Supporting service-dominant business model evaluation in the context of business model innovation

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PROEFSCHRIFT

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door

Rick Augustinus Maria Gilsing

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Het onderzoek dat in dit proefschrift wordt beschreven is uitgevoerd in overeenstemming met de TU/e Gedragscode Wetenschapsbeoefening.

Summary

Stimulated by factors such as digitisation and globalisation, contemporary organisations increasingly adopt a service-orientation to better cater to the needs of customers, whom increasingly expect coherent solutions rather than stand-alone products. To reduce service complexity that underlies these novel offerings and to foster business agility, we observe that many organisations engage in business networks, in which organisations exchange and integrate services to co-create value. These collaborative, service-dominant business settings can be conceptualised as *service-dominant* business models. In contrast to traditional business models, which typically reason from the perspective of a single focal organisation, the success of service-dominant business models depends on the participation of all organisations represented in the business network, as each organisation contributes an essential piece of the value that is created. As a consequence, the *evaluation* of service-dominant business models calls for a holistic, networked assessment of the business model design, explicating and analysing how value is co-created and captured in these business settings. However, existing literature offers limited guidance and support towards the evaluation of service-dominant business models, particularly in the context of business model innovation, in which novel, not yet operational business model designs are subject to significant uncertainty. In such cases, business model evaluation is needed to support decision making to advance the innovation process.

In this thesis, we investigate how service-dominant business model evaluation can be supported in the context of business model innovation. To guide our research endeavour and to understand the practical value of our findings, we have followed the design science research methodology. Drawing upon theory with respect to service-dominant logic, business models, business model innovation and business model evaluation, we propose a context framework to offer methodological support towards service-dominant business model evaluation in the context of business model innovation. In doing so, we highlight the need for support in terms of two methods (named IDEM and INEM) that address the diverse evaluation challenges highlighted for the framework, as well as an auxiliary technique to interpret the outcomes of these evaluation tasks (named SKPI-T). We have evaluated the validity and utility of the proposed artefacts by means of a set of business scenarios drawn from industry domains such as mobility, logistics and agriculture, which are increasingly characterised by a service-dominant mindset. Through these scenarios, we were able to bring together a comprehensive set of industry experts to evaluate the validity and utility of the proposed design artefacts.

The composite use of the framework, methods and auxiliary technique delineate how service-dominant business model evaluation is structured in the context of business model innovation, in turn offering practitioners guidance and support on the evaluation of service-dominant business models. With respect to research, the findings of our work offer support towards the further conceptualisation and concretisation of service systems and service-dominant business models.

Preface

Before you lies what can be considered as the culmination of my Ph.D. journey, a journey in search of both knowledge and personal development, characterised by significant self-determination and freedom. Writing this preluding section, ironically as the final part of my thesis, I believe I can now start looking back at this journey with a sense of completion; admittedly also a bit more at ease, as the more I entered and delved into the increasingly interesting chapters of my research, the more I felt uncertain with respect to its expected contributions and significance and whether I was able to face the challenges posed. Luckily, I never felt entirely alone in dealing with these challenges. Even though conducting a Ph.D. is often considered as a solitary endeavour and therefore normally is driven by the capabilities, motivation and ingenuity of the researcher, completing such a project essentially never occurs in complete isolation. A Ph.D. thesis in its essence is a philosophical piece of work that builds upon, but also integrates the contributions, efforts and support of many concurrent people. This is no different for my work, which is built upon the contributions and support of many colleagues, friends and family. It is to those people that I would like to express my warmest gratitude here, as without their contributions and support this work likely would not have existed.

I will first start by thanking the research team that guided me throughout my Ph.D., and as such has contributed most to the conception of this work. To Oktay, as my co-promotor and daily supervisor, you have persistently motivated me to strive for better things and to take a proactive role in conducting the research, whereas you have provided me careful guidance in terms of structuring and communicating my work, both in academic and practical settings, to enable me to do so. I highly value the open-minded yet focused perspective you have kept throughout the project, which motivated me to stay on track and wherever needed sparked me to refocus. I also greatly appreciate how in an environment of constant change, be it in the context of research or a shifting working climate, you were consistently able to allay any uncertainties I have had and to support me in moving into the right direction.

Paul, as my promotor, your guidance and insightful feedback have helped me to advance my work significantly, and often challenged me to rethink the status quo and to think outside-of-the-box. However, you also stressed the importance of balancing such efforts with the need for pragmatism and modesty. Given your experience as a researcher in general, but also your expertise as the driver of supporting service-dominant business, you moreover helped me in understanding how my work would relate to either strategic or operational areas of business engineering and what research challenges as a consequence should be faced to make this research worthwhile. In addition to research, I also greatly appreciate the insightful chats we have had about personal experiences and career development, which I undoubtably will build upon for the next chapters of my career.

Anna, as my second co-promotor, I applaud how quickly you were able to settle within our research team, joining as a more late addition to the project. I cannot imagine the difficulties of diving into a new project at a late stage and moreso the complexity of entering into an entirely different research domain. However, you were able to quickly adapt to this novel setting and as such were able to support me in great detail, contributing towards the later phases of the research project and subsequently its finalisation. In this light, I would also like to express my gratitude to Barış, offering valuable support and feedback throughout the research project. You were always available for a quick chat or discussion, essentially about almost anything, and actively took part in and contributed to most of our research endeavours. It is therefore only fair that you also explicitly receive credit for the research presented in this work.

My research project was part of a larger research initiative aimed at further conceptualising and concretising service-dominant business engineering, involving several other Ph.D. students working on interfacing projects. As a result, I was able to present and discuss my thoughts, ideas but also concerns amongst fellow peers and in a much more informal setting. This enabled me to 'share' the research load to some extent and to better understand whether my ideas were indeed valid or sensible. In this context, I firstly would like to thank Ege, as you were significantly involved in my research - I can only imagine for you sometimes a bit ad nauseam. Over the course of our projects, we have had many talks, discussions and sporadically even rants about our research, its context and significance. Whilst I believe such thought processes are natural for any Ph.D., I am happy that I was able to share this with you given the similarities between our projects, which helped me put things in perspective and reflect on my research in a much broader sense. Complimentary, I would like to thank Frank and Bambang, constituting the remaining pieces of the service-dominant business engineering puzzle, for the discussions and in-depth talks we have had, and in helping me understand how my research would relate or interface to your works to expand on its applicability.

Moving to the people a bit more distant from my research, I would like to thank my colleagues at the Information Systems Group for the generally positive working climate in which I was allowed to work and the interesting mix of perspectives this climate offered. In particular, I would like to thank Caro, Ege, Jonnro, Jason, Paulo, Kostas, Sicui and Sander for their friendship and the many enjoyable and entertaining moments we have shared, that allowed me to let off some steam when needed. I hope we can continue to create such memories in the future as well.

Lastly, I would like to thank my oldest friends and family for their unconditional support and for ceaselessly enduring my presence. Without the support given to me by my mother and father, always encouraging me to do as best as I can but not inhibiting the choices I make, I would likely never have ended up here. In large, this thesis therefore can be considered as their achievement as well. As for my brother, I truly value your presence and hope to do so for many years to come.

Concluding this section, I would like to thank you as a reader unfront for taking the time to read this preface, and hopefully subsequent parts of this thesis. I hope that you may find the work presented in this thesis both valuable and interesting and that it in some form may contribute towards a better understanding of service-dominant business engineering.

Rick Gilsing

Eindhoven, September 2020

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List of Abbreviations

BASE/X : Business Agility through Cross-Organizational Business Engineering
BM : Business Model
BMC : Business Model Canvas
BME : Business Model Evaluation
BMI : Business Model Innovation
BPMN : Business Process Management Notation
BS : Business Strategy
CBMP : Continuous Business Model Planning
CSOFT : Customer Relationship Service Organization Finance Technology
CSS : Customer Service Scenario
DSR : Design Science Research
FRA : Free Ride Amsterdam
GDL : Goods-Dominant Logic
IDEM : Ideation Evaluation Method
ILS : Intentional Linguistic Summary
INEM : Integration Evaluation Method
KPI : Key Performance Indicator
SC : Service Compositions
SDBM : Service-Dominant Business Model
SDBMC : Service-Dominant Business Model Canvas
SDBM/R: Service-Dominant Business Model Radar
SDL : Service-Dominant Logic
SKPI : Soft-quantified or soft-KPI
SKPI-T : Soft-quantified Key Performance Indicator Technique
SLBMC : Service-Logic Business Model Canvas
SLR : Systematic Literature Review
SOA : Service-Oriented Architecture
STOF : Service Technology Organization Finance Model
TAM : Technology Acceptance Model
VISOR : Value Proposition, Interfaces, Service Platform, Organising & Revenue Model
VNA : Value Network Analysis

Chapter 1

Introduction

1 Introduction

In this chapter, we introduce the research presented in this thesis. In Section 1.1, we provide a background on the concept of service, how it has evolved from its preliminary conceptualisation and how it has increasingly become interwoven in the dominant business logic of contemporary organisations. Next, in Section 1.2 and 1.3 we highlight the research gap that still persists with respect to this topic, and explicate our research objective and research questions accordingly. We elaborate on the research approach followed to achieve our objective in Section 1.4. We further scope our research work in Section 1.5 and make explicit how our research contributes to both research and practice in 1.6. We conclude this chapter by means of a structural overview of the thesis in Section 1.7.

1.1 Service-dominant business and business models

The concept of *service* has existed as far back as organisations and societies have engaged in the exchange of objects or commodities (Vandermerwe and Rada 1988). In its purest essence, a *service* is defined as the process or performance (Lovelock 1991) by which competences are applied to benefit either one's self or the benefit of a different entity (Vargo and Lusch 2004). In that perspective, the mere activity of using a product or good, such as consuming an apple or reading a book can as such be considered a service. However, we see that our contemporary understanding of the notion of service and its practical application and implication has gradually evolved in conjunction with the shifting nature of economic markets in which services have been offered.

In the *industrial age*, organisations widely adopted, in line with neoclassical economics, a manufacturing perspective of value creation, by which customer value is embedded in products through the characteristics of the produced goods and commodities (Marshall 1890; Savitt 1990). According to this perspective, organisations -through the exchange of manufactured products- can offer or provide value to their customers, who, as a result, become owner of the product and are able to consume its embedded value. This is often characterised in literature as a *goods-dominant* orientation of business (Vargo and Lusch 2008, 2017). As a consequence of this goods-orientation, services in the industrial age have typically been considered as a residual or complement to a product or good, used to enhance the product offering (Vandermerwe and Rada 1988; Vargo and Lusch 2004). Services have been and still are often explained in terms of related product offerings (Vandermerwe and Rada 1988). This is not necessarily a bad thing: many contemporary manufacturing organisations leverage services to great effect to enhance the value of current product offerings or to strengthen customer relationships, for instance by means of *servicing* (such as the repair of products), by providing product or software upgrades as a service, or by offering complementary services (such as the delivery of products) (Gebauer et al. 2005). However, for these organisations, the core business logic remains centred on product offerings rather than service offerings. A major implication of such a goods-dominant or product orientation is that organisations, apart from understanding how customers use products and the initial preferences customers may have with respect to (attributes of) the product, have limited impact on how the customer creates value (Vargo and Lusch 2004).

With the dawn of the *information or digital age*, we see that markets have become interconnected and globalised, creating a world of increased and dynamic competition (Camarinha-Matos and Afsarmanesh 2005; Kindström 2010; Engel and Ebel 2019). As a result of this heightened level of competition and the consequential saturation of markets, margins on product offerings increasingly diminish, forcing organisations to seek novel opportunities to create customer value in order to remain competitive (Oliva and Kallenberg 2003; Gebauer et al. 2005; Kowalkowski et al. 2017). Accordingly, a more explicit customer-orientation is required, which requires organisations to focus on how offerings are used by customers to create value rather than on the characteristics of what is being offered (Heinonen et al. 2010).

As a consequence of the digital implications, customers demand customised, coherent and integrated solutions to satisfy daily needs (Grefen 2015; Kowalkowski et al. 2017). To address this challenge, we observe an ever growing shift in the business logic of contemporary organisations, in which they move away from a traditional goods-orientation and increasingly adopt a *service-orientation*, for which services rather than products are at the centre of the value propositions (Kindström 2010). In such cases, we see that products are deployed to support services and may become the mechanism by which services are created and delivered (Kowalkowski 2011; Grefen 2015). The nature of services facilitates organisations to interact directly with the customer, to customise their value propositions based on the needs of the customer and to co-create value accordingly (Grönroos and Helle 2010; Grönroos 2011). Furthermore, since by means of service offerings the organisation remains owner of the deployed products or goods, the customer is not burdened by the management and maintenance of the products (Grefen et al. 2015). Next to this, the intangible and specialised competences underlying services make the resulting solutions offered increasingly difficult to imitate (Vargo and Lusch 2004). As a result, an explicit service-orientation enables organisation to sustain competitiveness in an increasingly globalised world.

In light of rapid technology change and the rise of digital technology, we see that when offering digitally-enabled or digitally-supported services, the interface between services and products in organisations may become (further) blurred or even disconnected (Ostrom et al. 2015; Engel and Ebel 2019). The interconnective and intangible nature of information technology enables organisations to offer services without clear-cut product offerings, which due to liquification of resources can be real-time integrated or obtained from other partners (Lusch and Nambisan 2015). Many platform-organisations such as Netflix or Spotify operate under this logic today, leveraging digital technology to provide digital services with network partners without any related product offerings. We see that these organisations, in order to provide coherent service solutions to their customers, typically act as the *integrator* of services or resources of many concurrent partners, forming service ecosystems (Böhmann et al. 2014; Lusch and Nambisan 2015). The novel recombination of resources available within these *service ecosystems* or *service systems* of organisations enables the network, including the customer, to co-create value and innovate value propositions (Jaakkola and Hakanen 2013; Vargo and Lusch 2017; Beverungen et al. 2018). As a consequence of the lack of (tangible) product offerings, organisations become explicitly customer-oriented, as value cannot be embedded in products (Heinonen et al. 2010). Taking into account the fleeting nature of customer demands and the intangible nature of the proposed solutions, service complexity increases, which should be adequately managed and coordinated through the interactions and exchange of resources between many concurrent organisations in the business network (Nenonen and Storbacka 2010; Lusch and Nambisan 2015).

In this contemporary perspective, we therefore see that many markets are dominated by a *service-dominant*, rather than *goods-dominant* logic of business and value creation (Vargo and Lusch 2017) and that the rise of digital technology has enabled the establishment of interconnected service ecosystems or business networks towards the provisioning of novel services (Jaakkola and Hakanen 2013; Böhmann et al. 2014). The complexity of these dynamic networked collaboration calls for both theoretical and practical support in terms of their respective structure, design and subsequent analysis, but also to foster the alignment of IT and business. In research, we see the increased emergence of the *business model concept* as an anchor point for understanding the deployment and implications of IT in a business context (Bharadwaj et al. 2013; Veit et al. 2014).

A *business model* describes, often by means of visual or textual representation (Burkhart et al. 2011), the logic of how value is created and captured within organisations or constellations (Osterwalder 2004). It makes explicit the organizational architecture by which an organisation or network creates value (Timmers 1998), and details the interdependent and often interconnected set of activities, resources and competences needed or used (Zott and Amit 2010). Moreover, it explains how value is captured, detailing the expected sources of revenue (Magretta 2002; Morris et al. 2005) but also the generation of non-profit oriented wealth, such as social or environmental value (Yunus et al. 2010; Short et al. 2013). For the remainder, we follow the definition proposed by Zott & Amit (2010), making explicit that a business model is 'a system of interdependent activities that transcend the focal firm and spans its boundaries'.

Although the concept of business model provides significant explanatory prowess, it is often criticised for lacking substance or being ill-defined. We see that a plethora of definitions for business model exists in research domains, such as e-business, strategic management, innovation management and marketing (Teece 2010; DaSilva and Trkman 2014; Veit et al. 2014). Although these definitions are increasingly convergent, they demonstrate the lack of consensus and perhaps uncertainty that still exists with respect to how business models should be considered. Nevertheless, the business model concept has remained prominently used in both research and practice as it is considered to bridge the gap between strategy and operational processes (Shafer et al. 2005; Al-Debei and Avison 2010; Casadesus-Masanell and Ricart 2010) and as such takes a pivotal role in explaining the *why* and *what* to any business endeavour. Business models have even been considered more important than the service or product offering it contextualises (Chesbrough 2007). In fact, many examples exist of back then novel technologies, such as the digital printer of Xerox or the digital camera of Kodak, of which we currently see the value, that initially or even entirely failed to be marketed effectively due to a lack of a suitable business model surrounding these offerings (Massa et al. 2016).

Business models and their related design concerns conventionally have been considered from a manufacturing viewpoint. As indicated, this manufacturing viewpoint concerns the purposeful integration of organizational resources to embed novel value into product offerings. As a consequence, this resource-based view (Wernerfelt 1984) is typically embedded for traditional business models, which focus predominantly on how the *focal organisation* can utilise both internal and external resources to create value for the customer (Teece 2018). Moreover, the distinct supplier-customer relationship between focal organisation and the end-user or customer is reflected in traditional business models by design decisions with respect to the delivery channels the focal organisation can leverage or how it can *service* the customer after the product offering has been exchanged (Kortmann and Piller 2016). A prime example in terms of tooling the design of traditional business models is the *Business Model Canvas* (Osterwalder and Pigneur 2010), which has become highly popular in both practice as well as business model research as a means to explore and design novel business opportunities.

However, in light of the increased prevalence of a service-orientation within contemporary, digital organisations and the networked characteristics that are associated with providing these complex service solutions (Blaschke et al. 2019), business model representations that only consider the viewpoint of the focal organisation are too limiting to fully understand and address the dynamic and complex interactions between actors in a network to co-create value (Clauß et al. 2014; Turetken et al. 2019b). Accordingly, these collaborations advocate *service-dominant business models*, grounded on the principles of service-dominant logic, to which its design concerns should reflect concepts such as *value co-creation*, *resource integration and exchange* and *value networks* in light of service provisioning, such that these collaborations can effectively be designed, but also understood (Blaschke et al. 2019). In response, several scholars have developed business modelling tools to accommodate the design of these *service-dominant business models* (Lüftenegger 2014; Zolnowski et al. 2014; Turetken et al. 2019b). These tools enable networks of organisation to explore new collaborations in a service-dominant world and to support the design and structure of these collaborations, allowing both practitioners and researchers to think in terms of business models.

1.2 Problem statement

As markets evolve, new trends emerge, new technologies surface and customer demands change over time, to which business models should be continuously *renewed* or *innovated* to sustain organisational competitiveness and performance (Chesbrough 2010; Teece 2010; Schneider and Spieth 2013). Given the pivotal role of business models to any business endeavour, bridging the gap between business strategy and operational processes, and considered a determinant of organizational success (Johnson et al. 2008; Casadesus-Masanell and Zhu 2013; Schrauder et al. 2018) the valid design of novel business models is emphasised.

Business model evaluation is typically conducted to support decision making with respect to the design and innovation of business models, and to understand both the *ex-ante* or *ex-post* performance of a business model (Tesch and Brillinger 2017; Schoormann et al. 2018). As business model innovation is often considered an iterative process featuring phases of exploration and concretisation to guide business models from initial ideation towards concrete implementation (Sosna et al. 2010; Frankenberger et al. 2013; Zott and Amit 2015), novel business model designs go through several iterations before these models can or may be implemented. As such, by means of a learning process, a business model design develops from a high-level, abstract design, to which many uncertainties still exist, towards a concrete, validated business model design, ready to be implemented (Sosna et al. 2010). However, even early-on decisions are to be made with respect to discarding poor models or redesigning an alternative at hand. Each phase in the innovation process consequently requires decision making with respect to the sustained innovation and concretisation of novel business model designs (Schrauder et al. 2018). Such decisions cannot solely be based on trial-and-error learning which, as the business model as consequence should be implemented to understand its performance, is costly and takes considerable time. Accordingly, additional guidance in terms of *business model evaluation* is needed to support decision making in *business model innovation* to drive the valid design of business models, taking into account the diverse characteristics but also limitations that exist with respect to decision making during any phase of the innovation process, without the explicit need to implement or roll-out initial business models (McGrath 2010).

This need for decision making support is even more prevalent for *service-dominant* business models, which feature a multitude of concurrent stakeholders, to which each stakeholders fulfils an essential role with respect to value co-creation, but also has its respective strategic concerns and motives which should be satisfied and evaluated (Jaakkola and Hakanen 2013; Turetken et al. 2019b). As a consequence, a multi-perspective evaluation, taking into account the preferences and desires of stakeholders, is required to grasp and make explicit what design or business decisions should be taken. Moreover, service-dominant business models feature a complex infrastructure by which resources are exchanged and integrated to co-create value, which creates an interdependent but also interrelated web of both resource and service exchanges between stakeholders. As opposed to traditional business models, such models demand a multi-stakeholder perspective on value co-creation, explicating and clarifying how each actor contributes a piece of the value created. To innovate or design novel service-dominant solutions, decision making support in terms of business model evaluation is needed that captures the dynamics of these networked business models, and enables stakeholders to understand what implications design decisions may have with respect to the structure and related performance of the business model.

Reviewing the literature in the field of *business model evaluation* (which is further detailed in Chapter 3), we see, however, that limited support is present in terms of methods or techniques for business model evaluation that are grounded on the key characteristics of service-dominant business, such as value co-creation and networked value capture. Predominantly, research in this field adopts a traditional viewpoint of business models, in which the focal organisation, rather than the network, is considered as the unit of analysis. As a consequence, the question with respect to how decision making can be supported with respect to the innovation of service-dominant business models, which captures how organisations in service-dominant business settings collaborate and co-create value, remains largely unanswered. The lack of evaluation support makes it increasingly difficult to make informed decisions with respect to the concretisation of networked collaborations, potentially resulting in ill-defined, inviable or infeasible business endeavours. Especially for novel business models, this need for decision support cannot be compensated by a more learning directed approach (e.g. trial implementation of business models), as this is typically costly and takes considerable time. In turn, the lack of evaluation support hampers the organisation's ability to effectively analyse and evaluate service ecosystems, especially with respect to how the structure of these ecosystems may influence how stakeholders within this network capture value (Jaakkola and Hakanen 2013). In light of these challenges and the highlighted research gap, this thesis addresses the following research objective:

To support the evaluation of service-dominant business models in the context of business model innovation.

