Business model design through a designer's lens: Translating, transferring and transforming cognitive configurations into action

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1 INTRODUCTION

Strategic managers are challenged to take advantage of digitalisation opportunities related to services of social media and web 2.0 technologies. Business innovations such as crowd sourcing platforms require a new way of integrating business to technology, articulated in a new business model designs (Afuah and Tucci, 2012; 2013). And also home healthcare monitoring platforms in the public and non-for profit domain of healthcare with impact on the care providing services, require such new business model designs (Hwang and Christensen, 2008; Mettler and Eurich, 2012; Lehoux et al., 2014). In response to the digitalisation opportunity, the high complexity of interconnecting multiple companies and clients in new ways of integrating business and information technology networks, the practice of strategic managers is in quest of design knowledge and methodologies to support the business model design challenge.

In parallel, in the academic discourse[1] the dominant perspective has been, to see the business model as a set of cognitive configurations (Baden-Fuller and Mangematin, 2013). Although discovery and experimentation have also been acknowledged as effective ways in which firms can probe complex and fast-moving environments to discover what works (McGrath, 2010). In bringing both perspectives together, translating cognitive configurations into action, designers are expected to perform an important role, adding "rational planning, timing, improvisation, intuition, the creation of meaning, communication, and many more of the virtues attributed to designers[2]". The aim of this paper is to provide an initial Designer's lens on business model design. In continuation of our contribution to the on-going conversations about the role of design in business model design, this piece provides insights on intermediating between strategic managers and designers, between theory and practice and between cognition and action.

Central to the design challenge in business model design, is finding a way to support the reasoning on business innovation with model objects that are manipulable, or experimentable (Baden-Fuller and Morgan, 2010; Baden-Fuller and Haefliger, 2013). However, besides some pioneering contributions (Simonse, 2014), little is known about business model *design* and the complex interplay between the designer, the use of design theory and design outcomes (Badke-Schaub et al., 2011). The intend of this paper is to gain a better understanding here, in so far as we will review the origin of modelling in design theory and reflect on its application within experiments of business model design. This paper identifies *design principles of modelling* and proposes *new principles of business modelling* derived from three practices of business model design in cases of eHealth services. We adopt a case study method to investigate the application with special consideration to the transfer of the design principles into the business model design context. And we reflect on the case analysis, framing principles of business modelling that are associated *with translating, transferring and transforming cognitive configurations into action.*

In the next section, this paper discusses the theoretical basis of the research study along three main principles of modelling and the formulation of the research question. Then the application section follows, with attention given to the method and results of business model

[1] Among other conferences also at the EGOS conferences in Helsinki, Montreal and Rotterdam.
[2] http://www.egosnet.org/jart/prj3/egos/main.jart?rel=de&reserve-mode=active&content-id=1392376003637&subtheme_id=1368705987445

design in three experimental cases of eHealth services. In the final section conclusions are drawn from reflections on the modelling in business modelling with the identification of three particular design principles of business modelling.

2 DESIGN PRINCIPLES OF MODELLING

'Modelling' in the design theory and methodology literature leads to three relevant perspectives from which we synthesised a main principle. From the human centred design(ers) perspective we formulate the first main principle 'visual reasoning by designers'. From the complex system perspective on the origins of modelling we formulate 'prescriptive aggregation of complex systems' and from the design methodology in the European tradition (ref. Anthology of design theory) we formulate the design principle of 'creation of an artefact'.

2.1 Visual reasoning by designers

'Modelling' is considered as a designer's ability of creative problem solving by visual reasoning and decision making. The way designers communicate is through visual thinking, framing, and coding design requirements into new models (Goldschmidt, 1994). Architects and designers use sketching not just to record an idea, but moreover to generate it. For visual modelling designers use symbols, signs, and metaphors through the media of sketching, diagrams, and drawings and thus translate abstract requirements into concrete objects, including 2D and 3D images, clay models and marquettes. And for example also in business modelling, by visual, generative modelling designers are able to discover new business model innovations (Simonse, 2014).

