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Innovation in Partnership Sourcing from a Vendor's Perspective

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Abstract. This chapter describes three generic categories of assets for technological innovation: 1) process innovative assets, 2) product innovative application assets, and 3) aesthetic design assets (Christensen, 1995). These different types of innovation are used as a framework for discussing effects-driven innovation at the IT vendor CSC Scandihealth A/S. CSC Scandihealth's business strategy regarding effects-driven innovation is described and related to a partner sourcing model with a client, a hospital in the North Region of Denmark. The chapter analyses how innovation can be organized and the different stakeholders, contexts, and perspectives undertaken by the vendor and the client while engaging in partnership sourcing supported by effects-driven innovation. The experiences and challenges are discussed on the basis of a number of projects with the vendor's clients.

Keywords: innovation, partnership sourcing, effects specification, effects-driven IT development, system development, healthcare.

1 Introduction

In this chapter, we elaborate on the concept of innovation and discuss it as part of partnership sourcing by means of effects-driven IT development. Partnership sourcing is described from the perspective of the vendor, CSC Scandihealth, CSC in short. CSC Scandihealth is owned by the CSC Corporation, a global leader in providing technology enabled business solutions and services. The overall focus of this chapter is on sustaining change and innovation as it is often found in large organizations (Christensen and Overdorf, 2000).

According to Christensen (1995), it is a general assumption in many industries that the ability to produce innovation is based on Research and Development (R&D) as a production process. Christensen (1995) further points out that the relevant assets are often understood in a narrow sense as an R&D department and an activity concerned with the development process by the use of application and design. Another misunderstanding of the R&D concept is that it is mainly synonymous with scientifically based research. We need to understand innovation as a collection of different assets, which together enable the organization to commercially exploit innovation.

Throughout this book, we address innovation within the systems-development process as a means for improving an organization's product or business-process innovation. The general focus is on sustained innovation providing "products and services that are better than their predecessors on quality attributes that are already appreciated by mainstream customers," which leads to evolutionary rather than revolutionary change (see Chapter 1 by Hertzum and

Jørgensen, 2011). In this chapter, we further distinguish between three different assets for technological innovation, as identified by (Christensen, 1995):

- Process innovation.
- Product innovative application.
- Aesthetic design.

A process innovation asset could, for example, mean a person who is good at making new ideas emerge during the process of holding a workshop. An example of product innovative application could be the identification of new markets for applying a specific product. Finally, there are those assets that enable innovation in the aesthetic design of a product, e.g., the construction of a user-interface so that they appear smooth and do not interfere with unnecessary information.

Together, these three assets provide a more accurate representation of technically innovative assets than the R&D concept (Christensen, 1995). We use this framework to describe how CSC Scandihealth experiments with effects-driven IT development as a means for innovation. This enables us to, among others, to clarify how CSC primarily recognizes human resources as assets of technical innovation.

In Section 2 that follows, we elaborate the innovation concept a bit further by discussing different ways in which innovation is organized. In Section 3, we describe how innovation is organized within CSC Scandihealth. CSC pursues partnership sourcing by means of effects-driven development. The generic process for this, used by CSC, is given in Section 4 while CSC's motivation for participating in the effects-driven development research program is presented in Section 5. Section 6 argues how partnership sourcing and effects-driven development support CSC's product strategy. Section 7 presents CSC's experiences and challenges and the chapter finally concludes in Section 8.

2 Organizing Innovation

Innovation requires the activation and coupling of different assets in the organization, and this cannot be expected to happen solely through the traditional employee roles within the organization (Christensen, 1995). In other words, you cannot, e.g., settle with designating a person for a role such as 'responsible for innovation'; it is rather the coordinated effort of all the employees who contribute to the different categories (process innovation, product innovative application and aesthetic design) that brings about the technical innovation in the organization.

When an organization pursues technical innovation, four types of trajectories for innovation can be identified: science-based, scale-intensive, the specialized vendor and vendor-dominated pattern (Christensen, 1995):

- The science-based trajectory is usually associated with a strong internal R&D resource performing innovation activities towards the industry's commercial objectives and is typically found in chemical and electronic industries. The clients focus is on price and differentiation of the product.