1.3 Research questions and contributions

To address the highlighted research gap and related research objective, we present the following research questions that help us structure the road towards achieving the proposed objective. These questions are the following:

RQ.1: How does the existing academic literature address business model evaluation and what are the gaps that remain with respect to the support for the evaluation of novel service-dominant business models?

Rationale: As a first research step, we study existing literature with respect to business model evaluation, to obtain a deeper understanding of the concept of business model evaluation at hand and relevant techniques, tooling and normative support that has already been proposed towards (traditional) business model evaluation. On the basis of this, we can position our research more clearly in terms of the research gaps that still exist with respect to service-dominant business model evaluation.

RQ.2: What context framework can be defined to structure service-dominant business model evaluation in the context of business model innovation?

Rationale: To provide support towards the evaluation of novel service-dominant business model designs, we first need to understand and specify the context in which we position our design artefacts. As service-dominant business model evaluation has only been sparsely addressed, there is a need to define a context framework, based on existing literature with respect to the core concepts of service-dominant logic, business model evaluation and business model innovation, that explains the required artefacts and specifies the requirements with respect to their design. We conclude from the context framework that, next to the need for methods to support service-dominant business model evaluation, we also need support in terms of structured performance criteria derived from strategy to validate whether a service-dominant business model satisfies strategic goals of the stakeholders involved. We present a technique to structure the generation of these performance criteria to support the use of methods towards service-dominant business model evaluation.

RQ.3: *What method can be developed to support the qualitative evaluation of service-dominant business models?*

Rationale: On the basis of the context framework (which is further delineated in Chapter 3 and Chapter 5), we highlight that due to the shifting characteristics of the innovation process, different requirements are imposed on the type of decision making per phase. Accordingly, taking these requirements into account, we have developed a method to support the qualitative evaluation of service-dominant business models, which is catered to the early-phase decision making within the business model innovation process.

RQ.4: What method can be developed to support the quantitative evaluation of service-dominant business models?

Rationale: As indicated above, our context framework emphasises that the phases of the innovation process impose different requirements on the type of decision making relevant to business models. Taking these requirements into account, we have developed a method to support the quantitative evaluation of service-dominant business models, which is catered to late-phase decision making within the business model innovation process.

With respect to research output, March & Smith (1995) consider four types of artefacts:

- Construct: the vocabulary or language used as conceptualisation to describe problems in the domain and how these problems may be addressed.
- Model: A set of propositions or a framework with respect to how constructs are related. Often used as a representation or translation of how things truly are.
- Method: A set of steps used to perform a specific task, such as specified guidelines or an algorithm. Methods are typically built upon constructs and a model that represents the solution space.

- Instantiation: the implementation or realisation of design artefacts in the environment it has been designed for. Instantiations enable researchers to understand the effectiveness and feasibility of the models and methods contained within the artefact.

In line with these naming conventions, we propose the following research outputs as part of this research:

- A model / context framework on service-dominant business model evaluation in the context of business model innovation
- A method to support the qualitative evaluation of service-dominant business models in early-phases of business model innovation
- A method to support the quantitative evaluation of service-dominant business models in late-phases of business model innovation.

1.4 Research approach

The domain of *information systems* aims to further knowledge on the application of information technologies towards the generation of benefits regarding increased effectiveness or efficiency within organisations as a result of this application (Hevner et al. 2004). By means of the purposeful application of information systems and the valuation of this application through the organizational context in which it has been applied, knowledge can be generated with respect to the use and management of information technology for organizational purposes.

Within the domain of *information systems*, two dominant, complementary research paradigms are followed to generate and acquire this knowledge, namely *behavioural science* and *design science* (March and Smith 1995). The behavioural science paradigm seeks to establish and justify theories that explain the organizational and human phenomena that surround the design, development, use and management of information systems artefacts (Hevner et al. 2004). The resulting theories capture and explain how organisations or humans interact with or use information technology and serve to inform both researchers and practitioners on how the application of information systems should be managed such that an information systems artefact may achieve its purpose or goal. On the other hand, the *design science* is fundamentally a problem-solving paradigm and seeks to develop novel ideas and innovations that support the effective or efficient design, analysis, management or application of information systems. Such novel ideas are -to a large degree- dependent on existing theories, but as the resulting information system artefacts are often applied in new contexts or domains, the application of these artefacts itself contributes to the development of novel theory.

In light of our research objective of designing a set of novel research artefacts to support service-dominant business model evaluation, we position our research within the design science research paradigm. Accordingly, we followed the operationalised steps by Peffers et al. (2007) to guide our research efforts (which we further detail in Chapter 4):

- *Problem identification and motivation*
  In light of the increased service-orientation of organisations and stimulated by the advances of digital technology, we see the emergence and increased prevalence of service ecosystems in which stakeholders collaboratively co-create value. In contrast to traditional, typically manufacturing oriented business settings, this advocates a holistic, networked consideration, rather than the perspective of a single focal organisation, of the business model that conceptualises these collaborations. However, our investigation of the literature resulted in limited support towards the evaluation of service-dominant business models (Chapter 3). To this end, design artefacts (Chapter 7 and Chapter 8) that address the holistic and multi-stakeholder evaluation of service-dominant business models, as well as an auxiliary technique to support the application of the artefacts and the support the interface to business strategy (Chapter 6) may facilitate both research and practice to better understand and analyse these service ecosystems.

- *Definition of solution objectives*
  On the basis of the identified problem, we systematically analysed the literature to derive a context framework for positioning service-dominant business model evaluation in the context of business model innovation. From this framework, we derived solution objectives and design requirements with respect to the proposed design artefacts to support service-dominant business model evaluation (Chapter 4).

- *Design and development*
  Taking the design requirements and artefact objectives as input, we iteratively designed two design artefacts -namely, *INEM* and *IDEM*- to support service-dominant business model evaluation (Chapter 7 and 8). We further structured our design process by following a *situational method engineering* procedure (Brinkkemper 1996; Ralyté et al. 2003). To support the interface between business strategy and business models, we moreover have designed an auxiliary technique (SKPI-T) to translate high-level strategic objectives into business model specific key performance indicators. For guiding the design of SKPI-T, we also followed the aforementioned situational method engineering procedure.

- *Demonstration*
  We illustrate our design artefacts by means of a running case study, which has been derived from real-life collaborations with practice. Accordingly, we make explicit how the methods are applied and how they ought to be useful in the selected problem context (Chapter 7 and 8).

- *Evaluation*
  On the basis of the initial demonstration, we further refined the proposed design artefacts and applied and instantiated the methods in real-life business cases for the support service-dominant business model evaluation, to understand the validity of the proposed design artefacts. Moreover, we used interviews and questionnaires with industry experts to elicit and understand what utility is generated by the design artefacts in light of the problem context (Chapter 7 and 8). Although not formally positioned as a design artefact, we also explore the utility and validity of SKPI-T by means of its demonstration in practice, and elicit from industry experts what utility is generated in light of the problem context to which it is applied (Chapter 6).

- *Communication*
  We communicate the findings of our research by means of this thesis and related academic publications, which are listed in Table 1.

Table 1: Overview of scientific publications and conference proceedings related to this thesis.

Chapter	Article
3	Gilsing R, Turetken O, Ozkan B, Adali O, Grefen P (2020) Business Model Evaluation: A Framework based on a Systematic Review of Methods. Journal publication under review.
6	Wilbik A, Gilsing R, Turetken O, Ozkan B, Grefen P (2020) Intentional Linguistic Summaries for Collaborative Business Model Radars. World Congress on Computational Intelligence (WCCI).
6	Gilsing R, Wilbik A, Grefen P, Turetken O, Ozkan B (2020) A Formal Basis for Business Model Evaluation Using Linguistic Summaries. EMMSAD'20.
6	Gilsing R, Wilbik A, Grefen P, Turetken O, Ozkan B, Adali O, Berkers F (2020) Collaborative Business Model Evaluation Using Linguistic Summarization. Journal publication under review.
7	Gilsing R, Turetken O, Ozkan B, Adali O, Grefen P (2020) A Method for Qualitative Evaluation of Service-dominant Business Models. ECIS2020.
7	Gilsing R, Turetken O, Ozkan B, Grefen P, Adali O, Wilbik A, Berkers, F (2020) Qualitative Service-Dominant Business Model Evaluation. Journal publication under review.
8	Gilsing R, Turetken O, Ozkan B, Slaats F, Adali O, Wilbik A, Berkers F, Grefen P (2020) A Method to Support the Concretization of Costs and Benefits in Service-Dominant Business Models. IFIP/SOCOLNET Working Conference on Virtual Enterprises (PRO-VE).

1.5 Research scope

Business models evolve and mature over time and follow a lifecycle dependent on internal factors, such as the design of the business model and the resources available to the organisation, and external factors, such as shifting market trends or technological advancements (Laudien and Daxböck 2017; Saebi et al. 2017). Typically supported through organisational capabilities, such as learning, sensing and leadership (Doz and Kosonen 2010; McGrath 2010; Teece 2010), and guided through generic phases of exploration and exploitation, business models go through sequential processes of invention, innovation, adjustment and withdrawal (Schneider and Spieth 2013; Laudien and Daxböck 2017) and evolve from an *embryonic* stage to an *emergent*, *growing* and *maturity* stage (Muzellec et al. 2015). Adopting the latter conceptualisation to describe the business model lifecycle, we can express this lifecycle in terms of *operational business models* (in operation, serving as an explicit source of value or revenue) and *non-operational business models* (not fully implemented, for which the value created is unclear and uncertain) as illustrated in Figure 1.

The first two stages entail the exploration of new, non-operational business models, whereas the last two stages mark the start of the exploitation of operational business models. Although operational business models are still affected and subject to innovation, this is driven by direct market or operational outcomes such as revenue generated by the business model or the degree to which it generates value. However, for non-operational business models, these outcomes cannot directly be grasped or measured and should be predicted. With respect to our research, we focus on novel business models (e.g., starting from an embryonic stage) for which the purpose is to explore how these can be operationalised. Rather than relying on trial-and-error learning in this stage (which would require a preliminary business model to be implemented which is costly and takes a considerable amount of time before its performance can be perceived), the support in terms of business model evaluation offered is focused on an *ex-ante* (foresighted, predicted) analysis of the outcomes of a business model. Through use of our proposed methods, we aim to mitigate this uncertainty with respect to business model evaluation by providing structured support towards decision making depending on the timing within the innovation process.

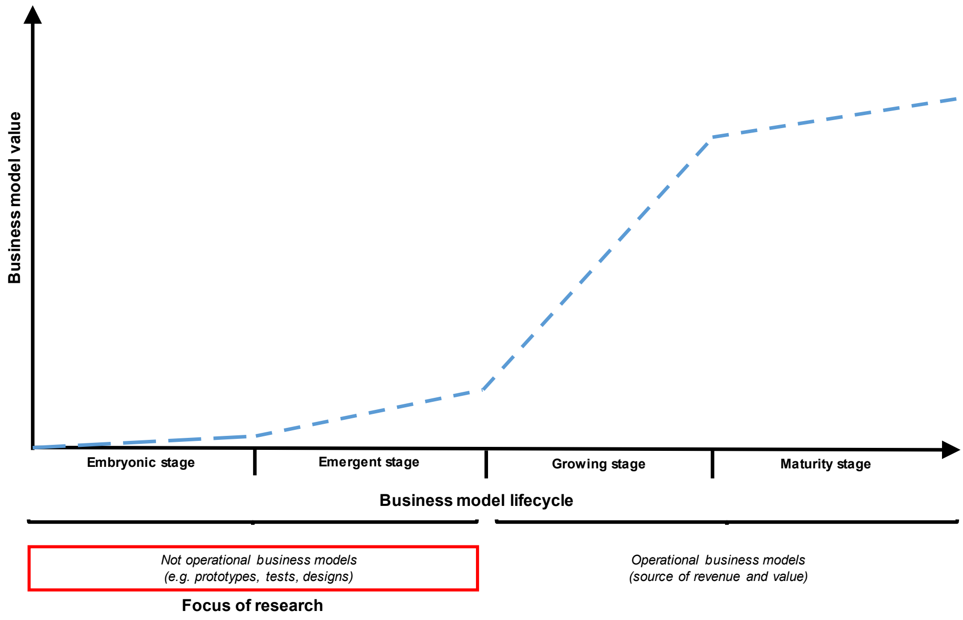

Figure 1: Business model lifecycle and the distinction between operational and non-operational business models (Muzellec et al. 2015)

1.6 Research significance

As emphasized by Gregor & Hevner (2013), knowledge contributed through DSR can be *descriptive* or *prescriptive* in nature. As our research objective is to produce a set of design artefacts as support for service-dominant business model evaluation, our knowledge contribution is predominantly *prescriptive*, elaborating on the steps to be taken to guide users/practitioners on service-dominant business model evaluation in the context of business model innovation. Through demonstration and evaluation of our set of design artefacts, we clarify and contribute knowledge with respect to how service-dominant business model evaluation can be supported, which, to the best of our knowledge, currently has not been addressed.

Considering the level of knowledge contribution, each design artefact we propose can be considered as a level 2 contribution, meaning knowledge contributions that together form a nascent design theory (Table 2). The conceptual framework with respect to service-dominant business model evaluation in the context of business model innovation, as well as the methods directed at the qualitative and quantitative evaluation of service-dominant business models, together offer normative guidance and operational principles with respect to how service-dominant business model evaluation should be conducted and applied to support decisions making, especially in cases for which business models are not yet operational. In such cases, decision makers cannot rely on the measured performance of business models (as implementation would be to costly and take considerable time) but rather have to predict or assess whether a business model design would be feasible or viable. We specify the inputs and outputs expected per evaluation step by means of our context framework and clarify the synergy between the two proposed design artefacts.

Table 2: Contribution types for design science research (Gregor & Hevner (2013))

	Contribution types	Example artefacts
More abstract, complete, and mature knowledge	Level 3. Well-developed design theory about embedded phenomena	Design theories (mid-range and grand theories)
^ ^ ^ ^ v v v v	Level 2. Nascent design theory – knowledge as operational principles / architecture	Constructs, methods, models, design principles, technological rules
More specific, limited, and less mature knowledge	Level 1. Situated implementation of artefact	Instantiations (software products or implemented processes)

Although the base methods we use for the design of our proposed methods are drawn from existing research (e.g., methods that already have demonstrated to be effective to support business model evaluation), we are required to extend these base methods in such a way that they accommodate the new application domain, and address the previously introduced characteristics of service-dominant business models (Vargo and Lusch 2004, 2008; Kindström 2010; Clauß et al. 2014). In turn, this requires the adaption and even novel (re)construction of already existing solutions, decreasing the solution maturity. Mapping proposed artefacts to the contribution framework proposed by Gregor & Hevner (2013) presented in Figure 2, we consider that the contributions highlighted for our research are bordering *invention* and *exaptation,* e.g., knowledge contributions through extending known solutions or through the design of new solutions to address new organisational problems.

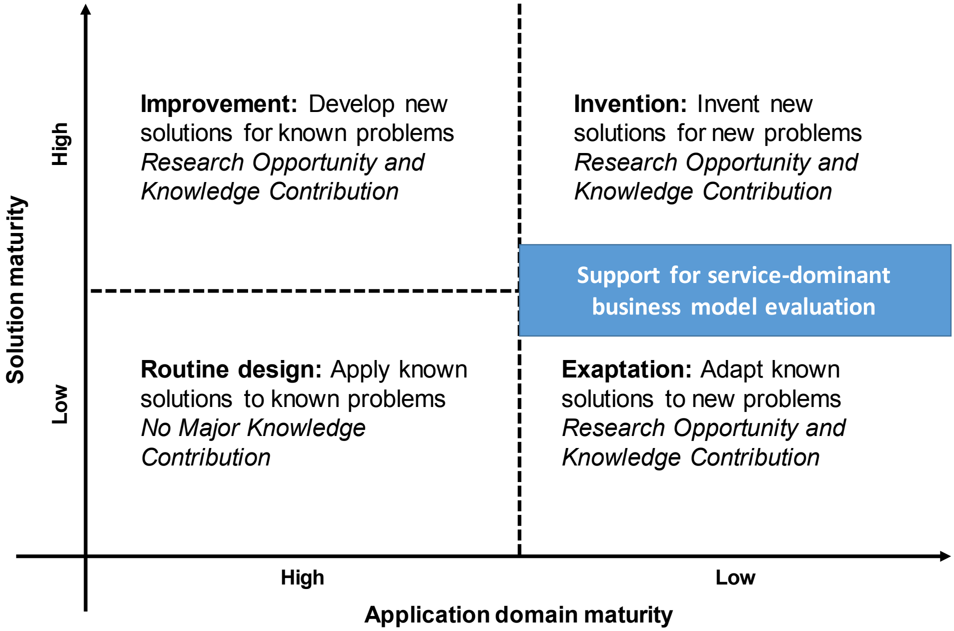

Figure 2: Positioning of research contributions (Gregor & Hevner (2013))

From a practical perspective, we contribute normative guidance to support the evaluation of service-dominant business models in the context of business model innovation. We make explicit how service-dominant business models gradually evolve and become concrete throughout the innovation process and indicate what challenges in terms of design and evaluation exist to do so. We complement this overview by a set of feedback loops to account for the iterative nature of any innovation activity, facilitating users to revert back or to reiterate over design activities. Our work moreover offers a toolset of methods that practitioners may use to address the diverse challenges of service-dominant business model evaluation and to support decision making with respect to their service-dominant business models.

1.7 Thesis structure

The structure of this thesis, which is also illustrated in Figure 3, is as follows: the current chapter represents the introduction to our research, providing the backbone and basis for the remainder of the thesis. Chapter 2 introduces the research background to our work, and highlights the core concepts, constructs and models we used to achieve our research objective. Chapter 3 examines and investigates related work on business model evaluation and how it is positioned in the light of business model innovation. Based on a *systematic review* of the literature, we have identified methods that are used for business model evaluation, and positioned their application to phases of the business model innovation process. On the basis of these findings, we propose a context framework for service-dominant business model evaluation in the context of business model innovation. We further discuss the details of this framework in Chapter 5. Chapter 4 presents the research design which is based on the design science research methodology. It elaborates on the objectives of the design artefacts, the design approach followed, and the procedure applied for the evaluation of the artefacts. As the context framework illustrated in Chapter 5 advocates the need for strategic directives to interpret the outcomes of our methods, we introduce a technique in Chapter 6 that can be used to translate strategic objectives into business model catered performance criteria. Next, in Chapter 7 we discuss the design, application and evaluation of the first method, IDEM, aimed at supporting the qualitative evaluation of service-dominant business models. Similarly, Chapter 8 discusses the design, application and evaluation of the second method, INEM, which is aimed at supporting the quantitative evaluation of service-dominant business models. We conclude this thesis in Chapter 9, in which we explicate our contributions to research and practice, reflect on our findings and the extent to which these have satisfied our objectives, and discuss the limitations of this study and propose directions for future research.

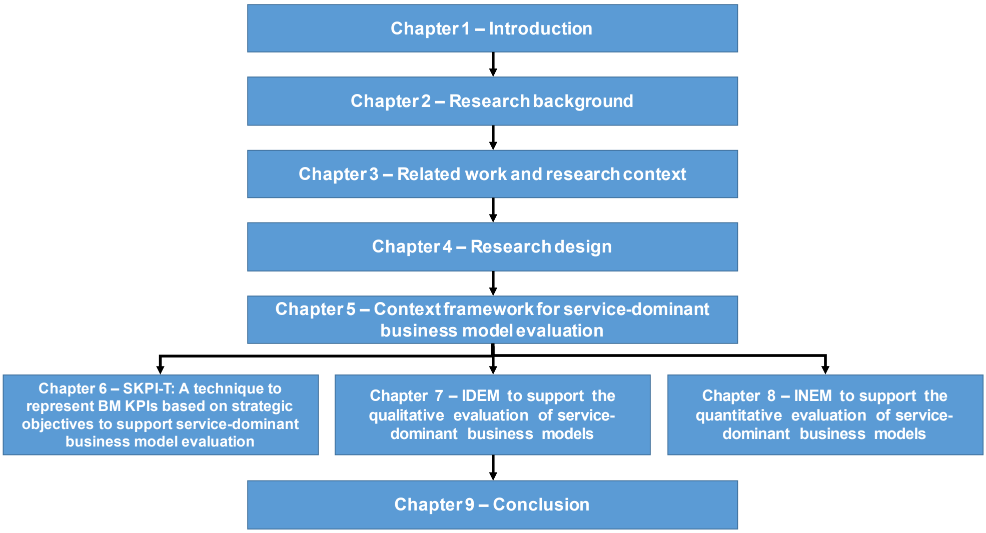

Figure 3: Structure of thesis

Chapter 2

Research background

2 Research background

In this chapter, we detail the concepts used in this thesis, and elaborate the research background relevant to our work. First, in Section 2.1, we detail the shift in dominant logic from a goods-dominant perspective towards a service-dominant logic. Next, in Section 2.1.1 we discuss the implications of the adoption of service-dominant logic on business engineering. Consequently, in Section 2.2, we zoom in on the business model concept and explain its conceptual underpinnings. Section 2.3 discusses and compares the tools that have been proposed towards business model design, reasoning explicitly from a service-dominant perspective. In Section 2.4 we discuss the concept of business model and discuss and compare prominent works on how business model innovation is conceptualised or can be guided in Section 2.5. We summarise this chapter in 2.6.