2.2 Prescriptive aggregation of complex systems

'Modelling' in complex system theory is regarded as a methodology to research behaviour of large complex systems in reality. According to Simon (1990) we '*capture in our models a simplified picture of reality which, nevertheless, will allow us to make the inferences that are important to our goals*'- Simon (1990). In order to understand the consequences of opting for one decision over another, designers construct prescriptive models. For useful business model design and manipulations, a model resolution level needs to be determined that are only possible when the model is simple enough to work through, but yet complicated enough to capture sufficient content of the firm's arrangements to make the experiment meaningful (Morgan and Morisson, 1999). To manage the complexity of representing reality in a model,

basic guidelines in modelling are: First, *to separate what is essential* from what is dispensable; second, to *make use of symbols* that represent natural language where appropriate, modelling with pictures or diagrams, rather than making use of numerical description; third, *to aggregate as much as possible*. This aggregation refers to the essential notions of system theory, that artificial systems have a "boxes-within-boxes" architecture with the important property that the behaviour of the units at any specific level can be described and explained without the need for a detailed picture of the structures and behaviour at the levels below. As such a model represents reality with a certain structure and resolution level that provides insights on orders of magnitude.

2.3 Creation of an artefact

In concerning 'modelling' as the language of the designer, the actuation of an artefact is essential (Roozenburg, 1993). Grounded in the research of Hubka (1980) who found that the designer is concerned with modelling for about 30% of its activities. A 'model' is an artefact, which reproduces the properties of an object. The model supports the designer to obtain answers to queries during the design process to elaborate, synthesize, evaluate and communicate. In a product development project different types of models can be generated for representing the product, such as: experimental set-ups, design sketches, mock-up models, lay-out drawings, block-diagrams, function models and prototypes. Properties represent the quality of the product prescribed as requirements in the design specification. Thus, properties of products are, apart from other, performance, size, color, reliability, costs. Some properties are quantifiable and offer functional benefits e.g. weight, speed, energy consumption. Others are less quantifiable such as appearance and ease of operation (Buur and Andreasen, 1989; Maier et al., 2014).

In transgressing from merely product design to product service system design, this research investigates the application of these modelling principles that are grounded in product modelling into new practices of business modelling. In particular we are interested in finding answers to the question of: *To which extent modelling as a product modelling ability can contribute to business modelling and what is similar and dissimilar when we compare the modelling process and outcomes*.

3 THREE EXPERIMENTAL CASES IN BUSINESS MODELLING

Given the emerging practices of business modelling and the nature of our research question we adopted the case study method (Eisenhardt, 1989) to investigate, in-depth the application and transfer of the design principles into the eHealth context. For the reflection we applied multiple case-analyses and compared three cases within the eHealth domain. The case where selected, representing a business modelling practice, a new product service system and experimental mode of modelling.

3.1 Case A: Health protection service system

Case A concerns a start-up organization that launched a health protection service system by a professional cardiologist (Meeuwen et al., 2014). The purpose of the health protection service is to make clients aware of living a healthier life by supporting them with an online service for their lifestyle advices and heart risk scores. The information service regularly gives advice on how the client can improve his or her lifestyle, and provides the client with a lifestyle score, updated bimonthly. In interactive sessions, five participants (clients, health professionals, managers and ICT developer roles in the network) visualized the value exchange of the service by using the visual business modelling toolkit, a pre-crafted instrument created by the strategic product designers. Three types of data (visual modelling data, interview data and observation data) were combined to frame, analyse and synthesize the business model view of each actor (see figure 1).

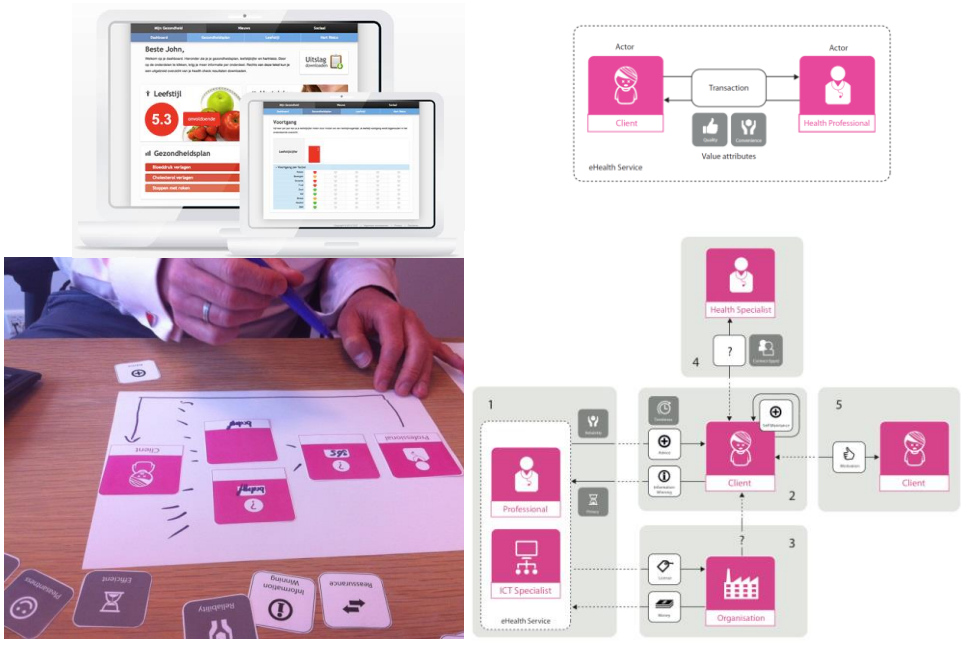


Figure 1. eHealth case A: Business modelling for health protection service

The outcome is the artefact of the business model design consists of five building blocks:

- Building block 1: involve a health professional, since this will ensure privacy and reliability in the transactions between the client and the service.
- Building block 2: provide an online flow of information with regular interactions to the client in order to stimulate self-management of personal health.
- Building block 3: involve an intermediate organization with a large customer base to extend the service's reach.
- Building block 4: involve a service-dedicated health expert for personal face-to-face contact with clients in order to ensure and increase the perceived quality of the eHealth service.
- Building block 5: include social interaction with other clients of the online service with a view to motivating and supporting the self-management of personal health.

Guided by the business modelling toolkit, the care model design artefact is visualized with elements of actors, transactions and value attributes.

3.2 Case B Personalised medicine service system for Diabetes

Case B is about the business modelling for the 'Artificial Pancreas' device developed by the DIAGO (Schultes and Tekeli, 2014). The device automatically controls and continuously monitors the blood glucose levels of insulin dependent diabetic patients. Together with the CEO and the marketing manager of DIAGO Diabetics, the designers developed the initial business model (Map A) for the diabetes self-measurement service (see figure 2).

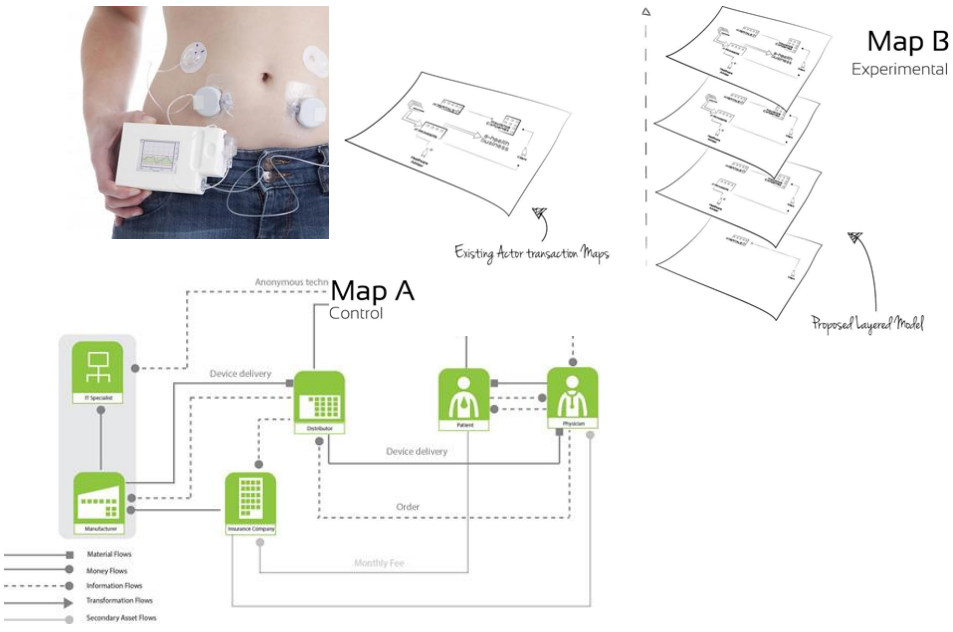


Figure 2 eHealth case B: Business modelling for Diabetes self-measurement service

For complexity reduction purpose, a second, layered business model was visualized consisting of separate layers of business model building blocks (Map B), telling the design story in a chronological way. In the experiment set-up of this case, two experiment groups with six participants (patients, managers and ICT-designers from the network), tested the usefulness of the single layered vs multi-layered map (Cozby and Bates, 2011).

The pre- and post-test measured on the boundary object criteria of knowledge t*ransfer, translate , and transform* properties *(*Carlile, 2004). Results showed that, when it comes to the understanding and communication of the business model content the knowledge transfer of the visual business modelling can be increased by the chronological layering of the model.

Table 1 . Synthesis of pre-and post- test results.