- The scale-intensive trajectory is characterized by strong internal process engineering skills. The client focus is primarily on price and experience base/novelty value. For example, you will find this type of company within the food industry.
- The specialized vendor trajectory involves predominant domestic product application resources and is often in close cooperation with clients who are performance oriented, i.e., functional requirements are more important than volume and price. Application opportunities are limited by technology and this trajectory is usually adopted by companies that manufacture machinery and instruments or by IT vendors.
- The vendor-dominated pattern of technological change is characterized by the clients' need being dominated by cost and driven by marketing assets. This is usually seen in firms in traditional industries, like production of garments.

These four types of trajectories for innovation are analytical in nature, and in the real world, the boundaries between them are often not very clear. On the other hand, companies tend to divide into clear functional organization subdivisions such as management, finance, production, etc. This functional organization comprises the context of innovation and it also, to a certain extent, defines the motivation for a company's innovation. The functional organization and the trajectories for innovation form the starting point for a company in identifying and pursuing the commercial potential for innovation.

It is a prerequisite to have access to the relevant innovative assets to be able to produce innovation (Christensen, 1995). On the other hand, companies rarely ground their innovation purely on the basis of new research also referred to as revolutionary change in Chapter 1 by Hertzum and Jørgensen, 2011. This means that industrial research is most often described by the ability to combine process development and new uses of technology by integrating scientific and technological competencies (Christensen, 1995) – described as evolutionary change in Chapter 1 by Hertzum and Jørgensen, 2011. In some cases, pure scientific research might be organized in projects aimed at creating a new competing product for the company, as for example, in the pharmaceutical industry when developing a new drug (Christensen, 1995).

The process innovative assets might interact with scientific research as innovation is often pursued through highly systematical approaches using scientific – or scientifically inspired – methods. Process innovative assets draws on cross organizational management and cross organization resources and it can seldom operate independent of the company, for example, alone within one specialized R&D department (Christensen, 1995).

The specialized vendor trajectory draws on the skills and resources that are prerequisites for product-innovative development activities. This is not only the case in physical product development, but also in development of software or information systems. The process here is mainly characterized by technological options used in a series of phases including identification, evaluation, selection, and subsequent different disciplines of deployment. The innovative process is not solely the result of a scientific activity, but it also involves the use of experience and firm-specific knowledge and it can draw on established operating and production processes in the company (Christensen, 1995). Hence, a company cannot just 'decide' to be innovative: the company must consider how the product development should be organized, what processes are appropriate, what methods should be used and, in particular, be aware of which employees in the company possess the different innovative skills needed.

To discuss the experience with innovation in CSC, we introduce a final analytical distinction of the concept of innovation by distinguishing between technical and functional application of innovation (Christensen, 1995).

- The technical application of innovation is seen as the task of reducing the technical uncertainty without increasing development costs or reducing production capacity. In a software developing company such as CSC this could be obtained by aiming at more efficiency in the work performed, and, as a simple example, be measured by the number of lines of code produced for a given quality using a given number of working hours.
- Functional application of innovation is the task of reducing functional uncertainty, often during the interaction with the clients' management and end-users. It concerns knowledge development in relation to design and implementation especially based on end-user requirements and preferences (Christensen, 1995). For CSC, this could include process and organizational development towards higher quality of the work performed, the services provided, and the products delivered. One way of measuring the commercial value, could be to measure the effect of a product on basis of the work performed by the client's end-users.

Common to both technical and functional applications of innovation is that this could be related to the work in the general sense, or more specifically on work involved in system development or clinical care with a specific client.

Before looking into CSC's innovation, we may ask how innovation actually appears in the real world. Empirical studies report that successful innovation is common in cases of functional uncertainty combined with close collaboration with end-users, having strong professional interests and competencies in relation to the product being the target of development (Christensen, 1995). Christensen also notes that large organizations often accumulate innovative assets in inappropriate ways. This is a consequence of the division and specialization of work with the implications for the development of subcultures among departments. Further, the three innovation types (process innovation, product innovative application and aesthetic design) do not exist on equal terms. Aesthetic design, for example, is often considered to be a marketing asset more than a real innovation active (Christensen, 1995). This can lead to a source of conflict within the organization because the desire or demand for an aesthetic design comes from the marginalized innovation assets. Innovation comprises both product and process where the two types can be more or less intertwined. Historically, automobile factories in the United States invented the assembly line idea, which is highly product oriented. Japanese companies have been highlighted for their ability to focus on the process as an important contribution to innovation. Japanese automobile factories invented LEAN (Womack and Jones, 1996), taking the assembly line a step further to, for example, include the workers attitude towards what creates value.

