

Original paper

Developing electronic co-operation tools; A case from Norwegian
healthcare

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Abstract:

Background: A lot of countries aim to create electronic co-operational tools in healthcare, but the progress is rather slow.

Objective: The study aim to find out how the authority's financing policy influence the development of electronic co-operational tools within public healthcare

Methods: An interpretative approach is used in this study. 30 semi-structured interviews with vendors, policy makers, and public authorities have been performed. Additionally, extensive document study and participation in 18 workshops concerning information and communication technology (ICT) in Norwegian healthcare have been carried out.

Results: We found that the inter-organisational communication in sectors, like healthcare, which have undergone an independent development of their internal information infrastructure will find it difficult to create electronic services that interconnect the organisations because such connection will imply that the heterogenic structure in all interconnected organisations are affected. The organisations will to a large extent depend on new functionality in existing information systems. The electronic patient record plays a central role in all parts of the healthcare sector and therefore dependence is established to the systems and their vendors.. The Norwegian authorities, who run more than 80% of the healthcare, have not taken extraordinary steps in order to compensate for this – the philosophy is that each healthcare institution should pay for further electronic patient record development. However, co-operational tools are complex due to the number of actors and the way they are intertwined with workflow. The customers are not able to buy a new functionality that is on the drawing table and the electronic patient record vendors are not willing to take the economic risk in developing co-operational tools. Thus, the market mechanisms in the domain are challenged. We also found that public projects in the case at hand, which just finance project management, will lead to money spent on planning and

specification without any further development toward convenience because vendors and user are not willing to spend resources without compensation.

Conclusion: We propose that the authorities take a coordinating role and must be willing to finance this kind of development because the regular market mechanisms do not function sufficiently. It is, however, critical that the coordinating role is achieved together with the actual participation of users. The users must not play the role of consultants, but of deciders.

Keywords: Health Communication, Public policy, Communication Barriers

Introduction

Many studies of healthcare information systems have taken place [1]. Research often focuses on the successes and failures of such systems, concentrating on the actual application without calling attention to the process that led to the design of the system. We believe that the development process (from idea to implemented system) and the incentives that contribute in making innovations, also play important roles in the creation of new information systems, and is therefore equally as important to study as a system in function. This article focuses on issues in the development of electronic co-operational tools that are supposed to allow different organisations to exchange information. Our case is drawn from Norwegian healthcare, but we believe that our analysis can apply to other countries and sectors. We examine the position of the vendors and customers in the healthcare market and the role that authorities' financing policy plays in the development of electronic co-operation systems for healthcare organisations.

Our article proceeds as follows: To better understand authorities' strategies concerning information and communication technology (ICT) issues in healthcare, we describe the philosophy behind neo-liberalism, the widespread political philosophy driving most policy decisions in western countries today. Further we outline the use of ICT in healthcare and how these institutions have built separate information infrastructures. We explain the characteristics of such structures using Information Infrastructure Theory and we deepen our research methods. Further we present the results – a threefold chapter, beginning with a description of the Norwegian healthcare sector and its level of ICT adoption, continuing with two case descriptions and finally explaining the perspective to the vendors, the healthcare users and the authorities. In the discussion we analyze the market within information systems

in healthcare and how the authorities' financing model effects the development of co-operational electronic tools. A conclusion and recommendations rounds off the article.

Healthcare spending, political philosophy and trade regulations

Healthcare plays a central role in today's society. Statistics from the Organisation for Economic Co-operation and Development show that the 34 countries that report to the organisation spent on average 5.8 percent of Gross Domestic Product on public health in 2007 [2]. Public expenditures on health measured as a percentage of total health expenditures range from about 45 % (e.g. the United States) up to more than 80 % (e.g. the Scandinavian countries) [3]. The way that healthcare is organized and financed is often a central issue in election campaigns in democratic countries. As a result, improved electronic co-operation and integration of the healthcare sector have become an essential part of authorities' strategies in Western countries [4-6]. Strategies for streamlining healthcare have differed among Western countries, due to the differing ways in which healthcare is organized and differing approaches to ICT development in the sector. It is however usual that ICT in healthcare is developed and maintained by private actors and in this way represent a vendor category that is not a part of the public ownership [7]. In order to analyze the elements that influence these varying approaches to ICT in healthcare, we will first shed light on the dominant political philosophy in Western states today [8] – namely, neo-liberalism.

Neo-liberalism is a set of economic policies that have become widespread during the last 25 years or so. The American economist Milton Friedman is widely known for laying the foundation of neo-liberal thought [9]. The term 'neo-liberalism' is comprised of two notions, namely "neo" meaning new and "liberal" meaning free from authorities' intervention. Neo-liberalism is characterized by the desire to intensify and expand the market by increasing the number, frequency, repeatability, and formalization of transactions. To obtain this outcome, the market should be based on the free flow of services, goods, manpower, and capital.

Friedman maintained that free markets create the best conditions for democracy; when people have power over their own economic choices, they will require power over those who exercise - state authority as well. The existence of free and autonomous individuals and organizations and a strong private sector with only limited state interference are keys to neo-liberal politics. Neo-liberalism justifies the limitation of authorities' intervention in the market by maintaining that markets are complex and unpredictable, thus making it impossible for the state alone to provide regulatory authority [10].

Political action in neo-liberal government aims to maintain order and security and construct frameworks to shape society. Public properties and services should be run based on market economic principles. Reforms based on this principle have been advanced according to the principle of indirect governance. This means that autonomous organizations have to find ways to adjust their practices in accordance with political expectations. For instance, a public hospital can receive income in the form of grants based on the number of patients it treats. Thus, public hospitals strive to manage themselves effectively and attract patients (or customers in market economic terms).

