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eHEALTH SERVICES AND TECHNOLOGY: CHALLENGES FOR CO-DEVELOPMENT

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Abstract: *The promises of ICT have been poorly redeemed in health care; many projects have failed. This article conceptualizes the co-construction of services and technologies in order to help future practitioners in the field to understand and find solutions to the challenges in ICT-enhanced service change. The conceptualization is created by structuring the findings of a case study with the help of theoretical concepts. The conceptualization then is implemented in another case to study its potential for finding challenges and suggesting solutions. Both cases demonstrate challenges for codevelopment that contributed to poor project outcomes. Participants in eHealth projects need a better understanding of development as the parallel shaping of multiple objects. They need better skills in managing the change process and a better understanding of methods for collaboration throughout the development. The projects would benefit from networking with actors who have adequate understanding of the process as a whole and of methods of codevelopment.*

Keywords: *eHealth, information technology, codevelopment, organizational learning.*

INTRODUCTION

Information and communication technologies (ICTs) have been seen as the current driver of economic development in Western countries (Freeman & Loucã, 2001). Social and health care constitutes an important factor in the national economy of welfare societies. Increases in national spending on health care due to rising demand for services has led governments over the last decade to turn to ICTs in the hope of rationalizing their health policies and improving the efficiency and quality of the services produced. Investments in health technologies are expected to bring benefits also to the societies at large, through enhanced productivity, economic growth, trade expansion, and increased competitiveness (Atun & Fizpatrick, 2005). For the citizens, equality, improvement in the quality of life, and support for disease prevention are promised:

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> eHealth applications have the potential to reduce costs, deliver healthcare services remotely and increase the efficiency of this delivery. Effective integration of eHealth applications and support services could improve citizens' quality of life of by enabling safer independent living and increased social inclusion. … eHealth provides access to health data that can promote healthier lifestyles and prevent disease. (Cabrera, Burgelman, Boden, da Costa, & Rodríguez, 2004 p. iv)

From the perspective of European Union, and using two Finnish studies as examples of European (and worldwide) eHealth development, the strategic, program, and financial steering has been strong for more than 10 years. Finnish national and European Union-level steering have pushed ahead the implementation of information systems and electronic patient data transfer in health care. Many projects have received considerable financing from EU research programs as well as from national sources. In Finland, the municipal autonomy in the development of services has lead to an array of various ICT solutions being adopted in different areas. Yet many projects have not produced anticipated outcomes (Hämäläinen & Hyppönen, 2006). The promises of ICT have been poorly redeemed, and the return on investment for health care organizations that have implemented ICT systems has been modest (Shekelle, Morton, & Keeler, 2006; see also Ministry of Social Affairs and Health, Finland, 2006). Among the difficulties experienced have been problems with the complexity of the implementation environment; a lack of focus on organizational transformation; a misalignment of interests, roles, and communication of social and technical partners, together with poor management of the entity of sociotechnical change; and a lack of usability and utility of the implemented technologies (see Clancy, 2005; Clarke, Hartswood, Procter, & Rouncefield, 2001; England, Stewart, & Walker, 2000; Gregory, 2000; Schoech, 2002).

McLaughlin, Rosen, Skinner, and Webster (1999) have concluded that technologies too often have been developed unconnected to the practices they were intended to improve. Work processes and technologies have been developed largely across different organizations having different professional orientations and interests, with actors using their field-specific tools, including concepts and models, to describe change (Ehn, 1992; Gregory, 2000; Kaulio, Karlsson, Rydenbrink, Dahlman, & Hallgren, 1995; Miettinen, Hyysalo, Lehenkari, & Hasu, 2003; Wood 1998). McLaughlin et al. (1999) have suggested a reason for this: a too simplistic notion of the interrelation of technology and work practices (see also Hyysalo, 2004).

There are similar experiences in the implementation of ICTs in health care in Finland. A ministry-led pilot project, the Macropilot, launched a nationwide 2-year implementation of the National eHealth Strategy in 1998 through numerous eHealth projects receiving approximately €4.5 million of national funding. The projects did not succeed in either developing eServices or generating new product development in IT companies. Cooperation between the social and health care services and technology providers remained weak (Ohtonen, 2002). Implementation of the National eHealth Strategy continued through new eHealth projects following an act issued in 2000 (laki sosiaali- ja terveydenhuollon saumattoman palveluketjun kokeilusta 22.9.2000/811; The Act on Experiments with Seamless Service Chains). The act extended the development of new health IT solutions and eHealth services to the whole country. A nationwide study was conducted in 2005, assessing the outcomes of these projects with respect to national goals (Hyppönen, Hämäläinen, Pajukoski, & Tenhunen, 2005). The results showed that the development had focused on

technologies, while little attention had been paid to re-engineering work processes. An in-depth case study analyzing the development of seamless elderly care services in one municipality revealed that there had been two major technology and 10 process re-engineering projects in 6 years, with little cooperation among them (Hyppönen, Saalasti-Koskinen, Perälä, & Saarikalle, 2005).

Those involved in these projects have done their own postmortems and learned important lessons. But the question remains regarding how to convince those who have not participated to develop systems in a more appropriate way. This article aims to produce a conceptualization of the co-construction of services and technologies that could help future practitioners in the field to understand the challenges in ICT-enhanced service change in order to find solutions to these challenges. This is done by a) conducting an in-depth analysis of an entire local eHealth innovation process from idea generation to an established eService provision, b) structuring the case study findings with the help of theoretical concepts from previous studies, c) applying the conceptualization in another case study (an ongoing project) to study its potential in the context of formative evaluation, that is, assessing the baseline status and the process of development and feeding the results back to the project managers for corrective action, and d) drawing conclusions on the challenges found in the projects with the help of the conceptualization, and discussing possible solutions to them.

CONCEPTS AND METHODOLOGY

Methodology and Methods of the Study

More rich, domain-specific accounts of both the technology and the organizational/economic environment in which it is implemented have been called for in innovation and technology assessment studies (Miettinen, 2006; Shekelle et al., 2006). In line with these demands, this study consists of two theoretically informed in-depth case studies. The empirical findings from Case I were reflected against existing theoretical conceptualizations (elaborated in the next section) and discussed with Case I participants to create an abstraction of the findings. This conceptualization was further used to abstract the findings from Case II. The findings from Case II were then discussed with the Case II project participants to help refine the conceptualization as well as to support the ongoing development project. The research design is illustrated in Figure 1.

The interrelation between the change of work practices and the development and implementation of technology is complex. This complexity sets the requirements for the data collection as well as for conceptual tools within which to structure the data. Some conceptual tools were found in the existing literature, but an existing, ready-made theoretical framework covering the entire sociotechnical innovation process was not found. Abandoning the existing theoretical concepts and adopting a purely inductive methodology—for example, phenomenography or grounded theory—was not an option since the study did not start purely from the empirical data: Theories were used in the data collection and as well as in the analysis. The same applied for purely deductive methodologies. According to Grönfors (1985), a deductive approach can make it difficult to interpret unexpected data. The methodology used in