Level of Boundary Object	CRITERIA	MAIN INFLUENCING FACTOR	SINGLE LAYERED	MULTI LAYERED
TRANSFER	Understanding the BM principle (get the idea, concept)	TOOL	GOOD	BETTER
	Imagine thyself in the BM scenario, Assuming an active role in the BM	EXPERIENCE & VISUALS	GOOD	GOOD *(BETTER)*
TRANSLATE	Recognize the dependencies of different stakeholders	EXPERIENCE & VISUALS	GOOD	GOOD *(BETTER)*
	Recognize/ Identify potential challenges, problems and pitfalls		GOOD	GOOD *(BETTER)*
TRANSFORM	Propose a solution (improve the BM by adapting it)	EXPERIENCE & VISUALS	GOOD	GOOD *(BETTER)*
	Transform the system/ map		GOOD	GOOD *(BETTER)*
	Discuss / explain s.th. along the map		GOOD	GOOD *(BETTER)*

Compared to the single layered version, the knowledge translate (co-analysis) and transform (co-design) properties of the multi-layered visualization were found similar useful. The clear and structured style of the visuals, as well as professional experience of the participants are indicated to be important for these modelling aspects.

3.3 Case C Personalised Hip replacement services

Case C relates to hip replacement services tailored to the personal needs and preferences of the patient. (Posthoorn and Gedde, 2014). The aim of visual business modelling was to identify, understand and visualise where the actors can add value, to the different stages of the hip replacement journey in order to improve the patient experience and enable them to manage their personal health. The modelling in this case connected the patient journey mapping (Mould et al., 2010) to visual business modelling mapping (Simonse, 2014). In interactive sessions, five participants (patient, physiotherapist, orthopaedic surgeon, orthopaedic nurse, and a business consultant) used maps, stimuli cards and free format sketches as tools to get a deeper and detailed understanding of the different feelings, thoughts

and frustrations regarding the hip replacement patient journey and the value exchange between network partners.

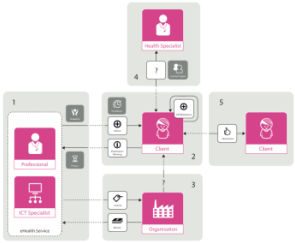
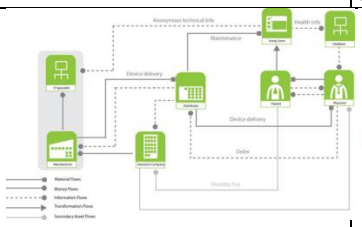
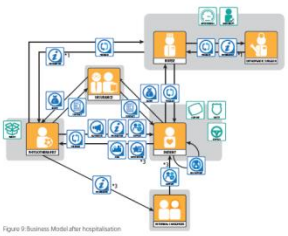
Figure 3: EHealth case C: Business modelling for personalised hip replacement service

During the sessions, the use of the tangible stimuli cards helped the participant remember events. Participants used the map to structure their story and organise the cards. The timeline on the map enabled the participants to indicate when they experienced emotions, needs or values, and who was involved. The data analysis combined all actor maps into the design of an overall business model map. The different clusters of cards were compared to identify similarities and differences. By working visual and tangible, it was easier to discuss the different types of value exchange between the actors within the process. An integrated care model design was generated for the pre-, during and post hospitalisation services of hip replacement. This integrated care model improves the communication between the actors concerning information, feedback and reassurance. By making expectations explicit to actors will enable the care to become more personalized, which will make the patient feel more secure of a treatment tailored to his needs.

3.4 Case analysis

In the case analysis across the three eHealth cases: first the application and transfer of the design principles into the PSS context is compared; second the striking characteristics of the business modelling process and new insights on the nature of business modelling are synthesized (see table 2).

Table 2.Comparision of application of modelling principles, modelling process and new insights across cases of business modelling