Neoliberal reforms contain two aspects; privatization and market mechanisms within the public sector [11-13]. Neoliberal reforms in Norway are more characterized by a trend to use market mechanisms within the public sector than privatization [12]. This implies devolution of public organizations and tasks to be run by strengthened efficiency goals at the lowest efficiency level: a New Public Management structure. This favors a decentralized and fragmented system with narrow business goals.

A central aspect of neoliberal reforms in Norway is generally a split between ownership and management, and between infrastructure and management [11]. When public ownership is preserved, management is located to autonomous institutions although within the public sector, but with business efficiency goals within a more narrow local organizational

rationality. This means that central steering is weakened in the sense that the distance between political leadership and implementing unit is longer, and the steering concerns more frames than concrete targets. The neoliberal concept presupposes that this kind of reform makes the whole system more rational and efficient. But it is doubtful if the sum of local efficiency results in fact actively adds up to an improved total efficiency at a higher level.

In the literature of public management reform in a neo-liberal perspective a distinction between different kinds of reform effects is defined, for instance between operational effects, process effects and system effects [14]. Operational effects may be efficiency and productivity. Process effects include service quality, customer satisfaction, administrative culture etc. System effects mean capacity of the political-administrative system, as coordination, innovation etc.

This means that if operational effects are strengthened in a narrow sense, as more weight on business and efficiency goals to make the single local unit more sustainable, other effects are weakened, as customer satisfaction (process effects) and coordination and innovation (system effects) (see also [11, 12]). The reforms may change the actors towards more single-purpose orientation and weakening a multi-purpose orientation. A multi-purpose orientation easier includes interests and goals which are not strictly on line with the main purpose of the organization, single-purpose generates the opposite.

The basic idea in neo-liberalism concerning free flow of services, goods, manpower, and capital is usually not absolute. In practice, several countries co-operate and create internal markets where this free flow principle functions. Comprehensive negotiations result in detailed agreements about trade practices within the internal market and between the internal market and the rest of the market. Regulations and threats of sanctions position the trading

bodies as significant actors. The European Economic Area (EEA) [15] with its European Free Trade Association (EFTA) Court [16] is a prominent example.

Due to the trade agreements that exist in an internal market such as the European Economic Area, customers and vendors have to act within the legislative framework. For instance, if a public organisation wants to buy a product, service, or software, a national request for tenders must be extended when the investment exceeds 60,000 euros, and a request for tenders must be extended to the entire internal European market when the investment exceeds 120,000 euros. Rigid regulations control the whole transaction process between vendors and customers from announcement to signed contract. Thus the regulation itself becomes an obligatory passage point [17]. The tender legislation is intended to ensure the effective use of public funds through cost-effective purchasing, and encourage the development of competitive business.

Information infrastructure in healthcare

In healthcare, the patient record is the key tool for many activities, both medical and mercantile. From a medical perspective, the healthcare provider needs to record relevant information about the patients and is obliged to document diagnoses, interventions, and planned procedures. Similarly, the patient record contains information fundamental to logistics, billing and statistics – which in turn plays a critical role in planning, financial management, and control. The potential for ICT to integrate all this information into a single record has proven highly attractive to policy-makers, promising to improve quality and cut costs, and providing a technological fix to the structural crises of exponentially increasing demand and limited public funding that face most public sector health systems [7]. Several commercial vendors provide electronic patient records. According to Porter [18], good competitors and customers are the key to success for any company in any industry.

Healthcare institutions have build up infrastructures that support their local activity and are typically present in the specter from big hospitals to general practitioners offices [19, 20]. Transforming co-operation routines *between* such institutions from for instance telephone or letters sent by post over to electronic services requires attention to the fundamentally composite nature of these practices. Electronic services must play along with all of the people, processes, procedures, tools, facilities, and technology which exists in the involved institutions and must be able to support the creation, use, transport, storage, and destruction of information.

Information Infrastructure Theory

To analyse topics concerning electronic co-operation between in the healthcare context, we will turn the attention to the information infrastructure theory which Hanseth and Lyytinen [21] define as a shared, evolving, heterogeneous installed base of information technology capabilities among a set of user communities based on open and/or standardized interfaces. Such an information infrastructure, when appropriated by a community of users offers a shared re-source for delivering and using information services in a (set of) community [21]. In the definition, three elements are especially important to highlight:

- *Evolving: Information infrastructures are not “designed”, but evolves continually, as growth and innovation expands it. This means that a co-operation service will be an expansion of the existing infrastructure. Radically changes are not possible to implement in a “big bang”, but will need the time as it requires.*
- *Heterogeneous: Infrastructures consist of different elements; technology, users, organizations, in large networks. A co-operational tool will therefore have aspect that surpasses to a large extent the technological part. The heterogeneity is extraordinary within healthcare. For instance the number of professions/users is overwhelming.*

- *Installed base of information, systems, artifacts, practices, and organizational structures are seldom created from scratch; rather they grow from existing practices. Healthcare has existed for a very long time and during this time the installed based has grown. The installed base exists both within each healthcare unit and within clusters of healthcare unit. (“Unit” can, in this setting, be defined as organization, department, office or similar)*

Creating co-operational services in healthcare strive with the issues that the information infrastructure theory point out. In fact, the co-operational electronic services try to interconnect infrastructures that are established and evolved for years

Contribution and research question

The study contributes with empirical insight into the development of electronic co-operational tools in healthcare. Our article tries to combine two domains that are rarely combined, namely political philosophy and “down to earth” aspects within information systems. We elaborate on how development of co-operational services put both the vendors and customers in a difficult situation and we also point out that the neo-liberalistic policy do not give the authorities the tools they need to stimulate the process. Based on this, we address the following research question: How does the authority’s financing policy influence the development of electronic co-operational tools within healthcare?