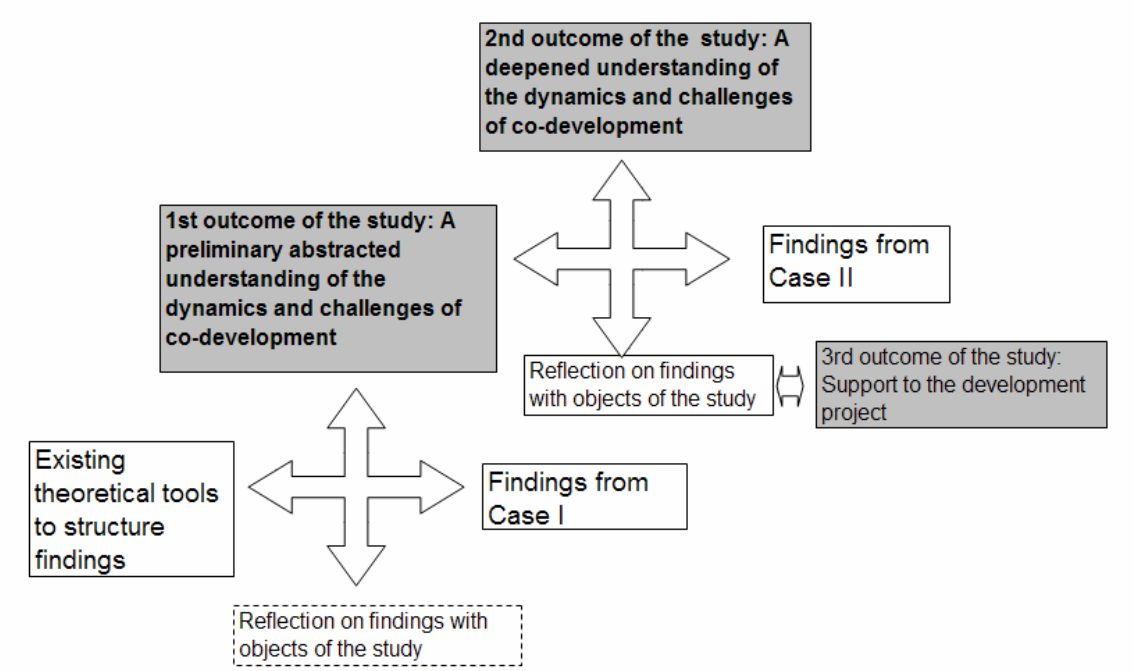

Figure 1. The design of the study. Findings from Case Study I were structured with help of the existing theoretical tools. The structured results were discussed with the informants. The outcome was a preliminary abstracted understanding of the dynamics and challenges of codevelopment of eServices and technologies in Case I. This understanding was further exploited to structure findings from Case Study II. The structured findings from Case II were discussed with the project participants and offered to the project in order to support the project work. The validated findings were also used to deepen the preliminary understanding of the dynamics and challenges of codevelopment of eServices and technologies.

this study can thus best be described as *abductive* (Grönfors, 1985; see also Thagard & Shelley, 1997): Some theoretical concepts and models were used as a sensitizing framework to direct data collection and analysis. The data collection and analysis proceeded as a dialogue between the concepts and empirical data, in which both affected each other.

Case Study I was partly retrospective in nature. The data about the origins of the innovation in 1994 and 1995, its construction in 1996, and its implementation in 1997 and 1998 were historical, consisting of documents (project plans, minutes, reports, letters, and other documents) and after-the-fact interviews with the key stakeholders in the project and service networks. Historical data were collected on the baseline status and the needs of the service activity, as well as the development of the service during the technology project. The historical data about the technology project focused on the innovators, idea generation, enrollment, activities, actions and operations of various stakeholders, the roles and cooperation between them, the tools used, and the different viewpoints of the development activity and disruptions to it. The development project had ended 2 years prior to the data collection for this study, which started in the year 2000. The first data collected in 2000 were empirical, focusing on the established use of the innovative, award-winning eService model that had been developed and piloted during the project. Historical data were collected after

this to study the needs for the innovation and its construction. Empirical data (i.e., data about the current eService model) included ethnographic participatory observation of the current and ongoing application of the eService, artifacts, and interviews with service providers and clients. Altogether, the key data in Case Study I consisted of historical interviews with 11 people, ethnographic interviews with 23 people, and 140 selected historical documents. The ethnographic data consisted of notes from one week of participatory observation, during which key events of the service provision in action were also videotaped for detailed analysis, and of artifacts (e.g., shopping lists and Internet shop interface printouts).

Case Study II was an ongoing project when the data collection started in 2004. The new tools or practices had not yet been implemented into the service practice when the study was initiated. Videotaped ethnographic observations were conducted of the preimplementation prescribing service status in three out of the four health care clinics that were to pilot the system (a North-Karelian central hospital, a Turku health center, and a Kotka occupational health unit), as well as two dispensing pharmacies, one cooperating with the North-Karelian and one with Kotka clinic. In the preimplementation stage, 16 workers (an equal number of doctors and pharmacists) were observed for 3 days while they were prescribing or dispensing medication, and then interviewed (see rapid ethnography, Bauersfeld & Halgen, 1996). Postimplementation observation of the practices and related interviews with the same individuals were conducted in 2005 in the first pilot organization that had managed to implement the integrated system (North-Karelia hospital) and in 2006 in the second area that implemented the system (Kotka occupational health unit and a pharmacy). Due to the scale of the project (a national pilot), questionnaires were also used to study the pre- and postimplementation service status and development needs in the pilot areas. The questionnaires were directed to doctors and pharmacists who worked in the piloting organizations and were selected to participate in the pilot. Altogether 74 questionnaires were sent in the preimplementation stage (response rate 50%) and 94 in postimplementation stage (response rate 50%). Also in 2006, a patient questionnaire was sent for all those patients in the national database who had been dispensed an electronic prescription (94 patients, of whom 54% responded).

Data about the origins of the innovation in Case II and the innovation construction process were collected from 132 project documents and 28 interviews with the key participants in the project. These data were partially historical, reaching back to the year 1999. Participant observation was conducted on the decision-making processes in the monthly project group meetings during 2004 and 2005. The analysis of needs of the network of actors participating in the service provision and contradictions found between the service and rules development activities were used as monthly feedback for the project group to be discussed and used in the decision making (see Westbrook & Gosling, 2002, p. 8). The initial analysis of the data in both cases was inductive in nature (open coding). Theoretical concepts were used in the second coding round (axial coding) to structure the analysis.

Theoretical Tools for Structuring the Change

Research on innovation and sociotechnical change has been conducted in various fields, including engineering, organizational sciences, history, economics, sociology, and psychology. Grudin (1990) has studied the evolution of the focus of information systems design since the 1950s. He found a continuous outward movement in the focus of the studies

from inside the computer to the interaction with the user (interface design) and work practices in organizational contexts. This expansion has required the simultaneous expansion of the expertise of the practitioners. Grudin (1990) shows the evolution of the disciplines involved from electrical engineering, to computer science, to human factors, to cognitive and social sciences and anthropology. Research methods have evolved from laboratory experiments to ethnographic studies to contextual participatory methods (see also Bødker, Kensing, & Simonsen, 2004; Ehn, 1992; Greenbaum & Kyng, 1991; Kyng, 1998).

The demand for multidisciplinary research has been recognized also in the studies on organizational development. According to Eason, Harker, & Olphert (1996), it is widely accepted that effectively implementing new technology in organizations requires the integration of both technical and social developments within the system, as well as the participation of key stakeholders in this change. The high failure rate of ICT applications in organizations is mostly due to a lack of attention to organizational issues. In their review of the available methods for studying sociotechnical system opportunities early in the design process, these authors concluded, "There is a paucity of methods to help in creation of integrated solutions… [and] "the examination of organizational and human issues must take place before technical investments are made, if they are to have real influence over the design of the technical system" (Eason et al., 1996, p. 402).

In order to conceptualize the entity of the sociotechnical development in Case Study I, theoretical concepts were needed that have been used in studies of technology as well as social change. This search led to studies using *cultural-historical activity theory* (AT). Three AT-based concepts or models were used in this study as the main heuristic tools to structure and conceptualize the findings: a) network of activity systems, b) multivocality and contradiction, and c) cycle of expansive learning. AT has been used to explore *networks of interacting activity systems* (Engeström & Escalante, 1996). Social and health care services are typically produced in collaboration with the client and often several institutions' professionals. This network is directly influenced by the financiers (e.g., the municipality), tools providers (research and technology organizations), and rules providers (e.g., legislators). In this study, the concept of a network of activity systems was used to conceptualize the activity and interrelation of actors participating in the production and development of the service to be developed within the eHealth project. Figure 2 shows the network of activity systems modified from Engeström (1987, p. 89; 1995, p. 54).

