). In this view existing institutions are not constrains on agency but they constitute the fabric to be used for entrepreneurial activities (ibid.). Emirbayer and Mische (1998) insist on this aspect by arguing that institutional entrepreneurship requires the ability “to contextualise past habits and future projects within the contingencies of the moment” (ibid. Page 963). However, existing institutions and social relations constrain and enable but do not determine the choices of actors (Hoffman and Ventresca, 2002). According to Battilana actors must fulfil two conditions to be regarded as institutional entrepreneur and not just change agents: they should initiate divergent changes (i.e. changes that break with the existing institutionalized logics), and actively participate in the implementation of these changes, meaning that they must actively mobilize resources to implement changes (Battilana et Al. 2009).

We will adopt the lens of institutional entrepreneurship to analyse a process of II innovation where actors initiated an institutional change process engaging in design, development and implementation of a new web-based platform for patient-hospital communication. Interpreting actors – in this case the MHR team – as institutional entrepreneurs helps to characterise institutional environment’s influences (constraining and enabling) on actors’ agency, and to understand their contingent strategy for resource mobilization. We import this conceptual approach into information infrastructure studies to zoom in on the actions of II designers.

## 3 Methods

In this paper, we report from an ongoing case study on the design, development and implementation of MHR. The case study designed as a longitudinal study of the MHR initiative started in 2010 and will follow its evolution until 2015. The study had a preliminary first phase of data collection in the period September 2010-September 2011 where interviews with team members were conducted periodically. Interviews were open ended, lasted about 1 hour and a half and were audio recorded and subsequently fully transcribed. The interview guide covered several topics, among others, managers were asked to describe the historical origins of the concept of MR, as well as to talk about technical challenges and implemented solutions, the organization of the users’ workshops, the consultations with the hospital managers and the privacy ombudsman. In addition, data derive from observation sessions of design workshops with users, and document analysis (internal project reports, design sessions reports, team members’ presentations to various audiences, policy documents, laws, and articles from specialized Norwegian magazines). We have also paid particular attention to the contextualization of our case and took into account experiences with past IT projects in the setting by accessing previous studies conducted in the same organization, the IT strategy documents for the healthcare sector in Norway, and overall the evolution of health ICT projects in Norway. This provided important information about both local and national contexts. We have also built on our knowledge from previous research engagements with the same IT department of the hospital where we have previously studied, among other issues, the EPR implementation process (see Hanseth et al 2006). A second phase of fieldwork started in March 2012 to November 2012 consisting of interviews of project team members and key people not directly involved in the project but in close proximity. In this round of interviews, we expanded our understanding of the project evolution.

This research is conducted with an interpretive approach (Eisenhardt 1989; Klein and Myers 1999; Walsham 1993). Data from interviews have been important to understand the interviewees' view on what they considered the main steps in the project history, main challenges in the process, the activities they undertook in order to handle them, and the resulting consequences of such activities. We have used theory of Information Infrastructure, and information infrastructure literature to guide our interests in defining research questions, and in the design of the study. A more detailed analysis of the infrastructural characteristics of MHR can be found in (Grisot and Vassilakopoulou 2012; Vassilakopoulou and Grisot, 2012). Further, we have used the lenses of Institutional Entrepreneurship to zoom on the MHR managers, and develop an understanding of the rationales and context of their strategic actions in the changing process.

## 4 Case Description

MHR started being conceptualized in 2002 and developed in 2005 by the IT department of a major Norwegian hospital. However, only in 2010 the solution was implemented on a wider scale and with a growing number of active users. MHR works at the interface between clinical care and patients, and constitutes a novel patient-provider communication channel in Norway. It offers a secure and trusted communication environment for patients and healthcare providers. MHR includes a security solution with secure authentication. Patients can access MHR authenticating from the Internet with their Net banking ID (BankID) or Buypass PKI. When authenticated they access their homepage. Here patients will see a number of services as their department or unit of affiliation has selected them. Clinicians can access MHR from within the hospital infrastructure authenticating with user name and password, and other hospitals connect to MHR through the Norwegian Health Network through secure VPN.