Methods

The research questions that we want to answer during this study, is a ”how” kind of questions within a complex area and according to Yin [22] a qualitative approach is recommendable. The interpretative method [23] is used to get a better understanding of the mechanisms influencing the development of electronic co-operation tools in the healthcare sector. The empirical material has been gathered through a longitudinal process that started in

2004 and continues today in Norway. Over this period, the first author has collected empirical knowledge from the following information sources:

- 30 semi-structured interviews with vendors, policy makers, and public authorities. The interviews were conducted by the first author and lasted between approximately 60 and 160 minutes.
- Participation in 18 workshops concerning ICT in Norwegian healthcare.
- Strategic documents and evaluation reports for ICT in Norwegian health care for the period 1997 onwards.
- Project documentation of four national ICT healthcare projects.
- Minutes from parliament
- Texts of speeches by the Minister of Health
- Management documents from the Ministry of Health.
- Minutes from meetings between the Ministry of Health and Regional Health Authorities.

The analysis of the collected material is based on the principle within the hermeneutic that is to understand the totality based on sections and a section based on the totality [24]. The hermeneutic circle entails a continuous fluctuating shifting in understanding between sections and the totality. Every section relates to other sections and to the totality and the section changes and becomes different after we have perceived something in a new way. The totality has changed when the sections got a new meaning. What seemed to be reason for the slow progress within development of co-operational tools, turned out to be something completely else when we had analyzed our material throughout the hermeneutic circle.

The information from the interviews are transcribed and sorted into themes. By combining all informational elements, it has been possible to understand the viewpoints of the different actors and how these viewpoints have affected progress in the field. The perspectives of the users (healthcare personnel that use the information systems), electronic patient record vendors, and authorities are presented in the form of a synthesis statement in the case description in order to help visualize the complex situation.

Due to the long timescale in this study, important events has been placed in a timetable in order to understand the context of different events and how they have interfered with each

other. These events are for instance; reorganisation of hospital sector, new legislations are introduced, new political strategies are published etc.

The first author was formerly a project member in a national project that failed and was terminated in 2009. This background as an insider [25] has given her valuable insight into the processes in question. It has also enabled easier access to key actors with whom it would otherwise have been difficult to make appointments. Nonetheless, throughout the data collection and analysis process, she had to re-examine her own perceptions. After initially ascribing the problems and delays primarily to the vendors, she increasingly realized the challenges were much more complex, involving interests, relationships, and interdependencies between many actors.

The second author has been involved in several research projects on public innovation and policy reforms and has acted as a discussion partner and co-author.

Results: Co-operational ICT in Norwegian healthcare

The following chapter will explain the basic structure of Healthcare in Norway and the adoption of ICT in the sector. Then we present issues concerning service development in the domain and explain how two public projects were run. Finally we present how the users (healthcare personnel), electronic patient record vendors and authorities experience the climate for developing new services.

Healthcare structure

The main actors in clinical healthcare in Norway are hospitals, general practitioners, home care services, and nursing homes. This structure has been stable for several decades. The sector is mainly public, but subject to various ownership and funding structures. General practitioners run private offices; strict regulations govern public refunds. Most general practitioners have been using electronic patient records since the 1990s. Homecare services

and nursing homes are run by municipalities, receiving funding from local authorities. The municipal sector slowly began to use electronic patient records for their patients in the 1990s, first for administrative and then for statistical purposes. In 2002, a reform transferred the responsibility for Norwegian hospitals from the counties to four regional health authorities, centralizing ownership under the Ministry of Health. The reform was intended to make the hospitals more efficient by introducing a business-modeled framework of political control. The reform also set up new management principles for the hospitals based on a decentralized enterprise model. Lack of internally integrated ICT systems in the hospitals was accompanied by a lack of all kinds of other electronic communication such as communication between different hospitals, between general practitioners and hospitals, between the municipality and the hospitals, and so on. The need for communication extended to all the levels of the healthcare system, including authorities (in cases dealing with refunds, applications, submission of statistics, etc.)

Service development

The Norwegian authorities had outlined clear strategies for ICT in the healthcare sector as early as 1997. “Seamless electronic co-operation” was stressed in all strategy documents that the Ministry of Health published. After 2000, electronic referrals, discharge letters, x-ray photos, and other records were sent between actors in the Norwegian healthcare sector, but the scale of this electronic communication was limited compared to expectations. The authorities supported some development activities but did not coordinate them. Over the last few years the Directorate of Health has taken charge of an increasing number of national ICT projects. Three big projects have already started. The following table gives a short introduction to some of the public projects underway in Norway recent years:

Project	Cost [million euro]	Project owner	Time and Status	Goal	Characteristics
ePrescription First version.	60	Directorate of Health	2005 – 2008 Pilot terminated in 2008. Failed.	Establish electronic transmission of prescriptions.	Many actors. One electronic patient record vendor participated. The vendor received 30% funding.
ePrescription Second version	15	Directorate of Health	2008-2011 Ran pilots in 2010. About to be rolled out.	Establish electronic transmission of prescriptions.	Two electronic patient record vendors participated. The vendors received 100 % funding.
Core Health Record	3	Trondheim City Council	2005-2009 Project terminated before any kind of testing.	Create a patient summary available on the Norwegian Health Net.	Many actors. Struggled to involve electronic patient record vendors due to vague requirements. Struggled to get some funding to the electronic patient record vendors.
Elin-K	2	Norwegian Nurses Organisation	2005-2011 Most planned functions have been established. Delayed several years.	Establish electronic communication between Home Care Services and general practitioners and hospitals.	Many actors. About 8 electronic patient record vendors involved. The vendors received about 30 % funding. Continuing project management.
Core Health Record	>15	Directorate of Health	2009-ongoing Prestigious project initiated on political level.	Create a patient summary available on the Norwegian Health Net.	Many actors. Avoiding electronic patient record vendors. Functionality based on ePrescription.