An *activity system* has been used to conceptualize the activity of each of the (institutional) actors participating in the network. AT sees human activity as a practice mediated by culturally evolved tools and artifacts. Human activity is also seen as a social, hierarchical practice, consisting of object-oriented activity of a community and goal-oriented actions and operations of individuals. Tasks (actions), divided among individuals, support the overall objectives of activity. Activity is influenced by different, culturally evolving rules and norms. When any of the elements changes (e.g., new tools are introduced into an activity system), this can impact other elements and processes of the activity (Engeström, 1987, 1995).

The concepts of *multivocality* and *contradiction* were used to conceptualize the needs for development of the networked service depicted in Figure 2. According to AT, all stakeholders bring with them their voice, that is, their interests and conceptions of the object

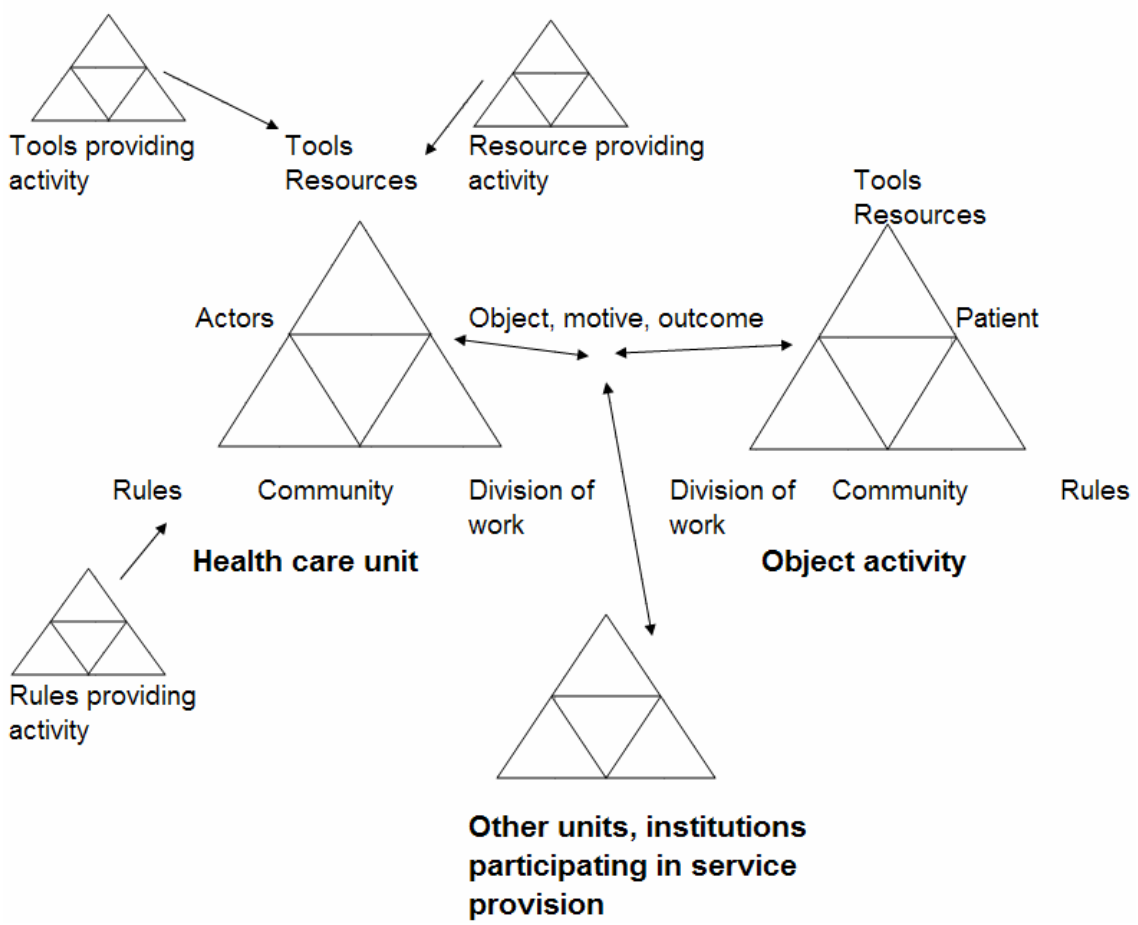

Figure 2. A network of activity systems as a conceptualization of the service activity to be developed (based on Engeström 1987, p. 78, 88; Engeström 1995 p. 47, 54, 55; used with permission). The health care unit is the central activity system, the viewpoint of which is taken to study the development. The actors are the workers providing the service to be studied. The object activity consists of the activity systems of the clients needing the care and medical services. The object of the activity is the common target of the actors' actions (e.g. a client's health problem) and the motive is why the activity is performed (e.g. to cure or prevent citizen's health problems). Different tools (concepts, artifacts, methods, and principles) are used by the actors to mediate interaction between themselves and their object, within the resources allocated for the service provision. The rules mediate the interaction between the community and the actors, and the division of work mediates the interaction between the community and the object. The other units (or, in fact, organizations) participating in the service are those with which the health care unit cooperates in order to work on the same object. These organizations can be depicted as similar activity systems with their own actors, tools, rules, communities and motives.

and its development in the network. The concept of multivocality therefore helps in directing attention to the different actors' varying interests, motives, and tools (including concrete technologies, knowledge, resources, and languages) for shaping the object (see also Miettinen 1999; Miettinen et al., 2003). According to AT, the transformation or change of an activity is triggered by contradictions. In activity-theoretical analyses, contradictions can refer to disruptions within or between the elements of an activity system, between whole activity

systems, or between an old and new service activity. Mismatches between the different voices are examples of manifestations of contradictions between activity systems in the network (Engeström, 1987).

A model depicting the gradual development of this network and its object/outcome through identifying and solving the contradictions through the *cycle of expansive learning* has been used within developmental work research to analyze and support the change (Engeström, 1987, p. 189; Engeström, 1995, p. 92). The model (see Figure 3) provided a conceptualization of the change process for this study. The development starts by an analysis of the existing model of (service) activity, which is conceptualized with help of the network of activity systems. The development is triggered by needs, the analysis of which is conceptualized by using the concepts of multivocality and contradiction. The cycle proceeds through the search for solutions to meet the needs and constructing a new model of (service) activity and tools for it. The new model of activity and its tools are conceptualized with help of the (changed) *network of activity systems*. These are implemented in practice. The final phase of the cycle is establishing and evaluation of the new model and its tools by comparing the old and new models of activity (see also Hyppönen, 2004).

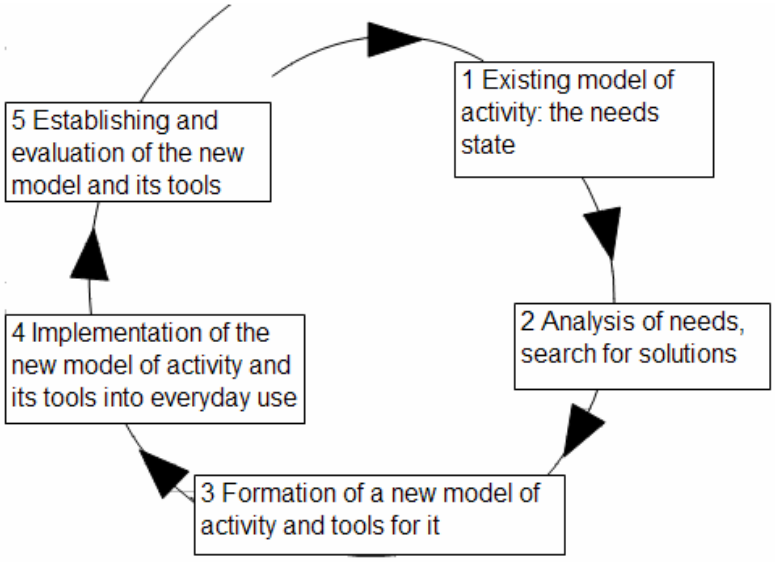

Figure 3. The model of expansive learning (based on Engeström 1987, 189; Engeström 1995, 92, 128). The line with arrows illustrates an open development and learning cycle of an activity (see Figure 2). The cycle leads to a qualitative change in the activity. The development is triggered by problems and challenges experienced by the actors in the current or existing service activity. (Box 1 illustrates this first phase of development.) Actors need to analyze the key conflicts in their activity in order to find solutions to them (Box 2). After this, a new model of activity and tools to support it can be constructed (Box 3). A new model is not just a set of corrections, but a qualitatively new way of defining the object and motive of work and related tools and division of work. The implementation and incorporation of the new practices into everyday use is depicted in Box 4. In this phase there can be contradictions between the old and new model of activity (change resistance), which is overcome by solving the contradictions. Box 5 illustrates transition into a phase, where the new practices are established into use and evaluated, leading gradually to the next cycle of development.