2.1 From goods-dominant to service-dominant logic

Influenced by traditional economics, organisations have long considered the interaction between organisation and customer as an explicit, distinct exchange of commodities and manufacturing products (Marshall 1890; Savitt 1990; Vargo and Lusch 2004). Value propositions were understood to be embedded into the offered product or good, and described the expected performance of the product, how the customer could benefit from it and what it would cost (Ballantyne et al. 2011). The value proposition consequently was communicated through a market offer to other parties and assumed to be consumed, resulting in typical supplier-consumer interactions (Bower and Garda 1985). As the role of customers was considered limited, significant attention, both from academic literature and practice, was directed at optimising or improving the organisation to generate competitive advantage, from the very conception of goods towards its delivery and exchange to the customer (Vargo and Lusch 2004). Perspectives such as the resource-based view (Wernerfelt 1984; Barney 1996), approaches such as value chain analysis (Porter 1985), and strategic considerations such as value principles (e.g., operational excellence, product leadership or customer intimacy) (Treacy and Wiersema 1993) or market orientation (Slater and Narver 1995) were proposed to better understand how, from an organisational viewpoint and by an explicit good or product orientation, these challenges could be addressed (Gummesson 2008).

The turn of the century however sparked the start of a significant change in perspective of how organisations can generate competitive advantage, especially in marketing research. The traditional perspective, which is conceptualised as an *organisation-centric, goods-dominant logic (GDL)* (Vargo and Lusch 2004), is based on the assumptions that product value is embedded (Vargo and Lusch 2008) and that organisations are unable to influence the way how value is appropriated by the customer once the product is exchanged (Grönroos and Ravald 2011). However, researchers, especially from a service perspective of marketing, have challenged these assumptions. For one, it is argued that a product or good does not contain or embed value. If the product is not sold, the organisation is left with its costs; if the product is not used, the customer has likely wasted money (Gummesson 2008). Only once used, the value of a product or good becomes apparent, which pertains to the experience a customer creates. Therefore, value can only exist in the context of the customer, which is referred to as *value-in-use* (Vargo and Lusch 2008) or *value-in-context* (Lusch and Nambisan 2015). Secondly, by means of servicing, organisations are able to interact with the value creation process of the customer (Grönroos 2011; Maglio and Spohrer 2013). The configuration of the service (which may still encompass products or goods) and therefore the way organisations interact with the customer shapes the customer experience (Vargo and Akaka 2009; Grönroos and Ravald 2011). Therefore, the nature of exchange between organisations should not be considered as supplier-consumer interactions, but rather as interactions aimed at co-creation (Vargo and Lusch 2008; Grönroos 2011; Maglio and Spohrer 2013).

Next to this reconsideration of how value is created, market factors such as rapid technological change and digitisation have further driven the shift for both research and practice towards a service-orientation. Digitisation has led to an interconnected, globalised world, for which the boundaries of markets increasingly disappear or become blurred (Engel and Ebel 2019). As consequence, fierce competition, especially in traditional, manufacturing-driven markets, forces organisations to seek after novel ways to create customer value, as profit margins on product offerings decrease significantly (Kowalkowski 2011). This is even further accelerated by advances in digital technology which enable organisations to improve operational processes (Gebauer et al. 2005). On the other hand, we see that digitisation and rapid technological change also cause the needs of customers to shift and become increasingly dynamic and volatile, as life cycles of product or service offerings increasingly are shortened (Tripsas 2008). Moreover, given the rise of many novel, valuable technologies, customers increasingly expect coherent solutions, rather than stand-alone products, to satisfy their everyday needs (Grefen 2015; Kowalkowski et al. 2017). As a consequence, we observe that organisations increasingly offer services rather than products as their core value propositions, either as a means to enhance product offerings (Kowalkowski 2011), to establish long-term relationships with customers or to better cater to the needs of the customer (Ostrom et al. 2015). Moreover, the intangible nature of services makes it increasingly difficult for competitors to imitate the customer value created. Accordingly, an explicit focus on services may support organisations to sustain competitiveness in contemporary markets.

In research, this new dominant mind set is typically referred to as *service-dominant logic (SDL)* (Vargo and Lusch 2004, 2008, 2017). For SDL, the focus of organisations lies on offering *services* rather than goods or products to co-create value (Vargo et al. 2008; Grefen 2015), to which these goods or products may be part of the servicing process (in fact, the way a product is used by a customer can already be considered as self-service) (Grönroos 2011). By means of the configuration of services, which occurs through the application of operant resources (such as skills, competencies and specialised knowledge) and operand resources (such as tools, machines, employees), organisations are able to interact with the customer and enhance, extend or support the value creation process (Vargo et al. 2008; Grönroos and Ravald 2011). Organisations (value facilitators) therefore create *value propositions* to customers by means of the product or service offered (Gummesson 2008; Ballantyne et al. 2011), and through service processes can influence the value created by the customer (value creators). The goal of these interactions of services or *service systems* is to generate reciprocal value to the parties involved (Vargo and Akaka 2009; Grönroos 2011; Maglio and Spohrer 2013). Mutual benefit therefore drives the principles of service-dominant logic. Accordingly, service-dominant logic is customer-centric, reasoning from how the offered service is valuable in the context of use (value-in-use) (Heinonen et al. 2010; Grönroos 2011).

Vargo & Lusch (2017) have summarised the principles of SDL through 11 premises or 5 overarching axioms that provide the foundation for SDL and capture its essence. The set of axioms is presented as a conclusion to this section in Table 3.

Table 3: Foundational axioms of service-dominant logic

Axioms	Description
A1	Service is the fundamental basis of exchange
A2	Value is co-created by multiple actors, including the beneficiary
A3	All social and economic actors are resource integrators
A4	Value is always uniquely and phenomenologically determined by the beneficiary
A5	Value co-creation is coordinated through actor-generated institutions and institutional arrangements

2.1.1 Service-dominant business engineering

Adopting a service-dominant mindset as an organisation however brings forward strong implications with respect to business engineering. Business engineering concerns the transformation of the business context into an IT context, and concerns the design and development of methods, models and frameworks to structure, align and support business activities by means of IT (Österle 2013). It concerns questions such as how an organisation finds new solutions to deal with business challenges and how these solutions should be implemented, or how the deployment of information systems may support achieving business goals. We see that the adoption of service-dominant logic brings forward two prime challenges that should be supported by the organizational and technical architecture of the organisation. Firstly, as service-dominant logic is customer-oriented, whereas customers expect coherent, integrated solutions to address or satisfy their needs, organisations are required to deal with *increased service complexity* with respect to their service offerings (Briscoe et al. 2012). To reduce this complexity, organisations are required or even forced to focus on their core competencies rather than to support the entire servicing of the customer (Ngo and O'Cass 2009; Gummesson and Mele 2010). However, as organisations tend to only excel in a limited set of competencies, satisfying the needs of the customer through service provisioning requires organisations to engage in collaborative business networks (Camarinha-Matos and Afsarmanesh 2005; Gummesson and Mele 2010). Within these networks, organisations exchange and integrate resources (as services) to provide or co-produce complete solutions to the customer or end-user (Normann and Ramirez 1993; Grönroos 2011). Therefore, service-dominant business occurs within networks of organisations (including the customer) or *service systems*, for which each actor focuses on the exchange and integration of resources (Vargo et al. 2008; Böhmann et al. 2014; Beverungen et al. 2018).

Secondly, SDL considers that value is only created in the context of the customer. However, in the era of digitisation, rapid technological change and globalisation, these customer needs are highly volatile in nature (Tripsas 2008; Heinonen et al. 2010). As a consequence, organisations are required to foster *business agility* to adhere to changing customer requirements (Lüftenegger 2014; Grefen 2015). Given that the core competencies of organisations are not likely to change quickly (Vargo et al. 2008), this implies that the previously mentioned networked structures of organisations should facilitate high dynamicity. New configurations of the business network (in terms of actors, and their respective resources or services offered) enable organisations to change the value co-creation process, and as a result the value-in-use created (Nenonen and Storbacka 2010; Storbacka et al. 2012). Dynamic configurations however require organisational interfaces for exchange that facilitate loose coupling, which should be reflected by the resources or services offered (Prahalad and Ramaswamy 2004; Grönroos and Ravald 2011). To do so, virtual enterprises may be established to rapidly couple and decouple resources to address business opportunities, leveraging the ubiquitous presence of the Internet (Mehandjiev and Grefen 2010). Summarising, organisations that pursue service-dominant business should ensure loose coupling through the resources and services offered within business networks.

To adequately address these challenges, the principles of service-dominant logic should be embedded in and supported through the business and resource logic of the entire organisation. In response, researchers have sought after representations, ontologies and frameworks or tools to support service business engineering, the design of service and business offerings, and the networked collaboration and co-creation of value (Böhmann et al. 2014). For example, Service-Oriented Architectures (SOA) have been used to guide the design of (web) services for organisations to support business processes (Papazoglou and van den Heuvel 2006; Weigand et al. 2009). By making the business architecture explicit from a service-oriented perspective, and leveraging both top-down and bottom up approaches, organisations can identify which services may support the creation of value to customers (top-down), and how the services should be organised or choreographed together to support business processes (bottom-up) (Nayak et al. 2007). Through modular design of these services, organisations are able to quickly adapt to changing customer requirements or networked structures.

Similarly, research on service systems (Maglio and Spohrer 2013; Böhmann et al. 2014) and value co-creation (Payne et al. 2008; Jaakkola and Hakanen 2013) have focused on engineering value co-creation from the perspective of SDL, providing support in terms of structuring and clarifying how an organisation can improve interaction with customers (Nenonen and Storbacka 2010). This has led to conceptualisations and frameworks to support the design of product-service systems that make explicit how services are supported through goods and products (Becker et al. 2010; Beverungen et al. 2018) the modelling of value constellations, which has strong ties with business modelling (which we discuss in Section 2.2) (Gordijn and Akkermans 2001; Hotie and Gordijn 2019), and the translation of service-orientation or strategy into organisational capabilities needed to effectively interact with both customers and organisations in these business networks (Karpen et al. 2012).

2.1.2 Service-dominant business engineering through BASE/X

As a conclusion to this chapter, we elaborate on the BASE/X framework (*Business Agility through Cross-Organisational Service Engineering)* (Grefen et al. 2013; Lüftenegger 2014; Grefen 2015), which is a conceptual framework for service-dominant business engineering that takes the premises of SDL at its core. Unlike the previously mentioned research advances on service- or business engineering, BASE/X is, to our understanding, the sole framework that considers the entire business (network) from a service-dominant viewpoint, and provides a holistic overview of the enterprise for which its associated business elements (such as *business strategy, business models*, *business process models (service compositions)* and *business services*) are tightly coupled, fostering the service-dominant mindset. Each of the business elements moreover is supported through models, tools and frameworks to support the engineering of respective layer. These models range from business representations towards IT implementation. The business pyramid of the BASE/X framework is illustrated in Figure 4. Note that the entire framework consists of three pyramids (i.e., the business pyramid, information systems pyramid and the platform pyramid) to support the IT implementation of the business layers – however these are considered out of scope. For the remainder of this thesis, we will draw on the structure of business pyramid of the BASE/X framework to further support our design choices with respect to *service-dominant business models*, and how this relates and interfaces to concepts such as strategy and process models.

The top layer of the 'pyramid', business strategy, defines the identity of the organisation, reasoned from the principles of SDL. The business strategy elaborates on the vision of the organisation (where do you want to go as an organisation?), the type of customer (segments) it pursues (who or what do we want to satisfy and what value do we offer?) and the generic or strategic capabilities the organisation possesses or should possess to interact with both customer and business network (Karpen et al. 2012; Lüftenegger et al. 2017). A service-dominant (SD) business strategy is considered to be relatively stable over time and evolves, as for almost any organisation, gradually, as a long-term time perspective is taken. The BASE/X framework embeds a tool to represent and communicate a SD business strategy through the Service-Dominant Strategy Canvas (or S-DSC) (Lüftenegger et al. 2017).

Given its definition and conceptualisation, the business strategy layer is tightly linked to the bottom layer of the pyramid, business services, which define the elementary 'building blocks' an organisation possesses to conduct business (Grefen 2015). From a marketing perspective, these building blocks are often described as *operand* (e.g., tools, machines, employees) and *operant resources* (e.g., skills and knowledge) (Vargo et al. 2008; Vargo and Lusch 2017) and considered from a IS perspective as *business services* (Weigand et al. 2009; Lüftenegger 2014). The configuration of these building blocks essentially details what an organisation can do or how it can interact with other organisations within the business network. The set of business services therefore defines the limits of what an organisation can do, which strongly relates to the capabilities it needs from a strategic perspective (Karpen et al. 2012). As a result, the business service layer is also considered to be stable and evolutionary in nature.

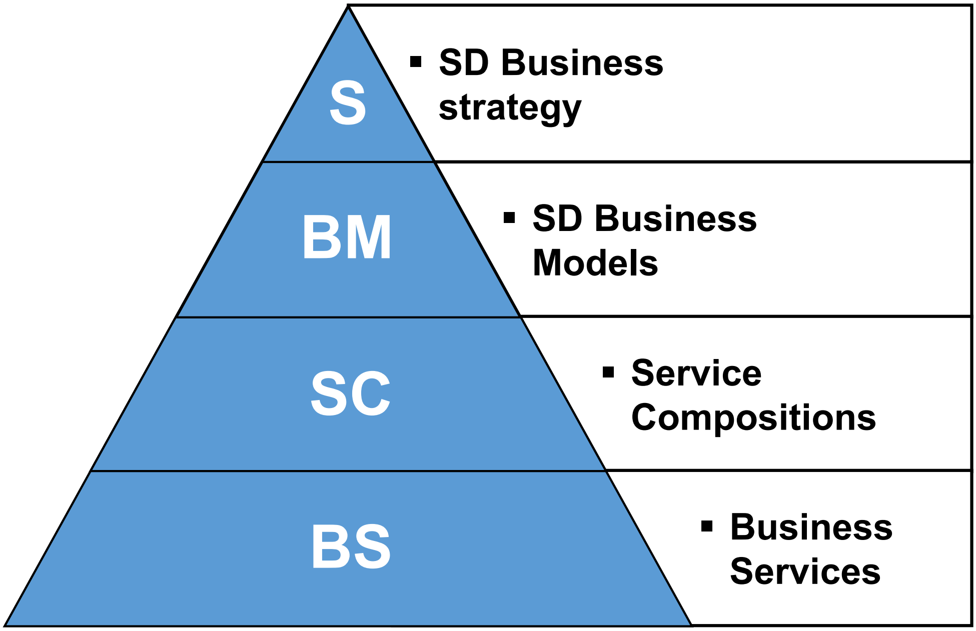

Figure 4: BASE/X framework (Grefen (2015))

Contrastingly, the inner layers, SD business models and service compositions, serve as the concretisation of strategy (through business models) and the orchestration of business services (through service compositions), and pertain explicitly to current (and therefore dynamic or volatile) customer demands. The SD business model layer makes explicit how a certain customer segment is served and what business logic is followed to create and appropriate value (Osterwalder 2004; Al-Debei et al. 2008; Zott and Amit 2010). A business model as such concretises or operationalises strategy (Magretta 2002; Shafer et al. 2005); a business strategy typically consists of multiple business models that may address different customer segments or strategic concerns. Business models are constructed or developed on the basis of the emergence of a specific need or customer demand, and are changed or seize to exist once these needs or demands change (Gilsing et al. 2018; Turetken et al. 2019b). The BASE/X framework accommodates business model design through the SDBM/R tool (Turetken et al. 2019b), which we will further discuss in Section 2.2.

Lastly, the service composition layer describes the business processes and composition of services needed to instantiate an SD business model (Grefen 2015). It does so by organising and choreographing the business services (the bottom layer) into compositions of services, or often referred to as business processes (Suratno et al. 2018). The resulting business process encompasses the activities need to operationalise the business model, and therefore to put into practice how value can be created for a customer segment (Gordijn and Akkermans 2001; Hotie and Gordijn 2019). As the business model changes, the underlying business processes have to be changed as well, making both the business model and service composition layer agile in nature. BASE/X accommodates the service compositions layer through the SDBMOM tool (Suratno et al. 2018; Suratno 2020).

The working of the interactions between layers, and its implications for conducting service-dominant business is represented in Figure 5. The strategy and business model layer describe the *goals* for business engineering from a service-dominant perspective – these layers elaborate on and make explicit what objectives an organisation pursues, which customers it aims to satisfy and which business logic it plans to follow. The service composition and business services layer describe the *operations* for service-dominant business engineering – these layers describe how the business logic resulting from the top layers can be executed or operationalised.

Conversely, the outer layers may influence each other and change evolutionary – the availability of business services may spark a change in strategy, whereas pursuing a new business strategy may require additional business services. Similarly, the inner layers are also connected and change revolutionary. Based on market demands, new business models are formed, which require business processes or service compositions to be orchestrated to operationalise these models. If the business processes underlying the business models are changed, the business models should be altered or discarded. Through the workings of the inner and outer loops, business agility can be created and service complexity can be reduced: the outer layers provide a stable environment (reducing service complexity) in which the dynamic market offerings can freely change (increasing business agility) (Lüftenegger 2014; Grefen 2015).

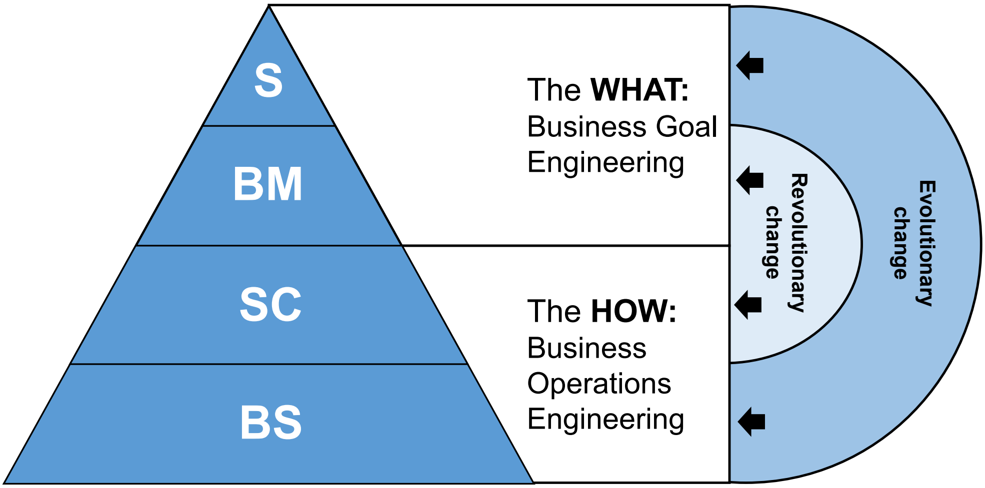

Figure 5: Relationships between service-dominant business layers (Grefen (2015))

2.2 Business model concept

The object of analysis central to our research, *business models*, has in the last 70 years become a prominently featured term for both research and practice. As a result, we see the prevalence of the business model term in research domains such as *e-business* (Timmers 1998; Weill and Vitale 2001; Osterwalder 2004), *strategic management* (Shafer et al. 2005; Casadesus-Masanell and Ricart 2010), *marketing* (Zott et al. 2011; Coombes and Nicholson 2013; Ehret et al. 2013) and *information systems* (Hedman and Kalling 2003; Veit et al. 2014). However, the term has often been misused and confused with other popular management terms such as strategy, business concept, revenue model or business process model (DaSilva and Trkman 2014). It is therefore no surprise that a clear consensus is therefore still lacking on the business model concept, its definition and its conceptualisation. Nevertheless, several researchers have focused on conceptualising and componentising business models or providing ontological background to the concept, in order to facilitate research with respect to business models as the object of analysis. An overview of these componentisations can be seen in Table 4.

Table 4: Componentisation of business models

Study	BM components
Timmers (1998)	Architecture, Product / Services, Actors, Revenue Model
Hamel (2001)	Core Strategy, Customer Interface, Value Network, Strategic Resources
Alt & Zimmermann (2001)	Mission, Structure, Processes, Revenue Model, Legality, Technology
Weill & Vitale (2001)	Strategic Objectives, Value Proposition, Revenue Model, Customer Interface, Core Competencies, Customer Segments, IT Infrastructure
Chesbrough & Rosenbloom (2002)	Value Proposition, Target Markets, Value Configuration, Cost Structure, Value Chain, Strategy
Hedman & Kalling (2003)	Market level, Offering level, Activity level, Resource level
Osterwalder (2004)	Value Proposition, Target Customer, Distribution Channel, Relationships, Value Configuration, Capabilities, Partnerships, Cost Structure, Revenue Model
Morris, Schindehutte & Allen (2005)	Offering factors, Market factors, Internal capability factors, Competitive strategy factors, Personal /investor factors
Al-Debei & Avison (2010)	Value Proposition, Value Architecture, Value Finance, Value Network

The set of conceptualisations shows that business models are considered to cover or provide the link between a broad spectrum of organisational levels and elements. For instance, business models are used to present or include strategic goals (strategic concerns) (Magretta 2002) towards defining the resources, capabilities or architecture required to operationalise processes (resource concerns) (Osterwalder 2004; Al-Debei and Avison 2010). Moreover, business models describe the relationship to the customer (customer concerns), by describing which customer segment is targeted, through what interface or channel the customer is reached, and what value is created for the customer (value concerns). Furthermore, business models explain how value is appropriated and how actors contribute to and benefit from participation (value capture concern). Lastly, the business model makes clear how the organisation is positioned with regards to its partners and suppliers, as well as to the market in which it is positioned (network concern).

We summarise these implications for business models as follows:

In general, a business model:

- relates to or reflects the business strategy that an organisation pursues;
- makes explicit what customer segment is addressed and how it is reached;
- represents the logic of how value is created and captured;
- describes the resources, capabilities and competencies needed to deploy it;
- How partners and suppliers are integrated for the network;

We reflect these concerns through the definition of a generic business model proposed by Amit & Zott (2010) (as also highlighted in Chapter 1), e.g., a business model concerns a 'set of interdependent activities that transcend the focal firm and spans its boundaries. The activity system enables the firm in concert with its partners to create and appropriate value'.

