

# HOW THE 'NEW' MAKES USE OF THE 'OLD': UNDERSTANDING RECONFIGURATIONS OF INFORMATION SYSTEMS AND ORGANIZATIONS IN THE NORWEGIAN HEALTH SECTOR

*Research-in-Progress*

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## **Abstract**

*This paper presents initial findings from ongoing research on how novel ICTs can make use of established sociotechnical arrangements in a productive way. Empirically it is based on three case studies on the design, development and use of web-based information systems that support patients' interaction with healthcare providers. The cases under study are intriguing as they provide empirical evidence of the role that novel technologies (within the Web 2.0 genre) can have for accelerating a healthcare shift towards "patient centeredness" and patients' active involvement in care (co-production of services). Our aim is to reach an improved understanding of reconfiguration dynamics paying attention to associations and interactions between the "old" and the "new".*

**Keywords:** Healthcare, Information Infrastructures, Configurations, Installed Base

## Introduction

In this paper we report from an ongoing study on the interplay between new information and communication technologies (ICTs) and existing modes of organizing within the Norwegian healthcare setting. Specifically, we report from three case studies on the design, development and use of novel web-based solutions that support patients' interaction with the healthcare system. Our aim is to draw attention to how the new ICTs make use of the established sociotechnical arrangements in a productive way, or in other words, how new technology leverages the latent potential of what is already in place. In this view we want to problematize the meeting of the 'old' with the 'new'. Our underlying argument, based on the "information infrastructure" perspective, is that this meeting can be made productive. We have approached the three cases from the perspective of healthcare providers that have initiated the development of the solutions under study. The specific scope of the paper is to bring into foreground different tactics for associating new ICT capabilities with established technological and organizational arrangements.

Information Systems research has shown how the introduction of new technologies is a cumbersome, unpredictable process (Berner et al. 2005; Currie and Guah 2007; Greenhalgh et al. 2010; Hanseth et al. 2006; Jones 2004; Westbrook and Braithwaite 2010). Organizations have already a diverse ICT portfolio in place shaped by path dependencies, legacy systems, work routines, i.e. an installed base to which new technologies bring requirements and changes. Taking an information infrastructure perspective, the installed base shapes the way established sociotechnical arrangements evolve over time enabling or constraining possibilities of adapting or interconnecting to new components (Hanseth and Lyytinen 2010). Scholars of information infrastructures (Bowker and Star 1999; Contini and Lanzara 2009; Hanseth and Lyytinen 2010; Star and Ruhleder 1996) discuss how ICT capabilities, materialities, people, and social forces evolve and interoperate over time, forming a layered heterogeneous infrastructure of old and new elements. When studying the development and implementation of ICTs within organizations, this approach directs the focus on how the interrelations between the established arrangement and the new elements play out. We argue that the existing infrastructural configuration is not only an enabling or constraining backdrop but a configurable arena full of potentialities. New technologies can unlock latent capabilities by leveraging the potential of existing infrastructures.

Another characteristic of information infrastructures is that they are open sociotechnical arrangements. This means that infrastructures are not software packages with predefined patterns of use and closed design phases, but they are continuously evolving, allowing appropriation by new user communities and developing new capabilities (Hanseth and Lyytinen 2010). The notion of the installed base (taking into account the existing arrangements in place) and the open character of infrastructures (recognizing an unbounded prospect for evolution) make this perspective particularly suitable to explore our research focus: the meeting of the 'old' with the 'new'. We take this perspective to study our three cases of design, development and use of novel web-based solutions for patients to interact with the healthcare system. In an infrastructure view these technologies are the 'new' elements for the existing sociotechnical arrangement. All three of them contribute to the currently unfolding change process within the Norwegian healthcare sector: the transformation from provider-centered healthcare to a more patient-centered mode. The new technologies under study are opening up possibilities for including patients as users of healthcare information systems (traditionally the realm of health workers). This transformation is a response to an unprecedented pressure to reform healthcare systems in Norway and throughout Europe. This pressure is instigated by concerns grounded in expectations for a challenging future affected by multiple interdependent factors: medical advancements that generate new more effective but increasingly costly treatment capabilities, an increase of patients living with chronic conditions, aging population, and economic development slowdowns. In this context, new delivery models are sought that will allow universal service access, comprehensiveness of care and elimination of health inequalities (as demanded by European societies) while simultaneously ensuring managed and non-prohibitive cost. In this quest, operating models and principles that have contributed to drastic efficiency improvements in different sectors of organized work are being considered as possible solutions. Notably, principles rooted to industrial traditions (exemplified by control, integration and standardization), along with principles rooted to retail management (exemplified by customer centeredness and co-production of services) are being investigated and adjusted for healthcare. The aim of the new operating principles promoted is to