3 Innovation at CSC Scandihealth

The most obvious way to describe CSC Scandihealth is by the specialized vendor trajectory because of the frequency of client involvement and the performance focus on functional requirements in the products supporting the workflow in the healthcare domain. From a client perspective, this means that the product value is appreciated in relation to the use of the product by end-users (clinicians) doing their work. It is precisely this value that CSC wants to make more visible as we shall see stated later in CSC’s product strategy.

CSC’s product strategy resembles the specialized vendor trajectory and the innovative application of IT-based products. Technology stacks from vendors such as Microsoft and Oracle, etc., drives the process internally. The term ‘stack’ refers to the understanding of a series of different technologies arranged on top of each other forming a stack based on, typically, database management systems at the bottom, functional programming languages and frameworks in the middle and ending in technologies supporting user interfaces at the top of the stack.

The need for new products is driven by the clients’ requirements, and the possibilities for innovation are determined by the technology's potentials and limitations as a technology stack forming a development platform. New products are developed to replace old, not always with new functionality, but often because clients want these new technologies indirectly. One example is the transformation of systems from mainframe to client-server technologies because there was a desire among clients to in-source hosting. This resulted in a technology shift and during the systems development process it was often both a question of what can be done on this platform, as well as a matter of what requirements the end-users needed.

CSC Scandihealth is specialized in offering IT-based solutions to the healthcare domain, a domain which is complex and highly specialized. At CSC, the primary innovation assets are the employees, who have built a corporate culture and product portfolio through almost 30 years, using their imagination and diverse knowledge of both the technical and the domain specific clinical issues.

The three types of innovation assets (process innovation, product innovative application, and aesthetic design) are present to a more or less visible extent. There is no department responsible for innovation or R&D. Persons with special skills are designated as use-ability experts. These skilled persons constitute aesthetic innovations assets and they are often allocated to projects on a consultation basis during design, or, for example, while evaluating prototypes. Concepts such as easy-to-learn and easy-to-use have in CSC become synonymous with the product as user-friendly and are a prerequisite to obtain actual widespread use of the systems by the clinical end-users. In CSC, this type of innovation assets are especially distinct among usability experts responsible for usability tasks and occupied with developing and evaluating usability in relation to a very local interpretation of the term. In other words, it is a more narrow conception of usability than a general and broader understanding of usability encompassing the entire innovation process.

Product innovative application is also distributed and visible in a similar fashion, not within any specific department but in relation to employees designated business architects. They are employed in a similar way and as the aesthetic design assets they are consulted throughout the process of development and when there are issues involving management, sales, and marketing.

The challenge for the development organization is a trade-off between the conditions a particular technology stack offers and the innovative product application assets' ability to seize opportunities and steer clear of the limitations within the design requirements defined by the client. This means that the ability to implement process innovation assets becomes crucial because it is necessary to uncover the needs of users and relate those needs to the technical framework. This was Christensen's (1995) point with user involvement of end-users having a strong professional skill profile being a prerequisite for a successful product development.

Process innovation is not as visible or institutionalized in a employee role as the two previous mentioned roles relating to aesthetic design and product innovative application. Process innovation is present implicitly in the form of project managers, or as a grassroots movement among the developers and configurators. For example, several production units pursue an agile and flexible way of working rather than adopting procedural and documentation-heavy approaches from the other business areas within CSC Scandihealth and CSC Corporation. There has been an adoption of elements from different sources of process improvement which have been integrated and adapted internally to local conditions. This results in process innovation involving elements of agile development methods such as the Dynamic Systems Development Method (DSDM) (Stapleton, 1997) and Scrum (Schwaber and Beedle, 2002). This example of process innovation is only visible internally, but as the trajectory implies the clients, they too get involved in the development during specification, design, and evaluation.

The success of innovation in CSC’s projects requires the involvement of the clients’ doctors and nurses. Moreover, the sense of responsibility and professional commitment, especially from end-user representatives when they are involved with the projects, is highly significant and has been pointed out by Christensen (1995). Participation of these ‘external’ assets from the client’s side is a prerequisite for successful innovation. The need for process innovation that includes external assets is therefore important when pursuing CSC’s business interests and implementing the company's product strategy.