2.2.1 Business models in the context of service-dominant logic

The shift from a goods-dominant towards a service-dominant logic requires organisations to embed an explicit service-orientation for defining their business models (Gebauer et al. 2005). Some researchers have explored the implications of service-orientation or SDL with respect to business model conceptualisation. For instance, Kindström (2010) and Clauβ, Laudien, & Daxbock (2014) analyse the implications of a shift to service orientation for business model conceptualisation. These works find that major implications of SDL for business models relate to a need for an articulated value proposition to customers, an explicit consideration on how value is co-created through interaction with the customer, but also through the value network, and a clear revision of the infrastructure (in terms of operand and operant resources) needed to support the deployment of business models. As a result, service-dominant business models do not pertain to a single organisation but feature a network of organisations servicing the customer, meaning that service-dominant business models should be conceptualised from a value network (rather than value chain) perspective, and should contain an explicit notion of how the customer generates value through this servicing. This also has implications for how the revenue model of the business model should be treated, which should be based on the exchange between all actors in the business model (and not pertaining to a single organisation). With respect to capabilities and resources deployed, service-dominant business models require an explicit consideration of how organisations are able to interact with partners, but also the customer, in the network. This puts strong emphasis on the operant, rather than operand resources, of the organisations in the business model. A similar conceptualisation for service-dominant business models is proposed by Lüftenegger (2014), who advocates the need for a service-dominant business model conceptualisation which explicitly features value networks, value co-creation or value architecture, value propositions and value capture. An initial definition for service-dominant business models is proposed by Grefen (2015), namely "*A business model is a setup of a number of collaborating parties to produce and deliver a concrete value-in-use to a specific customer segment*." This definition is further refined by Turetken et al. (2019b), defining a service-dominant business model as "*a representation of the way in which a network of organizations, including the providers and customer, co-creates a value for the customer through a solution-oriented service and generates revenue and benefits for all network partners*".

2.3 Business model representations and design tools

As a business model in essence is abstract, it needs to be represented through textual or graphical means in order to communicate what it describes and how it functions (Burkhart et al. 2011). In response, several tools have been proposed to support the design or representation of business models in general, such as the Business Model Canvas (BMC) prominently mentioned and used in both research and practice (Osterwalder and Pigneur 2010). However, the BMC reasons from a traditional, manufacturing view of business models and focuses on how resources (such as customer relationships, core competencies and resources of suppliers and partners) can be combined or integrated in a novel way to create value for the customer.

Accordingly, the BMC is structured in such a way that it accommodates business modelling from the perspective of a single organisation and how this organisation may draw upon different sets of resources. This does not fit the implications of service-dominant business, which advocate a holistic, networked consideration of business models to fully understand how value is co-created. As our research explicitly concerns service-dominant business models, we should represent business models through tools that can take these service-dominant characteristics into account. In this section, we will therefore discuss the most prominent tools presented in literature with respect to service-oriented or service-dominant business model design, and compare to what extent they accommodate the implications of SDL. Based on our comparison, we motivate the selection of a design tool that we will use for the remainder of this research.

2.3.1 e3-value model

Originating from the e-business domain, Gordijn & Akkermans (2001) propose the e^3-value model, which has its own ontological basis and modelling notation (named e^3-value). The notation and structure of the e^3-value model are illustrated in Figure 6. It reasons from multi-actor networks, in which a consortium of organisations collaborates and delivers the service offering to the end-customer (Gordijn 2004). Accordingly, taking the exchange of economic value as the basis of interactions between actors in the model, it facilitates the modelling of value networks of organisations and end-customers interacting in the business model. The resulting business model contains three viewpoints or layers and represents the actors participating in the business model and the objects of economic value that are created, exchanged or consumed by or between actors (*global viewpoint*), the way actors may be constructed of partnerships or constellations of (sub) actors (*detailed actor viewpoint*), and the activities an individual actor conducts to create or add value (*value activity viewpoint*) (Gordijn and Akkermans 2003; Gordijn 2004). If the objects of exchange consequently can be quantified, profitability sheets can be derived per actor to illustrate the financial viability of the business model design (Gordijn and Akkermans 2001).

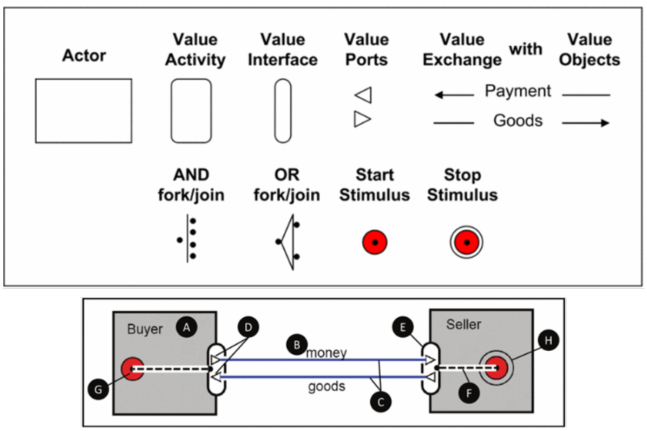

Figure 6: Notation and structure of e3-value model (Schuster and Motal 2009))

2.3.2 Continuous Business Model Planning

Continuous Business Model Planning (CBMP) is a value modelling approach based on the VDML standard proposed by the Object Management Group that reasons explicitly from the business model concept and explores the interrelationship between business constructs such as strategy and operations and how this impacts value creation and exchange, which accordingly serves as the basis for decision making with respect to business model design (Poels et al. 2018, 2019). It offers methodological guidance on how decision making may be supported, rather than a sole static representation of the business model, features steps such as *discovery*, *prototyping* and *adoption* that guide users to innovate or evolve their business model design, such as illustrated in Figure 7. In terms of business modelling, CBMP leverages a set of business or value modelling approaches for the representation of business models or collaboration. It draws upon Value Network Analysis (VNA) to explore how value is exchanged between network or collaboration partners in the business ecosystem (Allee 2008), it leverages the BMC to describe the capabilities deployed and key activities of the business model of key participants in the ecosystem and uses strategy maps (which is a derivative technique of the Balanced Scorecard of Kaplan and Norton (1996)) to how the choices made for the business model and ecosystem may influence value creation. Through use of CBMP therefore, each business model design is thus considered and designed in the context of its corresponding ecosystem and how its structure impacts how value is created.

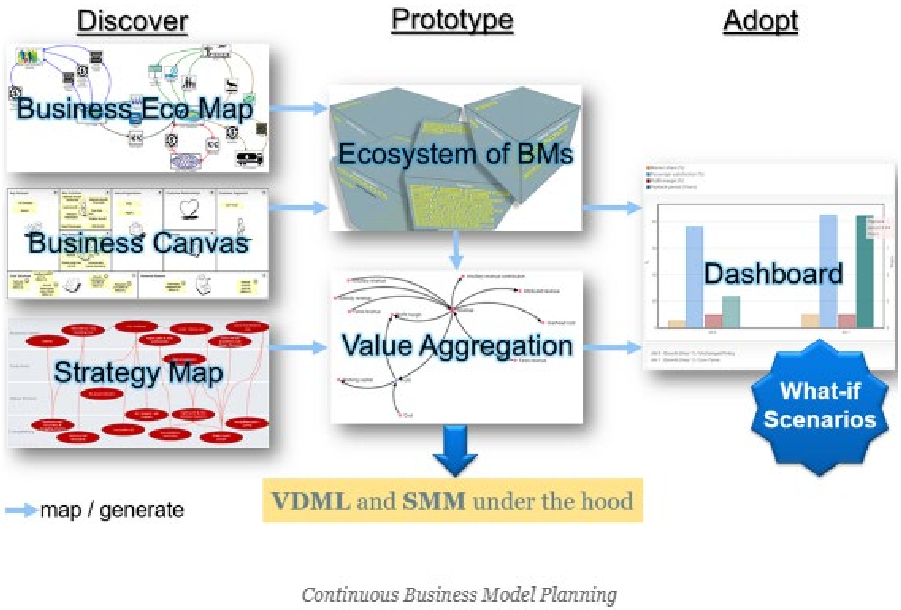

Figure 7: Continuous Business Model Planning (from (de Man and van Donge 2017))

2.3.3 STOF-model / CSOFT-model

Taking service offerings as a basis, Faber et al. (2003) and Bouwman et al. (2008) propose the STOF-model to design business models. An overview of the STOF-model is presented in Figure 8. The acronym STOF represents the components *service domain, technology domain, organisation domain,* and *finance domain* relevant to business model design. For each domain consequently, guidelines are presented to structure its design. The output of the business model (e.g. through the interlinked domain) consequently is presented as the value offered to both the customer as well as the service providers that take part in the business model. A variation of the STOF-model is proposed by Heikkilä, Heikkilä, & Tinnilä (2008) named CSOFT that adds a fifth domain to support the design of business models, namely *customer relationship* domain.

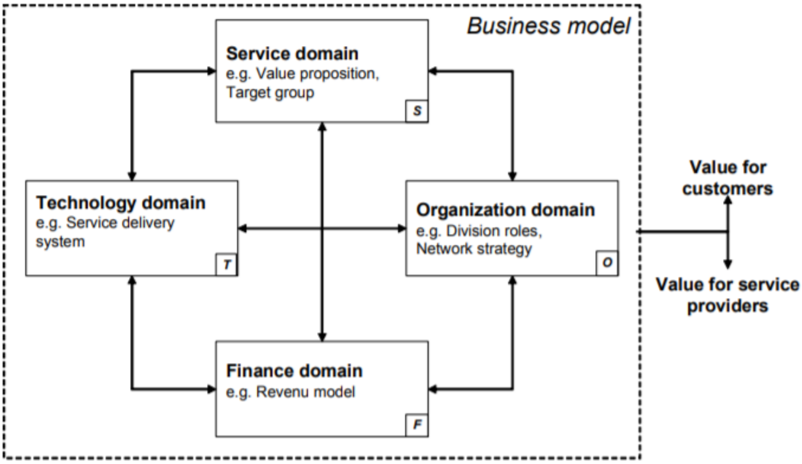

Figure 8: STOF-model (Bouwman et al.(2008))

2.3.4 Service Business Model Canvas

Reasoning from service science, Zolnowski, Weiβ, & Böhmann (2014) propose a service-oriented variant on the BMC named the *Service Business Model Canvas* (SBMC). An illustration of the SBMC is given in Figure 9. Contrasting to the BMC, the SBMC explicitly takes services offerings as a basis for the conceptualisation of the business model building blocks. Moreover, the SBMC incorporates two additional perspectives connected to the building blocks for the focal organisation, which represent the perspectives of the customer and partner. Per type of actor, analogously to the BMC, the resources, core competencies, value propositions and costs and benefits can be specified. However, through its linked structure, business modellers can define how these building blocks relate to other actors in the business model design, to clarify how value is co-created or how resources are integrated. The partner perspective can be duplicated to account for the set of partners that participate in a service-dominant business model design. As such, a holistic consideration of the business network is accommodated.

	Customer (Customers in the business model)						
Customer perspective	*(Costs borne by customers)*	*(Resources provided by customers)*	*(Activities carried out by customers)*	*(Value proposition for customers)*	*(Contribution of customers to maintain the relationship)*	*(Channels provided by customers)*	*(Revenues captured by customers)*
Company perspective	**Cost Structure** *(Costs borne by the focal company)*	**Key Resources** *(Resources provided by the focal company)*	**Key Activities** *(Activities carried out by the focal company)*	**Value Proposition** *(Value propositions of the focal company)*	**Relationship** *(Contribution of the focal company to maintain the relationship)*	**Channels** *(Channels provided by the focal company)*	**Revenue Streams** *(Revenues captured by the focal company)*
Partner perspective	*(Costs borne by partners)*	*(Resources provided by partners)*	*(Activities carried out by partners)*	*(Value propositions for partners)*	*(Contribution of partners to maintain the relationship)*	*(Channels provided by partners)*	*(Revenues captured by partners)*
	Key Partner (Partners in the business model)						

Figure 9: Service Business Model Canvas (Zolnowski et al. (2014))

2.3.5 Service Logic Business Model Canvas

In line with the reasoning for the development of the SBMC (Zolnowski et al. 2014), but with an explicit focus on the principles of SDL, Ojasalo & Ojasalo (2015) also propose an adaption of the BMC to accommodate SDL named the *Service Logic Business Model Canvas* (SLBMC). The SLBMC is illustrated in Figure 10. In contrast to the SBMC, the SLBMC does not explicitly accommodate a networked view (in terms of multiple perspectives that can be separately modelled), but rather incorporates the concept of co-creation through the building blocks for the focal organisation. As a result, each building block is explicitly linked to how this affects or relates to the viewpoint of the customer.

Key Partners **From our point of view:** • Who are our key partners? • What are the roles of our partners? • What resources do we need from our partners? • How do the partners benefit from the cooperation? **From customer point of view:** • How does the customer experience our partners? • What kind of partnerships does the customer have and how should they be taken into account?	**Key Resources** **From our point of view:** • What skills and knowledge do we need? • What other material and immaterial resources and tools are required? **From customer point of view:** • What skills and knowledge is required from the customer's side? • What other customer's material and immaterial resources and tools are required? **Mobilizing Resources and Partners** **From our point of view:** • How do we coordinate multi-party value creation? • How do we utilize and develop partners and resources? **From customer point of view:** • How can the customer utilize and develop partners and resources?	**Value Proposition** **From our point of view:** • What value are we selling? • What are the elements of our offering? • What is unique in our offering? **From customer point of view:** • What value is the customer buying? • What are the elements of the customer needing? • Which of the customer's challenges and problems need to be solved?	**Value Creation** **From our point of view:** • How is our offering embedded in the customer's world? • How can we facilitate the customer to reach their goals? **From customer point of view:** • How does the value emerge in customer's practices (also from mental and emotional experiences)? • How are customer's long-term benefits accomplished? **Interaction and co-production** **From our point of view:** • How can we support customer co-production and interaction between us and the customer? **From customer point of view:** • What are customer's activities during the use and different use contexts? • What are the customer's mental models of interacting with us?	**Customer's World and Desire for Ideal Value** **From our point of view:** • How do we get a deep insight and holistic understanding of the customer's world (context, activities, practices, experiences), their future strategies, and their own customers' world? **From customer point of view:** • Why does the customer buy? • What kind of benefits does the customer desire? • Functional • Economic • Emotional • Social • Ethical • Symbolic • If there were no limits, what would be the customer's desire for the ideal situation and world?
Cost Structure **From our point of view:** • What are the costs inherent in our business model? • What are our other sacrifices? **From customer point of view:** • What costs and other sacrifices are required from the customer?			**Revenue Streams and Metrics** **From our point of view:** • What is our earnings logic and how is our financial feedback generated? • How can we apply customer value-based pricing? • What else valuable do we get other than money? • What are the key performance metrics of our business success? **From customer point of view:** • For which benefits is the customer actually willing to pay and how? • What is the financial value to the customer? • What are the key performance indicators of the customer's business and how are we following them?	

Figure 10: Service Logic Business Model Canvas (Ojasalo & Ojasalo (2015))

2.3.6 VISOR framework

Reasoning from service provisioning in digital ecosystems or through digital platforms, El Sawy & Pereira (2013) propose a five component framework for designing (digital) service-oriented business models named VISOR. The VISOR framework is illustrated in Figure 7. The acronym VISOR incorporates the aggregated business model dimensions *Value proposition*, *Interfaces, Service Platform, Organising Model,* and *Revenue Model*. Each dimension is accommodated by a set of guidelines or techniques to populate the respective dimension. The dimensions are interrelated (as indicated by the arrows between the dimensions) and should therefore be considered holistically when designing a business model. The goal for any business model design is to align the dimensions accordingly such that to a maximised value proposition to the customer is created (indicated by *real value proposition* and concretised by the dimensions *revenue model* and *value proposition* above the diagonal line) at the expense of the costs incurred to be able to deliver this offering (indicated by *real cost of delivery* and concretised by the dimensions *organizing model, service platform* and *interface*).

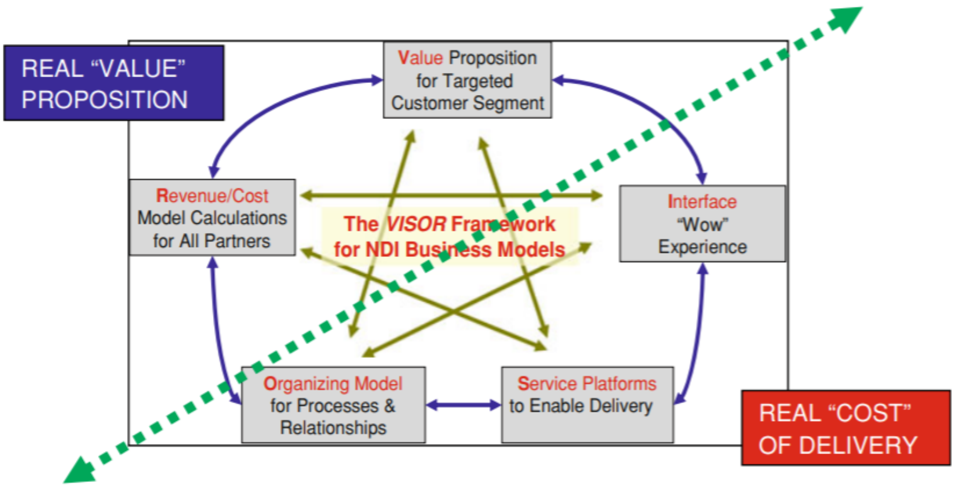

Figure 11: Illustration of the VISOR framework (El Sawy & Pereira (2013))

2.3.7 Service-Dominant Business Model Radar

Grounded on the premises of service-dominant logic, Grefen et al., (2013) Luftenegger (2014) and Türetken et al. (2019b) propose the *Service-Dominant Business Model Radar* (SDBM/R). The SDBM/R entails a circular template for representing business models. Through this representation, it explicitly accommodates a networked perspective of how stakeholders in the network collaborate to co-create value with the customer. Consequently, for each stakeholder included in the model, the user can indicate its value proposition, the activities needed to generate this value proposition and the costs and benefits that are derived from participating in the business model. The SDBM/R template is presented in Figure 12.

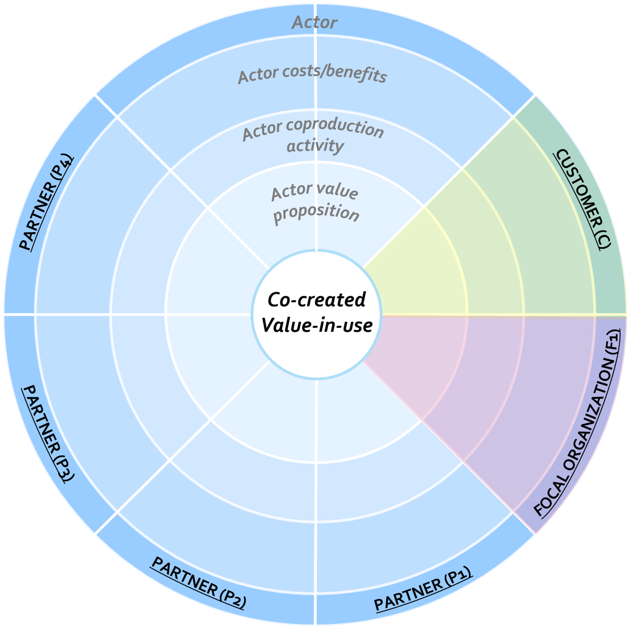

Figure 12: Template for the Service-Dominant Business Model Radar (Türetken et al. (2019b))

2.3.8 Comparison of service-oriented business model design tools

To conduct the comparison and subsequent selection of the most appropriate design tool, we first generate a set of selection criteria with respect to the premises or axioms of SDL and its implications for service-dominant business models. In essence, SDL reasons from services (A1) and the co-creation of value, including the customer or beneficiary (A2 and A4). Given the characteristics of offering services in contemporary environments, organisations engage in networked collaborations to be able to provide these services (Vargo et al. 2008; Kindström 2010). Each stakeholder within a network proposes a value proposition by means of resources deployed, which through coordination, integration and exchange are the basis for value creation (A3 and A5). As elaborated in Section 2.2.1, this means that service-dominant business models should be *networked*, focus on *value co-creation* and *value-in-use*, elaborate on *the exchange of resources and interactions between partners* and *consider the value model by means of exchanges between stakeholders, including how costs and benefits are exchanged*. Summarising these implications as selection criteria, we propose the set of criteria described in Table 5 and the consequent comparison of the tools with respect to these criteria.

Table 5: Comparison of service-oriented business model design tools

Sel. Criteria	**Description of criteria**	Business model design tools						
		e^3-value	**CBMP**	**STOF**	**SBMC**	**SLBMC**	**VISOR**	**SDBM/R**
Service orientation (S1)	The tool takes service provisioning as the basis for designing business models	+/-	+/-	+	+	+	+	+
Value creation and servicing (S2)	The tool explicitly considers the value created for the customer and how it interfaces	+/-	+	+	+	+	+	+/-
Networked perspective (S3)	The tool accommodates an explicit networked view of business models and demonstrates how value is co-produced	+	+/-	-	+/-	-	-	+
Value finance and exchange (S4)	The tool makes explicit how value is appropriated for all stakeholders	+	+	-	+/-	-	-	+
Capability and resources (S5)	The tool makes explicit what capabilities and resources are leveraged to support the business model	+/-	+	+/-	+	+/-	+/-	+/-

As SDL requires an explicit networked orientation in the context of business, we see that STOF/CSOFT, SLBMC and the VISOR model perform rather poorly on the selection criterion *networked perspective* as these tools do not facilitate its user to explicitly (only textually) model which actors partake in the business model, and how these actors exchange resources or services in order to create value. The perspective of these tools is relatively organisation-centric, although it more explicitly defines the network in contrast to, for instance, the BMC. This also holds too some extent for the CBMP, which, although it considers the business model to be positioned as part of a larger, networked ecosystem, it leverages the (organization-centric) BMC for its design of the business model. Accordingly, value co-creation is somewhat implicit for this tool. Contrastingly, the SDBM/R, given its circular design, accommodates an explicit networked orientation, in which each actor can freely interact with other actors in the business model. To a lesser extent, this is also facilitated by e^3-value and SBMC, although these tools consider a bilateral, rather than multilateral, relationship between actors.