enhance efficiency while retaining or even improving the service levels already achieved. Although the challenges are well understood and visions have been shaped, the transition to the a new more sustainable situation is far from straightforward (Berner et al. 2005; Currie and Guah 2007; Greenhalgh et al. 2010; Jones 2004; Westbrook and Braithwaite 2010). The complexity of the required sociotechnical transformations is such that the linear path that foresees translating visions to policies, inscribing policies in technologies, and embedding technologies in everyday work cannot be followed (Dey et al. 2013; Ellingsen and Monteiro 2008; Guah and Currie 2004; Hanseth et al. 2006; McNulty and Ferlie 2004).

In order to understand how new ICTs can leverage the potential of existing sociotechnical arrangements, we make use of theoretical resources from ANT (Latour 1986; Latour 1999) and the multilevel perspective in large scale sociotechnical transitions (Geels 2002; Geels 2006; Geels 2007). Specifically, we work with the concept of configuration trying to grasp how a given sociotechnical configuration evolves over time from a status of possibilities to one of realized potentials. Analyzing our three cases we find different tactics for associating new ICT capabilities with established technological and organizational arrangements. In the next section we introduce our theoretical approach and then, we continue with a description of our methodological approach and the cases. Subsequently, we present our preliminary findings, and conclude with a discussion of the findings and of the relevance of our ongoing research.

## Theoretical Approach

The notion of configuration conveys the idea that a set of elements are clustered into forms that are more or less stable, and when the term 'configuration' is used the aim is to identify archetypical sets of configurations (Mintzberg 1983; Ross et al. 2006). In our research we embrace a more dynamic understanding of configuration. We base our understanding of configuration on Actor-Network Theory (ANT) and the work on the multi-level perspective to understand sociotechnical transitions (Geels 2002; Geels 2006; Geels 2007).

ANT adopts a socio-technical perspective to the analysis of technological systems that views the world as associations of technical and social actors (Latour 1986; Latour 1999). In this view, everything in the social and natural worlds is treated as "a continuously generated effect of the webs of relations within which they are located"(Law 2009). Thus ANT is an argument not about the 'social' but about the associations which allow connections to be made between elements. Law describes the building of actor-networks as the process of overcoming the resistance of all sorts of human and technical actors and weaving them into associations with other actors (Law 1992). ANT studies have addressed how associations gain coherence and strength (stabilize). They have addressed re-configuration processes of actor-networks by studying strategies to a) convert network elements (translate); b) enlist actors and prevent them from 'leaving' (enrollment) ; c) bestow qualities and motivations to actors (roles as scripts) ; d) become functionally indispensable (the notion of obligatory passage points) ; e) become transportable (Callon 1986). Thus, a stable actor-network is only one of the possible configurations of associations, while other can be more elusive (Law and Singleton 2005) or fluid (De Laet and Mol 2000).