Experimental Case	**eHealth Case A**	**eHealth Case B**	**eHealth Case C**
Key reference	(Meeuwen, Walt Meijer and Simonse, 2015)	(Schultes and Tekeli, 2014)	(Posthoorn and Gedde, 2014)
eHealth service	**Health protection service system**	**Personalised medicine service system for Diabetes**	**Personalised hip replacement services**
Designer's instrument for Visual reasoning	Visual Care Modelling toolkit: icon cards for actors, transactions, value attributes. Blanc cards, markers and A3 paper. -Client and Health professional – start cards.	Visual Business Modelling toolkit: icon cards for actors and objects. Blanc cards, markers and A3 paper.	Visual Business Modelling toolkit: icon cards for actors, e*motion values*, added value, channels. Blanc cards, markers and Patient journey (Timeline) map
Prescriptive aggregation for Business model	Network structure properties: identify all actors, transactions and value attributes that provide the service to the client (including peer-to-peer client exchanges).	Layering actor-transaction building blocks in business-to-hospital service network structure.	In connection to patient journey, start from barriers – model network actors value exchange solutions of eHealth service providing for Hip.
Artefact Business Model Design (Outcome)		 	
Modelling process	Modelling in co-design with actors involved. Start with interactive session with service owner and with client to discover important actors. Generating multiple actor view models. Synthesis of Business model Design by strategic designer. Create artefact with building blocks of actor-transactions.	Co-analysis and Co-design of business model with service owners – strategic design team: Venture CEO / Marketing manager / two strategic designers. Designers communicate the artefact with layers to other actors involved in the network.	Modelling in co-design with actors involved. Start with emotion value cards to identify barriers in patient journey. Collect multiple actors' viewpoint on barriers and value adding solutions. Synthesis of new value exchange solutions by strategic designer. Create artefact with building blocks of new actor-transactions solutions.
New insights on nature of business modelling	Tangible cognitive configurations on values exchanges, the mental models of actors, become explicit by visual business modelling. (For discovery of *new* network structure properties – blanc cards are very important).	Shared vision, translating (co-analysis) and transforming (co-design) roles and value exchanges into model. Useful communicated by modular building blocks.	Modular building blocks evoke transformation by iterative loops and integration of actor's views and expansion of value exchanges in substructures.

4 DESIGN PRINCIPLES OF BUSINESS MODELLING

In this section [*here initial texts from case-analysis and our work in progress that is currently executed!]* we reflect on the case analysis and the enfolding literature with respect to the research question. Drawn from the logic across cases, in comparison to contrasting and supporting literature, three additional principles of modelling are identified.

4.1 Actors modelling: translate the cognitive configurations into action

All cases design the business model by combining actor's views. A number of different actors, participate in an interactive sessions to visualize what they perceive as the business model from their point of view. In the actors modelling, four actor views appeared to be important for the synthesis of the different views into a comprehensive model:

a) Client -user modelling: in correspondence to findings of Hienerth et al. (2011), building on the 'user as designer' notions of Von Hippel,(1988).
b) Health professional -expert modelling: important for the credibility, viability and privacy of the service (Meeuwen et al., 2014).
c) ICT-developer - web-technology modelling: inherent to business model innovation notions of business model design (Simonse, 2014).
d) Network intermediary - eco-system modelling: perquisite for integration of business organisation perspective.

The commonalities of at least the views of these actors influence the business model design.

By visual modelling, the tangible cognitive configurations on values exchanges, the mental models of actors, become explicit. The use of the visual toolkit stimulates the articulation of each actor's view, the translation of the cognitive considerations associated to (perceived) customer desires and the delivered service structure. The icon cards, instead of texts, provide easy recognition and ease of use. For mediation across the boundaries of organisations collaboration of strategic managers with designers appeared to be very useful. This corresponds to the findings of Buur et al. (2013) on similar approaches of participatory business modelling, evidencing that the visual and tangible modelling process is extraordinarily successful in initiating conversations about how to innovate business in cross-disciplinary and cross-functional groups.

4.2 Modular prescriptions: transform value exchanges of the network structure into building blocks of the business model

In all cases, building blocks with the properties of actors and value exchanges are modelled to construct the whole business model design. The business model design include both a high-

level overview of the network architecture that illustrates the whole care service delivery and enough detail of specific roles and activities of value exchange in modular building blocks of between at least two actors. Similar to product modelling (Alexander, 1964) is in business modelling, the modular prescription in substructures. Dissimilar to product architectural innovation (Henderson and Clark, 1990) is the relational object of modelling: the network structure of collaborating actors who are connected by internet technology. The initial properties of the network structure of a business model are the actors and value exchanges. The modular building blocks evoke transformation of the current situation by iterative loops and integration of actor's views and expansion of value exchanges in substructures.

4.3 Shared vision: transfer of communication and commitment

In all the cases, the business model artefact had an embedded story or scenario communicating among the various audience involved, for example how it provides people with protecting their health, or personalizing their glucose medicine dose or their information provision concerning their hip treatment. The model objects are therefore more than the denotation and source of information as some product models can be restricted to. The business model design has a catalysing role in communication. It is the explicit reason for their creation, in contrast to product modelling where it can be a second. Business model designs frame the inter-functional communication of interpretation and demonstration across the different organisations. The business model designs constitutes a shared vision in correspondence with Bucciarelli's notion (1994).

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