Given the lack of an explicit networked view, we also see that these tools do not perform well for representing the *value finance and exchange* (S4) – how each actor appropriates costs and benefits from participation (Al-Debei and Avison 2010) – as these tools cannot make explicit how costs and benefits are transferred. Whilst e^3-value does accommodate its users to represent what actors participate and the bilateral transactions between actors, it only takes into account financial costs and benefits. Similarly, although the CBMP includes a consideration of how value created and is exchanged for the ecosystem, this does not directly become apparent from its designed business model. As mutual benefit or betterment is at the core of SDL, this provides somewhat limited modelling options or the need to deploy multiple concurrent modelling techniques.

With respect to the generation of *value-in-use* (S2), the tools rooted on the structure of BMC (such as CBMP), as well as STOF and VISOR perform well, as these tools explicitly indicate through what interface the customer is serviced, and how this interface should support the customer to generate value (Grönroos and Ravald 2011). For e^3-value and SDBM/R, this interface to the customer is rather implicit.

Lastly, with respect to representing *capabilities and resources* (S5), reasoning from operand and operant resources, the SBMC tool performs well. As the SBMC in essence represents a stack of BMC, it is able to capture the organisational capabilities needed per respective actors, and is consequently able to represent this for all actors modelled. Whilst the SLBMC also mimics a BMC template, it does not accommodate these networked properties. Contrastingly, although both the SDBM/R and e^3-value are able to represent business models from a networked perspective, the tools only facilitate users to indicate what activities actors in the model are expected to conduct, but not the resources that are needed to support these activities. Only by decreasing the level of aggregation (e.g. going from activity level to resource level), the resources that are required or deployed become apparent.

From our comparison, we see that both the CBMP and the SDBM/R perform rather well with respect to service-dominant business modelling, as these tools facilitate the explicit representation of networked business models and the way value is co-created and captured. Whereas the SDBM/R includes this as part of their modelling notation, the CBMP leverages a combination of organization centric business modelling tools and ecosystem design tools to do so. Whilst this may give a less direct overview of the networked business model, it in turn facilitates users to offer more modelling depth to the collaboration (for instance in terms of resources deployed). The SDBMC on the other hand lacks a more explicit networked perspective (considering the networked business model as a 'stack' of individual business models), through this structure it does facilitate a more detailed overview of how each business model is configured. As the SDBM/R tool is one of the highest scoring tools with respect to the selection criteria, and to avoid the use of multiple concurrent tools, we select the SDBM/R tool to represent service-dominant business models for the remainder of this thesis. In the subsequent section, we will provide a more detailed overview of the working and application of the SDBM/R.

2.3.9 The SDBM/R – detailed overview

The SDBM/R is a graphical template for designing service-dominant business models (Lüftenegger 2014; Turetken et al. 2019b). Its circular layout, mimicking a 'radar', facilitates its users to model networks of organisations that collaborate jointly in a business model setting. The SDBM/R is moreover accommodated by a *customer service scenario* (CSS), which elaborates how the customer is expected to use the service, including the interactions it may have with organisations represented in the business model.

As presented in Figure 12, the SDBM/R is divided into slices or 'pieces of a pie' which represent the actors that participate in the business model. Although the number of actors in general can be increased to fit the preferences of the stakeholders or business model designers, a business model designed through the SDBM/R tool should always feature *at least* three actors, namely the customer or end-user of the business model, the focal organisation (either the initiator of the business model or the 'owner') and an actor that is either *core* (crucial to providing the service) or *enriching* (stimulates or supports the viability or feasibility of the model). If the set of roles differs or less than three actors are defined, the model is either not networked (in case a third actor is missing which results in a bilateral interaction), has no ownership (in case the focal organisation is missing) or does not include the customer. As a result, the designed model does not adhere to the principles of SDL.

The SDBM/R consists of four rings that facilitate users of the tool to represent the contents of a business model design. The middle ring, *value-in-use*, describes the expected value that the customer of the business model will receive through using the service offering. As demonstrated by the layout of the SDBM/R, all slices merge into the value-in-use, to illustrate that the generation of value-in-use is a networked effort, depending on the contributions of all stakeholders represented in the business model.

The outer rings (e.g., *actor value proposition*, *actor co-production activity*, and *actor costs and benefits*) are specific to the stakeholders modelled for the design. The actor value proposition represents the individual *abstract* value a stakeholder (which also includes the customer) contributes to the generation of the value-in-use.

The actor co-production activity represents the *concrete* activities a stakeholder has to conduct in order to generate the proposed value proposition. The actor value proposition and actor co-production activity therefore should be tightly linked. These co-production activities are an aggregation and orchestration of the business services or operand and operant resources a stakeholder possesses (Lüftenegger 2014; Grefen 2015). Sequencing these activities with respect to the stakeholders participating in the business model design makes explicit how organisation collaborate and interact with each other, and moreover facilitates the operationalisation of the design (Suratno et al. 2018).

The *actor cost and benefits* ring describes the stakeholder specific costs and benefits that are expected to result from the business model design. The costs relate to what the stakeholder has to invest or give up in order to participate in the model, whereas the benefits relate to the value captured from the model (Osterwalder and Pigneur 2010; Zott and Amit 2010). Given the networked structure of the business model, benefits or costs may be the result of the investment of, or transaction to other stakeholders in the model (value is exchanged), based on how stakeholders collaborate in the business model. Note, moreover, that these costs and benefits can be financial, but also non-financial (such as social or environmental) in nature (Lüftenegger 2014; Turetken et al. 2019b).

The SDBM/R has been applied in a number of industry projects (Traganos et al. 2015; Grefen et al. 2016; Turetken and Grefen 2016; Turetken et al. 2018, 2020), and the results on its application and evaluation have been communicated with scholars in a number of publications (Luftenegger et al. 2013; Grefen et al. 2015; Turetken and Grefen 2017; Gilsing et al. 2018; Turetken et al. 2019b, a)

2.4 Business model innovation

Business model innovation concerns the search for a new business logic for the organisation in order to create new and novel value for involved stakeholders (Casadesus-Masanell and Zhu 2013). It focuses predominantly on the definition of value propositions for customers, suppliers and partners and how value can be captured from novel business model designs (Gambardella and Mcgahan 2010; Baden-Fuller and Haefliger 2013). Business model innovation stems from the recognition of organisations that new, innovative technologies or business ideas intrinsically are not always valuable, unless supported through a feasible and viable business model, meaning that such business opportunities should always be considered in conjunction to business model innovation (Chesbrough 2007). Consider the example of Xerox, which traditional business model was largely focused on selling toner and paper as their source of revenue (e.g. razor-blade business models), and sought-after technologies that would therefore increase the speed by which copies could be made. Although Xerox did find solutions to increase the volume of copies, it also developed technologies that did not match this pursuit. These technologies however proved to be valuable in the future (such as personal printers, wireless printing), but as the business model of Xerox did not fit these technologies, Xerox ultimately did not leverage them – missing out on significant potential for value creation (Chesbrough 2010).

Rather than only considering the business model as a *vehicle* for innovation, the business model itself may become the source of innovation and novel value creation (Massa and Tucci 2013; Schneider and Spieth 2013). Examples such as Uber or Airbnb highlight the need for a new business model (e.g. platform business models) that supports the technology of online streaming (Täuscher and Laudien 2018). Whilst the technology deployed in essence is not new, it is the way the business model is shaped that generates the competitive advantage for these companies. By means of facilitating customers easy and convenient access to intermediaries and service providers, these companies establish a novel value proposition to customers and as such are able to attract and retain consumers effectively (Johnson et al. 2008). Similarly, we observe that even though the underlying technologies of organisations are similar, the configuration of the surrounding business model may define success or failure. For instance, back in the day when Netflix instigated home delivery of DVDs on a subscription basis, Blockbuster attempted to imitate this business model design with a similar value proposition. However, given the capabilities present at Netflix (such as a patent on 'ordered lists') and the lack of alignment between the strategy of Blockbuster and its associated business model, Netflix retained its success even though the business model design in essence was highly similar (Teece 2010).

However, as for any business object, the performance of a business model design is not permanent and is bound to decline over time (Chesbrough 2007; Lindgardt et al. 2009). Research has argued that business model innovation is strongly linked to organisational performance, and allows organisations to satisfy changing demands, reach for new market opportunities within existing markets or access entirely new customer segments (Johnson and Lafley 2010; Massa and Tucci 2013). Therefore, the capacity or capability to timely innovate your business model is argued as a crucial source for competitive advantage or to sustain competitiveness (Hamel and Välikangas 2003). Business model innovation however is a complex, dynamic task that requires organisational competencies such as strategic leadership and strategic awareness (Doz and Kosonen 2010; Bock et al. 2012), supported through capabilities such as organisational learning and experimentation to be effective (McGrath 2010; Sosna et al. 2010; Andries et al. 2013; Berends et al. 2016). Although no clear definition for business model innovation has emerged, it has been tentatively defined as '[the process of] designing or modifying an existing firm's activity system (Zott and Amit 2010), or the discovery of fundamentally different business models in existing business (Markides 2006). Therefore, business model innovation focuses on the renewal, improvement or redesign of an existing organisation's business logic (Osterwalder and Pigneur 2010; Foss and Saebi 2017). Business model innovation is considered to be the output of either of two subsets of business model change – one that considers the design of novel business models pertaining to new organisations (business model design and generation) or one that considers a reconfiguration or acquisition of organisational resources to change an existing business model (Massa and Tucci 2013; Berends et al. 2016; Foss and Saebi 2017). Whilst both paths to business model innovation may produce the same output (e.g. an innovated business model), each path itself has vastly different challenges in terms of organisational, strategic and tactical decision making. For instance, for the former, challenges such as organisational inertia or dominant logic trap may challenge effective business model innovation (Bouchikhi and Kimberly 2003; Mitchell and Coles 2003), whereas for the latter uncertainty with respect to business model validity and feasibility, as well as the lack of technical and organisational resources will prevail (McGrath 2010; Massa and Tucci 2013). As indicated for our research scope (Chapter 1), we focus on the innovation of novel business models rather than the adjustment or adaption of existing business models. In other words, these business models typically are designed from scratch.

As indicated by the initial definition of business model innovation, business model innovation is not a static, singular activity, but rather a series of activities or a process, featuring several iterations and feedback loops to arrive at a working business model. Although business model innovation therefore can be considered as non-linear, normative guidance or clarity in terms of structured approaches, processes or conceptualisations of the process of business model innovation may help structuring business model innovation or highlight the steps organisations go through to innovate their business models (Bucherer et al. 2012). Furthermore, business modellers may benefit from the use of business model patterns (Remane et al. 2017; Osterwalder et al. 2020) or reference models (Abdelkafi et al. 2013; Gilsing et al. 2018) to offer structure or support towards the (systematic) design and innovation of business models or to explore the impact of how changes to the business model design may impact the business model as a whole. Such standardized templates make explicit best practices, generic structures of business model components or even entirely generic business model templates that can be leveraged to support business model innovation. Such templates can moreover be catered to specific business domains (e.g., smart mobility (Kley et al. 2011; Gilsing et al. 2018), manufacturing (Weking et al. 2019) or consumer goods (Caridà et al. 2017; Remane et al. 2017).

As mentioned, several scholars have moreover investigated how the process of business model innovation can be conceptualised to offer procedural guidance or clarity. In the next sections, we will discuss some of the prominent works that conceptualise the structure or support conducting business model innovation presented in literature. In Section 2.5 we will compare these works in light of our research objective and select one of the works as the basis for the remainder of the thesis.

2.4.1 Trial-and-error based learning for Business Model Innovation

Sosna, Trevinyo-Rodriguez, & Velamuri (2010) argue through a comprehensive longitudinal case study that organisations go through two distinct phases with respect to business model innovation, involving four explicit innovation steps. Based on the domain knowledge with respect to trial-and-error learning, they define the two phases as *exploration* - exploring and developing new business model designs in response to change, threats or difficulties, and learning from the insights, mistakes and decision within this sub process – , and *exploitation* – implementing the (viable) business model design by changing the organisation, embedding structures and patterns and rolling out to the respective markets, leveraging the knowledge generated in earlier phases (but also generating new knowledge). An overview of this conceptualisation is presented in Figure 13.

Each phase subsequently also contains two concrete stages. For exploration, these include *initial business model design* (Stage 1) and *business model development* (Stage 2). The former deals with generating new ideas with respect to designing a new business model and initial viability testing, whereas the latter focuses on a more thorough viability analysis with respect to market testing, acceptability of new products and effectiveness of delivery. Throughout the process, mistakes and successes are recorded such that organisations can learn from these insights and redefine their business model. The output of the exploration stage therefore is typically a viable business model design.

For exploitation, the concrete stages are defined as *scaling up the business model* (Stage 3) and *sustaining growth* (Stage 4). With respect to Stage 3, the focus for the organisation is on ensuring that the organisation is changed in such a way that it supports the new business model. An important task here is to maintain a viable and feasible business model, with respect to both internal and external triggers. Lessons learned from the first two stages are taken into account to support this organisational change process, and to make sure the knowledge is dispersed over the entire organisation. The output here is a fully operational (innovated) business model. Stage 4 concludes the innovation process by sustaining the business model with respect to future challenges, either until the business logic changes or until the business model seizes to exist (which essentially sparks a new iteration of the business model innovation process).

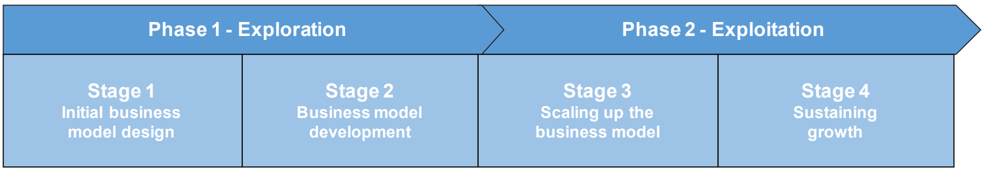

Figure 13: Trial-and-error learning for BMIP (Sosna et al. (2010))

2.4.2 Processes of leaping or drifting for Business Model Innovation

Berends et al. (2016) identify on the basis of four practical cases related to business model innovation two distinct processes towards business model innovation which organisations may deploy to innovate or improve their existing business model. These processes or process patterns are defined as *leaping* and *drifting*, and built upon general, distinct and contrasting learning modes leveraged for business model innovation, namely cognitive search and experiential learning. An illustration of these process patterns is depicted in Figure 14. For cognitive search, cognition is followed by action, e.g., organisations first aim to understand how changes to the business model may impact its expected performance. On the basis of this generated knowledge, action in terms of business model adaption is taken. Accordingly, this learning mode can be characterised by a forward-looking process (Gavetti and Levinthal 2000). Contrastingly, for experiential learning, cognition follows from action. Through experimentation of business model adaptation and reconfiguration, organisations are able to explain or make sense of why things happen or how the business model is affected by means of change. This is characterised as a backwards-looking process (Gavetti and Levinthal 2000). On the basis of their findings, for the process pattern *leaping*, cognitive search is followed by experiential learning. The process pattern is typically applied for the development of novel business models. As a consequence, an organisation first builds cognition with respect to the idea underlying a novel business model design and the subsequent conceptualisation of this business model design, formulating a tentative value propositions (Berends et al. 2016). This may involve several loops or iterations of mechanisms *conceptualisation* (identifying the need for change and ideation of novel opportunities) and *creation* (designing a business model and value proposition) before an agreed upon conceptual business model design has been derived. Next, by experiential learning, episodes featuring steps of *experimentation* (prototyping and testing) and *adaptation* (refinement of business model) are applied to further develop and operationalise the business model design and to arrive at a viable and feasible scenario for the respective stakeholders of the business model. On the contrary, for *drifting*, experiential learning precedes cognitive search. This process pattern is more typical for the reconfiguration of an already established business model. Although drifting also starts from conceptualisation, identifying the need for change, it is followed by experimentation and adaptation before cognitive learning is applied (creation).

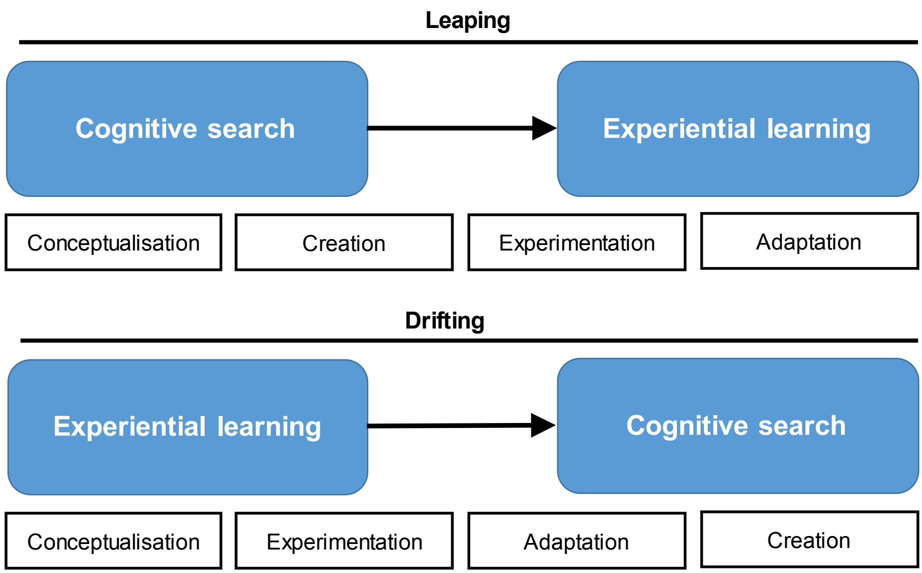

Figure 14: Process patterns of leaping of drifting (Berends et al. 2016)

2.4.3 Collaborative Business Model Innovation Process

The *Collaborative Business Model Innovation Process* (co-BMI) proposed by Heikkila & Heikkila (2013) reasons from business model innovation for networked services, and consists of two sub processes related to business model innovation, namely the process of systematically analysing the business model, joint by the process of learning and consequently adapting the organisational environment to support changes made to the business model. An overview of co-BMI is presented in Figure 15.

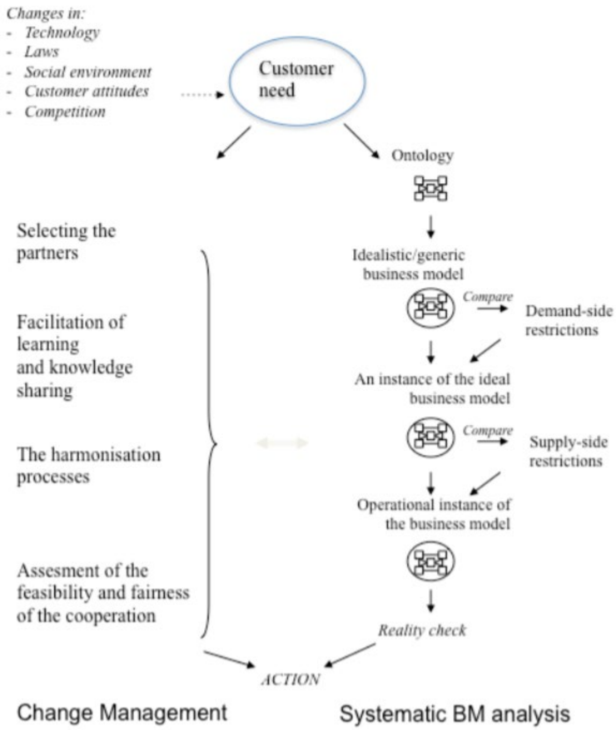

Figure 15: co-BMI process (Heikkila & Heikkila (2013))

The right side of the process framework, systematic BM analysis, starts from a customer need or opportunity for business that justifies the design of a new business model. Taking a business model ontology and supported by means of tooling, this process considers the first business model design to be generic, which should be confronted by demand-side restrictions. This implies that organisations should investigate the expected customer segment, customer value created, specific limitations and restrictions with respect to this segment, and analyse how these effects influence the viability and feasibility of the business model design, and what changes should be made to make the design more concrete. This results in an instance of the business model (a concrete business model design), which should then be confronted to the supply-side restrictions. This implies checking whether the participating organisations for the models possess the expertise, capabilities and resources needed to operationalise the business model. A lack of resources or capabilities may justify changing the composition of organisations included or require a product or service offering to be altered. Lastly, a reality check is conducted to assess the final viability and feasibility of the business model design. This includes carrying out proof-of-concepts, market testing and analysing the strengths and weaknesses of the model. Any implications, mistakes or successes should be recorded and may spark feedback loops to previous stages.

With respect to the change management process, (which is positioned on the left side of Figure 15) the first task is to compose the network that is expected to support the initial business model design. The basis for this composition is the exploration and combination of capabilities, resources and infrastructure needed to support the business model design. Any changes resulting from the systematic business model analysis process with respect to the network consequently spark changes here. The next task involves learning and knowledge sharing between stakeholders in the networks, based on the insights received from the business model analysis process. Any implications for demand-side restrictions may spark the network to shift or different resources and capabilities to be required within the organisational change process. Once the business model design is instantiated, organisations within the network start making adjustments to the organisational structure, which sparks the next task for this process. This involves ensuring that the organisational strategy effectively supports the implementation of the business model, setting up processes that operationalise the business model and establishing inter-organisational connections, agreements and exchanges to other partners within the network. The final task for this process involves a final network assessment of the model before it is implemented, which concerns issues such as proportional distribution of benefits, fairness and negotiating terms of co-operation (Heikkila and Heikkila 2013). Both the organisational as well as the business model process merge into concrete action for implementation and further roll-out.

2.4.4 The Cambridge Business Model Innovation Process

Geissdoerfer, Savaget, & Evans (2017) propose, based on a systematic literature review and consequent application of expert judgement, a business model innovation process framework consisting of eight sequential but iterative steps to guide business model innovation, which are encapsulated by three overall phases to business model innovation, namely concept design, detail design and implementation. The resulting framework, the *Cambridge Business Model Innovation Process*, is illustrated in Figure 16. The steps identified are *ideation, concept design, prototyping, experimenting, detailed design, piloting, launch* and *adjustment & diversification*, and are accompanied by explicit activities to be conducted for each step, as well as the potential challenges organisations may face during these tasks.