MHR has a hybrid architecture: the security solution and authentication is delivered as a service based on Novel Access Manager, and external authentication solutions like Nets, BankID and Buypass. The portal itself builds on Oracle database server and iKnowBase content management system. MHR has a modular architecture and the functionalities offered can be combined according to the different needs of the health providers. At present (autumn 2012) MHR offers several services such as: appointment booking and ordering of self-tests, secure messaging between health personnel and patients, deputy solution (parents/children), forms to be filled by patients and used by clinicians, ordering solutions (net shop) for treatment accessories, record of medicines, a Wikipedia network for patients, next-of-kin's and health personnel, and some specialised services – for instance for patients with Haemophilia (registering of drug use). Other specialized services are under development or running in test environment.

## 5 History

We describe evolution of MHR in an historical perspective structured in three main phases: (I) the first phase (2002-2005) covers the conceptual design and initial design decisions; (II) from 2006 to 2009 the project got experiences from initial use; and (III) from 2009 to 2012 the surrounding environment in the hospital posed challenges in the form of a merger and a large failed IT project. At the same time, MHR found room for additional expansion in functionality.

### 5.1 First phase 2002-2005: conceptual design

The very initial conceptualization envisioned MHR as a component in a new Clinical Portal for the University Hospital. Early in 2000, facing problems of fragmentation and standardization, the IT department started looking at portal technologies as a possible solution to establish a hospital wide infrastructure that would integrate existing systems. At that point in time, the IT department had struggled to define a successful integration strategy (see Hanseth et Al. 2006). Thus, they started tinkering with portal technology, and this led to the idea of a loosely coupled infrastructure where the

many clinical and laboratory systems were brought together under the common umbrella of a portal, and did not need to be integrated with each other. Thus some of the members of the IT department went to the US to visit several companies working on portal solution for healthcare (e.g. Patient Site by CareGroup, Boston ), and surveyed existing portal solutions, however concluding that these solutions were not good enough as they would only give the possibility to access old systems and did not provide web services. During 2000-1 the portal technology matured and in 2002, they (IT dept) started actively working on the Clinical Portal concept. One of the first sketches showed the portal illustrated with six arrows representing six different views of use areas of clinical information: three for clinical internal use, one for administrative purposes, one for supporting the cooperation of healthcare personnel (access to data), and one represented the idea of giving patient access. From this point, they started elaborating this idea further.

In the autumn of 2002 (to summer 2003) first the design of the Clinical Portal and then its actual development started. The team included an object ware company and an interaction designer from that company. On the side of the portal design, two team members on their own initiative started to draw some basic sketches of the patient-access idea using small card notes of what would then become MHR. The basic sketches had possible screen shots and notes on possible content. However, at the time the focus of the IT department was on the Clinical Portal, and not until 2005 did they started the actual design and development on MHR. At that time (2005), the Clinical Portal project started to face serious challenges, and turned out to be technically much more complex than expected, with problems of performance and stability.

Support for the development of MHR came in 2005 for several reasons and without controversies: *“there were several people around that thought it was a good idea to do something, so not very controversial, no I don’t think so”* (informant). The head of the department at that time was a visionary and motivated person who saw *“that patient services over internet would be something that would come, it was a question of not “if” but “when and how” this would come”* (informant). In other words they had internal support at University Hospital. Second, in 2002 the Norwegian public healthcare was reformed. In the new structure, the University Hospital, once owned by the counties, became owned by the central government and a decentralized enterprise model consisting of five Regional Health Authorities (RHA) was created (4 after 2007 when the Southern and Eastern Authorities were merged). The RHA were given enhanced local autonomy with their own executive boards and powers of authority to set priorities and manage the regional and local health enterprises (each RHA owns a number of local Health Enterprises). Among others the RHA had the task to harmonize the IT infrastructure of the hospitals within their region. The IT department at University Hospital did not agree with some of the choices made by the RHA of their region. The RHA for instance wanted to harmonize the EPR systems across the region, and did not see the portal solution under development as in line with the regional strategy. Differently, the IT department at University Hospital wanted to support the portal which had some innovative and potentially competitive features, however they were not yet operational. In order to have a “showpiece” for the RHA, it was decided to support MHR which at that time was under development and taking shape. An informant says: *“We started to work on something that was completely different, and a showpiece, and the managers were very keen that it was a way to show what we could do”*. Thus, MHR got funded. A third reason why MHR got funded and support was the email problem. According to the Norwegian Law on health information security it is illegal to use email in the communication between hospitals and patients. However, the IT department knew that at University Hospital’s many departments were communicating with patients via email. One informant defined the situation as a “ticking bomb” they had to do something about. In this context, the support for secure communication provided by MHR was seen as the most important service.