Table 1: Public projects underway in Norway recent years

Development processes

In order to describe the problems a typical project that try to create an inter-organizational service run into, we will in the following describe two project processes. These are the Core Health Record project owned by Trondheim City Council and ePrescription owned by the Directorate of Health. The description focus on four issues: 1) The healthcare needs 2) Project financing 3) Challenging work with requirement specifications 4) Dependence on electronic patient record vendors.

Core Health Record

Trondheim municipality experienced that their professionals in the home care service struggled to gain updated information about the medicine that their nurses administered to their clients, and the city council applied for funding to run a project creating a Core Health Record with the purpose of reducing adverse medicine events and contribute to better resource use in healthcare sector. The aim was to create a co-operational tool that both the

general practitioners and the home care service could use. They got 650,000 euro in founding funds from the Directorate of Health. However, the funding did only include project planning and project management. It did not include funding to any vendor or the users that should do the pilot testing.

The general practitioners are those who are responsible for our clients' medication as long as they are not hospitalized, and our Core Health Record will show the medication that the general practitioners have in their system, together with new prescriptions that other physicians, in the hospital or at the emergency service, have prescribed. In this way our nurses will know what kind of medicine the patients should have. [Project manager]

The project group considered it peremptory to integrate the Core Health Record with the electronic patient records both in the Home Care Sector and the general practitioners. This was considered as critical in order to make a user-friendly service and they meant that the general practitioners' electronic patient record system should be the most significant information source for the information in the Core Health Record.

From a technical point of view, the Core Health Record service should consist of two major elements; 1) a database containing the Core Health Records and 2) read/write functionalities in the electronic patient records in Home Care Sector and general practitioners. Trondheim City put out a limited tender and bought the database based on pre-specified requirements. Basically, the project team wanted to include as few electronic patient record vendors as possible, but felt forced to include all the nine vendors, and to produce a national solution, because funding from Innovation Norway (a public business funding organization) was not available otherwise. However, the electronic patient record vendors wanted to have national specifications on such a service because otherwise would be too risky for them. After

applying for more than one year, the project managed to receive funding – to cover some of the expenses in connection with integration work that the vendors had to carry out.

User workshops and technical workshops were arranged and specifications were further developed. The project was administered by well trained managers, but due to the complexity in the specification work, experts from Norwegian Centre for Informatics in Health and Social Care were hired to run the process. The specification work concerning integration with the electronic patient record was a difficult task and the electronic patient record vendors did not find the specifications suitable:

It is not possible to start some kind of development based on the specifications - we must rewrite the whole damn thing. It is on such a theoretical level that all of it needs to be explained in a practical frame. [Electronic patient record vendor]

None of the electronic patient record vendors started to make integrations in their systems for the Core Health Record because of the poor user specifications that was made and they were not willing to take the economic risk by developing the Core Health Record functionality.

I can't imagine that our doctors will pay anything extra for the Core Health Record [Electronic patient record vendor]

Without any effort from the electronic patient record vendors, the project made no progress and was terminated in 2009 without achieving any kind of testing.

ePrescription

In 2004, the Ministry of Health initiated a project called ePrescription, which stood for electronic prescriptions. The most important argument for this was a regulation that instructed the National Insurance Administration to document all prescriptions handled by the pharmacies. However, implementing electronic prescriptions was also expected to provide

benefits for pharmacies, which could handle prescriptions faster and with fewer errors. The doctors saw the potential for decision support, improved quality, and less time spent on writing prescriptions. The patients could have their prescription distributed to any pharmacy, and the authorities could distribute changes to regulations more efficiently. The project was to be completed in 2009.

The following actors were included in the project: Norwegian Pharmacist's Union, National Insurance Administration (NIA), Norwegian Medical Association (representing physicians) and Norwegian Medicines Agency (NMA), which concerns all information concerning medicine in Norway. The project was managed by the Directorate of Health.

The ePrescription project was established with funding from the parliament of about 30 million euros. From the outset, this 30 million euros project did not intend to fund the electronic patient record vendors for making the electronic prescription functionality as a part of the electronic patient record or grant to the pilot users.

First of all, the authorities wanted an electronic prescription system to document the use of medicine and control the public financing aspect of medicine distribution. In the beginning of the project, the management targeted its efforts toward this end. However, the physicians' representative was dissatisfied with the system that had been outlined, as the physicians' perspective was lacking. The system did not allow for some kind of support during the prescription phase, such as interaction control and product information. Neither was it possible to send orders to the pharmacy for those patients who got their medicine packed in separate single-use doses. The physicians are vital in the prescription process. Without their goodwill, prescriptions would probably still be in a paper-based format, and this would have undermined the concept of substantial electronic cooperation concerning prescriptions.

Another problem was that the three vendors of the hospital-based electronic patient records demanded better requirement specifications before they were willing to develop anything. As a result, the project initiated working groups in the hospitals to work out user requirements for hospitals. It was difficult to launch an initiative and recruit volunteers in large institutions like hospitals, and about two years passed before the working group was able to deliver.

