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**Publication date**  
2016

**Published in**  
Service Design Geographies

### **Citation (APA)**

Oosterholt, R., & Simonse, LWL. (2016). Service Pathway: a Case Study of Business Model Design in Healthcare. In N. Morelli, A. de Götzen, & F. Grani (Eds.), *Service Design Geographies: Proceedings of the ServDes.2016 Conference* (pp. 563-573). (Linköping Electronic Conference Proceedings; No. 125). Linköping University Electronic Press. <http://www.ep.liu.se/ecp/contents.asp?issue=125>

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# Service Pathway: a Case Study of Business Model Design in Healthcare

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## Abstract

Care pathways are used in hospitals to manage the decision making and care processes across medical specialities. The latest innovation in hip replacement is a care pathway that enables a patient discharge on the day of surgery. While the clinical attributes have been well researched a detailed understanding of the organisation is missing. We apply business modelling to create an organisation model of the care pathway and translate the embedded knowledge to other hospitals. A case study was conducted of the outpatient THA care pathway at a teaching hospital in the Netherlands. We present two visual models of the critical phases of the care pathway, with which we add the organisational attributes to support adoption of the innovation to other hospitals. Designers design business models for services. However more examples of practice are needed to contribute to the knowledge base of business modelling toolkits. In this paper we apply business modelling in the domain of healthcare.

**KEYWORDS:** business model design, visual modelling, service pathway, healthcare, hospital, hip pathway.

## Introduction

A model represents a simplified reality, allowing us to manage complexity and to reason accordingly (Simon, 1990). Models communicate visually and contain a message for the user. They are able to transfer and translate knowledge across organisational boundaries (Carlile, 2004). Visual modelling emerged in the design community where designers think and communicate in a visual manner and translate abstract requirement into concrete objects such as 2D & 3D images and physical objects (Goldschmidt, 1994). Visual modelling is a part of the intellectual skill of designers, representing the sketches and drawings of design solutions. The skill is mastered on design schools and remains part of the designer's ability throughout their professional career. In practice, designers widely utilise visual modelling and

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## Introduction

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also trust on this capability when entering a service context (Segelström, 2009). Reflections on these experiences made apparent that the design of business models behind the services appeared to be within our field of expertise (Simonse, 2014). However more experiments and examples of practice are needed to contribute to the knowledge base and sophisticate the tool kits of business modelling. In this paper we apply business modelling in the domain of healthcare with the design of a care pathway model.

## Business Model Design

Business models describe how *value* is created and delivered (Teece, 2010). We utilise this concept in order to capture the *value exchange* in the design of service pathway models and depart from the definition of a business model by Amit & Zott: 'A business model depicts the content, structure, and governance of **transactions** designed so as **to create value** through the exploitation of business opportunities.' Amit & Zott (2001, p.511).

The content represents operational information or goods that are being exchanged, the structure specifies the parties (network of actors) that participate in the exchange, and the governance considers the ways in which flows of exchange are coordinated (Amit & Zott, 2001).

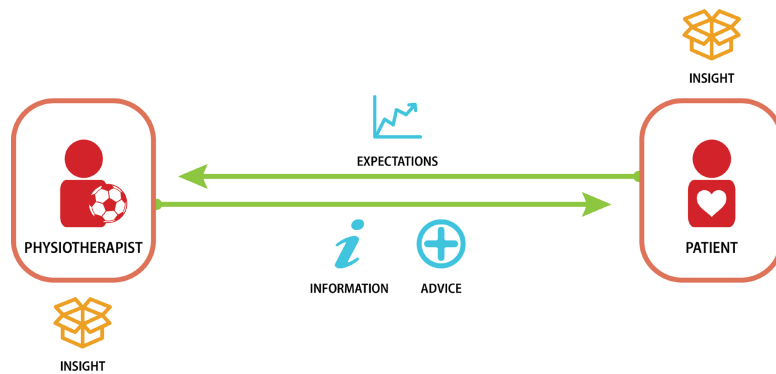
Models represent reality on different levels of analysis. Business models represent a simplified reality of value networks, a meso level, depicting how an organisation creates and delivers value (Chesbrough & Rosenbloom, 2002; Johnson et al., 2008). Our research dives deep into a micro level of analysis involving the design of a care pathway model in a hospital organisation.