Geels has taken this sensibility for sociotechnical associations to the study of large technological transition. He conceptualizes configuration processes of 'shifting assemblies of associations' following Latour. In this view when a new artifact is introduced into an existing network it triggers further changes and transformations, it is neither a mere add-on nor a substitution for existing artifacts. Geels further elaborates this understanding by introducing the notion of *configuration that works* (Rip and Kemp 1998). A configuration that works refers to a configuration that fulfills a function. Rip and Kemp argue that *configurations that might work* become *configurations that work*: thus they visualize a journey where the socio-technical configuration becomes better adapted to its context. In our research, this view is used to explore the processes of reconfiguration that take place between the existing infrastructure and the new ICTs. In this process, associations evolve with specific effects. We seek to understand how in the reconfiguration process from *configuration that might work* to *configurations that work*, the potential of existing information infrastructures is leveraged through the introduction of novel technological components.

## Methodology and Case Studies

The research is designed as a cross analysis of three case studies running in parallel. We examine reconfigurations in their natural settings, with no clear cut boundaries, and employ multiple methods of data collection including observations, interviews and document analysis (Benbasat et al. 1987). Specifically, we study new patient-oriented, web-based technologies in the context where they are designed and developed and in the context where they are implemented and used. Further, we map and study the current IT landscape in the Norwegian healthcare context at large, including policy documents, law and regulations on the use of health information, standards for IT in healthcare, and documents related to ongoing relevant initiatives. Following this research approach we examine how “things change over time” (Pettigrew 1997) positioning our cases within the overall attempted transformation of healthcare in Norway (pursued by multiple initiatives that run in parallel). In this way, we are studying the reconfiguration process “not as if it represents one stream in one terrain, but more like a river basin where there may be several streams all flowing into one another, dependent on one another for their life force and shaping and being shaped by varieties of terrain” (Pettigrew 1997). Data analysis is made in an iterative, inductive mode going through documents, interview transcripts (all interviews have been recorded and afterwards transcribed verbatim) and observation notes in order to identify themes. Our analysis is guided by the theoretical framework adopted through which we make sense of the trajectories we follow.

The focus of the three case studies is on how the new technologies introduced will reconfigure established sociotechnical arrangements within healthcare. This requires attention to (i) the specific characteristics of the new technology and its origin, (ii) the existing information routines in the specific healthcare setting where the new ICT will be implemented (including homecare information routines), (iii) the deployment process of the new ICT within established sociotechnical arrangements, and (iv) the reconfiguration process of the established sociotechnical arrangement once the new ICT is in use.

The first case study concerns the design, development and use of MyBook. MyBook is a secure web-based solution for storing personal health data. It has been developed during the last two years as a private initiative (of a doctor) in collaboration with X University and is accessible both from a browser and as an “app” for mobile phones. The intention is to provide patients new means to store documents in folders in MyBook, and then share them with health practitioners or other interested parties. Users/patients can monitor who logs in and access documents.

The second case study concerns the design, development and use of MyRec. MyRec is a web based portal for patients that has been designed by the IT department within hospital S. MyRec started to be conceptualized in 2002, and its development started in 2005. It is now in use in hospital S. It offers to patients general functionalities such as secure email with clinical personnel, access to selected EPR documents (e.g. discharge letters), view on medications, change of appointments at outpatient clinics, in addition to more tailored functionalities for specific conditions. For instance, patients with hemophilia who are requested to report their use of blood coagulant drugs, can use a special online form; patients needing medical equipment (e.g. pumps or catheters) can place an order in a web shop-like environment.

The third case study concerns the design, development and use of HealthNorway. This is a National citizen oriented portal that consolidates information on prevention, health, wellness, illness, treatment and patient's rights. Information is delivered by various health organizations that are responsible for the content being up-to-date, knowledge-based and of high quality. The use of the portal is not meant to replace personal contact between patient and health care professionals. The portal also provides administrative e-services such as change of General Practitioners, access to active prescriptions and monitoring of health expenditures.