Due to the slow progress in hospital sector, none of the electronic patient record vendors in this sector developed the electronic prescription functionality. Only one electronic patient record vendor for general practitioners developed functionality. The project were able to offer the vendor 175 000 euros – which was about 0.6% of the total project budget. The remaining two vendors were not able to participate because they had recently introduced new electronic patient record systems that needed a great deal of attention and due to capacity problems in the development departments.

The specification process took place with much involvement from doctors in the form of interviews, meetings, and workshops. The electronic patient record vendor participated in much of this work. During this process, the specification was not unambiguous and was changed extensively:

The technical specification of the message we were supposed to get from the Norwegian Medicine Agency was only ten percent OK when we started developing. [...] They had defined classes and stuff that they wanted to use in the message but the message itself was not defined. And there were a lot of changes in the class structure afterwards.

[Electronic patient record vendor]

The Norwegian standardization organization, KITH, was included in the project, yet, a great deal of testing and error detection was necessary in order to communicate seamlessly between the actors. The workload necessary for establishing communication between the

electronic patient record and the rest of the actors, for instance the prescription database, was very time-consuming and several times greater than initially expected.

A pilot test was launched by the Minister of Health in a small municipality in Norway in May 2008. The electronic patient record vendor insisted that it should be postponed for a few months, but this was refused.

Those who manage the [ePrescription] project have obviously decided to keep it on schedule, and this is said in such a way that you understand that there is a lot of prestige in the project – as if there is somebody who will rap them over the knuckles if they don't.

[Profiled health actor]

The electronic patient record system that was integrated with ePrescription was a completely new system, but unfortunately the vendor had not had time to test it sufficiently in-house. The ePrescription was installed just a few days after the installation of the new electronic patient record. This caused even more trouble for the pilot users, who received too much experimental software to test in a busy working day. As a result, the combined functionality offered to users was not good enough and was characterized as a “living hell” in the Norwegian media. The pilot was aborted after only three months. The pilot user claimed to have lost “a considerable” amount of income during the pilot testing.

A new version of the ePrescription was developed and tested in general practitioner's offices in a pilot two years after the first test – this time with much more successful outcome. In the second attempt to create the service, two of the electronic patient record vendors got funding that nearly matched their commitment. This funding was however considered as extraordinary and do not represent a new practice. The service is run as a regular service in 2013, however the hospital sector is still not included.

Perspectives

We will now zoom in on three actors that play significant roles in the case at hand and explain separately how each of the three actors experience the current situation. The three actors are: a customer, an electronic patient record vendor, and an authority representative. The perspectives give and further insight that explains why the actors act as they do. We emphasize that each statement is a synthesis based on interviews with several entities within each actor category.

Electronic patient record vendors' perspective

We run a commercial enterprise – that means that we need to make some money in order to survive and hopefully give our owners some income on the investment they have made in the company. If we are not capable of that, we cannot stay in this business. All our development efforts are based on the needs of our customers who pay for our products in form of a yearly license and support services. They are our most important partners and we hope to keep them happy with our product, ensuring that they do not change suppliers. The challenge of dealing with our customers is that they do not speak with one voice – the wish lists they come up with are infinite and they prioritize their wishes differently. We prioritize improvements by compromising between the number of customers that want a specific improvement, the priority of this improvement among the customers, and the effort required to develop the improvement. However, the most challenging lists of improvements we get are the ones that come from the authorities every year. These lists influence the electronic patient record dramatically. The authorities use information in the electronic patient record for two reasons. Firstly: they use this information as the basis for payments to hospitals and general practitioners. Secondly: they are interested in a variety of statistics, and the electronic patient record is a natural source of that kind of information. We are required to comply with the list

of demands from the authorities. For instance, healthcare institutions are obliged to send a certain amount of information when they send an electronic medical certificate to the authorities. Every time the authorities make a change in the information required, the electronic patient record system must be changed in order to fetch or assemble the necessary information. Our estimations indicate that complying with the requirements advanced by the authorities takes up about 30 percent of our development resources. This is quite a lot when we consider that the authorities do not pay any money in order to get the information they need. In addition to requirements from the authorities and orders and requests from our customers, we get regularly requests from a number of projects in Norway. These projects, most of them public, have a lot of good ideas about new services they want to create in the healthcare sector. As soon as these planned services include some kind of patient information, the electronic patient record becomes a necessary communication object. However, those with the good ideas about new services seldom or never have any money to pay us in order to integrate the service they want to create. We experience this all the time! Well, it is one exception – when the pilot of the first version of ePrescription failed, we got an invitation to participate in the next version and this time we were promised good payment and offered a bonus payment if development was completed before a fixed date. I believe that the Directorate of Health had a bit panic due to the fiasco in the first version. However, the normal situation is that the authorities pay a lot of money to consultants and project groups to run the projects, but they do not pay those who are going to turn the idea into a reality. I find it strange. I wonder how many kilos of paper are produced without achieving any kind of implementation... Another problem with these projects is that they come up with specifications/requirements that are either too vague or quite specific. We have experienced that in both cases – vagueness or specificity – we have to work extensively with these projects in order to understand what they actually mean by their specification. Even once we

get an understandable specification, it is often not possible to implement it in our electronic patient record because it does not fit with the users' workflow. What appears to be an easy job often turns out to be complex and difficult. We have also experienced that the initiatives from different public project groups seem not to be coordinated. The requirements are often so interwoven that they cannot be treated separately. I wish that the authorities could coordinate their healthcare development efforts.