### *Network of actors*

The network of actors is the key element in business model design that enables the value exchanges, collectively the actors account for the value creation in the model (Amit & Zott, 2001). The network consists of different partners across organisational boundaries who are linked by value exchanges (Zott & Amit, 2010). The persons representing the partners are the actors in the network. Our research focuses on the organisational network of a care pathway, actors connected by value exchanges spanning organisational departments.

### *Value exchanges*

Figure 1 shows an example of a value exchange. Two actors participate in the exchange (patient, physiotherapist). The patient discusses his or her expectations regarding recovery after surgery with the physiotherapist. The physiotherapist informs the patient about the rehabilitation procedure and provides advice on how to prepare adequately. The transaction enables the physiotherapist to understand the patient's needs in order to provide the right care. The patient gains insight into the rehabilitation procedure and preparation. A value exchange consists of the transaction content and the value attribute. The content relates to what is transacted in the value exchange, as displayed in the centre of Figure 1 (blue icons), and consists of elements such as forms of information (Table 1). The value attribute represents the reason why the transaction takes place (Figure 1, orange icons). Value exchanges are bilateral, creating and delivering value to both participating actors.



**Figure 1** shows an example of a value exchange between two actors

## Service Pathway: a one-day length of stay

Care pathways are widely used to manage the decision making and care processes across medical specialities within hospitals. The aim is to improve the quality of care, patient satisfaction, efficiency and reduce risk (de Bleser et al., 2006). A care pathway is a: ‘...complex intervention for the mutual decision making and organisation of care processes for a well-defined group of patients during a well-defined period’ (Vanhaecht et al., 2007; p.137).

In the field of total hip arthroplasty<sup>1</sup> (THA), fast-track care pathways are used that aim to give the patient the best available treatment in the shortest needed time by combining evidence-based clinical features and organisational optimisations (Husted, 2012). However, patients remain in the hospital for several days to recover.

The latest breakthrough innovation is an outpatient THA, a care pathway that enables a patient to be discharged on the day of surgery. The clinical attributes used by Hartog et al. (2013, 2015) are the same for an overnight and outpatient care pathway, but determining organisational changes are incorporated in the outpatient pathway. This has resulted in an intensification of the provision and organisation of care.

A shorter length of stay (LOS) is beneficial for patients. Hospitals also benefit from an outpatient THA care pathway as resources are saved and costs are reduced (Aynardi et al., 2014). The establishment of a fast-track care pathway does not ensure successful outcomes in itself, the successful coordination of the care activities and team is a crucial element (Husted et al., 2010; Kehlet & Wilmore, 2008; Maessen et al., 2007). A fast-track care pathway is therefore highly dependent on its model of organisation. Improving the organisational flow is considered to be an important future strategy to further optimise the care delivery in the pathway:

*‘Strategies to improve the organisational flow may be warranted, even mandatory, for further improvement as waiting for physiotherapy, radiographs to be taken, crutches to be handed out, a surgeon to appear for discharge etc. may be barriers for early discharge when the functional discharge criteria are fulfilled’ (Husted, 2012, p.31).*

<sup>1</sup> A surgery where the hip joint is replaced.

Despite the acknowledged impact of the organisational aspects of a care pathway on reducing the LOS, little research exists on how a care team and care processes should be organised to optimise LOS in THA care pathways. The clinical attributes are well researched, but a detailed view on the facilitating organisation is still missing. We bridge this gap with the design of a visual care model to provide insight in the organisation of the care pathway depicting how the care team and care processes enable a patient discharge on the day of surgery.

## Design of the care pathway model

In this study we investigate the organisation of the outpatient THA care pathway and add to its clinical attributes the organisation attributes in order to support adoption of the innovation to other hospitals. The research questions that guides our investigation are:

*What is the optimal design of the outpatient THA care pathway model for Hip Cure to communicate to other hospitals?*

We apply business model design as a designerly practice to design a care pathway model of this healthcare innovation, we term this care pathway model design.

