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Value Based Service Innovation in Healthcare

Author

Paul Johannesson

is Professor of Information

Systems at the Royal Institute of Technology, Stockholm

Martin Henkel

is a lecturer at Institute, in the area of information systems

The complexity of today's health care systems is increasing with large numbers of specialised actors cooperating in novel organisational forms and networks. At the same time, stakeholders in health care need to innovate in order to manage changes in social attitudes, economic conditions and the potential of medical technologies. In order to meet the challenges of complexity and innovation, healthcare organisations need to design new forms of collaboration as well as novel service offerings.

Value Models: A Novel Form of Enterprise Modelling

Designing innovative healthcare services, including e-services, is an intricate task that needs to address the needs and wants of citizens as well as the goals and constraints of healthcare providers. An effective instrument for this task is a novel form of enterprise modelling, called value models, that focuses on the exchange and transformation of resources in value networks.

Complexity and Innovation

A core component in the European welfare society is an equal and efficient healthcare system. Large resources are spent on healthcare, but a number of problems still remain, including unequal access to healthcare, large variations in outcomes of treatments, deficiencies in service quality, and inefficient resource use. A main reason behind these problems is the complexity of the healthcare sector, where a large number of stakeholders participate and interact in order to ensure the delivery of highquality healthcare. Organisational forms, vocabularies, IT systems, regulations, and relationships vary and evolve over time, thereby contributing to the complexity. Furthermore, European healthcare faces a period of potentially profound changes: in social attitudes, economic conditions and the potential of medical technologies. This makes the ability to innovate and evolve essential for stakeholders in healthcare.

In order to manage complexity and support innovation, healthcare organisations need to acquire effective instruments for managing their knowledge about themselves and their environments. One popular instrument for this purpose is enterprise modelling that offers graphical representations of the structure, processes, information, resources, people, and constraints of an organisation. A novel type of enterprise model has recently been proposed, so called value models (or business models). A value model gives a high level view of the actions taking place in and between organisations by identifying actors, resources and the exchanges of resources between the actors, thereby making it possible to visualize networks of cooperating actors. Value models provide compact and graphical descriptions of complex networks, which makes them ideal for supporting communication between different stakeholders. Furthermore, value models can be used for the purpose of innovating new and improved healthcare services by supporting stakeholders in reasoning about the values and benefits of the services. In this article, we will outline how value models can be used for service innovation in healthcare.

The Basics of Value Models

The central entities in value models are actors, resources, and exchanges and transformations of resources. The purpose of a value model is to show how these entities can be configured in order to form value networks, i.e. networks of actors that collaborate to produce value.

Actors. An actor is someone who is able to participate in resource exchanges and transformations. An actor is typically a legal entity, such as a person or a company.

Resources. A resource is an object that is viewed as being valuable by some actor. A resource is typically scarce; otherwise an actor would not consider it valuable. Some concrete examples of resources are books, cars, movies, haircuts, and medical treatments. However, resources can also be of a more psychological and social nature, such as status, beauty, pleasure, health state, honour, and feeling of safety. The first examples of resources are often classified as economic resources, meaning that they can be controlled by an actor and can be transferred from one actor to another. The latter examples of resources are internal to an actor and cannot be sold or bought.

Transformations. An action that uses some input resources to produce new or modify existing resources is called a transformation. For example, water and flour can be used as input resources in a baking conversion to produce bread. Another example is an eye treatment that is used to improve the health state of a patient.

Exchanges. An exchange of a resource occurs when one actor transfers the ownership of a resource to another actor.

The Eye Hospital Case

The figure below shows an example of a value model. The model is an excerpt of a larger value model created in the REMS (Re ferral Management and Support) project, a collaboration project between the County Council of Stockholm, St. Eriks Eye Hospital, and The Royal Institute of Technology. The purpose of the project was to improve the collaboration between the primary care providers and the eye specialist clinics within the Stockholm area. The value model was used as a starting point for analysing the resource exchanges between the patient, the primary healthcare units and the eye specialist clinics. Subsequently, this analysis was the input to defining new e-services supporting the resource exchanges.

In the value model in Fig. 1, actors are shown as stick person icons and exchanges as labelled arrows. A label on an arrow tells which (economic) resource is exchanged and, within parentheses, the benefits of using the resource, i.e. what benefits the receiving agent can get by using the resource in a transformation.

Let us take a closer look at the exchanges from the primary healthcare provider to the patient. When a patient experiences an eye health problem, she will visit a primary healthcare provider. The primary resource this provider offers is an investigation service. The benefit of this investigation is that the patient gets an increased feeling of safety. Furthermore, the investigation provides a basis for an information exchange, where the provider informs the patient about her health status. This information has the benefit that the patient will get an increased knowledge of her health condition. If the patient needs further treatment, either the primary care provider will carry out the treatment (not shown in Figure 1) or the provider refers the patient to an eye care specialist at a hospital clinic that is able to provide advanced treatments. To do this, the provider offers a referral to an eye specialist treatment, which is a voucher for an eye treatment.