## Preliminary Findings

The study of MyRec started in 2010 (as part of a larger research project entitled Flexible Integration Processes in the Public Sector) and then, in 2012 we started studying the other two cases. We have been following the design and development of functionality for all three initiatives and we have been able to identify a number of similarities that make them interesting for a cross-case analysis but also a number of singularities. These are described in the paragraphs that follow and summarized in Table 1.

In all three cases novel technological capabilities and internet based networking are leveraged in order to achieve three important aims. The first aim is to provide services and not fixed, predefined computer functions (i.e. functionality is altered, extended and rearranged on a regular basis as part of the normal user experience, the services themselves are loosely coupled and it is possible to discontinue or radically alter them without significant impact to remaining services). The second aim is to grow an “architecture of participation” in which the service acts primarily to connect the edges to each other (the objective is to reach out for patients and enhance patient healthcare provider communication). Finally, the third aim is to assemble preexisting functionalities and route to them (functionality is added not only from scratch but also by content syndication and re-use of existing data services of others). All these aims can classify our three cases as instances within the Web 2.0 movement (O’Reilly 2005). Nevertheless, there are significant differences from typical Web 2.0 instantiations: information is not shared among peers (there are significant knowledge and power asymmetries between patients and healthcare providers), information classifications are directed (from the healthcare provider side), developments and extensions are heavily regulated as sensitive information is circulated. The selection and development of desirable functionalities is controlled by different actors in the three cases: MyBook is an initiative taken from outside the healthcare sector; MyRec is initiated from within a specific hospital and functionalities are proposed by the clinics; HealthNorway is a national initiative and directions for functionality development are driven by healthcare visions and policies.

In all three cases, the intention is to provide ICT support for communication among patients and healthcare providers in Norway. In that sense, at a high level of abstraction they all aim to be appropriated within the same institutional environment. However, the breadth, scope and envisioned use of the three ICTs are dissimilar. MyBook is a personal 'app'-like solution for storing and sharing health information that can be mostly valuable within patient – general practitioner encounters. MyRec is a portal for patients affiliated with a specific Hospital and aims to facilitate specific patient-hospital communication needs, while HealthNorway is 'the' public portal and is mostly oriented to supporting patient – healthcare system coordination (e.g. facilitating the general practitioner assignment process, providing information for hospital selection, etc.). Thus, the specific established sociotechnical arrangements they meet are diverse. In all three cases the teams that are working on the initiatives aim to ensure usage and to become ingrained within their targeted settings. But as they have different champions and they aim to be embedded into different established arrangements they also follow different strategies for their deployment. MyBook follows a “users before functionality” strategy (Hanseth and Lyytinen 2010) (concentration on one core functionality: before new functionality is added the user base should have grown enough to sustain the added cost of development). MyRec is using modularity (Baldwin and Clark 1997; Parnas 1972) to drive adoption and use: each clinical group can select modules from the existing repertoire, or they can require the development of new ad-hoc modules. In its current status, it is constituted by modules that are either active (e.g. secure messaging, on-line bookings, forms filling, patient self-reporting of drug consumption, self-reporting of diet and lifestyle, etc.); planned to be activated (e.g. access to admission summary, functionality for patients with diabetes); planned to be expanded (as for the drug self-reporting module) or recently discontinued (e.g. patients’ forum, patients’ diary). Finally, HealthNorway is being deployed by adopting the role of “incubator”. Project participants are aware that numerous private solutions exist to support digital dialogue between patients and healthcare practitioners but putting in place a public solution is thought to be important for four reasons: a) single login (to ensure ease of use for patients); b) security (at a level that currently provided by private solutions); c) better outreach to the general public (patients); and d) improved ability for impact measurement. So, private initiatives are not ruled out and the intention is to enter to partnership relationships with them offering a trusted platform from which they can evolve.