Activity theory has been used as a framework for enhancing design practices in computer-supported collective work (CSCW; Kling 1991; Kuutti & Arvonen, 1992; Redmiles, 2002), as well as the related fields of human-computer interaction (HCI), and information systems (IS; Bertelsen & Bødker, 2000; Bødker, 1991; Kuutti, 1991; 1995; Nardi, 1996). Use in social studies of health care technologies include studies of, for example, electronic health records (Gregory, 2000), diabetes programs (Hyysalo & Lehenkari, 2003), a neuromagnetometer (Hasu, 2001), and an automatic health care alarm system (Hyysalo, 2004). Applications in developmental work research and expansive learning include studies of the development of primary care work (Launis, Simoila, Saarelma, Punamäki, & Engeström, 1991; Saarelma, Launis, & Simoila 1994), specialized care (Kajamaa, 2005), occupational health (Engeström, 2003), and the development of joint work practices between primary and specialized care (Engeström, Engeström, & Kerosuo, 2003; Vähäaho, 1999).

Embedded in the model of expansive learning is an idea that the development is triggered by contradictions in the network and it proceeds by solving these problems. However, in both cases analyzed in this study, the actors who generated the ideas for (service) development and the new eService concepts as solutions to problems in the service activity were mainly different from those participating in provision of the service developed. Thus the (ICT) project networks were largely external to and independent of the service provider's networks (the networks of the potential users of the technologies). In either case, further understanding the interrelations between these two networks was needed. It has been suggested that the network conceptualizations of actor network theory (ANT) could be used to expand the AT network conceptualizations (Miettinen, 1999; see also Lehenkari, 2006). Studies applying ANT and AT in the analysis of innovations (Hasu, 2001; Hyysalo, 2004; Miettinen, 1999) offered a basis for reflection and further elaboration of the conceptual framework. For this study, Callon's ideas on the co-construction of the object and actor network with the concepts of innovator, enrollment, and translation of interests (Callon, 1986a, 1986b; Law & Callon, 1992) provided useful heuristic tools. These concepts helped to detect the shifts of control between the service provider's network and the ICT project network in both of the cases in this study during the different phases of development.

There are potential conceptual conflicts when combining AT and ANT, which Miettinen (1998) has analyzed. Both are interested in the simultaneous development process of an artifact and a network of actors connected to it: the shaping and being shaped of the social and material. However, ANT has adopted a principle of generalized symmetry in order to surpass the juxtaposition between the subject and object. The notion of the actor in ANT refers thus to both humans and artifacts (Callon 1986a). In this respect, the present study adopted an activity-theoretical approach. In AT, the subjects (humans) and the objects (technology, the law, etc.) do not possess a symmetrical position. This follows from a notion of object-oriented historically developing activity, which is mediated by cultural signs, tools and artifacts (Vygotsky, 1979, p. 54). The orientation of the activity of subjects (human actors) towards an object to be shaped is the key principle.

The empirical findings of Case Study I and II are presented in the next sections. The different phases of the development are numbered in the text with the headings "Phase 1" to "Phase 4" to follow the phases of expansive learning depicted in Figure 3.

CASE STUDY I: CONSTRUCTION OF A MODEL FOR STUDYING CODEVELOPMENT OF SERVICE AND TECHNOLOGY

The objectives of Case Study 1 were a) to provide an in-depth study of a sociotechnical innovation process in health care from the idea generation phase through to established use, and b) to structure the findings with help of conceptual tools in order to generate a conceptualization of the process of codevelopment of the eHealth service and technology.

An eHealth project was selected that had developed award-winning Internet-based service innovations (Internet shopping and Internet counseling) for home-care in one Social and Health Care Office in the Helsinki area. The project was part of a larger EU Telematics Applications Programme project (1994-1998). The aim of the Finnish subproject was to demonstrate the applicability of information and communication technologies in home-care and home nursing services. The project was completed 2 years before my study was initiated in 2000, which made the longer-term impacts visible for study and analysis. In the following, I analyze the development following the phases in the model of expansive learning (Figure 3).

Findings

Phase 1: The Needs State

In 1994, two researchers in the social and health care research institute began to innovate an ICT project, which later became a subproject in an EU project. Both individuals had expertise in medical informatics and service accessibility, which they wanted to exploit. They shared an interest in seeing how modern information technologies could be used to develop home-care services, as well as an interest in participating in EU-supported activities. Early on, they viewed Internet shopping as one possible application. The researchers enrolled the city planning office to obtain the municipality's support required for joining an EU proposal with a national substudy. The city planning office also was interested in the possibilities of the Internet and joined the researchers in drafting a project plan. The city's participating officer saw the project as an opportunity to use modern technology to improve the image of a particular city suburb that was developing into a problematic neighborhood. The city planning office had good cooperation with a teleoperator, a software company, and a hardware supplier, for whom the city was a big client. These technical partners joined the network in order to serve an established client. They also had products that they wanted to sell with help of the project. The city planning office finally offered the project to the social services office at the finalizing stage of preparing the project proposal. The social services office manager agreed, becoming the representative of the service network in the ICT project group. The office manager saw the ICT project as an opportunity to reallocate part of the increasing workload of the home-care workers to private subcontractors. To care for an increasing number of clients, the office had received some extra funding (resources) from the municipality for buying services from subcontractors, but not for increasing their own service production. Altogether, the office listed seven services where ICTs could be implemented, of which all but two were abandoned prior to or soon after the clinical trials started. Of these, the eShopping application addressed a specific problem: that of caring for an increasing

number of clients without increasing the number of agency's staff. The needs states for the other ICT applications were not so well defined, but rather were motivated by a general wish to see how ICTs could be applied in home care. Home-care shopping and home-care counseling were the only two services where the electronic applications remained in use after the project ended. The development of the eShopping service is addressed here in more detail.

Phase 2: Analysis of the Needs, Search for Solutions

The preimplementation network of the service activity systems (see Figure 2) consisted of three primary actors: the home-care workers employed by the social services office, their clients, and the local shops. The home-care worker made the grocery list together with the client, or picked it up from the client's home, and purchased the groceries. Sometimes the worker went to the shop with the client as part of the rehabilitation. Prior to implementing the Internet shopping application, tools used in this activity were the shop advertisements, workers' knowledge of shop products and clients' preferences, and the handwritten grocery lists. According to a client survey, home-care clients were very satisfied with the assistance they received from the social services office in terms of grocery shopping.

The home-care workers, clients, and local shopkeepers had not participated in planning of the project. The interests of some of the actors (the users) or inherent contradictions of the shopping assistance service were not analyzed to inform the decision-making about the solutions. No alternative solutions were sought for the problems experienced by the office manager. A year after the project had started, and when the Internet shop application was nearly ready to be implemented, it was calculated that each shop visit took an average of 1.5 hours of a worker's time, which added up to two person-years at the office level. If two years of work time could be saved with help of ICT, the saved time could be allocated for the care of several new clients. There was still no knowledge at that time about the competence and motivation of the clients and shops to implement the solution.