The *concept design* phase focuses on establishing the structure of a new business model design and its related components with respect to a customer need or strategic opportunity. This usually results in clear representation of a business model design or even a display or prototype of the proposed model. The consequent phase, *detail design*, focuses on understanding how well the proposed design works. This involves analyses such as feasibility analysis and viability analysis and initial market testing. The output of this phase should be a viable business model design to be implemented. Any lessons learned are captured and may drive a reiteration over concept and detail design. Finally, the *implementation phase* focuses on operationalising the business model design, setting up organisational structures to support the model and monitoring its performance. This may spark the subsequent scaling up of the model.

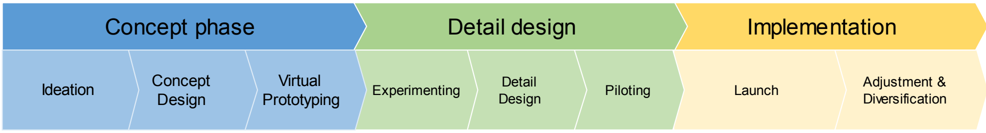

Figure 16: Framework for the Cambridge Business Model Innovation Process (Geissdoerfer et al. (2017))

2.4.5 The 4I Framework of Business Model Innovation

Frankenberger, Weiblen, Csik, & Gassmann (2013) propose, based on a case studies analysis of 14 business model innovation projects, an integrative, four phase framework (featuring the phases *initiation*, *ideation*, *integration* and *implementation*) for business model innovation named the *4I Framework of Business Model Innovation*. A representation of this framework is presented in Figure 17.

The first phase, *initiation*, involves analysing and understanding the needs of the ecosystem, and identifying important stakeholders. The goal of this phase therefore is to obtain a full understanding of the problems and needs to be addressed by the novel business model. Achieving strategic objectives, shifting market needs or business threats serve as triggers to start the initiation phase. The output of this phase is to generate concrete targets for business model design or redesign.

The second phase, *ideation*, concerns generating potential new business model designs. The goal here is to address the identified challenges of the initiation phase by means of a novel business model. As indicated in the framework, it is important that external fit is created between what was identified for the initiation phase and the proposed solution emerging from the ideation phase.

The third phase, *integration*, is aimed at establishing a viable and complete business model design, which focuses on giving meaning to the structure of the business model, making concrete, detailed decisions with respect to how value is created and captured and ensuring that stakeholders represented for the business model agree and ensure their support. The output of the integration phase as such represents viable business model designs to be implemented. Typically, the integration phase focuses on concretising the abstract business model design coming from the ideation phase. Although the business model design therefore is subject to change, internal fit should be established between the ideation and integration phase (meaning that the business logic, such as the value offered, customer segment or the network structure for both models should not drastically change).

The last phase, implementation, is to make sure that the business model design can be put in practice, reducing risks and uncertainty with regards to its design. This includes changing the organisation and its processes in such a way that the business model can be operationalised. Moreover, the organisational structure should support the business model implementation, both strategically and culturally (Doz and Kosonen 2010). Monitoring the performance of the implemented business model after initial market roll-out, the business model consequently can be scaled step by step.

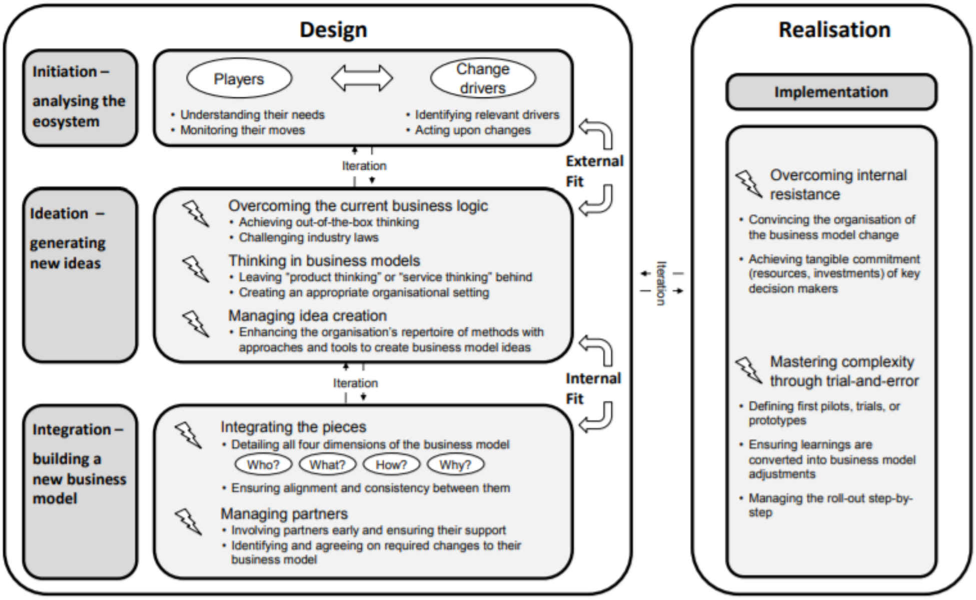

Figure 17: The 4I Framework of Business Model Innovation (Frankenberger et al. (2013))

2.4.6 Business model innovation: A process perspective

Zott & Amit (2015) propose a high-level business model innovation process, developed from principles of design theory. With respect to a design process, two abstract, generic phases are identified, namely an analytical phase (related to finding and discovering what to design) and a synthetic phase (related to inventing and making the proposed design). On the basis of this, a process model for BMI is proposed that consists of five generic stages, namely *observe, synthesize, generate, refine* and *implement*, for which *observe* and *synthesize* refer to the analytical phase, whereas *generate, refine* and *implement* relate to the synthetic phase (Zott and Amit 2015). The model is presented in Figure 18. For *observe*, the goal is to understand how all stakeholders for an existing business model experience or participate for the proposed business model offering, and to identify what problems, challenges or objectives may be present here to drive business model innovation. Next, for *synthesize,* the insights derived from the previous phase are placed within the context of business models and the market surrounding them. Questions such as 'what should our customer segment be', 'what are the needs of the customer', 'what can we currently do better', 'what partners should be involved' should be asked. The output of this stage should provide the requirements for business model (re)design, which relates to the next stage of the BMI, *generate*. The focus for this stage is on the redesign of existing business models or the design of entirely new business models that address the previously derived requirements. Several business model designs can be generated here by means of workshops, brainstorming sessions or structured approaches. The next stage, *refine*, focuses on evaluating the business model designs that have emerged from the *generate* stage. The goal here is to reduce the number of alternatives to a set of commonly accepted (by all stakeholders), detailed solutions. Techniques such as scorecards, prototyping, multi voting and multi-criteria analysis are used here, but more often than not this evaluation happens rather ad-hoc (Zott and Amit 2015). Finally, the *implement* stage focuses on mobilising the organisational resources and setting up the cultural and organisational structure to support and operationalise the new business model, including the activities conducted by external parties. This step often includes initial market testing and subsequent roll-out to understand the outcomes of the business model.

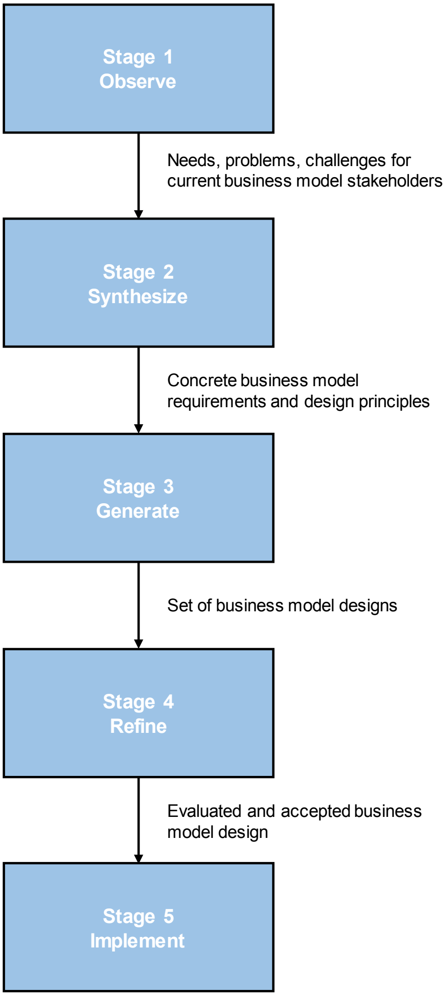

Figure 18: Process perspective on BMI (Zott & Amit (2015))

2.5 Comparison on processes of business model innovation

The objective of our research is to provide support towards the evaluation of service-dominant business models in the context of business model innovation. In this context, we focus on business models that are developed from scratch, e.g., are new to the organisation or collaboration. We therefore do not support the evaluation of *operational* business models (but rather the process before actual operation of the innovated business model design). Accordingly, phases related to the scaling of the business model design, which considers the business model to be operational, are not required to establish this evaluation support. We see that almost all process descriptions start from a phase or activity that concerns observing, sensing and identifying the need for business model innovation, which is typically followed by the creation or conceptualisation of a novel business model and value proposition. Some of the process descriptions, such as the proposal by Zott & Amit (2015) (Figure 18) or the proposal by Frankenberger et al. (2013) (Figure 17) focus consequently on the explicit offline evaluation of the business model design (without experimentation) explaining the challenges faced with respect to evaluation for business model innovation. In contrast, process conceptualisations such as proposed by Sosna et al. (2010) (Figure 13) and Berends et al. (2016) (Figure 14) elaborate more implicitly on how business model evaluation should be supported, and rather refer to practices of experimentation and learning for understanding how the business model design should be configured. To build the context for our evaluation support, this understanding of what challenges are faced is important to provide structured support. Although these frameworks essentially are more linear and as a consequence more rigid, lacking an explicit consideration of capabilities such as organisational learning, these offer a more structured basis for the development of concrete evaluation support, given the explicitly mentioned challenges per innovation phase. Accordingly, we select the 4I-framework proposed by Frankenberger et al. (2013) given its already existing academic support (as opposed to the process perspective by Amit & Zott (2015) for the remainder of our thesis. We should note however that these frameworks are strongly similar in terms of the steps or phases highlighted towards business model innovation (Wirtz and Daiser 2018).

2.6 Chapter summary

Traditionally, organisations have shaped their interaction with customers as a distinct, explicit exchange of goods and commodities, as customer value was considered to be embedded in the characteristics of offered products. Through transfer of the goods or commodities, ownership changes from organisation to customer, allowing the customer to consume the embedded value. How customers consequently use the product and thus appropriate value was deemed outside of the reach of organisations. As a result, organisations focused on improving and optimising products and the way these products are transferred or delivered to customers to compete and provide superior customer value. This business logic is summarised as *goods-dominant logic*.

The last decade has sparked the emergence and widespread adoption of *service-dominant logic*, which challenges the assumptions underlying goods-dominant logic and poses that value is always determined by the beneficiary. As a consequence, it is of lessened importance what characteristics a service or offered product has, but more importantly how the customer uses a product or service and the experience it establishes. To be able to influence the customer's value creation process, organisations provide services rather than offer products to interact with customers and shape the context in which value is created.

Adopting service-dominant logic has several implications as to how business is conceptualised. As services are catered to customer needs, which are highly dynamic, the offered services become highly complex in nature. In order to provide these complex services, organisations engage in dynamic, collaborative business networks to exchange and integrate resources. Given the fleeting nature of these networked collaborations, the internal structure and business logic of service-dominant organisations should be configured in such a way that it provides a stable context to these dynamic offerings. This requires a reconsideration of key business concepts such as strategy, business models, process models and elementary capabilities and resources in light of service-dominant business. We see that research addressing these challenges draw from domains such as service-oriented architecture, service systems and service science to provide conceptual approaches towards business engineering.

A holistic consideration of service-dominant business engineering is provided by means of the BASE/X framework. To the best of our knowledge, this is the sole framework that proposes a holistic consideration of business engineering from a service-dominant business perspective. The BASE/X framework encompasses the business spectrum of business strategy towards elementary services, reasoning from the premises of SDL. The framework provides conceptual guidance on how alignment can be established between key business concepts (e.g., business strategy, business models, service compositions / process models and business services), and provides tooling per business concept to represent or model each layer.

We see that service-dominant logic is slowly becoming more prevalent in business model research, as the principles of SDL impact how business models are shaped and represented. Several tools have been proposed that reason explicitly from service-dominant principles, such as the SLBMC, SBMC and SDBM/R. We also see that initial evidence is found on establishing a theoretical integration between service-dominant logic and the business model concept.

In line with our research question, we also elaborate on the concept of business model innovation. As many contemporary markets become more and more fast-paced, business models should continuously be adapted to match shifting market needs and incorporate new (digital) innovations in order to remain competitive. Business model innovation concerns this challenge of renewing, exploring or improving either current or new business models. Business model innovation is argued to influence organisational performance, but requires careful (strategic) direction and guidance. To provide normative guidance in the form of structure, scholars have proposed several structured processes towards business model innovation. We compare these process descriptions and have selected the 4I-framework to illustrate business model innovation for the remainder of this thesis, given its explicit description on what challenges are faced in terms of evaluation, which provides the basis for the development of structured evaluation support.

Chapter 3

Related work and research context

3 Related work and research context

In this chapter, we set the scene for our research, and discuss the related work on the topic of business model evaluation. First, in Section 3.1, we explain the concept of business model evaluation and how it is operationalised by means of quality attributes in literature. As limited guidance or structure is present for business model evaluation in the context of business model innovation, in Section 3.2, we describe the systematic literature review we have conducted to gain a better understanding of the structure. We examine the most relevant studies to our goal identified accordingly in Section 3.3. On the basis of our findings and the implications of SDL, in Section 3.4, we propose and introduce a framework that accommodates service-dominant business model evaluation in the context of business model innovation, which will serve as the scope for the remainder of this research.

3.1 Business model evaluation

While the business model concept is widely adopted and referred to in academic research and practice, in general the concept of business model evaluation has not received much attention, for which research is fragmented and in early phases of maturity. Business model evaluation is often considered as "the act of analysing and understanding the (perceived) performance of a business model" (Brea-Solís et al. 2015; Moellers et al. 2019). As mentioned, business models take a pivotal role for any organisation and consist of interrelated components which makes designing business models inherently complex (McGrath 2010). Through business model evaluation, organisations can explore how design choices impact the outcomes of the business model, reduce uncertainty with respect to its outcomes, or can compare between business model alternatives (Brea-Solís et al. 2015; Schrauder et al. 2018). Accordingly, business model evaluation helps organisations make decisions with respect to the design or configuration of their business model, which is an increasingly important task in contemporary dynamic and uncertain market environments (Tesch and Brillinger 2017; Schoormann et al. 2018).

As briefly introduced for the introduction of this thesis, one should note that business model evaluation can be conducted at *design-time* (referred to as *ex-ante business model evaluation*) and at *run-time* (referred to as *ex-post business model evaluation*) (Mateu and Escribá-Esteve 2019). Starting with the latter, *ex-post business model evaluation* concerns the assessment of the performance of operational business models. This may support understanding the longevity or life cycle of the business model to assess when business model redesign or renewal is needed (Saebi et al. 2017). As the business model is operational, data with respect to its technical or business performance can reliably be obtained or measured. As a result, the outcomes of business model evaluation (obviously dependent on whether it is conducted properly) typically reflect the true performance of the (operational) business model design.

Contrastingly, *ex-ante business model evaluation* typically concerns the evaluation of business model *designs*, which are yet to be implemented. Accordingly, as it is unclear how the business model design will perform in practice, uncertainty with respect to the business model design is high, especially in early phases of innovation (McGrath 2010; Tesch and Brillinger 2017; Mateu and Escribá-Esteve 2019). Consequentially, limited high-quality accurate data typically is available for *ex-ante* business model evaluation, making it significantly more difficult to support this task. Logically, in cases where business models are marginally renewed or limited changes are proposed, data of previous iterations of the business model may be used to support business model evaluation (which offers some evidence towards its expected outcomes). However, in cases where entirely new business models are designed or innovated (Foss and Saebi 2017), this data typically is not available or significantly uncertain. Nevertheless, decisions still have to made to concretise or innovate the business model design. Accordingly, *ex-ante business model evaluation* depends in large on predicting the outcomes of business model designs, taking into account the characteristics of the innovation process related to uncertainty and data availability (Tesch and Brillinger 2017). Accordingly, this requires a careful consideration of how business model evaluation should be conducted in the context of business model innovation, as business model evaluation positively impacts the success of novel business models (Schrauder et al. 2018). As mentioned, we consider *ex-ante business model evaluation* as the scope of our research.

As business model evaluation focuses on understanding the performance of business models, it is important to further clarify what business model performance entails. Related work on business model evaluation has focused on different quality attributes for concretising business model performance. These quality attributes are defined *feasibility* (De Vos and Haaker 2008), *viability* (Ballon and Delaere 2008; McGrath 2010) and *robustness* (Haaker et al. 2017; Täuscher and Abdelkafi 2018), which are dependent on the configuration or design of the business model and its logic followed by means of its underlying *structural validity* (Osterwalder et al. 2005; Zott and Amit 2010; Brea-Solís et al. 2015).

The quality attribute *business model feasibility* (De Vos and Haaker 2008) relates to the degree to which a business model can be operationalised, implemented and deployed, and addresses the technical performance of business models. Therefore, it concerns whether the combination of resources available through the stakeholders included for the business model allows the business model to be implemented and deployed (Haaker et al. 2017). These resources may already be present beforehand, may be generated through the integration of resources in business networks, or may be the result of future acquisition.

On the other hand, the quality attribute *business model viability*, related to the business performance, is usually demonstrated through a business case that assesses the implications of stakeholder-specific costs and benefits emergent from the business model (Haaker et al. 2017; Gilsing et al. 2018). Depending on the strategy of included stakeholders, which drives business model participation, the costs and benefits captured from the business model may be financial, but also non-financial in nature, such as *environmental* (pertaining to nature and ecological impact) or *social* costs and benefits (pertaining to society and societal impact) (Boons and Lüdeke-Freund 2013; Short et al. 2013; Freudenreich et al. 2019). Assessing how value is captured in the network (e.g. revenue model analysis or value model analysis) allows decision makers to understand the viability of a business model design (Allee 2003; Bocken et al. 2015). Logically, any changes made to the value model may impact the feasibility of business models, as it can affect resource availability or the configuration of resources. Likewise, striving for feasibility may require additional investments that impact the viability of business models.

The quality attribute *business model robustness* captures the uncertainty related to technical or business performance and is usually expressed through scenarios, what-if analysis or probabilistic theory (Haaker et al. 2017; Täuscher and Abdelkafi 2018). As such, it is related to business model performance in the sense that it extends both business and technical performance analysis by addressing the likelihood of cost and benefit outcomes, uncertainty with respect to structure, market or technology challenges, and the expected overall longevity of the business model and its life cycle.

Lastly, we coin the term *structural validity* to capture work addressing the logic, structure, value mechanisms and dynamics underlying the business model design (Osterwalder et al. 2005; Zott and Amit 2010).The general structure of the business model and its related logic influence how value is created and captured for the business model design, which in turn affects how the business model design is perceived to perform. Obviously, an invalid structure may yield an undesirable value proposition to the business model design. Although it therefore does not directly express performance, it provides the basis and as such heavily influences the quality attributes *viability, feasibility* and *robustness*, and is considered to understand whether the business model design adheres to strategic concerns and design decisions of the stakeholders involved.

3.1.1 Tools and techniques to support business model evaluation

We observe in both literature and practice that a variety of tools or approaches have been proposed to conduct business model evaluation. Traditionally, business model evaluation has been considered from the viability perspective, directed at analysing the revenue model of business models, given its dominant position as a driver to search for or participate in new business models (Morris et al. 2005). As a result, financial tools drawn from the domain of economics, such as cost-benefit analysis and related metrics or real-option pricing, are prominently advocated in literature as a primary tool for business model evaluation (McGrath 2010; Osterwalder and Pigneur 2010; Massa and Tucci 2013).

However, as sustainability is increasingly emphasised for business model design (Boons and Lüdeke-Freund 2013; Short et al. 2013), an explicit financial orientation of what defines viability is too limited (Yunus et al. 2010). Given that many contemporary business models consist of many types of stakeholders, which may be organisations driven by profit maximisation, but also end-users, government bodies, or societal contributors (Gilsing et al. 2018), there is need to account for both financial and non-financial outcomes of business models (Bocken et al. 2015; Freudenreich et al. 2019). As a result, financial tools have been complemented or even exchanged by techniques such as multi-criteria analysis to include the preferences and perceptions of stakeholders and to be able to compare financial to non-financial outcomes of business models (Tesch and Brillinger 2017; Schoormann et al. 2018).

To assess the robustness of business models, techniques such as simulation analysis or scenario analysis are commended to account for the variability of the performance of business models under different circumstances or conditions (McGrath 2010; Tesch 2016). On the other hand, we even see the widespread use of the business model canvas, next to a basis for generation of novel business models, as an 'evaluation' tool to assess the structural consistency and validity with respect to elements of the business model design. Lastly, we see increased use of business process modelling techniques to understand how a business model may work in practice (Suratno et al. 2018).

3.2 Systematic literature review on business model evaluation techniques and their timing for business model innovation

Although, as illustrated, a variety of tools or techniques have been proposed towards business model evaluation, existing research still offers limited guidance, especially from an engineering or normative perspective, on how business model evaluation should be structured in the context of evaluation. More specifically, there is still limited clarity on what set of techniques can be applied, but importantly limited guidance is presented on why certain techniques should be applied in light of business model innovation, their timing and the evaluation goals these techniques aim to satisfy. Taking the business model innovation process by Frankenberger et al. (2013), we see that business model innovation addresses various diverse challenges to advance from conceptualisation of new business models towards the operationalisation and implementation of business models, which results in different evaluation challenges per phase that should be satisfied. Moreover, uncertainty with respect to the outcomes of a business model design is more significant at early phases of the business model innovation process, for which the business model design is still far from implementation or operationalisation, which impacts how business model evaluation can be supported or applied (McGrath 2010; Mateu and Escribá-Esteve 2019). If we look at the traditional techniques proposed for business model evaluation, the traditional (financial-oriented) techniques are typically dependent on data which is not always present or uncertain for early phases of the business model innovation process (Zott and Amit 2015; Tesch and Brillinger 2017; Dellermann et al. 2018). As a result, some techniques may not be as effective to support business model evaluation at all phases of the innovation process (Tesch and Brillinger 2017). Moreover, this purposeful application of tools and techniques also depends on what evaluation challenge is addressed for business model innovation. However, we observe that this 'correct' timing of techniques to guide business model evaluation in the context of business model innovation is not or only to a limited extent elaborated in literature (Tesch and Brillinger 2017; Schoormann et al. 2018)

As our research objective is to provide support towards service-dominant business model evaluation in the context of business model innovation, we first have to understand what techniques are available in related literature to support business model evaluation, and to identify at what timing with respect to business model evaluation and to what purpose these techniques have been applied to support business model innovation. In response, in this section, we discuss the systematic literature review (SLR) performed to create a better understanding of what techniques are available to support business model evaluation, their characteristics and timing in the context of business model innovation.