Table 1. The Three Cases Under Study			
Technology	Targeted Established Sociotechnical Arrangement	Deployment Approach Followed	
Common Aspects	Web 2.0 adjusted for Healthcare (heavily regulated development, expert based information classifications, not P2P).	Healthcare within Norway.	Experimentation and exploration - features continually altered, extended and rearranged.
MyBook	Access from mobile phones and computers. Cloud based.	Mainly general practitioners and other healthcare specialists (e.g. physiotherapists) during consultations with patients.	“Users before functionality.”
MyRec	Access from computers only. Interface between the internet and the closed, secure broadband network for electronic communication within the health sector (Norsk Helsenett SF).	Clinics within hospitals and their interactions with patients.	“Driven by modularity.”
HealthNorway	Access from computers only, significant technical provisions for privacy and security. Trust as a main concern.	Patient – healthcare system coordination (e.g. general practitioner assignment process, hospital selection, etc.).	“Incubator and trusted platform for others to build upon”.

In all three cases the new technologies introduced are actively seeking to unlock the untapped potential of the information infrastructures that are already in place. We illustrate this using three specific examples, one from each case (the examples are summarized in Table 2).

MyBook targets the currently unrealized potential of making full use of health records for medical decision making. The earliest use of electronic documentation of patient information in Norwegian health services dates back to the 1970s, while the first releases of healthcare applications for entire hospital coverage started in the 1980s (Norwegian Center for Electronic Patient Records 2009). Today, electronic patient records are used in almost 100% of hospitals and general practitioner offices and in approximately 80% of nursing homes (idem.). This means that in Norway today, there are multiple records with health related content per citizen, as every contact with a doctor, hospital or other health institution leaves a digital trace. The content and handling of existing patient records is regulated by the Health Care Personnel Act, the Patients’ Rights Act (both adopted in 1999) and the Personal Health Data Filing System Act (adopted in 2001). Patients have the right to access and obtain copies of their records. Within healthcare organizations, stored health data can only be directly accessed by the data controller, the processor, or anybody working under their instructions. This makes illegal to share health databases across organizational boundaries or to log on to each other’s databases (Doupi et al. 2010). The idea behind MyBook is to assemble key medical information that is dispersed in various places and difficultly accessed. Instead of attempting to fully homogenize the content of the multitude of applications that exist today, the new technology is offering the possibility for patients to digitize and classify key health information (according to predefined healthcare classification categories) and make it accessible to health personnel. Selection and ordering of information is made by patients themselves similarly to the way that they currently provide their own account of their medical history to their doctors. In this way, the conventional consultation process can be enhanced by leveraging the accumulated patient information that currently exists but is difficult to access.

MyRec’s original development was guided by the idea of providing patients with on-line access to their own records, but also access to information and direct communication with clinicians. Record access is a concept concrete enough but also open to opportunities; a MyRec team member says: “*There are two*

areas of possible benefits from MyRec that have not been demonstrated fully yet. One is related to the preparation for a stay at the hospital. There is potential to improve so when the patient arrives he/she has already been approached digitally via MyRec (...) And the other part that is really important is the follow-up part". Reaching for the untapped potential in the case of MyRec has been very challenging. As clinical departments are operationally co-owners of their respective modules, uptake is slow and although usage can be sustained, growth is difficult to achieve. "The conclusion was that patients were ready to take up this kind of services, the technology was ready ... it was the hospital organisations that were not quite ready yet! And this is the hard part of it, how to integrate this in the clinical workflow...more users is a difficult thing. The only way to get users, is to push the clinical departments" (MyRec team member). MyRec is not attempting to create new data structures or new ontologies for health-related data but to explore and exploit what is already in place. However, accessing information through MyRec turns out to be problematic not only because it poses significant workflow rearrangement requirements but also because it requires coordination with other on-going technical developments. For instance, prompt access to health data stored in the hospital was required in the case of a specific category of patients that follow a nutrition therapy and have their diet closely monitored and their blood periodically analysed. For these patients it is very important to know the results of their blood tests as soon as possible in case they need to adjust their diet. However, accessing this information through MyRec turned out to be problematic, and the development of the module had to be put on hold as one of the participants describes: "We have to have that retrieved from the laboratory system, not from the patient record (...) and getting new integration now before SYSTEM Y is a bit difficult. So we are a bit on hold. We have the description and the design, everything ready but on hold".