Employees who represent CSC’s innovation assets need a process that binds internal and external innovation activities together and comprise both functional and technical application of innovation. As a process innovative asset, CSC uses effects-driven development to mediate innovative work between developers and configurators from CSC and end-users from the client representing a different focus on the application of innovation (technical and functional respectively).

4 Effects-driven IT development in CSC Scandihealth

Effects-driven IT development (EDIT) is a research program at Roskilde University, which has engaged CSC for several years (see Chapter 8 by Hertzum and Simonsen). Contributions from CSC to this research initiative are done by integrating different projects with the client in the research work.

The research concerns how the utility value or effects of using implemented IT-systems can be used as a driving force for system development. This means that the effects that motivate a client´s investment and use of the system in the daily clinical work also constitute the effects that become the driving force in the design of CSC’s solutions. This implies a development and implementation of IT solutions organized with the close and thorough involvement of the clients’ management and end-users. Effects-driven IT development at CSC can be characterized as an effects-driven, experimental, and participatory process:

- Effects-driven because it means specifying the effects to be achieved with IT solutions, and subsequently, after implementing an IT-system, measuring the extent to which they are achieved. This approach enables CSC and the client to work systematically to ensure value in the client’s investment.

- Experimental because the healthcare sector is too complex for the development process to predict the solutions that both need to respect the important details of the work and need to add a substantial value. This means the process of development and implementation must adapt to the work environment and organization as it also changes along with the implemented IT solution.
- Participatory because the healthcare professionals representing the end-users are the only ones that possess detailed knowledge of the daily clinical work which is necessary to understand the conditions by which the IT solutions must operate and to specify the relevant requirements for the solutions.

Effects-driven development is undertaken during three different stages in the development process; during specification, design, and evaluation (see Chapter 7 by Simonsen, Hertzum and Barlach for a detailed example).

The overall process, while engaged with a client, can be described as a series of workshops ending with the deployment of a solution designed in collaboration with the client, see Figure 1. First, the management´s effects requirements (effects workshop, management focus) set the scope for the project and serves as a guide for the workshop with the end-users (effect workshop, end-user focus). During specification, the effects are used to identify management and end-user requirements relating to both the overall goals for the organization and the daily work performed fulfilling the mission. (We refer to Chapter 7 by Simonsen, Hertzum, and Barlach demonstrating how effects are specified in a five-level hierarchy). Later in the process, the same effects specify how the solution must be evaluated to determine if the design supports the requirements specified by both the management and the end- users. The effects are used at the LAB workshops (users are confronted with mock-ups or early prototypes in a ‘laboratory’ setting) where the evaluation methods are first consolidated and later put to work in the IN SITU workshops (users evaluate mature prototypes by simulating or performing actual work using the system) where the measured results help to determine if the design need re-work or can be put into production.

The end-users are engaged in workshops through-out the design process, and the effects identified serve as documentation of the design and are translated by CSC into technical requirements for the IT system. This ensures the progress of the development, as the requirements are implemented in mock-ups or prototypes and building towards the solution being deployed in production. The design process can be repeated and evaluated in instances where the system is implemented and taken into production. During evaluation, effects are measured and feed-back informing whether the desired effects have been achieved sufficiently is provided.

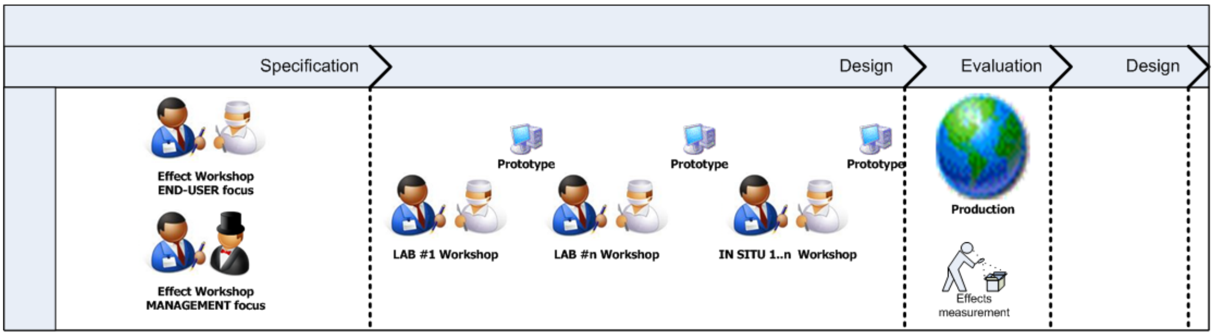

Figure 1. The specification, design, and evaluation process utilizing effects in various workshops.