Phase 3: Creation of a New eService Model and Implementation Tools

The software provider in the ICT project had an Internet shopping application that the project planners believed local shops would be eager to implement as part of improving their service. In the eService model envisioned by the ICT project group, home-care clients would order groceries directly from the shop via the Internet from their home computers, and the shop would deliver the order to the client. The model would eliminate up to two person-years' time of the home-care workers currently used in manually providing such a service. The hardware provider would provide the equipment and the teleoperator the network connection. The project network operated for nearly a year to develop the technology for this envisioned service model.

When implementing the model, it became evident in practice that the envisioned service model in fact could not be realized: The shops were not interested in selling their products over the Internet and the clients, and even some home-care workers, were unable to use the technology. After many difficulties, the social services office managed to negotiate a partial deal with one shopkeeper. The store was willing to give its product data to the Web service maintained by the software provider. However, the shop did not want to receive shopping lists via the Internet nor to collect and deliver the groceries. The social services office

enrolled a delivery company to collect and deliver groceries. Yet, this delivery company did not want to receive the lists directly from the clients by phone or the Internet. Many clients were not willing or able to use the computer or Internet for ordering groceries. The only option left for the social services office was to designate one of the home-care workers to receive clients' shopping lists by phone, enter the data into the Web shopping application on behalf of the clients, and send the information over the Internet to the delivery company.

Phase 4: Implementation and Diffusion of the New eService Model

Receiving and mediating clients' shopping lists became a major part of one home-care worker's work. The Web shopping application was not designed to be used over the telephone in real time since it had thousands of products with poor search functions. The office worker ended up writing the clients' lists by hand on paper. After the phone call, she entered the data into the Web application. The service providers tried to make the best of the technologies, but the real needs of the actors participating in the eService provision did not coincide with features of the technologies. Feedback from the service providers to develop the software came so late that new developments could not be started within the project time frame. At the end of the project, the software company did not continue the innovation process in cooperation with service providers, due to the poor outlook on getting a return on their investments. They had no interest in redesigning the application. The shop had no interest in updating the product list, and the social services office had no interest in the double work. In spite of much effort put in the development, the social services office had to give up on the Internet application about a year after the project ended. After this, clients' telephone-generated shopping lists were written by hand directly onto fax sheets, and then faxed to the delivery company. The Internet technology was abandoned, but the service model that was created to use it remained. The new eService model did not spread in the organization.

Phase 5: Establishing and Evaluating the New Model of Activity and Its Tools

The fax-based shopping model ultimately established in the social services office did help to outsource part of the home care workers work to the delivery company, but other objectives and expectations set for the project were not met: to rationalize work, cut costs, and improve the quality of the service. From the social services office perspective, the idea of saving two person-years had turned into using one person-year on the phone and securing the other person-year from the private delivery company. By reducing the frequency of the service from 5 to 2 days per week, further resources could be saved and used for the care of new clients. The new IT-based service model revealed further needs to develop other aspects of the shopping service, such as tools and rules for assessing clients' needs and calculating service costs. These impacts had not been anticipated.

From the perspective of home-care clients, the service quality was reduced radically. Apart from the shopping frequency being reduced from daily to two times per week, the transferring of shopping lists via phone and hand-written faxes caused many misunderstandings. Clients' knowledge about the shop products diminished when they or their caregivers no longer visited the shop. Many clients also had difficulties in using the phone to order the groceries. The service operated inflexibly, serving primarily the needs of the

delivery company (to do the round as quickly as possible to make the service economically feasible). Clients had difficulties in matching the arrival time of groceries, the arrival time of the home-care worker, the timetables of other services, and their own everyday schedules.

Case I Conclusions: Codevelopment of Service and Technology Structured with the Conceptual Tools

Case Study I illustrated the ill fate of a technology-led implementation project. The service-providing network and the technology-oriented ICT project network remained mainly as two separate networks, with distinct objects of development and little collaboration. One cycle of expansive learning (see Figure 3) did not seem sufficient to depict the totality of the development. As depicted in Figure 4, two cycles were required: one depicting the development cycle of the shopping service (the larger cycle) and another one depicting the development cycle of the electronic application planned to be implemented in the service (the smaller). How these two cycles and actors within them interacted—or, rather, did not interact—became the main focus of interest in Case Study I.

The (ICT) project network that focused on developing the electronic applications was in control of the development until it was time to implement the eService application. The control is depicted by a solid line in the ICT applications development cycle. A broken line in the service development cycle in phases 1-3.1 illustrates the lack of participation of the actors in the service-providing network in shaping the ICTs and the eService concept to be implemented. When the implementation efforts failed, the control shifted towards the service network. The networks cooperated for a short time in order to create a solution that could be piloted. This is depicted by the solid lines of both cycles between phases 3.1-3.2. Once the solution had been created, the main control shifted to the service network (solid line). The project network trained the users, but the service network was left to incorporate the application into everyday use, develop alternative ways to make best of it, and give feedback to the project network. The project network did not update the technology to accommodate for the use realities (broken line), and the project cycle ended without the created technologies becoming established into use.

The lack of adequate collaboration early in the project and again in the implementation phase made it difficult for the networks to learn from each other. The ICT project network acted as the innovator. In Phase 1, the project network's view about the actual service activity and the needs within remained vague. Analysis of the old model of service provision was not done to provide the baseline information about the system and preconditions for its change. In Phase 2, an analysis of the actual contradictions in the service provision to find the development needs was not performed. The conflicting interests and needs were not found to inform solutions to be selected. The project network's view of the problems, needs, and conceptions of the different users was dictated by the technology available through the technical partners rather than being user focused. The lack of information exchange between the networks and the partially contradicting views about the needs and solutions within the service network (of which the project network was not aware until late in the development) is illustrated with the lightning arrows in Phases 1 and 2. The construction of the new eService model and technical solutions to support it was done by the project network. It was not grounded

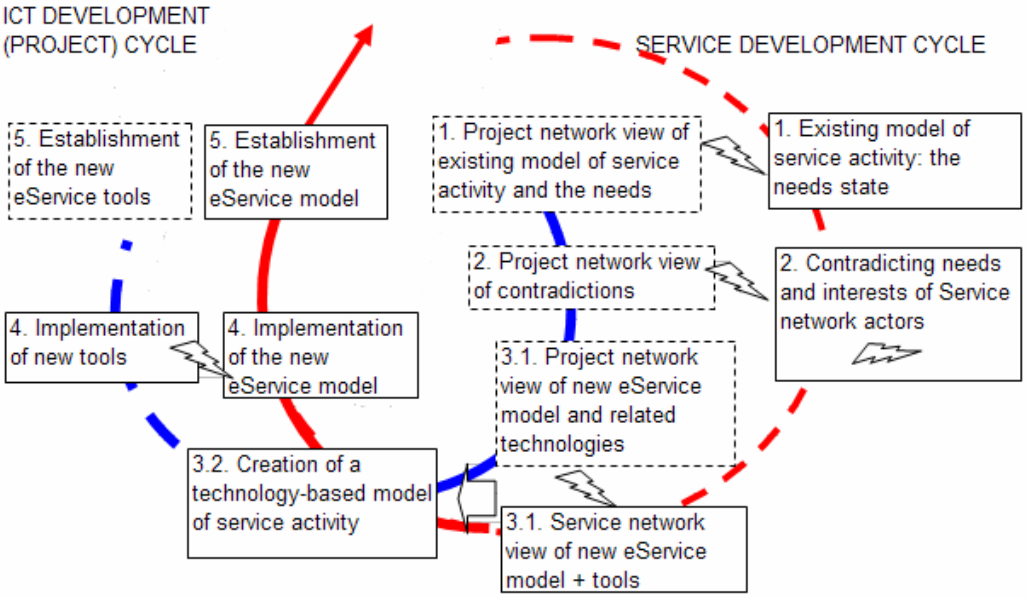

Figure 4. Codevelopment of services and technology in Case I, structured with help of the model of expansive learning (cf. Figure 3). The larger cycle (red) depicts the phases of development and expansive learning within the shopping assistance service. The key actors were home care staff, clients, and local shops. The smaller cycle (blue) depicts the phases of development of the new tools for the shopping assistance and expansive learning within the tools developers (the ICT project group). This group consisted of technology providers, researchers, the city council, and the manager of the social services office. The project group acted as innovators and leaders of the development. In each of the phases, there were problems the collaboration between the two groups of actors due to inadequate information transfer between them, depicted by the lightning arrows. Weak influence of the service providers on the tools development in phases 1-3.1 is illustrated as a broken line of the service development cycle during these phases. Weak input of the tools developers in Phase 4 (lack of updating and further developing the tools) is illustrated as a broken line of the ICT development cycle during these phases. Abandoning the ICT-based tools in the service is depicted by ending of the ICT development cycle before Phase 5.