As designers we apply business modelling as a designerly practice to design a visual care pathway of the outpatient THA care pathway, we term this care pathway model design. The care pathway model serves to represent the organisational reality and to translate the embedded knowledge of the outpatient THA care pathway to other hospital organisations and facilitate its adoption.

## Method: Case Study Research

In order to design a care pathway model a detailed understanding of the outpatient THA care pathway is necessary. A single embedded case study research method is applied. Allowing us to gain insight in the organisation of a complex care system (Yin, 1999), while retaining the holistic and meaningful characteristics (Yin, 2009). While coding is the common approach for qualitative data analysis (Charmaz, 2006; Eisenhardt, 1989). We employ a visual business mapping tool kit as it is 'particularly attractive for the analysis of process data because they allow the simultaneous representation of a large number of dimensions, and they can easily be used to show precedence, parallel processes, and the passage of time' (Langley, 1999; p.700). The graphical representation of our care pathway model is an abstract conceptualisation, an intermediary step in order to construct a theory.

We selected the Reinier de Graaf hospital because it is the only hospital in the Netherlands that employs an outpatient THA care pathway, and were the first European healthcare organisation to publish about such a pathway (Hartog et al., 2015), consequently it is considered a unique case (Yin, 2009) to study. The Reinier de Graaf hospital is a large teaching hospital and provides care to several hundred thousand patients annually. Seven orthopaedists operate at the hospital, one of them performs the surgeries in the outpatient THA care pathway. Between 1 April 2014 and 30 October 2015, 100 patients were discharged in an outpatient setting

For data collection, 16 semi-structured interviews were conducted to map the value exchanges within the care pathway. Standard interviewing techniques were incapable of collecting a detailed image of the value exchanges in a complex network structure. A visual care model toolkit was developed to aid in mapping the value exchanges, the toolkit is a modification of the toolkit by Arts-Posthoorn & Gedde (2014), and has been used in the design of a pre-care e-health service in Meeuwen et al., (2015). The toolkit visually maps the value exchanges that take place and acts as inspiration to uncover implicit information, the toolkit also structures the story of the interviewee and creates consistency in the different interviews.

## Care Pathway Design

We present two models of the most critical phases in the outpatient THA care pathway: diagnosis & preparation (care phase 1) and mobilisation & discharge (care phase 4). The models are a visual representation of how the care pathway is organised to enable a discharge on the day of surgery. The models depict the network structure of actors connected by value exchanges (Figure 1) and are critical in enabling a same-day discharge from an organisational perspective. The value exchanges are visualised in the models but are not defined in a table due to size restriction.

### *Model #1 diagnosis and preparation phase.*

The pathway model design of the first care phase visualises the network of actors and value exchanges concerning the diagnosis of the patient and preparations needed for the admission, surgery and recovery of the patient. Figure 2 shows the as-is care pathway at the case hospital (left) and the design (right) side by side. The visual differences are the direct result of the optimisations that have been incorporated in the design. The design involves nine actors (reduction of two) and a total of eight patient centric value exchanges (reduction of two). The critical organisational attributes of this phase are: patient preparation (mental and practical), patient education, aligned care team and efficient sequence of value exchanges.

The design removed value exchange problems and inefficiencies that exist in the *as-is* care pathway. In the *as-is* situation patients are educated by an orthopaedic consultant on two separate occasions and during a group education session. The content of these exchanges unnecessarily overlap and waste valuable resources. For this reason, the group education was removed and the orthopaedic consultant has been replaced by an intake nurse. The intake nurse now conducts the medical anamnesis. The education of the patient is realised by the digital patient information application, which provides the patient with the right information at the right time in order to prepare and educate the patient sufficiently for discharge on the day of surgery. The scheduling of the day of surgery is embedded in the patient application. At the case hospital the ward doctor is also present at the outpatient clinic which is not self-evident. To create a more generic and clear model the ward doctor has been replaced and its responsibilities are fulfilled by the orthopaedic surgeon (conducting the physical diagnosis) and the nurse (marking of patient's leg on the day of surgery).