Employees from CSC and researchers from Roskilde University have collaboratively been participating in several projects to ensure that new experience and knowledge are developed and incorporated into projects organized as in Figure 1 (see Chapter 8 by Hertzum and Simonsen). CSC's contributions include devising generic tools and processes for developing products with the client, focusing on effects. The effects represent the central concept for the specification of requirements while also being associated with the measurement tools that are to document the impact in the clinical work domain.

Often, one or more overall desired effects are, in fact, the client's motivation to start a development project. Instead of asking the client to specify requirements for the end-product functionality (often using a technical vendor 'language' that is foreign to the client), effects-driven IT development focuses on:

- Effects – rather than functional requirements
- Measurements – above assumptions
- An effects-driven process – rather than a functionality-driven process

Some examples of effects from the perspective of the individual end-user, when introducing an IT system into their clinical social domain include:

- Significant reduction of the mental load in the registration and evaluation of data – resulting in greater client satisfaction.
- Less missing information that must be found from alternative sources to make decisions – resulting in the reduction of resource consumption.
- Fewer follow-up inspections due to better coordination and sharing of knowledge across disciplines – resulting in an overall better quality of core services.

Effects-driven IT development can be related to the three generic categories of assets for technological innovation. A mapping between the three innovation types and three effect categories is outlined in Table 1. The functional use of innovation can be related to the effects, which is a result of the use of the IT product that increases the quality of the clinical work. A similar mapping is indicated for the technical application of innovation with the efficiency in the work supported by the system and for the aesthetic innovation with the user's satisfaction when operating the system. The inherent expectation in CSC's strategy is reflected by a functional application of innovation which must result in a quality effect experienced by the involved end-users engaged in clinical work. The effects method support that the client needs is translated into innovative design, which is evaluated to document how the implemented solution results in the expected effect.

The mapping in Table 1 should not be taken as being too unambiguous. Effects are rarely precisely related to one and only one of the categories (quality, efficiency, or satisfaction); rather, an effect may be expressed in all three categories, but there should be a priority of the category that is the most desirable. If a client wants to implement a quality-related effect, one should expect the main contribution to come from the innovation assets mastering the functional application of innovation – and, hence, this should be prioritized. However, one cannot expect a quality effect to be realized only by concentrating on the functional use of innovation. Openness to relevant contributions from the other types of innovation and related effect categories should be maintained.

Innovation types in use	*Effect categories*
Functional use of innovation	Quality
Technical application of innovation	Efficiency
Aesthetic innovation	Satisfaction

Table 1: An example of innovation types mapped against effect categories.

Christensen argued that innovation cannot be taken for granted just because the innovative assets are present in the company. Therefore, the EDIT project in CSC can be viewed as an example of establishing processes and organizing assets to create optimal conditions for innovation.

5 EDIT research in CSC

Why is it important for CSC Scandihealth to collaborate with the effects-driven IT development (EDIT) research program and to use effects in the development of their healthcare solutions in Denmark?

To answer this, we must first understand the market situation on healthcare IT in Denmark. This market is characterized by several major and smaller vendors who all vie for clients, i.e., decision makers from the regions provided with public healthcare. The rules for procurement and project execution are regulated by the European Union (EU), and they are centrally managed from the organization providing healthcare services, in this context, the Danish Regions. There are many expectations of what an investment in a healthcare IT project can generate of value and which needs and problems it can solve. The expectations are expressed both from the political side and by the many stakeholder groups of end-users (doctors, nurses, etc.) that are involved during the development and implementation process.

How can CSC contribute in this market and what is CSC's core competency?

CSC differs from the rest of the CSC Corporation by primarily offering products over projects. CSC has offered healthcare IT solutions since 1972 and has built up competencies in line with these developments. CSC has followed a technical path embracing new technologies and incorporating them into products as they evolve and become available. From an organizational perspective, this has been driven by changes in the client organization's tasks, which again is a result of political strategies and professional clinical knowledge that require new development or proliferation of the product portfolio. The employees at CSC comprise both staff with an IT technical background (computer science and computer scientists) and staff with a clinical background (doctors and nurses).