in the needs, interests, and possibilities of the service network (the network of users). This became evident only when the project network model was to be implemented. The mismatch between the project network view and the view of the user network (of which the project was not aware at this phase) is illustrated by the lightning arrow in Phase 3.1. When the project network became aware of the mismatch, a new eService model was constructed with help of the service network. The eService model was redesigned, but the technology was not: It had been developed for the previous, unrealistic eService model. The mismatch between the piloted eService model and the technology implemented was realized during the piloting by the service providers. The mismatch is represented by a lightning arrow in Phase 4. The feedback was given to the technology providers, but they had no interest in updating the technology when the pilot ended, whereby it was abandoned. This is represented by the broken line at the end of the technology development cycle. An eService model was established, but the Internet technology designed to support it was not.

Prior studies have shown the need for cooperation of all network actors at early stages: Technology providers or IT researchers are not experts on everyday service provisions, with

their problems and challenges, nor on the planning and development of social and health care services. These are not the technology providers' core tasks. Service providers are not experts in the opportunities that technologies can offer (see also Eason et al., 1996; Schoech, 2002). Better cooperative planning between the project network and the service network from the start could have helped the project to ground the development of IT to the actual needs of the service network. Using effective methods for collaboration in analyzing user needs and selecting solutions could have helped the project to codesign the new eService model and IT to support it (Eason et al., 1996; Gregory, 2000; Hasu, 2001; Lyons & Kearns, 1997).

Previous research also shows the lengthy and demanding process of technology implementation, during which the technology and its use are reformed (Hasu, 2001; McLaughlin et al., 1999). At best, the cooperation will provide a continuous forum for improvement of technology and its use (Victor & Boynton, 1998). The technological development in Case I did not reach this state. Improving the implementation results could have been attempted by allowing time for the collection of feedback from users and an iteration of the service model and technologies to fit the needs of different stakeholders. This would have required commitment of the key project network stakeholders after the EU project had ended.

On the basis of Case I results, four questions about the co-construction of technology and eService could be formulated that proved important in determining the outcome of the development:

- Phase 1: Which and whose problems and needs is the eService development based on?
- Phase 2: How are the alternative solutions defined and by whom?
- Phase 3: How are the service and technology defined as objects of development and thus co-constructed?
- Phases 4-5: How does the co-construction continue after implementation?

In the next section, the conceptualization created in Case I is implemented in another eHealth project (Case II) in order to study the practical value of the conceptualization in the context of formative evaluation. Case II was an ongoing case where the conceptualization was used to produce information and feed it back to the project managers for corrective action during the development project.

CASE STUDY II: EVALUATION OF A NATIONAL ePRESCRIBING PILOT

The Finnish Ministry of Social Affairs and Health (STM) initiated a national ePrescribing project in 2000. The project was one of four strategic projects of the STM in implementing the National eHealth Strategy (Ministry of Social Affairs and Health, Finland [STM], 1995, 2006). The project developed and piloted a national concept for ePrescribing in Finland from 2000 to 2006, which was implemented in four pilot organizations and surrounding pharmacies in Finland. The piloting was arranged to guide the decision-making about the national implementation of the service and related ePrescribing legislation.

At the end of 2003, the STM called for an evaluation of the pilot project through its research and development organization, the National Research and Development Centre for Welfare and Health (STAKES). The aim of the evaluation was to help direct the project work

and to conduct interdisciplinary analysis of the outcomes of the pilot to inform the permanent legislation to be formulated (Hyppönen et al., 2006).

Findings

Phase 1: The Needs State

Since the late 1980s, there have been many local trials in Finland to test different technologies for transferring medical prescriptions electronically from doctors' offices to pharmacies. Most of these projects were initiated by technology providers. In 2000 the STM established a high-level project to collect experiences on the early trials, to list the stakeholders' needs, and to draft a concept for a nationally unified ePrescribing system. Representatives from all of the key governmental regulatory and administrative bodies and national pharmacy and doctors' associations were invited to the project group, together with a representative from two hospital districts. Patients and technology providers were not represented in the high-level project group.

The high-level group met several times in 2001 to define the needs, select a solution, and to draft a new, national IT-based prescribing concept. The group collected data from experts, visited three health centers or hospitals, sent a questionnaire to patient information systems providers, and arranged a working seminar for systems providers to inform the decision making. The group reported on normative requirements for ePrescribing, presented flow charts of work processes, listed the problems of the current system for different stakeholders, and envisioned benefits and risks from ePrescribing. Alternative concepts for ePrescribing were presented with conclusions for the model to be piloted in Finland. The report provided a good but still quite general basis for the development.

Phase 2: Analysis of the Needs, Search for Solutions

The high-level group report described the needs and a suggested a solution. In 2002 the STM asked the high-level group (henceforth, the high-level steering group) to continue to arrange and steer the piloting of the described system. Four regions were selected to implement the system for clinical piloting. Each district was to organize the local pilot at their own expense, and the high-level steering group was to steer and coordinate the development. The STM wished to keep the organization as light as possible to facilitate fast implementation and piloting of the system during 2003. It was seen as a straight-forward technology implementation exercise. The STM issued an experimental decree on ePrescribing in 2003, under which the clinical piloting could be done.

The four local piloting networks consisted of a health care unit or a hospital clinic, their patients, a couple of local pharmacies, and the local social insurance institution office. Each of the health care organizations used a different legacy system (Electronic Patient Record, EPR). The pharmacies used two different pharmacy systems. Each health care organization operated in a different health care sector (different fields of specialized care, primary care, or occupational health), with a different emphasis on prescribing activity. None of the pilot areas had done an analysis of their concrete prescribing activity, its challenges, preconditions

for change, and needs for its development. They justified their interest in participation with a need to "be at the forefront of ICT development."

One representative from each of the four regional pilots was invited into the high-level steering group. All four regional representatives came from the piloting health care organization. The four local representatives thus had to speak not only for their own organization but also for their clients, their technology providers, the local pharmacies, and the local social insurance institution office.

Phase 3: Creation of a New eService Model and Tools for It—Specification Round 1, with Stand-alone Prescribing and Dispensing Programs

The original idea was to test the technical feasibility of the suggested concept within a year. Since the EPR-integration would take time, the high-level steering group decided to pilot the concept with a stand-alone ePrescription authoring and dispensing program. It was completely separate from the practitioners' existing EPR and pharmacy systems, pharmaceuticals databases, and other tools that the users had for creating prescriptions and in dispensing the medication. The high-level steering group was the only forum where common requirements for the system rising from regulations, different technologies, and varying stakeholders needs could be generated. The steering group ended up wearing two hats: It made strategic decisions as well as acted as a national project group defining and redefining specifications for the different system elements and functionalities. Participants had different viewpoints in realizing the different functions, which slowed down the decision making. The problematic dual role of the steering group was frequently questioned by practitioners. The work was reorganized in 2005, but this did not bring the end users and the technology developers into closer collaboration.