With initial support and funding, in 2005, MHR project started with the following characteristics. First, MHR was supposed to be a “meeting point”, not only access to record but access to patient services. An informant says *“access to record is a good thing but it should not be the sole focus and we should not create a solution around that service or we would end up in the wrong direction”*.

Another informant adds that the important aspect of the MHR was the ‘my’ part: *“the point was that it was ‘mine’. Mine as in ‘patient’s own’. The intention was that certain things were the patient’s and some things came from the hospital.”* The patient was seen as active participant in communicating with the hospital. Second, MHR was designed as architecturally independent from other systems. MHR was built to be a “solitary system” in many ways. An informant says it was *“a strategic choice we did very early on, the portal is so interconnected with absolutely everything and you get so frustrated”*. The MHR team did not want MHR be part of the Clinical Portal. The idea was that MHR could be easily transportable and implemented in short time. He also adds that the process of designing and developing MHR was organized as independently as possible from everything else: *“that meant doing this ‘guerilla’ tactic: few people involved and design of the system as independent from other systems as possible. Because that is what we see with other projects, if you have a project going on for over three years the environment you work in is going to change drastically in three years, like merging with other hospitals or new management. So we are still officially only three persons allocated to the MHR project, and the rest is hired people. This would have to change at a point but I think this is part of the reason why we are still there”*. They have also looked into the possibility of commercializing MHR but decided to postpone it keeping the solution in-house and the project organization simple and small. A third characteristic that shaped the initial development of MHR was the split into two competence areas: functionalities with patient focus and functionalities with a more administrative focus. One informant says that MHR was intended from the beginning to be not just “another door into the hospital where to get some information”, but rather it should become *“a meeting point where also the hospital personnel should meet half ground, and the patient should be able to set the premises to decide how this meeting takes place”*. MHR provides a framework where patients are in control: if they want to use it, how they want to use it. For instance the MyDiary functionality (an area where the patient could write their personal notes) was designed in a way that only patients had access, and they can decide to share it with doctors. Finally, MHR was initially designed with a security solution called BuyPass PKI for authentication of users both for patients and for internal use in the hospital. This required patients to install a card reader on their pc with a CD for BuyPass and another one to make the reader to work. In case of problems patients would call the hospital for support. This solution was quite cumbersome and time consuming and in the initial experiences triggered the development of open services, and later the addition of another security solution.

## **5.2 Second phase 2006-2008: initial experiences**

In the second phase starting in 2006 we describe the initial experiences of use of MHR. The first two functionalities to be designed and used were secure email and changing appointment. The email functionality is actually not email: messages entered in MHR email are not sent to ordinary email accounts. An email is sent just to notify that there is a message to be read in MHR, and then the patient needs to log in MHR to be able to read it. The email functionality, as previously mentioned, was an important drive for MHR development and use. One of the first departments using it was Children and Youth Rheumatology at University Hospital who used to have an ordinary mail box for patients with quite sensitive messages. A department from another hospital in the region was also among one of the early users. There, the doctors were concerned about patients not being able to reach them, and asked for secure email. Differently from email, changing appointments does not require logging in. The changing appointment functionality was initially developed in response to a request by the Children Department at University Hospital. They had problems with their booking of appointments routines resulting in patients not showing up at scheduled times. Appointments at the department were given to patients’ parents via postal letters also indicating the phone number for changing or cancelling appointments if needed. The problem was that parents would usually call the department at lunch time, and were often unable to get through. This resulted in patients not showing up for appointments. Thus they asked the IT department (not MHR, as they did not know about the project) for a solution. MHR offered the possibility to require changing appointments on line, and in an open environment (not log