### *Model #4 Mobilisation and discharge phase*

The fourth pathway model design visualises the network of actors and value exchanges concerning the mobilisation and discharge of the patient at the ward. Figure 3 shows the as-is care pathway at the hospital (left) and the design (right) side by side. The design involves six actors (reduction of one) and a total of five patient centric value exchanges (unchanged from as-is). The critical organisational attributes of this phase are early patient mobilisation, flexible availability of the physiotherapist, functional discharge criteria, joint decision making and availability of the care team.

The design removed value exchange problems and inefficiencies that exist in the as-is care pathway. In the as-is situation the ward doctor rarely visits the patients at the ward post-operatively, because he or she has to be present at the outpatient clinic at the time the patient returns to the ward for recovery. The visit of a doctor is however very important and therefore the ward doctor and orthopaedic surgeon are merged into the role of doctor. A role that can be shared by multiple actors to ensure the patient is visited multiple times by a doctor; at discharge and once or more before that. This provides the doctor a better view on how the patient is progressing and will increase the patient satisfaction due to more quality contact with caregivers during a short stay at the hospital. Furthermore, the patient information application is added, enabling the patient to receive the right information at the right time.



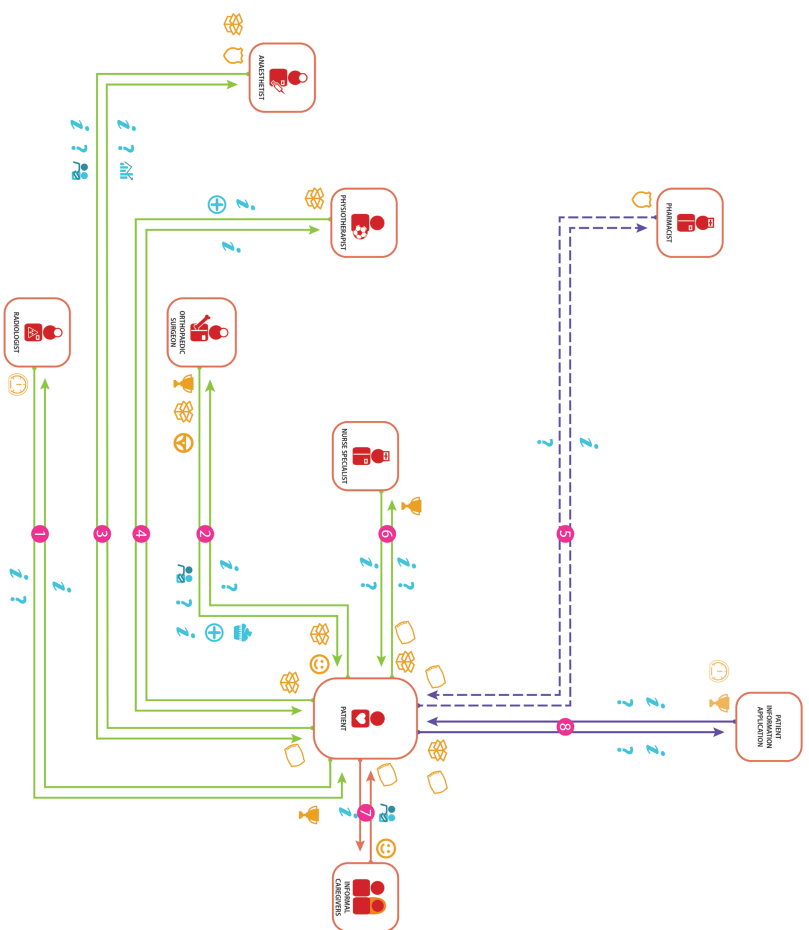
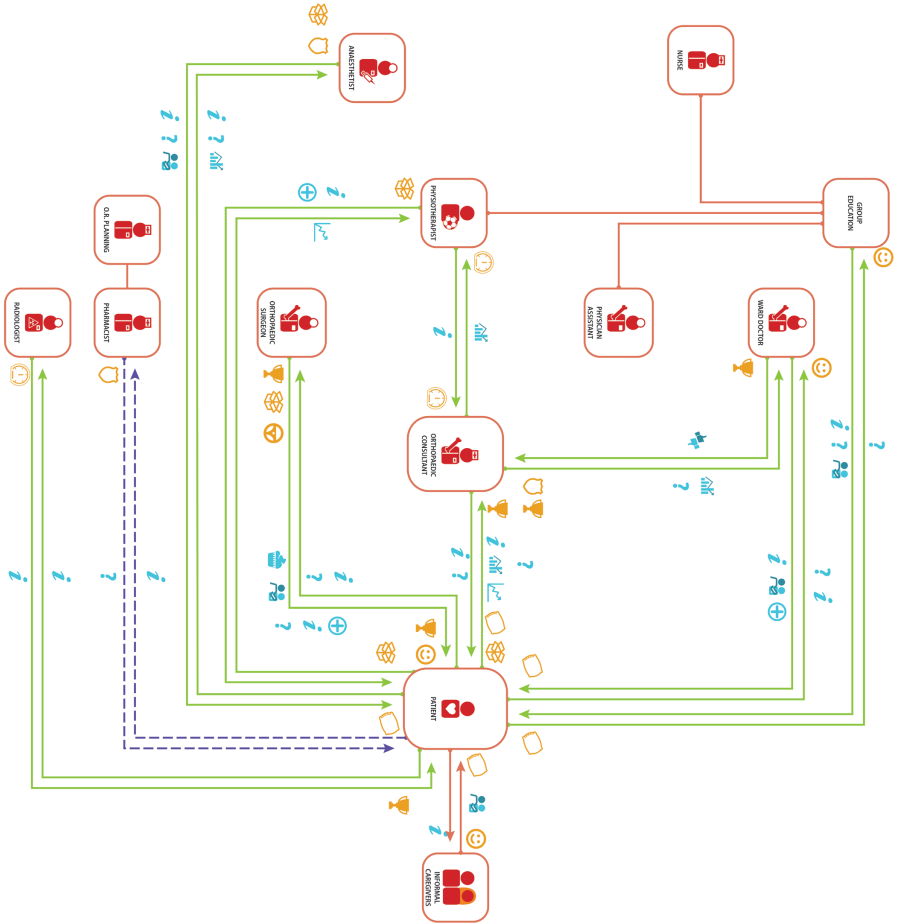