To provide structure to conducting our SLR, we followed the search protocol defined by Kitchenham & Charters (2007). First, we introduce and motivate our research questions central to our SLR. Consequently, we describe the search strategy followed for conducting the SLR, as well as the inclusion and exclusion criteria applied for selecting relevant studies. Next, we elaborate on the findings through application of our research design. We synthesise the findings into a framework to guide business model evaluation.

3.2.1 Research questions

The main objective of the SLR was to identify the techniques used for evaluating the performance or viability of business models by analysing the studies in academic literature that report on their application, understand the relevant characteristics of these techniques, and investigate their application for the business model innovation process. As explained, we use the process description by Frankenberger et al. (2013) to structure the process of business model innovation. A comprehensive overview of the techniques used for evaluation as well as an understanding of their characteristics and timing for business model innovation should facilitate both research and practice to conduct business model evaluation and innovation more effectively. Accordingly, our first research question relates to the identification of evaluation techniques, to obtain a comprehensive overview of the techniques that have been applied in academic literature. Therefore, our first research question is:

RQ1. What techniques for business model evaluation can be identified in academic literature?

Our second research question relates to the timing of application in the business model innovation process for the identified techniques. As highlighted by Tesch & Brillinger (2017), there is a need to understand the timing in the business model innovation process at which the identified techniques are used. Despite the difficulty in generating an all-encompassing precise representation, such a mapping can provide initial insights into the effectiveness and usefulness of evaluation techniques at respective innovation phases. For instance, a high frequency of applications of a technique at a certain innovation phase may indicate that such a technique is commonly deemed as useful for understanding business model performance in that phase. Similarly, a low frequency of applications for a technique at an innovation phase may indicate that such a technique is considered less useful at that phase. Accordingly, the second research question is formulated as follows:

RQ2. At which phase of the business model innovation process (Frankenberger et al. 2013) can the identified techniques be applied?

Based on the results of our research questions, we propose a framework which presents an overview of the techniques that can be used at different phases and how these techniques can be applied.

3.2.2 Search strategy

To provide answers to our research questions, we defined a search strategy following the protocol defined by Kitchenham & Charters (2007) which consisted of *search string, search procedure* and *selection criteria*. We started with an initial search string related to business model evaluation, and consequently through a set of trial runs optimised our search string with respect to the amount of papers identified and their relevance. The final search string for the search procedure was defined as follows:

"Business model" AND ("evaluation" OR "assessment" OR "feasibility" OR "viability")

We included the terms 'assessment' as a synonym for 'evaluation' to be complete and comprehensive, and 'feasibility' and 'viability' (which in practice are often used interchangeably) to broaden the scope of the search. This way we aimed to cover studies that focus explicitly on the outcomes of business models (e.g., costs and benefits that emerge from the business model). Although we focus on identifying techniques for business model evaluation, we did not explicitly include terms as 'technique' 'method' or 'approach' as, in our trial searches, these appeared to be too restrictive. Similarly, we highlight the relevance of business model performance for business model evaluation, but did not include 'performance' as a keyword, as this significantly inflated the number of search results with studies on topics like organisational or strategic performance. Our further analysis of the search results indicated that the terms 'feasibility' and 'viability' were sufficient to cover relevant works presenting performance related discussions on business model evaluation.

We have searched relevant works in the following online library databases: *ACM Digital Library, AIS Electronic Library, Emerald Insight, ScienceDirect, SciVerse Scopus, SpringerLink and Web of Science*. We selected this group of library databases as it covers a broad range of scientific domains, such as strategic management, innovation and technology management and information systems, in which the business model concept has become a key topic of research. As a result, we expect that our study includes most relevant work related to our research objective.

We defined the selection criteria (presented in Table 6) to determine the studies that were directly relevant for our review. The application of the selection criteria was conducted in two stages: context and content. The steps and criteria applied in the *context* stage set the scene for the thorough analysis conducted in the *content* stage. The steps in the *context* stage were performed jointly by three researchers (authors of this paper), whereas the *content* stage has been covered by a single researcher, after which the results were verified by the remaining researchers. Any differences for included or excluded articles were discussed until a consensus was achieved.

Table 6: Selection criteria for the search procedure

Stage	**Type of criteria**	**Name of criteria**	**Description**
Context	Inclusion (I1)	Language	The study is written in English
	Inclusion (I2)	Publication date	The study is published between 1-1-2000 and 1-8-2019
	Inclusion (I3)	Scientific relevance	The study is either a (peer-reviewed) journal article, (scientific) book section/chapter or conference paper
	Inclusion (I4)	Search string	The study complies with the search string for either title, abstract or keywords
Content	Inclusion (I5)	Business model evaluation approach	The study applies, validates or proposes a method that facilitate the evaluation of the validity of a business model design
	Exclusion (E1)	Evaluation of business model design method	The study is excluded if it focuses on evaluating a business model design method
	Exclusion (E2)	Focus on evaluation of technology or product innovation	The study is excluded if it focuses only on evaluating a technology or product innovation within a business model

For the first stage (*context)* we applied the above-specified search string and context criteria as listed in Table 6. As a result, we obtained 4941 studies. As some digital libraries provide different search functionalities (i.e., searching papers on keywords and title only, or lack of filtering functionality for the language of the paper), some inclusion criteria were adapted or checked manually to fit as best as possible to a certain digital library.

The second stage (*content*) concerned a multi-step analysis of the remaining studies. First, the lists of relevant papers in each digital library were sorted by relevance. Then, we read the titles to deem initial relevance, and subsequently abstracts and keywords of the articles to eliminate those articles which although the title seemed promising did not turn out to be relevant. We applied the fifth inclusion criteria (I5) to guide us in this selection process, which states that the study should mention an application, validation or proposal of techniques for business model evaluation and the assessment of business model performance.

For the list of each digital library, we continued this examination of papers until no relevant work was located after 100 consecutive papers. (For instance, if we considered paper 150 as relevant, we stopped reviewing the list of papers in that digital library if the further examination of papers between 151 and 250 did not locate any additional relevant work.) Next, we eliminated the duplicate papers found for multiple digital libraries and generated a single list of papers with 313 articles for further review.

The further review of the remaining 313 articles, our second step of analysis, involved reading and going through the articles in more detail, and examining whether business model evaluation was conducted and how it was conducted. Specifically, we focused on the sections in relevant articles that discussed the application of techniques towards business model evaluation or to analyse the performance of a business model design. From the analysis of these articles, we derived two exclusion criteria to exclude works that were not relevant to our research objective. The first criterion (E1) was derived and applied to exclude works that discuss the evaluation of a business model *design method*, or use a business model design method to analyse the business model. These studies present insights on the performance of a business model design method (process-oriented) rather than how the business model is expected to perform (product-oriented), for which we do not aim to find insights. Given the scope of our research, we also excluded studies which focused exclusively on evaluating the performance of a product or technology innovation, as the object of analysis for our research is the business model as a whole (exclusion criterion E2). These studies discussed the evaluation of specific products or technologies (often related to smart grids, photovoltaic cells or water / pump stations in which the term business model is synonymous with economic or business model) resulting in techno-economic analyses. Whilst the economic performance of a product is relevant to the performance or viability of business model, the focus on the technical feasibility of a new product or service is out of the scope of our research.

The application of all criteria resulted in a set of 56 relevant *primary* studies from which the results were extracted. The full list of these studies, including classification scheme, is available in the Appendix A of this dissertation. The breakdown of search results is presented in Figure 19.

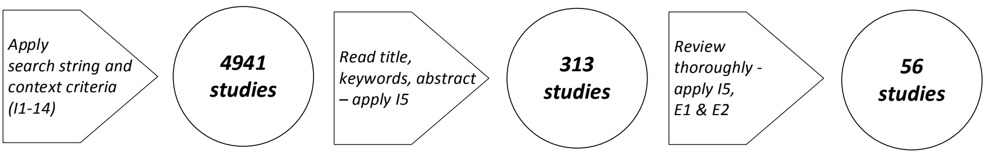

Figure 19: Breakdown of the search results

3.2.3 Results

In this section, we discuss the findings of our SLR, and provide answers to our research questions. First, we describe the generic evaluation techniques we have identified and their frequency of occurrence for the primary studies. We briefly elaborate each generic technique, encompassing potential sub variations. Lastly, we discuss the results of mapping the evaluation technique to the respective business model innovation phases in which they have been applied.

Identified business model evaluation techniques
In our review, we analysed the primary studies and identified the techniques that have been applied to evaluate the performance of business model designs, as well as their relative frequency of their use. To answer our first research question, Table 7 lists the identified generic technique, and their frequency of occurrence.

The results show that *expert judgement, scenario analysis, financial cost-benefit analysis* and *simulation analysis* are most frequently used to support the performance evaluation of business model designs. Out of 56 studies, 27 discuss an application of expert judgement to assess the performance of business model designs, whereas 30 studies use (a variation of) scenario analysis to support business model evaluation. From a more quantitative perspective, 20 studies use financial cost-benefit analysis to analyse the predicted performance of a business model, whereas 18 studies leverage simulation analysis to assess business model performance. We will discuss the identified generic techniques in more detail in the remainder of this section.

Table 7: Business model evaluation techniques identified in the primary studies

Identified generic evaluation method	Frequency of occurrence	Occurrence in the primary studies
Expert judgement	27	[S1] [S3] [S11] [S12] [S14] [S15] [S16] [S19] [S21] [S23] [S24] [S26] [S28] [S30] [S32] [S35] [S36] [S41] [S42] [S46] [S47] [S49] [S50] [S51] [S52] [S53] [S55]
Scenario analysis	30	[S4] [S7] [S8] [S11] [S13] [S15] [S17] [S21] [S22] [S25] [S26] [S27] [S28] [S30] [S32] [S33] [S35] [S37] [S38] [S42] [S43] [S44] [S45] [S47] [S50] [S51] [S52] [S54] [S55] [S56]
Multi-criteria analysis	10	[S5] [S14] [S15] [S19] [S23] [S29] [S30] [S34] [S36] [S49]
Financial cost-benefit analysis	20	[S3] [S9] [S10] [S12] [S15] [S17] [S22] [S25] [S26] [S27] [S30] [S31] [S32] [S33] [S37] [S39] [S40] [S42] [S48] [S56]
System dynamics analysis	7	[S4] [S6] [S8] [S35] [S44] [S45] [S51]
Simulation analysis	18	[S2] [S3] [S12] [S13] [S14] [S17] [S18] [S20] [S22] [S25] [S32] [S33] [S37] [S38] [S40] [S54] [S55] [S56]

Expert judgement

In general, *expert judgement* is used to elicit the opinion of stakeholders involved or experts within the business domain to understand whether the business model design is likely to perform or be viable (O'Hagan et al. 2006). Based on their knowledge or past experience, or by leveraging strategic or performance metrics (Heikkila et al. 2016; Mateu and March-Chorda 2016), experts or stakeholders are able to intuitively make qualitative assessments with respect to the viability of elements such as the business model structure, likeliness of consumer adoption of the service or product offered by the business model, and the projected costs and benefits. Although the results may often be high level and qualitative, expert judgement provides decision makers with a quick way of obtaining useful insights for evaluating business model designs (D'Souza et al. 2015). Moreover, applications in group settings (such as *Delphi method* or *brainstorming*) can bring together the knowledge of multiple experts directly, by which differences in expert opinions can be discussed and resolved. Although care should be taken to avoid biases, this allows expert judgement to produce generalized and robust insights for business model evaluation (Laukkanen and Patala 2014).

Scenario analysis

Most frequently featured in our primary studies, scenario analysis is used for business model evaluation to explore what-if situations, and to understand how changes for both the business model itself, as well as the market in which the business model is positioned, may impact the performance of the business model design (Tesch 2016). These what-if scenarios may range from high-level change factors or threats (such as changing market demands, shifting competition or generic business model structure), to highly granular risks and uncertainties with respect to business model parameters. Through exploring these what-if scenarios, decision makers are able to better understand the how the viability of the business model design may be affected and under what conditions.

Several variations of scenario analysis are used in our set of primary studies. *Risk analysis* (Vose 2008) is used to understand and quantify the risks associated to costs and benefits to analyse the robustness of the viability of the business model design. This is often used in conjunction with *sensitivity* a*nalysis*, which involves adding probabilistic values to financial costs and benefits or defining multiple scenarios (e.g., optimistic, normal or pessimistic) that reflect possible future outcomes. Accordingly, the viability of the business model design is evaluated against these scenarios. *Impact analysis* (Allee 2003) takes a more qualitative perspective and explores how changes to the business model design may impact its viability through identifying what stakeholders or business model elements can be affected. Finally, *SWOT* (Strength, Weaknesses, Opportunities, Threats) and *PESTEL* (Political, Environmental, Social, Technical, Economical, Legal) *analysis* (Yüksel 2012) is aimed at capturing how external effects (such as market influences) may impact business model performance.

Multi-criteria analysis

Multi-criteria analysis is used for business model evaluation to compare costs and benefits, key performance indictors (KPIs) or pros and cons resulting from a business model design (Ishizaka and Nemery 2013). Multi-criteria analysis facilitates decision makers to incorporate subjective stakeholder preferences, as the application of the technique requires stakeholders to indicate how preferred or important a KPI, cost or benefit is compared to other outcomes of a business model. Accordingly, the technique offers ample flexibility to decision makers to evaluate and compare multiple outcomes of a business model design, which moreover do not have to be expressed in the same dimension of units (for instance, increased financial profit can be compared to increased environmental pollution). Using pairwise comparison between costs and benefits emerging from a business model and normalizing the results, the technique facilitates decision makers to derive relative weights per performance criterion for a business model design (Zografos et al. 2008). Based on how well a business model alternative performs on these criteria, it allows decision makers to objectively interpret business model performance or select between business model alternatives (Daas et al. 2013). Several algorithms for conducting multi-criteria analysis have been used in our primary studies, such as Analytic Hierarchy Process (AHP) or Analytic Network Process (ANP) (Saaty 1988), ELECTRE (Roy 1999) and TOPSIS (Yoon and Hwang 1995).

Financial cost-benefit analysis

Financial cost-benefit analysis permits decision makers to assess and investigate whether the expected monetary benefits of a business model design will outweigh the monetary costs of implementing and sustaining this business model (Mishan and Quah 2007). For business model evaluation, financial cost-benefit analysis strongly pertains to the revenue model of the business model, which is often the dominant component in the business model structure and main driver of business model endeavours (Morris et al. 2005). Through financial cost-benefit analysis, decision makers can investigate the future viability of a business model design, understand the cost structure of the resources deployed and map how cash flows can be exchanged between network parties. A variety of financial performance metrics is used to accommodate financial cost-benefit analysis in our primary studies, such as Net Present Value (NPV) Internal Rate of Return (IRR), Break-even Analysis (BEA) and Return on Investment (ROI) (Mishan and Quah 2007).

System dynamics analysis

System dynamics is predominantly used for business model evaluation to explore how business model parameters or outcomes change over time, and what short or long-term impact it may have on other business outcomes of the model. System dynamics uses a modelling language and mathematical tool that enables decision makers to represent or translate a business model design as an interrelated set of systems, focusing explicitly on the dynamics, exchanges and influence of interactions between these (sub-)systems (Sterman 2000). Through modelling these dynamics and relationships as feedback loops and stock and flow structures, decision makers are able to analyse the impact of changes in business model parameters for business model performance. Moreover, the designed system dynamics model can facilitate quantitative analysis of business model performance over time, depending on the complexity of the model and the mathematical functions included.

Simulation analysis

Within our primary studies, simulation analysis has been used to support business model evaluation for a variety of purposes. Most often, simulation analysis is used to understand the (financial) performance and to analyse the risks associated with a certain business model design. However, simulation is also used to ‘enact’ a business model to understand its dynamics and performance under a set of model parameters. Each model parameter can follow probabilistic distribution that represents the risk or uncertainty related to the parameter. Accordingly, decision makers are able to deal with or reduce uncertainty with respect to the outcomes or performance of a business model (Power and Sharda 2007). Several variations of simulation analysis to support business model evaluation have been used in our studies. Examples include agent-based simulation (Tian et al. 2008), event-decision tree simulation (Copani and Rosa 2015), and discrete-event or business process simulation (Fishman 2013; Brandt et al. 2017).

Timing of business model evaluation techniques
To address our second research question, we investigated the phases of the BMI process at which our primary studies applied the identified evaluation techniques, for which as indicated we adopted the process description proposed by Frankenberger et al.(2013). We conducted the mapping of the selected studies to the relevant phases of the BMI process (Frankenberger et al. 2013) by leveraging the goals of the respective phases and translating these into evaluation goals.

- Initiation: As the goal of the initiation phase is to identify strategic opportunities for which a business model should be designed, the evaluation technique should concern the assessment of these strategic opportunities in light of the to-be designed business model.
- Ideation: The goal of the ideation phase is to generate business model designs that fill the void or satisfy the need identified in the initiation phase. Therefore, the evaluation technique at this phase should focus on assessing the strategic fit of the business model design with respect to the preferences of the focal organisation or stakeholder network.
- Integration: The goal of the integration phase is to concretise the business model and find a working business case to motivate participation of stakeholders. Therefore, evaluation techniques here should focus on assessing the business case of the business models (how is value concretely created and captured by stakeholders).
- Implementation: This phase focuses on operationalizing the business model and changing the organisation to accommodate this. Evaluation techniques for this phase should give decision makers insights on operational performance, resources to be deployed, setting parameters and understanding and mitigating risks and uncertainty.

Leveraging these concrete evaluation goals, we assess for each of the primary studies what goal the evaluation tries to pursue, to identify the innovation phase it is in. We then map the techniques used in these studies to the respective business model innovation phase. Figure 20 presents the mapping. It should be noted that a study may apply more than one technique to support evaluation at a certain phase of the innovation process, and that a study may also cover the evaluation of more than one phase (for instance both the evaluation of the ideation and integration phase).

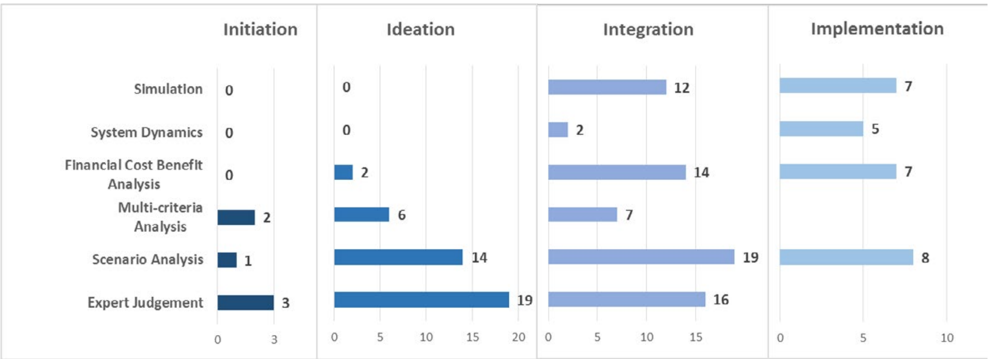

Figure 20: Application of the evaluation techniques at the relevant phases of the business model innovation process

Our analysis of the mapping yields two main findings. First, only to a limited extent, the identified generic techniques are applied to support the evaluation at the *initiation* phase. At this phase, the dominant concern is the analysis of the environment/ecosystem with a strategic lens, to identify strategic needs or opportunities that match the interests of the organization or ecosystem. Hence, we attribute this lack of use of the evaluation techniques at this phase to the fact that the evaluation at the initiation phase does not necessarily take the business model design as the focal point of evaluation, but aims rather at the strategic opportunities that provide the basis for a new business model design. As our research design explicitly takes the evaluation of a business model as point of interest, it makes sense that studies that focus on the evaluation of strategic opportunities are not explicitly considered. Nevertheless, given the role of business models, it is important that this link between strategy and business models is established (Magretta 2002; Casadesus-Masanell and Ricart 2010). For our primary studies, articles that do focus on the evaluation of the initiation phase almost always include this activity as part of a broader BMI cycle, either to understand and evaluate the ecosystem in which the business model is to be positioned or to derive goals and requirements for the subsequent design of the business model. Contrastingly, the *integration* phase includes applications for all identified techniques to support business model evaluation and prominently features as the focus of evaluation for the set of our primary studies.

As a second key finding, we see that no technique is applied to support the evaluation of all phases. Although the generic category of scenario analysis does feature for all phases, this is due to the fact that scenario analysis is treated as an aggregation of sub variations (to increase the interpretability of the results), for which these variations do not feature for all phases. We can moreover see that for the *ideation* phase of business model evaluation, the results show that qualitative techniques such as *expert judgement*, *scenario analysis* (specifically *impact analysis*) and to a lesser extent *multi-criteria analysis* are used. Conversely, the *implementation* phase shows a strong presence of applications of quantitatively-oriented techniques such as *simulation*, *system dynamics* and *financial cost-benefit analysis,* as well as the application of quantitatively-oriented variations of *scenario analysis* (specifically risk and sensitivity analysis). From these findings, we can conclude that as the BMI process progresses to implementation, quantitative support for business model evaluation becomes predominant in use, whereas the early phases of BMI are characterised by qualitative evaluations of business model design. This coincides and conforms to how decision-making processes in general are perceived and supported.