Users' perspective (users in terms of healthcare personnel)

In our workplace, the electronic patient record is the most important ICT tool that we use. This is also applicable in other levels in the Norwegian healthcare system. Almost all information flow between different health organisations concerns patients. Because the healthcare system is divided into levels, the patients are moved between the levels depending on what kind of healthcare they receive. Moving patients include of course moving patient information. This is stored in our electronic patient record, and a seamless electronic information flow is thereby an integral part of our electronic patient record system. We have become very dependent of this record because it contains enormous amounts of patient information and is woven into our work practice. Replace the electronic patient record feels like an insurmountable task! Even general practitioners think twice before changing electronic patient records because of the considerable amount of work required to transfer the most important information from the old system to the new one and additionally, a new system requires a new workflow.

Today, very much patient information between healthcare institutions is on paper or in more "innovative" ways. X-ray photos are for instance transported in taxis between hospitals in our capital! We would like to have electronic seamless communication because we would have avoided a lot of manual typing of information between the systems and we could have a

more efficient exchange of patient information. However, creating new services between health organisations is very difficult task! I know – because I have been part of a group that pre-specified a new service and I must say I felt stupid. It is one thing to discuss how a new service or function should work in principle – but it is very difficult to imagine how it will meld together with the rest of the system. The final specification must be done during real testing, because we do not see the range of the new system before we test it in our setting. There are a lot of public projects going on, but we must limit our involvement, because our patients are our first priority. Some of the services that are on the drawing table are so complex that we understand that it will takes years and years before we see any real results. In that case we find it difficult to get involved. I think that the first time I heard that we were supposed to have electronic prescriptions was more than eight years ago. This service has recently been tested at full scale. It took years and years even though the project was run by the Directorate of Health. Our electronic patient record vendor devoted all their developers for more than a year just to complete the electronic prescription functionality. It was impossible to discuss anything other than prescriptions during that year!

Developing new electronic services has also another important element, and that is the pilot testing. It costs blood, sweat, and tears to be a pilot user. I would prefer not to think about how many hours we have spent during the test period we participated in. You must be mad to say “yes” to tests and experiments like these. The organizations that join this kind of test will experience drops in productivity, that’s for sure. Healthcare institutions that have high efficiency demands cannot participate in such activities, which is sad because they should absolutely influence the ICT tools that they use every day. My impression is that the developers do not understand how we work in practice, so you can’t expect them to create something useful without our involvement. I have been in direct contact with the developer at our electronic patient record vendor, and I can really recommend that kind of cooperation. It

is during the testing of the new functionalities that you really understand how it integrates with your work.

Authorities' perspective

We have worked intensively to create effective ICT for the healthcare sector and our strategy plans have been published regularly since late nineties. During the first years, we drew up the goals and tried to influence the sector by supplying it with a range of financing. We allocated funds of diverse categories. Municipalities and others were encouraged to apply for these funds. The money has mainly been channeled through two organizations: Innovation Norway and the Directorate of Health. Innovation Norway is the Norwegian Government's most important instrument for the innovation and development of Norwegian enterprises and industry. The Directorate of Health is responsible for ensuring that policies are implemented in the healthcare sector, and they administer some money that is intended to stimulate electronic co-operation in the sector. This kind of funding has been largely based on competition, but some national projects have been able to include all the electronic patient record vendors (for general practitioners, municipalities and hospitals) with funding from Innovation Norway. The idea is that the product (applying a function in an existing application) should be attractive to users and will create income in form of new sales and increased license income. We are not willing to pay the electronic patient record vendors to make them develop functionality. The authorities should not be a partner in such trading.

Despite our initiatives, we feel that the development within ICT in healthcare generally happens extremely slowly. The evaluations we have carried out during the last 10 years lead us to conclude that we do not often reach the goals we set – we still have yet to meet goals that we set years and years ago. Due to this concern, we have decided to take charge of more of the ongoing work. The electronic prescription project was the first project that we

managed from the directorate level, and there are more to come. These projects that are established in the directorate need however an approval of the Government, so it is politicians that finally determines the commissioning of these projects. We do not have any unrestricted funds that the healthcare as one complete sector can spend on ICT development.

From our perspective, it looks like the electronic patient record vendors are the weak point in the chain. In fact, all the projects that involve electronic patient record vendors report delays – all of them. We have in fact decided that a new service, the Core Health Record, should not be integrated with the electronic patient record in the initial versions. We cannot rely on the electronic patient record vendors because that will delay our goal of having a new Core Health Record within a few years. We do know that the clinicians will prefer, or even demand, to have the service integrated with their electronic patient records, but for the meantime we plan to avoid this problem area. Principally, we believe that the users of the co-operational tools must play the leading role. They must define for their vendors how their information systems should work, and it is also the users of the systems that should pay for the development of new functionalities. If we just pay the vendors, they will not feel committed to the product they deliver. They will just develop it and leave it, without taking any kind of ongoing responsibility. If the vendors risk a great deal of equity capital, then I believe they will put a lot of effort into the product they are making, which will become attractive for their customers. There are so many vendors that the authorities cannot pay them all. Moreover, we cannot distort the competition among them and most of all - we need to follow the international trading regulations.

Discussion

In the following section we will elaborate how the authorities' financing policies have affected the development process of information systems in the healthcare domain. First, we

will describe the unique position of the electronic patient record in healthcare. Second, we will show how new legislations and big projects run by the authorities shift the focus away from the development of users wishlist. Third, we describe the difficulty of navigating the customer/vendor relationship in the development of co-operational tools. Finally we summarize the effect of neo-liberalism within the focused topic.

The Electronic Patient Record – an item that doesn't “flow freely”

The core idea driving the neoliberal way of thought is that vendors will create a diversity of products and will struggle to satisfy the market. In this way the market will expand and the customers will be able to choose the goods that they prefer at any time. In the following section we will explain why it is so difficult to equate information systems to any ordinary consumer product. It thus presents a challenge to market mechanisms.