Figure 2 shows the care pathway model of the diagnose and preparation phase, as-is (left), design (right)

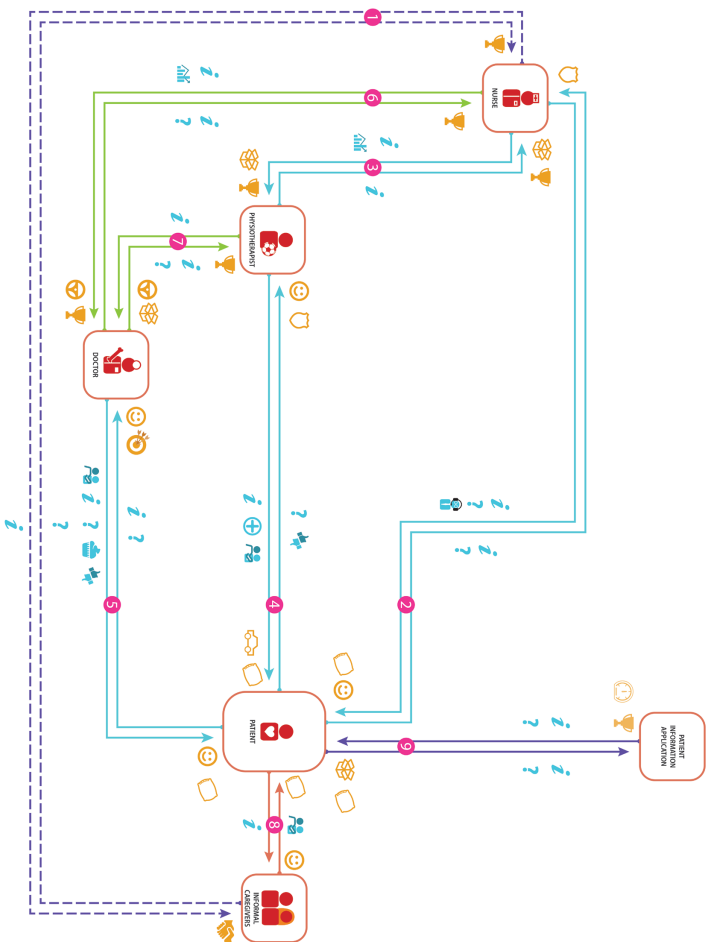
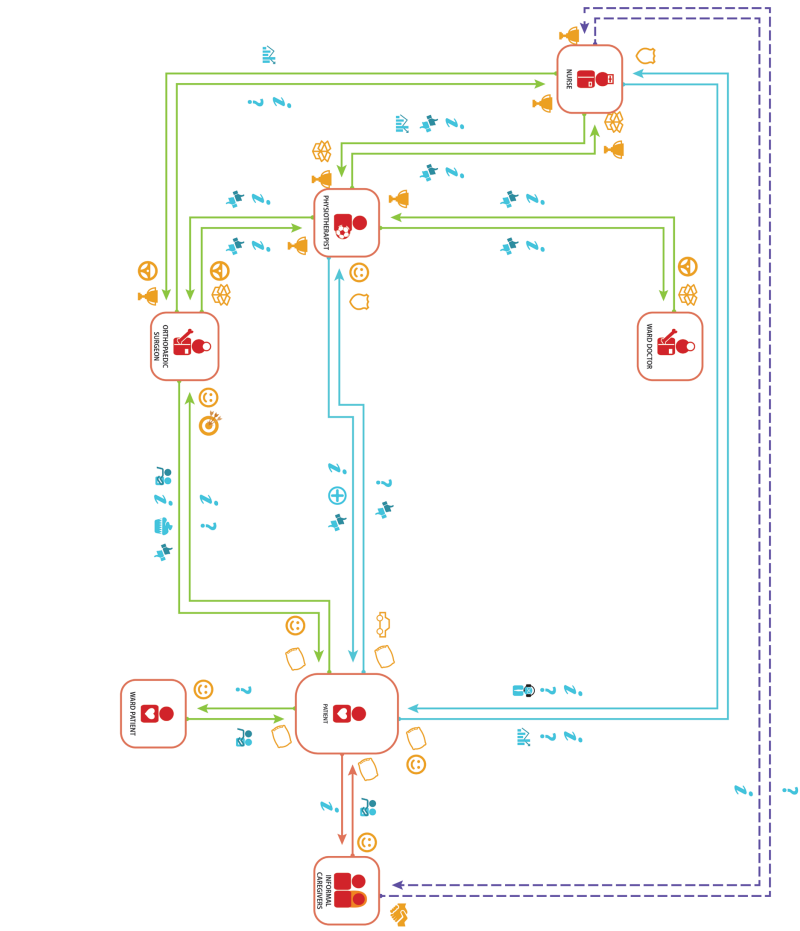


Figure 3 shows the care pathway model of the mobilisation and discharge phase , as-is (left), design (right)

## Professional implications

The presented care pathway model is of interest for professionals involved in hip care pathways to gain insight in the organisational structure of an outpatient THA care pathway. This enables them to compare their own care pathway to the model and inspire their care teams to improve their own care pathway, to ultimately reduce the length of stay of hip patients.

## Future research

As designers we use care model design to support the adoption of care pathways by providing insight in the organisation of the care pathway, showing what value exchanges take place and ultimately how value is created. The use of business model design in constructing a care pathway model was effective in gaining in-depth insights in the complex organisation of the care pathway at the case hospital. As designers we are used to make visual artefacts that minimise the communication boundaries with stakeholders, allowing us to properly discuss them with these stakeholders and continue development. The business modelling method had a similar role during the interviews and the development of the models, and is suitable for improving the organisation of care pathways in hospitals.

## Conclusion

In this case study we investigated the organisation of the ground breaking outpatient THA care pathway. The models visualise the organisation of the care pathway of the two crucial phases: the *diagnosis & preparation* and *mobilisation & discharge* phases. The models show the network of actors connected by value exchanges, with which we add the missing organisational attributes in order to support the adoption of this innovations to other hospitals. The visual differences between the *as-is* and the *design* are the direct result of the optimisations that have been incorporated in the design.

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