Laboratory testing of the stand-alone prescribing and dispensing programs and the national database was initiated in 2003. Very soon after the first laboratory tests, the pilot areas reported that the stand-alone system would slow down the work too much, and the doctors were not willing to implement it in a clinical setting. Any ePrescribing system was required to be integrated with the pilot organizations' EPR-systems.

Phases 3 and 4: Specification Round 2, with Integrated ePrescribing Systems and Their Piloting

When the clinical implementation was delayed, the pilot period was extended by extending the pilot decree twice: first to the end of 2005 and later to the end of 2007. The integration of ePrescribing functionalities into four different EPR and two pharmacy systems took time. The integration took place separately in each of the local pilot areas. The EPR technology providers did not participate in the high-level steering group. There was also no common project group to harmonize the development of the different legacy systems and to implement the commonly defined requirements.

The city of Joensuu was the first site to start the clinical trial with the integrated EPR system and a stand-alone pharmacy program, in May 2004. The second site, Helsinki, started with its stand-alone authoring and pharmacy programs in October 2004. The third site, Kotka, started with an integrated EPR and pharmacy system in June 2005. The fourth site, Turku, had

not started by June 2006, when the management group decided to end the clinical piloting of the system. By that time, Helsinki had stopped the piloting due to lack of interest of clients and doctors, and Joensuu suffered equally from a lack of interest by clients and doctors, resulting in practically no use of the system. Only in Kotka had the system spread from one occupational clinic (3 doctors) to all clinics (11 doctors) and all pharmacies in the area. However, the efforts to spread the system to a municipal health center had failed. As a result, clinical use of the pilot system was very modest. In 18 months, fewer than 1,000 ePrescriptions had been sent to the database, many of which were for test purposes rather than for patients.

Phase 5: Evaluation of the Implemented Systems, Specification of the National Legislation

At the end of 2005 the high-level steering group was replaced by a high-level management group and several subgroups to draft national requirements, cost-benefit estimates, and legislation for the national system. A consulting company was hired to draft a dissemination plan and to lead the practical work of preparing the national dissemination of the system. In June 2006, the management group concentrated all of the remaining resources on planning the national implementation, and the local pilots were stopped without the system becoming established in any of the pilot areas. With the end of the clinical piloting, the development in pilot organizations seized in Phase 4. The development of the rules and a national level tools (the prescriptions database) has continued to pave way for nationwide diffusion and establishement of the system. The act on ePrescribing was issued on February 2, 2007. The act entered into force on April 1, 2007, allowing a 4-year transition period. Following the transition period, all prescriptions should be made in electronic format, thus forcing the local organizations to develop their local tools and practices to conform to the new national rules and tools.

Evaluation of the clinical pilots was done in 2004–2006 in the organizations where the integrated systems were implemented (Joensuu health care, Kotka health care, and a Kotka pharmacy). Helsinki had stopped the pilot without integrating the systems. Use in Joensuu clinic was so modest, that there was no point in conducting the postimplementation study in the local pharmacy. The systems still were not completely technically reliable. Lack of cooperation with users and designers had resulted in poor usability of the technology (e.g., slowing down work due to a feature requiring signing of each pharmaceutical separately with an electronic signing procedure and lacking required features of technologies). New service practices had not been redesigned in parallel with technology, leading to complaints from the doctors about time-consuming consent procedures and errors in the prescribing and dispensing process due to old working habits. Patients' means of managing their own medication had been decreased when they no longer had tangible documents of their complete medication (prescribed and dispensed) history. Patients' rights and possibilities to control the use of their prescription data also were diminished. The planned patient interface and the possibility for patients to conceal sensitive prescriptions had not been implemented. Many of these problems became evident already in 2004 and were given to the high-level steering group, but improvements to the pilot systems were not made because the changes were regarded as too expensive by the pilot organizations bearing the costs. In 2006 the pilots were stopped without any updates to the systems, when the high-level management group made a decision to focus all remaining resources on drafting the ePrescribing legislation and national requirements.

Conclusions from Case Study II: Conceptualization of the Codevelopment of ePrescription Service and Technology

The objective of Case Study II was to apply the conceptualization created in Case Study I in another case (an ongoing project) to explore its potential in the context of formative evaluation. The conceptualization was used to structure data from the ongoing Case II. The results were fed back to the project managers for corrective action.

With the help of the conceptualization created in Case Study I, the coevolution of the ePrescription service, the technology used, and the legislation to steer it could be delineated (Figure 5). It consisted of three objects of development rather than two, of which the development of legislation for ePrescribing emerged as the main object. The governmental actors (regulators) initiated the development, and the national high-level steering group was in strong control of the development throughout the process. This is shown in Figure 5 as a solid cycle of the legislation development. The other two cycles represent the prescribing service

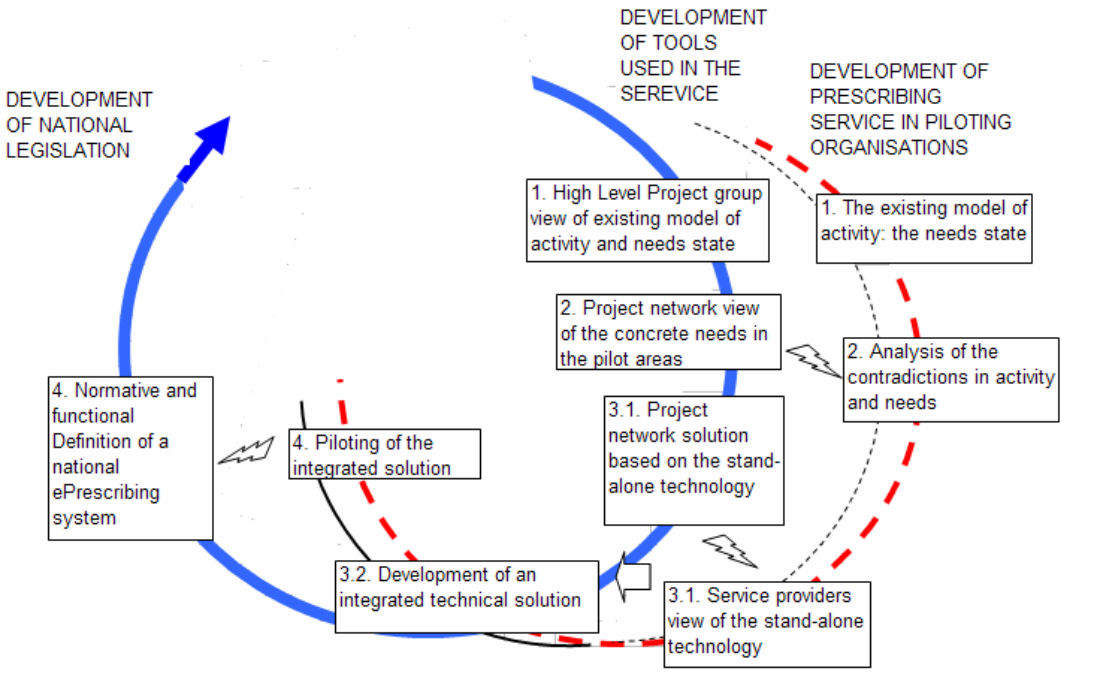

Figure 5. Structuring Case II findings with help of the conceptualization. The larger cycle (blue) depicts the phases of rules development and expansive learning within the members of the high-level steering group responsible for the development project. The smaller cycle in the red, bold broken line depicts the phases of development of the prescribing service, and expansive learning within the local piloting networks consisting of patients, doctors, pharmacists, and social insurance officials. The third cycle, in the thin, black broken line, depicts the tools development to achieve the prescribing service. The high-level steering group acted as the innovator and leader of the development. The broken line on the tools and service development cycles throughout the development illustrates the lack of focus on development of new eService practices and usable tools for the practices. The partially contradicting views between the groups of actors in the three different cycles, and lack of information exchange and collaboration between them, are depicted by lightning arrows in different phases of development. Abandoning the ICT-based tools and the ePrescribing service model after piloting is depicted by ending of service and tools development cycles after Phase 4.

and technology developments. They were supposed to inform the legislation development. Both of these cycles are drawn with a broken line throughout the development, illustrating the weak emphasis on these objects in the total process and the weak control that the service network actors in the pilot areas and their technology providers had over the development.