In our study, we found that private companies develop and sell the most essential information system in healthcare, namely the electronic patient records. Design issues are a matter of concern between vendors and their customers [18]. The vendors spend a lot of resources in shaping the electronic patient records according to their customers' requests, and new versions are released regularly. The electronic patient record has a fundamental part of the information infrastructure in healthcare institutions. Replacing such a system is resource-intensive because of its heterogeneity [21]. It contains an enormous amount of data and is intertwined with working methods. Changing the electronic patient record in a hospital is a process with significant costs that normally takes years to complete, due to the necessity of transforming data from old to new systems and the organisational changes that the new system causes[26]. Inter-organisational information flow in healthcare is mainly concerning patients. Since each institution has an electronic patient record, exchanging patient information need to be integrated with each record system. Otherwise, this will require extra

work in form of manually transformation of data into the record system. Developing a new service between two or more levels in healthcare will, according to Information Infrastructure Theory, imply a pairing of two (or more) information infrastructures, which further implies that the heterogenic structure in all organisations are affected. This includes such as all electronic patient record vendors that deliver the systems and all the system users in both (all) organisations.

Due to language issues and country-specific regulations and healthcare structure the electronic patient record is a product that is tailored to meet each country's specifications.

Within healthcare this means that a) the electronic patient record is an item that customers seldom replace, b) the electronic patient record is an obligatory passage point when it comes to the interchange of patient information and c) electronic patient record vendors act as gatekeepers in the development of electronic co-operation within healthcare systems.

Our findings may however be transformed into other domain than the healthcare sector.

Electronic co-operation between organisations that have undergone independent development of their internal information infrastructure will most certain meet the same challenges that the healthcare sector has. Such critical information systems, like the electronic patient record, and their vendors will hold a unique position.

Interference from the authorities – clinical issues loose priority

Neo-liberalism emphasizes that customers are powerful market actors and declares that the authorities should not regulate the market because it is complex and unpredictable. We will now show how Norwegian authorities interfere in the electronic patient record market in such a way that customers' requests are given lower priority.

Electronic patient record vendors are regular commercial actors that must run a profit. Income is always one of the most important goals for a commercial actor. Corporate board members will not accept recurring weak annual profits. Thus, electronic patient record vendors must balance payouts in relation to the effort they put into development – both over the short and long term. The long time frame refers mainly to the receipt of license revenues from their customers. Making a product that keeps old customers and attracts new ones therefore becomes crucial. The development department is staffed with the number of developers that the company's income justifies and the number is kept stable. The wish list concerning improvements of electronic patient records is at any moment always much longer than the development department can deal with – it is always a matter of priority. Authorities' interference in the relationships between electronic patient record vendors and their customers has consequences for electronic patient record development – both in terms of functionality and priority. We found that the authorities have two powerful ways of influencing the electronic patient record development: through regulations and through funding. Influence through regulations: The vendor contracts with their healthcare customers oblige them to change the electronic patient record system according to any new regulations introduced by the authorities. Most of the new regulations that are adopted are a result of economic and/or statistics concerns. Thus, the vendors have developers constantly working on regulatory compliance issues. Influence through funding: The authorities can buy the functionalities that they prioritize by contracting vendors, like in the second version of ePrescription. Depending on the degree of funding, the electronic patient record vendors will prioritize the order from the authorities above the wish lists of their customers. The wishlist will not disappear while working on well paid orders from the authorities. In our case we found that the electronic patient record vendors spent more than a year producing the

functionality that such an order demanded. As a result, the wish lists from their customers, containing more basic functionalities, were put on hold.

From the Norwegian Healthcare case we can suggest a more general result: When the authorities interfere in information system development with regulations or well-paid assignments, the vendors' attention is drawn to the authorities' requests at the expense of the customers' requests. By doing so, the authorities interfere with a complex market and act contrary to neoliberal philosophy which further implies that user's requirements are downgraded.

So much planning and so few real outcomes!

Norwegian authorities need, according to the trading agreement with the European Union, to put out on public tenders before procurement surpassing the 60 000 euro limit. Grants to vendors and users for actually developing a new functionality in information systems are not in line with regulations and do not fit into the neo-liberalistic philosophy. We will now show how this impedes progress in establishing electronic co-operation within healthcare systems. Additionally, we will explain how the authorities have tried to initiate the development of co-operational functionalities. This investment actually wasted public money.

From the customers' perspective, we see that purchasing unfinished co-operational functionality is very difficult for the healthcare institutions to do, because it is impossible for them to invest money in something of unknown utility that will take years to develop. They also experience that pilot testing is very time consuming and affects the productivity. The users also describe that preparing requirements of a new co-operational service is extremely difficult because the new service has to fit into their own complex workflow and it is difficult to explain and understand how the new service is supposed to interplay with users in other organizations. The users are aware of the tight coupling between the nature of the co-

operation and how their work is infiltrated with the infrastructure in their job and in this way underpins some of the essence in Information Infrastructure Theory. In sum, users find it difficult to order co-operational services due to weak economic incentives and that these services are extremely difficult to order. Thus, these users are not powerful actors that are able to expand the aforementioned market like the basic philosophy in neo-liberalism assumes. Based on the vendors' perspective we found that they often find that the effort required for development in public projects is much more than initially estimated. Underestimation often results from vague or poorly adapted design requirements. This matches the users' perspective and is a result of the complexity in information infrastructures. When the development of new services or functionalities includes co-operation with other vendors, the oversight of the development phase decreases dramatically. No single vendor has control over the end product. Users do not pay for the new functionality in advance and the some kind of public funding are rarely and insufficient. ePrescription was the only exception. This means that the vendors are supposed to take the economic risk when it comes to development of electronic co-operation within healthcare – a risk that they are not willing to take.