The strategy of the company shows that it is not enough to merely have a deep knowledge of the technologies and the healthcare domain, but that a competitive vendor also needs to master an increasing requirement for organizational change involved as part of the delivery. This is the result of an increasing complexity and demand for dynamics in the healthcare core services, which in turn induce demands on efficiency and quality in the delivery of products supporting these services. IT is increasingly linked to the client's core production services, either indirectly as a reporting tool or directly through documentation, resolution, and quality assurance. This central role of IT contributes to the need for quality in the innovation process. For example, the quality of clinical work is directly reflected in the quality of the clinical documentation supported by IT systems. So there is a tight coupling between the value represented by the clinical work and the different factors, including IT support, which affects this value.

Today, the clinical provision of services means that technology becomes a prerequisite for the clinical work: IT is one of the key tools in the daily work of healthcare professionals. The consequence is that the IT product must match the unpredictability and differentiation encountered by the various end-user groups in the organization, all providing specialized and diverse services that change continually. In other words, it has become harder to specify exactly what the client wants and the time development takes place and the pace of change is shortened. This tendency is continually enforced by pressure on the work organization from the policy makers. This in turn drives the requirement for efficiency in the innovation process at CSC, as the cost of development cannot be increased although the complexity continues to grow. Furthermore, stakeholders in the project must be represented at many levels within the organization on both sides of the client–vendor relationship and demands for swift responses to changes are very much present from the client.

The factors that contribute to the value of the IT product and require contributions from CSC include usability, the ability to effectively make use of available functionality, and the ability to add sustained quality to the clinical work. This comprises all three types of innovation (process innovation, product innovative application, aesthetic design) and might be specified as effects that can support the development and demonstration of values in an IT solution.

As part of the collaboration with the EDIT research program, CSC financed an industrial PhD project. The PhD project is based on selected delivery projects at CSC that involve development of new IT, where the need for technical and functional application of innovation are linked to the product strategy of the company.

The immediate motivation for CSC and the clients involved in an effects-driven project is to give them a unique opportunity to demonstrate the usefulness of a new clinical IT system. Documentation of effects may subsequently be included as part of management agreements with the vendor and other stakeholders. This documentation of specific effects and overall utility value is innovative compared to current IT projects, which most often focus on technical deliveries and not on the overall usefulness. From a marketing perspective, there is a commercial potential for the vendor in sales situations with similar clients, where the vendor is given the option to refer to the qualities of the product based on measured effects.

The overall motive for CSC in applying effects to drive the development process is to meet the requirement for innovation and have the effects obtained from the innovation evaluated by both parties (client and vendor). Appreciation of the product is central to the commercial outcome that CSC can expect as a result of a successful delivery. The effect approach embed Christensen's (1995) various types of assets profiles for innovation and organizes them by creating a medium and a process that make it possible to systematically develop innovative solutions with documented value.

6 CSC Scandihealth's product strategy

To meet the expectations of the clients, CSC has repeatedly articulated a strategy and approach regarding how CSC views progress and how CSC intends to live up to its role as an innovative vendor in relation to the healthcare domain.

The company's mission is to be ready to seize the challenge that lies in being involved in multiple processes and linking technology support closer to the clinical work. The vision involves a close relationship and establishing integrating technology platforms with individual clients as well as between different healthcare providers, as stated by CSC's CEO, Freddy Lykke:

> The vision we have is that the healthcare community is increasingly integrated into the various sections of society, coming closer and closer together, and our mission is that we [CSC] can help to make the linkage of the healthcare community (CSC, 2006).

Freddy Lykke elaborates how this vision can be implemented through a bottom-up approach:

> The bottom-up approach is basically another way of saying that it is the clinicians themselves that are to define how their work processes are to be supported, rather than we [CSC] come with a system where we have defined how we think the workflow should be at the various hospitals and their wards. We provide a system that allows the clinicians to dynamically define how the system should work in their specific situations (CSC, 2006).

There are several points in this statement: creativity or innovation comes from those who are involved in the everyday tasks that constitute the clinical work domain. This requires the involvement of many different professionals and knowledge domains. Another point is the acknowledgement of the value owed to the local clinical knowledge combined with humility towards the challenges that lie in getting closely involved with this as an IT vendor. CSC does not come with *the* solution, but provide a process and a technology stack constituting a highly configurable framework system constituting a platform supporting the development of solutions through a close collaboration with client representatives. To be able to handle the increased complexity and dynamics of the client in the development process, a very dynamic process that includes innovation related to technical application is required. At the same time, the client expects that the process is organized so that the quality of the functional use of innovation is both perceptible and sustained.