The challenges and possible solutions found with the help of conceptualization in the codevelopment of the ePrescribing service and technology were presented as a feedback during the project. Certainly, due to the strong participation of the regulators (policy makers, legislators, and standardization experts) in the national high-level steering group, the regulatory needs and requirements were well covered in the concept. However, the representation of the end users or their technology providers in the steering group was weak or nonexistent, which made it challenging to learn from the users and develop a useful and usable system to be piloted. Further, it was stressed that data from each of the pilot areas would be needed regarding their concrete prescribing activity and any key contradictions and preconditions for change in order to plan the needed changes in the overall ePrescribing activity and to specify requirements for technologies to support a new model of activity. The lack of this knowledge is depicted by text boxes framed with broken lines in Phases 1 and 2 in Figure 5. The feedback was regarded as important by the national high-level steering group, but it had little immediate impact, since the clinical testing was already about to start.

Feedback given to the pilot about Phase 3 emphasized the need to concentrate more on the development of new working practices and providing the tools to support them. This feedback also came too late to have any impact. The development in Phase 3 had included two design rounds, which are depicted in Figure 5. The first round concentrated on developing stand-alone prescribing and dispensing programs, the implementation of which was refused by practicing doctors. The mismatch between the project and user view of the solution is represented by a lightning arrow in Phase 3.1. A second design round was initiated to develop and implement integrated EPR technologies (Phase 3.2). However, this design round was nearly finished when the evaluation started.

The national requirements were drafted by the high-level management group. They were not entirely in line with the experiences from the pilots, depicted by a lightning-arrow between the cycles in phase 4. The pilots did not run long enough to demonstrate the utility of the system for different user groups. This was communicated to the project network (high-level steering group) in the final evaluation report. Local technology and service development cycles also ended with the end of the pilot. The legislation development cycle continued with the act on ePrescribing, with its issuance on February 2, 2007. It presents a new norm or rule for the service providers, leading to pressure to initiate a new cycle of development in the local prescribing services and the EPR systems used. The feedback from the different stakeholders collected by evaluators in the pilot study can be seen in the legislation and its background document (the bill). It remains to be seen how much the feedback is exploited in the local development projects.

DISCUSSION AND CONCLUSIONS

The starting point of this study was the vast literature documenting failures of health care ICT projects. The aim of this article was to conceptualize a process of co-construction of services

and technologies to help future practitioners in the field to understand and find solutions to the challenges in ICT-enhanced service changes. Case Study I provided an in-depth analysis of an entire eHealth innovation process, from idea generation to an established eService provision system. The findings were conceptualized with the help of concepts mainly from cultural historical activity theory (AT) in order to understand the challenges in the development. This conceptualization was applied in another case study (an ongoing project) to study its potential in the context of formative evaluation, that is, for analyzing an ongoing case and feeding the results back to the project managers for corrective action.

Depicting the development with just one cycle of expansive learning does not seem to suffice. In both cases, multiple objects were being shaped simultaneously by separate networks that should have collaborated tightly but didn't. In both cases, one network took over the development of the entity—focusing on the object that was in its core interest—at the expense of other objects and shapers. Adding parallel cycles to the model of expansive learning and focusing on the relationships between the cycles helped to depict this finding in Case Study I and to bring out challenges in the codevelopment of technology and service at each phase of the development. Case Study I was a retrospective study, and the results could therefore not be used to support the development.

Case Study II was already at the end of Phase 3 (see Figure 5) when my study was initiated. The conceptualization helped to structure the parallel developments of ePrescribing legislation, practice, and technology, and to extract challenges, which were fed back into the project. The results concerning Phases 1 through 3 were regarded as important by the project partners, but they came so late in the process that the project could not implement the suggested amendments. There was strong political pressure for quick implementation to demonstrate the feasibility of the concept. The conceptualization also helped in structuring the analysis of a new eService model implemented in the clinical pilot areas (Phase 4) and in providing feedback for its further improvement. However, this information was not fully exploited during the project because the piloting was stopped in order to focus on the development of the national specifications and legislation. The information is, however, reflected in the bill and ePrescribing legislation, issued on February 2, 2007.

There were some differences in the two cases that challenge the applicability of the conceptualization from Case I to Case II, and which also contribute to understanding the relatively weak impact of the support offered in Case II. Case I illustrated a local, technology-led project in which regulators did not play a big role. The user network was in control of the decision on diffusion of the technology and the new service model. Case II, on the other hand, was a normatively led national project in which the national regulators were in control of defining the diffusion of the system by making it mandatory by law. The success of the piloting was not a condition for diffusion in Case II, as it was in Case I.

The scale and overall purpose of the projects were also different. Case I was a local IT project aiming to improve the home care shopping service of a local social services office. Case II was a national-level project, where the final objective was to create a national solution for ePrescribing and the legislation to diffuse it. The conceptualization needed to be adjusted to accommodate for the shift from a local to national perspective and the emergence of political objectives. The ePrescribing concept was high on the (political) agenda, which also influenced the decision making in the project. There was political rationality in the decisions—for example, in the decision to stop the pilot in order to hasten the national

implementation of the system. Even if the pilot system was not yet working well in the pilot areas, there was a strong political will to go ahead with the rules development and expand the system to national level. The evaluation provided some indication of the reasons for poor success in the pilot areas, and some of the issues were addressed in the bill and the new ePrescribing legislation. Case II indicated that ongoing (formative) evaluation can provide useful information to steer decision-making but, if the information does not support the political objectives, it may not be implemented. Further research is needed in the context of policy implementation projects to study the applicability of the conceptualization. Case II raised questions about transferring methods used in local ICT projects to national level projects.

The study collected and analyzed data from Case II, and fed the results back to the project group to be used in the decisions about the development and to the national policy makers to inform the permanent legislation on electronic prescriptions. This approach can be likened to the approach of "constructive technology assessment," which attempts to extend technology assessment to all phases of technology development, including its earliest stages (Rip, Misa, & Schot, 1995). The approach builds a bridge between formal and informal evaluation conducted by different social groups. It places emphasis not only on "what impacts," but also on "whose impacts" gain attention (Freeman, 1995). The request from the STM to conduct a process and outcome evaluation on a national eHealth pilot can be interpreted as a wish to move towards a more dialogical approach in policy implementation practices, with a will to bring forward the voices of different stakeholders during the formulation of the permanent ePrescribing legislation. Collecting empirical data for decision-making during a national policy implementation project is not yet very common, which led to some mixed feelings in the high-level steering and management groups. This is at least part of the reason for the poor immediate impacts of the feedback. Another reason may be the late start of the evaluation and that the piloting project was not designed to be adjusted with the feedback. Further research is required in which the conceptualization is applied from early on (from Phase 1) to draw further conclusions on the applicability of the conceptualization in providing support for projects.

In spite of their differences, both cases shared the same challenge of balancing different objects of development. The project plans did not accommodate for the shaping of multiple objects or for changes in the direction or speed of the development. Both cases suffered from the lack of analysis of and learning from the practices in which the technologies were to be implemented. Both projects had inadequate forums, methods, and tools for a balanced co-construction of multiple objects. Importantly, however, neither of these cases is atypical for contemporary practices. Therefore, as the results indicate, eHealth projects need a better understanding of multiple objects of development (e.g., the service, its tools, and its rules) and how to co-construct them in a balanced manner. The projects also need concrete and clear skills and methods to manage the totality of change, to collaborate and learn from others throughout the development. This study suggests that eHealth projects need to build a balanced network of actors who have adequate knowledge about a variety of objects of development and the required skills for constructing and managing the entity so that they can surpass the challenges of codevelopment of eServices and related technologies.

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