We found that several projects within new electronic collaboration tools in Norwegian healthcare have been financed with public money. What characterizes these projects is that vendors and pilot users are not included in the financing budget. Projects have been established and co-operational tools have been specified. These public projects find that it is extremely difficult to enroll electronic patient record vendors due to the situation described in the previous section. If the vendors do not have reason to believe that the new functionality will bring money to their company, the development will be put on hold. Thus the money invested in public projects will lead to money spent on planning and specification without any development and can in this matter be considered to wasted public money.

The concept of funding public project in order to prepare user specification and then order (or put out on a tender) is in line with the regulations concerning public procurements in the European Economic Area market. However, these procedures are not well suited for procurements that should end up with electronic services between information infrastructures.

Summary - co-operational electronic tools in healthcare

In this article we have focus on the challenge to develop electronic communication between healthcare institutions. This kind of co-operation in the healthcare sector is an expressed goal from the sector itself and the authorities have underlined such strategy in a last 15 years through their strategy documents. Electronic patient record vendors are dependent of satisfied customers and are in this respect positive to inter-organizational electronic information flow as well. All three groups that are focused in this study want to achieve innovation within the current topic but the progress is limited. The discussion has showed the mechanisms that oppose the innovation. If we represent our findings of the effects of the funding policy for innovation within electronic co-operation in Norwegian healthcare, using Pollitt's definition [14], we find the following:

Actor	Operational effects	Process effects	System effects
<u>Electronic patient record vendors:</u>	<i>business efficiency</i>	<i>insufficiently financed</i>	<i>innovation deficit</i>
<u>Healthcare institutions:</u>	<i>high efficiency</i>	<i>difficult participation</i>	<i>innovation unable</i>
<u>Authorities</u>	<i>reduced steering</i>	<i>partly financing</i>	<i>innovation not obtained</i>

Table 2: Effect of neo-liberalistic policy concerning innovation of electronic co-operation tools in Norwegian healthcare.

Developing this kind of electronic communication between separate actors is system innovation across organizational borders. This requires coordination of separate and different activities from a perspective of common goals and interests on a higher level and in a long

term perspective. The new public management and neoliberal reforms have created a system that counterworks such aims. Strengthened weight on operational effects as business efficiency and local sustainability on a decentralized level create negative effects on a processual and system level. The different actors in this case are fenced within their local rationality: health care service institutions are linked to daily activity to fulfill the needs of their clients, the private firms have to fulfill business goals, and the public authorities' steering is restricted to the role of a distant and passive owner, with instruments/incentives adapted to a limited market situation. A main general result is incongruence and distance between the different actors who ought to operate coordinated on a common domain to obtain a common innovation result.

Conclusion

In this study, we found several reasons why there has been little progress in establishing electronic co-operation within Norwegian healthcare – this despite healthcare users and authorities, who pay for more than 80% of healthcare expenses, do want this kind of communication. We found that healthcare institutions have established separated information infrastructures and that co-operational services will in fact be a interconnection of two (or several) information structures. Such interconnection will be a very difficult due to the intertwining between work flow, information system, and organizational issues in each organization. In the healthcare sector, the electronic patient record has a unique position in the information structure, because information and co-operation is centralized to this information system. Essential information systems, like the electronic patient record, will be difficult for customers to switch and are not easily changed to the best available in the market. If public healthcare plans for new co-operational services or functionalities that involve the electronic patient record, the initiatives will be stopped by the vendors of these systems that do not foresee the possibility of their customers (general practitioners, hospitals,

municipalities) paying extra for the service or functionality. However, electronic patient record customers will find it difficult to pre-order something that will take years to develop and to do so without knowing, up front, the user friendliness of the new service /functionality. The authorities, who to a large extent have practice neo-liberalistic principles, have not taken extraordinary steps in order to compensate for this – the philosophy is that the users of electronic patient records should pay for further electronic patient record development. Public projects in the case at hand, which just finance project management, will lead to money spent on planning and specification without any further development toward convenience because vendors and user are not willing to spend resources without compensation.

We found also that the authorities are interfering with the development of functionality in electronic patient records as they have come up with new legislation and in one occasion, paid for development in a project that was ran by the Directorate of Health. In this way, the electronic patient record vendors' attention is drawn to the authorities' requests at the expense of the customers' requests.

Recommendation

To obtain innovation across borders between different and separate actors, two strategies may be discerned: either specific incentives tailored to the specific criteria of the innovation object and its target and inserted externally from higher level, or the system should be reformed to suit a broader set of goals and functions, included the type of innovation needed. Due to the nature in ICT in healthcare, the reform strategy is not suitable because such information infrastructure need to be expanded stepwise [27]. We will therefore recommend the strategy based on incentives tailored to ICT in healthcare. It is, however, critical that the goals are inserted by actual healthcare users. ICT in healthcare is a very complex domain so the users must not play the role of consultants, but of deciders. An improvement would be to:

- Prolong planning and elucidation to implementation
- Expand public financing to cover implementation
- Create a common institutional structure between the group of actors to include them as joint implementators

Limitations

This study has not included issues like standardization, legalization, security and development techniques.

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Conflicts of Interest

There are no conflicts of interest. The article contains reflections concerning prevailing political philosophy in the western part of the world. We will therefore stress that none of the authors are members of a political party or appears as political active.

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Abbreviations

ICT – information and communication technology