A client representative, chief physician, Carsten Elleman from Roskilde County Hospital, testified CSC's vision:

> What has been the argument against electronic healthcare records (EHR), is that they are too stiff, they are too heavy, and we cannot change them along the way when necessary. They [CSC] have demonstrated that they can adapt really, really fast. And that is nice to see (CSC, 2006).

Or to put it another way, the client is satisfied with the dynamic process offered by CSC as this means that the time from concept to testing will be short and less complicated and that changing requirements can be configured in the system very fast.

CSC’s product strategy includes that CSC changes the overall perspective from “delivering a *product* to the client” to “delivering a *solution* to the client.” The commercial motivation for this is seen as the acknowledgment of the great savings that can be expected by using a framework system that already contains a highly specialized domain knowledge built into them over many years. Many resources has been used to enrich this technology platform with the domain knowledge and reuse and/or reselling it – a direct motive in CSC’s strategy. Moreover, it means that you can move the delivery of new products closer to the client which is demanded and appreciated (see quote above by Carsten Elleman).

CSC's strategy also includes, expanding their activities and responsibilities from primarily being concerned with technical systems to increasingly include a responsibility for the organizational implementation and utilization of IT systems. The motivation for this is found in an acknowledgment at CSC that for a client, 30% of the overall costs for a large IT project are grounded in the technical IT system, while 70% of the costs are due to organizational implementation. Hitherto, CSC's strategy has been almost exclusively focused on the delivery of the IT system. Now CSC offers services and responsibility aiming at not only applying the technological innovations, but also supporting the functional use of the innovation and the quality of the work supported by the IT system. This challenges the traditional ways of evaluating the delivery within an IT project context (time, resources and specified content) and points to effect evaluations of how the problems and needs that motivated the client to start the IT project are being solved.

A long-term partnership sourcing arrangement includes the continuous development and maintenance of the delivered IT solutions – also after they have initially been implemented at the client site. It is necessary to organize the partnership and differentiate between what parts are optimally developed and maintained by the client, who possesses domain expertise and the good knowledge of local conditions and needs, and what parts are to be maintained by CSC. The effects-driven approach plays a central role in mediating and managing the partnership relation, and takes the collaboration between the client and vendor into account without prioritizing certain types of innovation. The key to this collaboration lies in the formative evaluation of effects that goes through the process as the parties must continually specify effects, negotiate conditions for the evaluation of effects, observe and measure how a specified effect requirement is met, and use the effects assessment as basis for continuing the project.

The demand for innovation and a process to support it externally is reflected in the above strategy ‘statements’ and sets the scene for collaborative innovation between CSC and its clients.

7 Experiences and challenges

There are both advantages and challenges for innovation through the effects-driven development (see also Chapter 8 by Hertzum and Simonsen, 2011). The task of EDIT is to provide process-oriented innovation in CSC and to ensure the development of a method that can accommodate all types of innovation. This is to be done without compromising CSC's commercial requirements.

CSC has through a series of EDIT projects developed and evaluated generic tools and processes, supporting the idea of using effects as a methodological approach to systems development projects with Danish clients. The experiences so far confirm some of the assumptions made about the properties of effects in relation to innovation and highlight also some of the challenges CSC faces when innovation is to be driven by, and translated into, IT products.

The EDIT research has resulted in lessons learned regarding CSC's use of effects in the specification and development work with the client as listed below.

Effects are easier to understand, formulate, and prioritize for clinicians than functionality specifications.

This is of great importance to establish a genuine involvement of the end-user organization that does possess IT-technical skills, and it supports the end-users to contribute to innovation in the specification and development process. Although the client has a very professional and skilled group of clinicians, they are not necessarily knowledgeable on technical issues and terms. Therefore it would be a mistake to believe that their clinical requirements were thoroughly represented if they were expressed in terms that belong to the technical domain only. CSC's strategy is motivated by this involvement and representation of requirements that must be clear to end-users. Experiences and challenges with effect specifications are further discussed in Chapter 7 by Simonsen, Hertzum, and Barlach.

Effects are stable, tempting, yet ambiguous for the IT developers.

Effect specifications do not change and after the early workshops (see Figure 1) and in CSC's projects they have proven to be very stable. It allows the project to concentrate on experimenting with innovation supported by prototypes without having to spend much energy on aligning all effect requirements in the process.