in). Now, in the letter from the hospital patients receive information on MHR in addition to the phone number. Thus, on the MHR website patients select the hospital and department they belong to, and fill in an online form where they are requested to write their name, birth date, phone number, existing appointment's date and time, and fill in a free text field on their reasons for requesting the change, and their preferences for setting a new appointment.

The rationale in the design of the functionality has been to try to keep it as simple as possible. This meant first, not requiring log in (too cumbersome), and second to ask patients to enter "just enough information". Patients enter as little details as possible about the appointment, and just enough so that secretaries would be able to identify patients, find their appointments in the PAS, do the changes and respond by letter or phone. The message is not saved in MHR. This functionality has had a very positive response from the department and their patients, and has been adopted with different degrees of success by many other departments afterwards. Another positive result is that patients change their appointment much earlier than before. Thus the department is alerted about patient not being able to come to the appointment a month in advance instead than two days, and they are able to schedule and reschedule appointments in a more efficient way. In addition, when a department decides to adopt the functionality, it can be tailored to their specific needs. For instance in one case where appointments are booked by the day (and not by day and hour), patients are able to see in MHR which days are available, and can in addition enter detailed information in a pop up box. In another case the same functionality allows also to order home self-tests that are sent to the requiring person via mail in an anonymous package.

In 2007 the team started working on a module for giving patients access to discharge letters. Discharge letters are stored in the hospital EPR, and a copy is usually sent to the patient's GPs at discharge from the hospital, but not given to the patient himself. While access to record was part of the original MHR vision, discharge letter is actually the first document from the record considered for direct access. The MHR team developed a solution in collaboration with the EPR vendor to show discharge letters in MHR, from where they can be printed (not saved). However the solution was not implemented and put on hold due to ongoing discussions about changing the EPR in the hospital to comply with RHA directives (the module will be ready but not in use in 2009 and working in a test environment as 2012). Another functionality was first put on hold and then had to be removed. The Privacy Protection Officer at University Hospital was also involved in the design process of MHR sorting out the legal restriction to health information handling which is quite rigid in Norway compared to other countries. According to the officer patients could write in MyDiary information that could eventually be important for clinicians but not accessible. One informant says: *"it is a pity because if we look at the (patient) side today it is not very developed and actually what exists there is mainly for illustrative purposes to show what can be done"*.

In 2008 an important change took place, having realized that the use of BuyPass to authenticate users (both patients and internals) was too complex and time consuming, MHR started using a security solution called BankID. BankID is developed by a cooperation of Norwegian banks for costumers' authentication in on line banking services, and a solution which most Norwegian are familiar with. It still requires the combined use of code calculator with PIN code, social security number and password; however familiarity played an important role. In additional, another advantage for the MHR team was that in case of problems patients would call the bank and not the IT support at the hospital. According to standards, BankID complies with the highest security level (level 4).

### **5.3 Third phase 2009-2012: troubled environment**

A third phase in MHR evolution started in 2009 with some major events in the environment, namely the merger of the largest hospitals in Oslo including University Hospital, and the failure of a very large and costly IT project. In 2009 three large hospitals in Oslo were merged into one Health Trust. The new hospital trust located in four main sites across Oslo city, was meant to offer one-door access to specialized services on National level, and local hospital services for the people of Oslo. The merger



entailed a complex reshuffle of service offer, restructuring of units, redistribution of responsibilities, and required forming new cooperation across units. Many IT project were put on hold in the period, and MHR suffered for limited funding opportunities. Resources went into a new large IT project that started in June 2009, and was supposed to deliver a new clinical information infrastructure (named Clinical Information Flow) for the new merged Health Trust with a consolidated view of patient contacts, journal notes, laboratory results and radiological results and images, common across all locations by 1<sup>st</sup> June 2010. However, in April 2011 the project was stopped after having spent 160 million Norwegian kroner<sup>1</sup>. The project leader stated that: *“The project was more complex and needed substantially more time and effort than anyone had predicted. It would probably have been planned differently had we known all the complex challenges at the project start. To run a project like this in an environment where four hospitals with strong cultures are about to be merged, is a challenge. The result is not an ideal situation for anyone”*<sup>2</sup>. The project turned out to be significantly delayed, more costly and complicated than expected.