HealthNorway is a conscious effort to leverage parallel nationwide initiatives. This is a strategy which is expected to ensure better exploitation of the potential of new infrastructural components that are being put in place. HealthNorway is envisioned as a gateway to healthcare provider oriented infrastructures for citizens and other actors external to healthcare (including private companies). For instance, via HealthNorway patients can access their medical prescriptions and, in the near future, a new functionality that will allow the renewal of prescriptions without visiting doctors will be available for special categories of patients. Linking HealthNorway to the e-prescription platform has been technically implemented and the initial functionality offered (prescription viewing) has been swiftly and successfully launched as it does not challenge the existing healthcare workflows. More work is required for prescription renewals for which a pilot is planned within 2014.

<b>Table 2. Examples of Exploiting Latent Capabilities of Pre-existing Information Infrastructures</b>		
Opportunity Identified	Expected Impact	Reconfiguration of Established Arrangements Required
MyBook	Facilitation of patient – doctor consultations.	Minimal: existing processes are not affected, light technical requirements.
MyRec	Special categories of patients (e.g. under strict dietary regimes) will have instant feedback in order to adjust their behavior sooner.	Significant: information practices within hospital have to be adjusted, technical coordination required to link to legacy systems.
HealthNorway	Improved convenience for patients.	None: does not affect healthcare practices, technically straightforward. BUT a strong potential to trigger future reconfigurations as patients start using it.

## Discussion and Further Research

The focus of the three cases under study is on how new Web based technologies contribute to the reconfiguration of established sociotechnical arrangements within healthcare. We are examining the attempted reconfigurations mainly from the perspective of healthcare providers looking into the coevolution of systems and organizational settings but we aim to expand our analysis by including also the perspectives of different patient groups. The technologies under study have specific characteristics: they are based on “architectures of participation” in which functionality acts primarily to reach out for users outside healthcare organizations (patients) that were not included in conventional healthcare systems, they offer the possibility of extraordinary malleability (functionality can be altered, extended and rearranged on a regular basis as part of the normal user experience), and they provide a newfound capability to consolidate and (re)combine preexisting functionalities and services (functionality is added not only from scratch but also by content syndication and re-use of existing data services). All these characteristics make them especially suitable for inducing a healthcare shift towards “patient centeredness” and patients’ active involvement in care (co-production of services). Nevertheless, as stipulated in theory and repeatedly proven in practice, when a new artifact is introduced into an established sociotechnical arrangement it triggers unanticipated changes and transformations and the (re)configuration dynamics can be unpredictable. In our research we aim to gain an improved understanding of these reconfiguration dynamics paying attention to associations and interactions between the “old” and the “new”.

The cases under study are intriguing as they provide empirical evidence of the effect of novel technologies (within the Web 2.0 genre) within sensitive and heavily regulated organizational settings (healthcare) that need to address pressing societal challenges. These new technologies have a significant potential to unlock latent capabilities of the existing healthcare information infrastructures but their application has to be congruent with the idiosyncratic nature of healthcare which is characterized by professionalism and volition, personalized service, information and power asymmetries, and time criticality. Our theoretical approach brings a sensitivity to the specificities of technology both on the ‘old’ side and on the ‘new’. However, ANT and the multi-level perspective on large scale technological transitions bring also into attention the multiple negotiations, strategies, and controversies. This remains to be explored in our cases. Further, as of today, we have been able to focus on *configurations that might work* by studying the three cases in their conceptual design and initial development and deployment phases. We cannot yet draw conclusions on the actual destiny of these configurations but we make their journey the object of our study which is framed as a “study of activities rather than accomplishment” (Lawrence et al. 2009).

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