Effects create a sort of tempting innovative "free space" for CSC's developers. Innovation assets from the technical domain are allowed to more or less freely translate the requirements related to specified effects without the constraints of traditional technical specifications of IT requirements. This "free space" (and dealing with the lack of technical requirements) can, however, prove problematic and require more experimentation with prototypes. The ambiguity inherent in the effects (when the developer is trying to translate effects into technical requirements) is a major issue to be taken into consideration by any project that applies the effects method and it entails a high demand for experiences, skills, and collective knowledge of the developers responsible for developing and implementing the IT system.

The inherent ambiguity lies in the effects' universal notation capability, and, as reported by earlier work on goal methods, effects can also be disruptive as communication and pose a risk by not providing any detailed multiple technical specifications (Stacey and Eckert, 2003, Jureta et al., 2008). End-users tend to tolerate these imperfections and value the negotiation benefits stemming from the speed and innovative space of using workshops with prototypes (see Figure 1). The purpose of designing with prototypes is to negotiate these uncertainties and challenge the participant's visions, expectations, and hypotheses through concrete IT experience enabled by the prototypes. The series of workshops should add to the confidence that the implementation is in line with the user requirements represented by the effects. Hence, the ambiguity should not be viewed in a disruptive or counterproductive way. The effect method should work to avoid requirements change resulting in either dissatisfaction with the client ('that was not what we asked for'), or increasing cost on the project's bottom line because 'feature creep' forces a change in an already developed code.

Effect measurement at implementation requires technically robust framework systems of a reasonable quality.

The systems from which effects are to be measured and evaluated must be technically robust so that errors identified initially when they are implemented can be corrected immediately – otherwise an interrupted implementation will result in the expensively built user motivation being lost and the effect driven process being terminated prematurely. The quality of the solution must be sufficient for effects to be able to realize. This entails that reasonable change requests that do not emerge until the clinicians' start using the system must be implemented promptly without interrupting the process.

It is indeed possible to ensure the robustness of a technological framework and to establish a prompt inclusion of immediate and emerging requirements from functional innovation, but it requires careful planning of available resources from CSC. However, technical uncertainty should not become a disincentive to explore the functional innovation during implementation and use of the system. For example, if you discover missing functionality in a given technological framework that is necessary to implement a user effects request, the project has a problem and continuing the implementation without this functionality poses a threat to the progress or might result in the client aborting the project.

8 Conclusion

The ambition of carrying out effects-driven strategic partnership sourcing between CSC and its clients is not met overnight. As mentioned by Christensen (1995), such a venue is a mix of existing and new organizations of the innovative assets striving to create a viable realization of the vision for innovation in CSC. The effects can be seen as a tool to fulfill ambition where there is a need for innovative work on many levels between the very different stakeholder groups, both internally within CSC and externally with those clients who are signing up for partnership.

The stability and applicability of effects among the nontechnical client stakeholders provide the opportunity to work systematically with innovation, while the formative evaluation ensures feedback and control over the process as well as its solutions. Effects-driven IT development has demonstrated that it can support CSC's product strategy and vision for the involvement of clients and hereby create value through innovation in a larger context, as quoted by CEO Freddy Lykke. At the same time, this approach supports CSC's strategy by taking specific technological frameworks into consideration as a platform for technical and functional innovation. Working with effects specifications (see also Chapter 7 by Simonsen, Hertzum and Barlach) illustrates how the diversity represented by developers and client/end-users can be constructively exploited forming a prerequisite for innovation. Developers' experience a 'free-space' to come up with innovative technical designs, but the inherent ambiguity when interpreting specified effects and translating these to technical innovation is also both a potential and a challenge.

CSC Scandihealth has been working with effects-driven IT development for years now (see Chapter 8 by Hertzum and Simonsen) but there is still a need to continue with systematic confrontations of the experience attained with the realities at the clients' side. This implies that CSC sustains and develops the knowledge obtained so far by bringing it into action in new projects and IT product contexts. An appreciation of innovation as comprised by process innovation, product innovative application, and aesthetic design implies that effects can work expeditiously as an instrument supporting both technical and functional innovation. In situations where mutual learning is established, through partnership sourcing and user participation, a valuable knowledge regarding innovative IT usage, effects, and utility value that can be directly translated into projects with subsequent clients is created.

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