During 2009 any development of MHR was stopped for a period by the Privacy Protection Officer at University Hospital. Another internet-based application currently in use in the hospital raised a discussion on secure data handling, and on the distinction of using and storing clinical data for research purposes or for patient care. The team realized how careful they needed to be in handling patient data, and the necessity to work in tight collaboration with the Privacy Officer.

A new opportunity came in 2010 with a project started as collaboration between Health and Rehabilitation, MHR and the Diabetes association, to develop learning, coping and interactive services for diabetic patients. The project was further supported by an EU project in 2012 investigating patient empowerment through IT-enabled patient self management. A first version of the module is to be released in December 2012 and includes an on line form the patient can use to self-report information health personnel routinely ask during consultations, such as medication list, blood sugar levels, need of new prescriptions, and if the patient wishes to discuss any specific issue during the next appointment. The aim is to make consultations more efficient by having already routine information available. In addition, the project included workshops held with teenagers to design functionalities to help them convey to their care givers how they experience their disease in everyday life. For example if they are afraid, sad or tired. An educational tool (DiaClock) is also being designed in digital form. It is formed as a 24-clock where patients can visualize the relation between food intake, insulin level, amount of exercise, and blood sugar levels. Patients can add food groups that affect blood sugar levels differently and insulin at different times of the day and obtain a visual picture of how these factors affect each other.

During 2011-12 the managing appointment functionality became very popular in the hospital and a major attractor for the uptake of new users. Hospitals belonging to another health region requested it. The Hospital Trust had recently decided to offer the managing appointment functionality on line to all patients in the outpatient clinics, expecting it to be operative by the end of 2013.

## 6 Analysis

The MHR project team has initiated its change process by diverging from the approach to project management usually implemented at University Hospital and at RHA (and at national level). Specifically, we analyse in section 6.1 the rationale for intentionally taking such divergent actions, identified as the first aspect in institutional entrepreneurship. Further, we focus on the second aspect, which analyses how the MHR project team has actively participated in the implementation of these

<sup>1</sup> The project received extensive press-coverage in Norwegian newspapers.

<sup>2</sup> Quote taken from Hans Nielsen Hauge's interview in Computerworld 23.05.2011 accessed on 27.11.2012 <http://www.idg.no/computerworld/article208401.ece?curPage=2>

actions. Despite the turbulent environment, uncertainties, and limited financial support, the team has managed to mobilize resources for innovation. We will discuss this aspect, namely the enacted institutional entrepreneurial strategy, in section 6.2.

## **6.1 MHR team as institutional entrepreneurs**

MHR is a web portal for patients envisioning patients as active users of on line services and offering an alternative (arguably more efficient) mode of communication between patients and healthcare providers. It introduces (i) asynchronous communication in the form of secure email and on line forms to prepare for consultations, (ii) access to documents as the discharge letter and lab results, (iii) access to quality information, (iv) real-time tracking of medicine use, and (v) on-line appointment management. MHR is intervening in the existing communication practices, routines, roles in an innovative way. Further, it is entering a new domain for healthcare information systems where patients are users, thus facing uncertainties and experimenting how new web-based patient services may be designed and implemented. However, innovative concepts as patient-centred services and patient empowerment are slow to consolidate; one of the informants relates this inertia to the slowness in MHR evolution: *“the change in mentality in the healthcare system is very slow; I see a change in the past 7 year, the concept of empowerment and giving patients a more active role is growing (...). But it goes slower than expected. And this affects directly the way we can develop services and deploy them”*. Changing the existing institution of patient-hospital relation by means of MHR is a complex undertaking, especially at a point in time where the context is troubled by failing IT projects, hospital mergers, sector reforms and political tensions as described in the previous sections. Such contextual aspects have significantly shaped the entrepreneurial strategy MHR project has enacted. We analyse in what follows the specific aspects shaping the strategy.