There are two benefits as a result of the exchange of the referral. The first benefit is direct: the patient will get an increased feeling of safety, since the patient knows that the referral can be used for advanced treatment, thereby reducing anxiety. The other benefit is more indirect: if the patient uses the referral, the treatment at the hospital clinic may improve the health state of the patient, i.e. another benefit of the referral is a potentially better health state. Furthermore, when the primary care provider starts investigating the patient, it gets a responsibility for the patient's health, i.e. the provider is responsible to carry out required actions in order to maintain or improve the patient's health state. The benefit is that the patient gets an increased feeling of safety, since she/he knows that a professional healthcare provider has a responsibility for her health.

The other exchanges in the value model can be described in a similar way, but this is left out for reason of space. The example illustrates some of the advantages of value models. They enable healthcare stakeholders to easily get an overview of their complex networks. They can be used to describe the rationale of a network and analyse its sustainability and the benefits it provides to its participants. Value models can also be used as a starting point for identifying business processes and services needed for realising the interactions of a healthcare network, and this is the topic for the remainder of this article.

From Values to Goals and Actions

As a first step in identifying and designing processes and services, it is helpful to derive goals from the resource exchanges in a value model. A goal is generally a description of a desirable state, something that is worth pursuing. In other words, a goal expresses something a business seeks to accomplish, a desired future state of affairs or condition. Examples of goals are being the market leader in an industry or having a profit of more than 1 million euros. Goals can be decomposed, i.e. one goal can be a part of another goal. Generally, the decomposition forms a hierarchy where high level goals are broken down into sub-goals. In order to achieve a goal, an organisation can make use of actions. The main difference between actions and goals is that an action states what an organisation will do to achieve a goal, while a goal tells what the organisation views as desirable. When breaking down a goal into a goal hierarchy, the goals will be more concrete further down the hierarchy and actions are commonly defined for these lower level goals.

One way of identifying goals from a value model is to address each resource exchange and focus on the benefits it is intended to provide. For example, starting from the resource exchange of Eye treatment, we can identify two top level goals "The eye treatment shall give rise to an increased feeling of safety" and "The eye treatment shall result in better health state", see Fig. 2. Each of these goals can be decomposed into a number of sub-goals. Such sub-goals may concern the exchange of information between actors, responsibility relationships between actors, transaction costs, internal efficiency, risk management, etc. In Fig. 2, we have decomposed the top levels goals mainly by focusing on information exchanges, taking into account what information patients should get and what channels should be used to distribute it. Goals at the

lowest level are related to actions that can support them.

Another way of identifying goals from a value model is to focus on desirable properties of resources that are exchanged as well as desirable ways in which the resources are delivered to the recipients. In particular, desirable properties in this context are high quality, fast, flexible, low cost, and secure. These properties are called value enhancers as they describe what makes resources even more valuable. The value enhancers can be used to assist a designer in finding goals that address the usefulness of a resource as well as the adequacy of its delivery. For each resource being exchanged and for each value enhancer, we identify a number of top level goals.

In Fig. 3, we have started from the resource Eye treatment and identified two top level goals based on the value enhancer "fast". The first one states that the waiting time for the eye treatment shall be short, while the second one states that the time for carrying out the treatment shall be short. Just as before, we can decompose these goals into lower level goals based on aspects like information exchanges, internal efficiency, risk reduction, and resource planning. In the example, we have primarily considered sub-goals about resource planning, i.e. how time slots shall be booked and used in efficient ways. Finally, we identify actions to support low level goals. These actions can vary in nature but they often take the form of new e-services. For example, the sub-goal of decreasing the number of patients not using their time slots can be supported by an e-service that reminds the patient via SMS.

In the REMS project the value model and goal models were created in several modelling seminars, each seminar included representatives for the involved actors. Together with a seminar leader proficient in goal modelling, the representatives identified sub-goals and supporting actions. In this way, the decomposition of top level goals into actions led to the identification of a number of e-services. A subset of these services was later implemented in a web-based system.

Concluding Remarks

The approach suggested in this article can be used in two ways. First, it can be used to systematically suggest and identify new innovative actions that improve the overall performance of a network of actors in the healthcare sector. A part of these identified actions will be the creation of new e-services. The approach will thereby assist designers in generating new ideas, where the use of value and goal models helps to ensure that all potential improvements are explored. Secondly, the approach enables traceability of actions to the high level goals they support. This enables designers to validate existing actions, in particular the effect they have on actors participating in a value network.

The proposed approach illustrates how value modelling can be used to systematically design, reconfigure and improve networks of healthcare providers, citizens, and other stakeholders. These tasks will become even more important in the future, as citizens are no longer only passive consumers but active co-producers of value in a healthcare network.

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