First, the ambiguous support from the RHA has created high uncertainties. One of the informants reports how the RHA acknowledged the project but not consistently supported it, he says: *“it is still the IT department here at the hospital that is the driving force, but the (RHA) has realized that they need a solution for communicating with the patients (...). So, yes, they have gone in and said that it is MHR that will be supported, but they have not really contributed with any substantial amount of money to really get it rolling. It ends up far down on their priority lists”*. The priority has been the hospital portal projects (first the Clinical Portal, then the ClinicalWorkflow). About this point, an informant says: *“MHR was a bit like a good idea existing on the side”*. Second, the trouble with the existing hospital IT projects at University Hospital and later at the Health Trust has taught MHR team to keep their project contained and technically simple. An informant states: *“We saw that the Clinical Portal project was very demanding, so if we were to wait for them to be ready to include the patients it would have taken forever”*, and *“The integration with Clinical Portal is heavy, very heavy. There have been several attempts to do electronic booking online. This is a very simple solution, and as an IT professional I find our solution almost embarrassingly simple”*. Another informant also sees the complexity of the Clinical Portal project as affecting the integration approach of MHR: *“when we started with MHR the Clinical Portal project seemed quite promising and I think we envisioned a much more integrated solution, today we try to keep the integration level as low as possible. And it turned out to be a good idea absolutely; if we had a high integration level at this point we would have been stuck”*. Keeping integration low seemed a necessity. Third, not being a priority project had effects also on the use of external developers, and on the relation with the company providing IT to University Hospital. In January 2006, the IT competence from all the hospitals in the region transferred to a new entity, and 1.09.2009 this scheme applied to University Hospital too. An informant describes the situation: *“At this point, the resources were moved...But the responsibility for maintenance and application management has not always been very clearly defined. The technical people used for MHR have also been used for many other projects”*. Here we see how hosting has not been well-planned but left to a more ad-hoc organizing of resources. Thus even in the cases where MHR obtained funds for developing new functionalities, they had to wait for an available time slot at the IT company otherwise busy with the prioritized projects. A forth aspect concerns the demand from

users, both patients and clinical and administrative personnel. The need to develop web-based patient communication and services was openly acknowledged by the authorities, the hospital managers and strongly advocated by patients and their associations. An informant explains: *"People have asked for this and there is a need among the patients. (...) Many have seen that there is a lot of good stuff here and this is the way the trend is moving and that we have to try to gather things and try to do something"*. Despite the above mentioned constraints, the emerging drive for patient-centered services, and the positive response of most users are strong enablers motivating the project team.

## **6.2 Entrepreneurial strategy**

Dealing with such challenges, MHR project has managed to survive over the years. One of the informants commented: *"It is fun to see that we have been able to stay so small, that we have stayed under the radar, and not been wiped out by the RHA, but at the same time we were big enough that they couldn't stop us. And slowly now the user uptake is going into the right direction so it will be extremely difficult to remove MHR at this point"*. It seems like 'staying under the radar' has been a strategy for managing the project and developing the solution. He also adds *"we decide to stay under the radar as long as possible for tactical reasons, because we understood that this could have been controversial in many ways. I was pretty sure that if we had said that ok we want to make a patient portal, a large project, we want 30-50 millions it wouldn't have worked"*. Another manager said: *"I think that part of the reason for success has been that we have kept it in-house and kept control all the way. I am terrified of selling it to external actors; I think that would have torpedoed a lot"*. Staying under the radar is in common language an expression that indicates behaving in a way not be detected or noticed (in WWII planes flying low to the ground could, in many cases, escape detection from the radar's radio). In the case of MHR, as the informants indicate, it has been a conscious strategy. They have stayed a small and local project team, and focused on developing functionalities for the departments' immediate needs rather than advanced large-scale functionalities. For instance, the managing appointments functionality was developed at first to solve an actual problem for one department, later taken up by several other departments, and just recently scaling to the whole Hospital Trust.

However, the MHR team stayed under the radar also out of necessity. For instance, they had to drastically reduce their ambition level of integration with the existing hospital infrastructure, and they did not have enough and continuous resources for long term planning. In practice, for the MHR team the strategy meant staying under several radars (i) of the regional authorities by avoiding entanglement with strategic IS projects, (ii) of hospital management by avoiding bidding mechanism that would apply to large IT solutions, and (iii) of the privacy officers by avoiding pushing the legal boundaries, and by avoiding storing patient data into MHR. It is interesting to note how this strategy has enabled the MHR team to a different entrepreneurial opportunities compared to traditional IT project that have to comply with rigid plans, contracts and budgets. They have been experimental and flexible for instance by adapting design, services and architecture.

## **7 Discussion and Conclusion**

II studies have emphasised how II are complex sociotechnical assemblages that evolve gradually according to emergent processes and complex dynamics (Monteiro 1998; Ciborra et Al. 2000; Hanseth et Al., 2006; Ribes and Finholdt, 2009). This literature has also acknowledged how sensitivity to initial conditions and the ability to manage complexity are crucial for II growth. In the case reported in this paper, the role of II designers is critical, and their actions have a strong strategic connotation. We have tried to uncover in details the capacity and space for agency of II designers. The conceptual framework of institutional entrepreneurship has helped to foreground roles and actions of II designers. Specifically, staying under the radar can be seen as a strategy of II growth. However differently from bootstrapping (Hanseth and Aanestad 2003), the strategy enacted in our case did not aim at

maximizing users' number but at minimising controversies, confrontations and frictions. It suggests that in complex and politicized environment, such as healthcare, it might be wise to sort out interdependencies in the initial stages of innovation process. In the case of MHR aiming at building a large user base right from the start might have been too risky, and it might have ended with closing down the project. Tilson and colleagues argue how only a stable installed base allows new connections to be created and that the means of connecting must be predictable (Tilson et Al.2010). In light of this argument, staying under the radar is a strategy that seeks to limit interdependencies to the stable ground.

Further, "staying under the radar" is a strategy that in our case relates to the non-dominant position of the MHR team. Its agency steers MHR project beneath 'radars' that would stop the initiative or would significantly alter it. In addition, the team enacts a bottom up approach for institutional change working through technology design and development. The analysis has shown how innovation in the case of II has combined institutional and infrastructural design. The ultimate and long-term goal of the MHR project has been to change the institutions related to patient-health care system interaction on national level. However, realizing such ambition needs the support of a national II. Accordingly, the MHR project has largely been seen and managed as an IT project. This shows how a successful strategy for institutional change also needs to incorporate and align with an appropriate strategy for II development.

The dominant approach to the development of large scale IIs, like telecom infrastructures, is top-down and specification-driven where reaching agreement on standards is at the core. This approach has also been the official and dominant one in Norway (Hanseth and Bygstad 2012). Hanseth and Bygstad have shown how this approach has overall turned out not to be very successful, and, in particular, it has not enabled the innovation of new and improved services (ibid.). Differently, the MHR case has been, so far at least, successful in developing innovative IIs that enable institutional change. The "under the radar" strategy has been successful as combined and integrated strategy to technology-driven institutional change, i.e. an integrated approach to institutional and infrastructural entrepreneurship.

In conclusion, in this paper we have addressed the challenges of institutional change in a complex environment where institutional entrepreneurs face significant constraints. We have presented the case of a web-based platform in Norway, and analysed the project team strategy – staying under the radar – that has enabled them to persist in their changing effort. We have argued how such strategy can be seen as a way to deal with complexities in Information Infrastructure evolution by intentionally sorting out and eventually avoiding certain interdependencies, pursuing institutional change, taming user maximization. Our contribution thus is an insight into understanding II designers' actions oriented towards II innovation.

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