3.2.4 A framework for guiding business model evaluation

The evidence we gathered and analysed through our systematic review of the academic literature strongly suggests that the applicability of the evaluation techniques to guide BMI largely depends on their timing within the BMI process. However, as illustrated by our results, none of the generic techniques are used to support all phases of the innovation process. As the business model innovation process encompasses the entire spectrum of decision making, from strategic to tactical to operational (Casadesus-Masanell and Ricart 2010), we conclude that a single, comprehensive evaluation technique to business model innovation is too limited and does not address these diverse challenges at different phases.

Early phase business model design and innovation is often characterized by uncertainty, lack of data and a lack of clear structure with respect to the business model design (Tesch and Brillinger 2017; Mateu and Escribá-Esteve 2019). As a result, it is challenging or even impossible to quantify all outcomes of the business model and to evaluate its viability (McGrath 2010; Dellermann et al. 2018; Simmert et al. 2019). However, at early phases the decision makers are still required to evaluate the performance of business model designs to ensure that the business model adheres to an organisation's strategic goals. Similarly, later phases of BMI require concrete, quantified evidence to support operationalization and implementation. Therefore, we advocate the need for a process-led approach of business model evaluation, elaborating how evaluation techniques should be used, for which the process maps to each phase within the BMI process.

In this section, we propose such a framework for guiding business model evaluation. To support the framework, we synthesise the purpose as to how the techniques and sub-techniques have been applied to support the respective phases of BMI. We therefore examine how a certain technique has been applied in light satisfying the evaluation goals of the respective innovation phase, and aggregate these results to present generalised findings with respect to their purpose for business model evaluation. Based on these findings and the results of our study, we present the resulting framework for guiding business model evaluation. For each of the phases, we elaborate in the subsequent sections how the techniques have been used to satisfy or contribute to the respective evaluation goals.

Application of techniques to support evaluation at the initiation phase

The evaluation goal for the initiation phase is to assess the strategic goals and opportunities that serve as the basis for business model design, and to evaluate the environment (in terms of market and stakeholders) in which the business model design is to be positioned. Given the high level of uncertainty involved in these challenges, the need for qualitative techniques is evident. Our review of literature indicates that *expert judgement, multi-criteria analysis* and *scenario analysis* are such techniques that have been applied for this phase (Figure 20). Expert judgement is used to decide ad-hoc on strategic opportunities, or help devise performance metrics that can be used to evaluate such opportunities, taking into consideration the market needs. Although the business model design is still unknown or unclear, the evaluation for this phase can be based on the (tacit) domain knowledge of the experts. To further structure the evaluation process, decisions are often supported by *multi-criteria analysis* to indicate the relative importance of performance criteria with respect to the strategic goals an organisation desires to pursue. Similarly, scenario analysis (e.g. SWOT or PESTEL analyses (Yüksel 2012)) is used by decision makers to evaluate the impact or risks associated with the identified strategic opportunities.

Application of techniques to support evaluation at the ideation phase
The evaluation of the ideation phase should facilitate decision makers to assess whether the business model design fits with the strategic goals set and provide a preliminary indication of the performance of these models (to motivate stakeholders to continue the innovation). Our results have shown that *expert judgement, multi-criteria analysis, scenario analysis* and to a lesser extent *financial cost-benefit analysis* have been applied to support evaluation in this phase. As the output of the ideation phase represents concrete business model designs, often explicitly represented through modelling tools, the available evaluation techniques are catered to the business model design along its components. Similar to the initiation phase (but taking the business model itself as point of interest), *expert judgement* and *multi-criteria analysis* are used to set up business model performance or selection criteria that allow decision makers to evaluate the strategic fit, structure and potential viability of the business model design. Eliciting the view of the stakeholders and experts, the decision makers consequently can determine whether the business model design is acceptable to be taken along the next phase of the innovation process, or whether the design should be changed (or even the strategic goals should be reconsidered).

Scenario analysis (specifically impact analysis) is used to help in this phase to understand how the business model can work in practice under a set of conditions or future scenarios to further support the evaluation (e.g., by means of storytelling (Tesch 2016)). If the business model design and the context at this phase already provides sufficient data with respect to its revenue model, a *financial cost-benefit analysis* can present insights on the initial viability of the business model design. The analysis at this phase is preliminary: due to business model design the likelihood of significant changes and uncertainty in this phase is high (Simmert et al. 2019).

Application of techniques to support evaluation at the integration phase
The evaluation goal for the integration phase is to determine if and under which conditions the business case for the business model design can produce a desirable outcome for all stakeholders (Meertens et al. 2014). In other words, the results of the

evaluation should motivate stakeholders to continue or to redesign the business model. In order to support decision making at this phase, more quantitatively-oriented techniques are needed. Our results show a substantial use of *financial cost-benefit analysis, system dynamics analysis* and *simulation analysis* to provide further quantitative support to the evaluation of a business model design, mixed with the use of qualitative methods to further support the evaluation. Quantitative methods, such as those listed above, are used to understand the financial viability of a business model design, and how financial viability may change over a time dimension for the stakeholders involved. A lack of financial viability may require the business model to be redesigned. However, depending on the strategic concerns of the respective stakeholders, viability may also depend on non-quantifiable or non-financial concerns (for instance social or environmental outcomes (Bocken et al. 2015; Freudenreich et al. 2019). *Expert judgement* and *multi-criteria analysis* can support this comparison between costs and benefits expressed in different dimensions, and as such, extend the viability analysis of the business case of the business model design.

Similar to the previous phases, *scenario analysis* (specifically risk analysis) is used by decision makers to conduct what-if analysis, but at this point in the innovation process taking more concrete business model elements as the point of analysis. More specifically, risk analysis facilitates decision makers to deal with uncertainty regarding outcomes of the business model design (for instance risks involving future cash flows) allowing them to assess the robustness of the model. This is frequently supported through *system dynamics analysis* to offer a detailed understanding of how changes in parameters (such as customer demand, pricing or competitor behaviour) may impact the viability of the business model (Moellers et al. 2019).

Application of techniques to support evaluation at the implementation phase

Evaluation of the implementation phase should give decision makers detailed, quantified insights on the performance of business models in relation to the operational processes to be deployed, the resources needed to support these processes and the business transactions to be conducted. The results of our review reflect the abovementioned need for quantitative, fine-grained decision support, which features techniques like *simulation analysis*, *financial cost-benefit analysis, system dynamics analysis* and *scenario analysis* (specifically risk and sensitivity analysis). Examining how these techniques have been used, the techniques help decision makers to obtain an even deeper (operational) understanding of viability, based on the resources that are deployed or available (Moellers et al. 2019). For instance, simulation analysis is applied to analyse the operational viability of the business model design with respect to resource deployment. Similarly, system dynamics analysis helps in understanding how changes in the capacity, workforce availability or service or product quality impacts the performance of the business model design, and to model the dynamics of customer demand under chosen business model settings (Täuscher and Abdelkafi 2018; Moellers et al. 2019). Lastly, scenario analysis (in the form of *risk or sensitivity analysis*) can account for testing the robustness of the business model design and to understand where the criticalities with respect to the operational viability of the business model are.

Practical framework for guiding business model evaluation
Based on the results of our review of the primary studies, and a thorough analysis of the applied evaluation techniques and their purpose to satisfy evaluation goals per innovation phase, we propose a framework for guiding business model evaluation, as presented in Figure 21. Based on the characteristics and challenges of each phase, we have derived explicit evaluation goals for each phase, which are described as the input for conducting evaluation at the respective innovation phase. Consequently, with respect to each evaluation goal, we highlight what purpose each technique has or how it is used to satisfy or contribute to achieving this goal. For each phase consequently, the framework can then be used to obtain guidance on which techniques are suited for the evaluation of a certain innovation phase, and how these techniques should be applied. Although any technique listed per phase in the framework in principle can be used (and can be used jointly), organisations can use their concrete evaluation goals (as a concretisation of the generic goals listed per phase), and the purpose of the techniques to guide the selection of techniques. This is especially relevant for the integration phase of business model innovation, for which the framework shows that all generic techniques in essence can be applied. For instance, if part of the evaluation of the business case requires organisations to reduce uncertainty, scenario analysis should be used. Similarly, if evaluating the business case requires a comparison between financial and non-financial costs and benefits, multi-criteria analysis should be used.

The generic evaluation goals per phase can be used as entry points by organisations to the innovation and evaluation process. The framework can as a result be used both for organisations that aim to improve existing business models and organisations that focus on developing entirely new business models (Schneider and Spieth 2013; Foss and Saebi 2017). For the former, it is likely that a business model design is already present, allowing organisations to enter the process at the ideation or integration phase (meaning the evaluation of the initiation phase may be lightweight in nature). In such a scenario, there is likely no need to evaluate the strategic goals that drive the design of a business model. The techniques highlighted for the integration and implementation phase can consequently be used to guide business model renewal or improvement. For the latter, which is often the case for radical innovations, strategic concerns related to new business models may have to be evaluated, whereas the structure of a new business model is likely to be absent or uncertain. In such cases, the entry point for organisations is the initiation phase, for which the entire process of evaluation should be conducted.

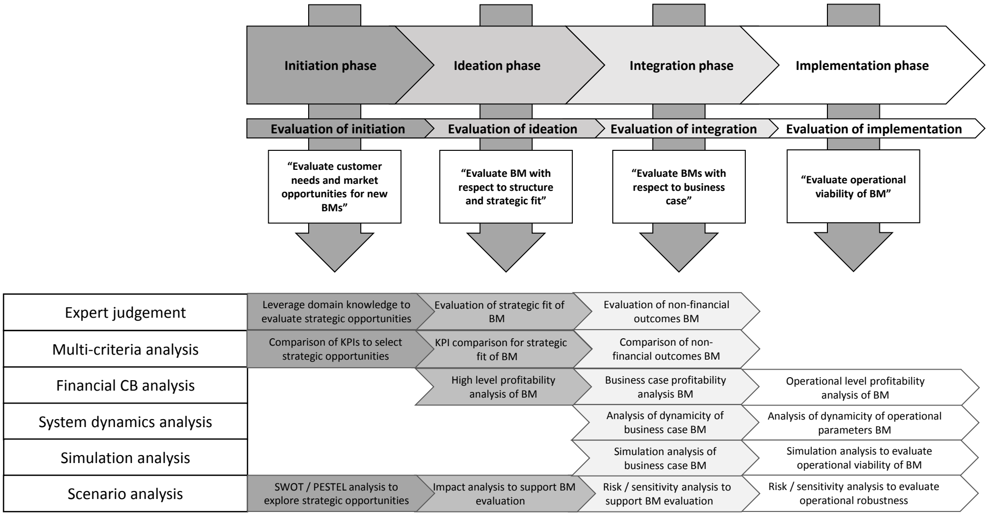

Figure 21: Framework for the application of evaluation methods at different business model innovation process phases

3.3 Related work on service-dominant business model evaluation

As emphasised, the implications of service-dominant logic bring forth requirements with respect to how *service-dominant* business models are structured and how value is created and captured for these business models, which impact the subsequent evaluation of these business models. Service-dominant business models demand a holistic, networked evaluation of the business model design, given the key contribution of each actor represented in the business network towards value creation. In contrast to traditional business models, this requires a networked assessment of the business model design rather than taking the perspective of a single organisation. From the set of primary studies for our SLR, we see that this traditional perspective is frequently reflected by means of how techniques are applied to evaluate business model designs, and as such are ill-suited to support service-dominant business model evaluation. From the studies that can be classified to consider more than one organisation for the business model (see Appendix A), we observe that most studies consider this in terms of a focal organisation and set of suppliers and partners, rather than a holistic view of the network (Copani and Rosa 2015; Moellers et al. 2019). Although we identify that a set of studies considers the terminology 'networked' or 'multi-stakeholder' evaluation of business models, often the case for game-theoretical approaches to business model evaluation (Gaivoronski and Zoric 2008; Tian et al. 2008; Gimpel et al. 2019), these approaches focus as objective on profit maximisation rather than mutual benefit, which goes against the collaborative nature stressed for service-dominant logic. Accordingly, such set-ups do not cater well to assess or evaluate the networked collaborations underlying service-dominant business models.

Demanding the need for a holistic consideration of business networks within service-dominant business models, the most commonly used method for our set of studies is the e^3-value value model (see 2.3.1) which through its notation accommodates a multi-stakeholder financial cost-benefit analysis. Whilst the use of this method makes explicit how actors benefit financially from participation in the business model design given a set of parameters, it offers limited guidance on how this is linked to concepts such as value co-creation and service exchange relevant to service-dominant logic, and how this can effectively be supported through evaluation.

3.4 A context framework for guiding service-dominant business model evaluation

The results of our SLR make explicit that several techniques have been applied to support business model evaluation, but the effective application of these techniques depends on their timing with respect to the business model innovation process. The resulting framework (presented in Figure 21) makes explicit what evaluation challenges are present to advance business model innovation (using the process description of Frankenberger et al. (2013)), what techniques are used to achieve or satisfy these evaluation challenges and when these techniques are used throughout the innovation process. The highlighted techniques consequently can be used as a starting point for the design and development of structured approaches towards the evaluation of business models in the respective phases of business model innovation.

As our research objective focuses on providing support towards the evaluation of *service-dominant* business models in the context of business model innovation, for which we take business model designs as the object of analysis, we should assess how the implications of service-dominant logic (Vargo and Lusch 2008) on business engineering and business model design impact the presented business model evaluation framework. To do so, we confront service-dominant business engineering (for which we draw upon the structure and foundations presented in the BASE/X framework (Grefen et al. 2013; Lüftenegger 2014) with the derived framework for business model evaluation in the context of innovation, to determine a context framework for *service-dominant* business model evaluation in the context of business model innovation.

Through service-dominant business engineering, organisations aim to address the challenges of service complexity and the need for business agility as a result of adopting SDL, by creating an explicit distinction the between stable organisational environment and organisational capabilities (e.g., strategy and business services) and the agile market offerings and deployment (e.g., business models and service compositions). As highlighted in Section 2.1.2, the stable layers of service-dominant business engineering provide the context in which the agile layers can freely take shape to satisfy or adhere to this context. Conversely, the composition and construction of the agile layers may challenge the contents of stable layers, resulting in revolutionary and evolutionary loops respectively. With respect to service-dominant business models, we see that two interfaces are present that influence the contents of the business model layer, namely the strategic and operational interface, describing the relationship between strategy, business models and operational or process models, which are highlighted in literature to be distinct but interrelated concept (Al-Debei and Avison 2010; Casadesus-Masanell and Ricart 2010).

If we contrast these interrelationships between the strategy, business model and service compositions (also referred to as business process models) layers to the phases of the business model evaluation framework, we can conclude that the decision-making with respect to the initiation and the implementation phase resides on different layers of service-dominant business engineering. As mentioned, the initiation phase concerns understanding the needs of the ecosystem and to uncover where opportunities, needs or challenges for stakeholders lie that can be addressed by new business models. The pursuit of a new opportunity or needs should always be considered in light of the strategy an organisation follows, such that no business model design is pursued which does not necessarily fit the stable strategy layer. Therefore, evaluation and subsequent decision making for the initiation phase is of a strategic concern rather than a business model concern – the object of analysis is to consider whether strategic opportunities are relevant to strategy and do not yet concern the business model design (which is to be designed for later phases).

Similarly, the implementation phase concerns understanding the operational performance of business models through operationalisation and subsequent roll-out of business models. As a result, evaluation support for this phase is related to operational decision making, understanding what parameters should be set to operate the business model, what resources should be deployed to conduct the required business activities and what technical interfaces should be established. Whilst this phase therefore considers the business model design as input, it translates a business model design into operational processes or service compositions (and even elementary business services) to understand how the business processes should be supported, what interfaces should be established and how the organisation should change to accommodate and implement the business model design.

Through these considerations, we therefore adapt the business model evaluation framework such that matches the layers of decision making for service-dominant organisations. This adjusted framework is presented in Figure 22. Whereas the ideation phase and integration phase prominently feature as phases relevant to evaluation with respect to service-dominant business models, the initiation phase and implementation phase reside on different layers of the service-dominant organisation (e.g. the initiation phase concerning the strategy layer and the implementation phase concerning the service composition and subsequent business service layer). Therefore, even though these phases are relevant to business model evaluation – as either the input or output of business model evaluation, these phases do not concern business models as unit of analysis.

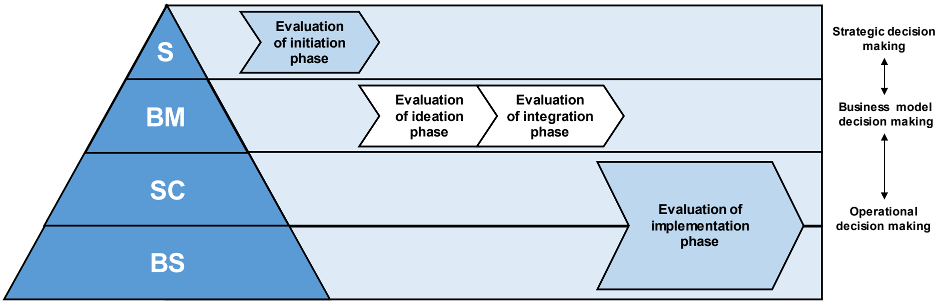

Figure 22: Mapping of business model evaluation to service-dominant business engineering

Accordingly, with respect to service-dominant business model evaluation, we consider the *evaluation of the ideation phase* and the *evaluation of integration phase* as the focus of our research, as these phases take the business model as basis for providing evaluation support to decision making. We therefore aim to provide support towards the evaluation of these phases by means of service-dominant evaluation artefacts. We dub these artefacts *IDEM* (*IDeation Evaluation Method*) and *INEM (INtegration Evaluation Method)*. However, given the interrelated nature of the phases of the business model innovation process, we take into account how the artefacts proposed interface with both the preceding and proceeding phases (evaluation of initiation phase and evaluation of implementation phase respectively).

3.5 Chapter summary

In general, the area of business model evaluation is fragmented to which a limited set of tools is provided, but without clear indications or directives as to how it should be applied, specifically in the context of business model innovation. We concretise business model evaluation by means of three quality attributes, namely *business model viability*, i.e., the business performance or business case of the business model (do we want it?), *business model feasibility*, i.e., the technical performance, representing the availability of resources and the degree of access (can we do it?) and *business model robustness*, the risks or degree of impact changes may have on either feasibility or viability (how likely will it happen?) and introduce *business model structural validity* as a quality attribute that influences these performance-related attributes.

As still limited research is present on providing normative guidance to business model evaluation, and to provide a context in which we position our research and from which we elicit research requirements, we conducted an SLR on the methods used for business model evaluation, their purpose towards evaluation goals and their timing with respect to business model innovation. We illustrate that many business model evaluations presented within academic research are directed at the *integration phase* of business model innovation, whereas limited attention has been given to the *initiation* and *ideation* phase. We highlight that business model evaluation is not a static activity to which a comprehensive singular artefact can be proposed, as many of the business model innovation phases have very distinct evaluation challenges and requirements.

We demonstrate that the nature of decision-making changes throughout the business model innovation process. Early phase business model innovation is accommodated by qualitatively-oriented evaluation methods that focuses on strategic challenges. These phases are usually characterised by a lack of business model structure, for which decisions on the 'optimal' structure are often subject to change and therefore characterised by significant uncertainty. As a result, qualitatively-oriented methods are favourable as these do not require high-quality data. Contrastingly, late phase business model innovation is supported through quantitatively-oriented evaluation methods that address operational challenges. For later phases, key decisions have been made with respect to the business model structure, decreasing business model uncertainty. Moreover, as the innovation process approaches the operationalisation and implementation of business model designs, data availability increases, allowing but also requiring the use of more quantitatively-driven decision support.

For our research, we focus explicitly on supporting the evaluation of *service-dominant* business models, which can be considered as a subset of 'general' business models. As a result, the findings of our literature review should be catered in such a way that it explicitly accommodates the evaluation of service-dominant business models. We therefore map service-dominant business engineering to business model innovation to understand what evaluation activities in the context of service-dominant business should be considered. We illustrate that, taking 'business model designs' as unit of analysis, the evaluation of the *ideation* and *integration* phase explicitly consider business model designs as objects of analysis, and therefore provide our context of research. Although we therefore do not take into account the *initiation* and *implementation phase*, we do take into account how the *ideation* and *integration phase* interface to these phases.

Chapter 4

Research design

4 Research design

In this chapter, the research design to provide answers to our research questions is elaborated. In Section 4.1, we elaborate on motivating the selection of an appropriate research methodology to guide our research, namely *design science research*. In Section 4.2, we translate the principles of design science research into concrete research activities, which is summarised by means of a visual overview of the research design. We then elaborate on each research activity within the research design, and explain how it contributes to providing answers to our research questions. We conclude this chapter by making explicit what knowledge contributions our work brings forward in light of design science research, and end the chapter with a brief summary in Section 4.3.

4.1 Design science research

As the object of analysis central to our research, *business models*, strongly pertains to the domain of information systems (Hedman and Kalling 2003; Al-Debei et al. 2008; Veit et al. 2014), and the context of our research, *service-dominant logic* or *service systems engineering* (Vargo and Lusch 2004, 2008), has been embraced by information systems research (Akaka and Vargo 2014; Böhmann et al. 2014; Lüftenegger 2014; Beverungen et al. 2018), it makes sense to position the output of our research as an information systems design artefact. For the domain of information systems, *design science research* (Hevner et al. 2004) has been emphasised as the dominant research paradigm (as opposed to for instance theory building or interpretative research) (Peffers et al. 2007). IS research is considered only truly valuable if positioned to simultaneously solve human or organizational problems and to generate new knowledge (Sein et al. 2011). As a result, information systems artefacts take the form of designs that can demonstrate knowledge contributions through applicable and valid solutions to problems (Peffers et al. 2007).

Within design science research, several concrete methods or approaches have been proposed to guide the development of design artefacts, such as *design science research process model* (Peffers et al. 2007) *action design research* (Sein et al. 2011) and *prototyping* (Baskerville et al. 2009). We chose the *design science research process model* by Peffers et al. (2007) for guiding our research, as the characteristics of our research context accommodates a more sequential set up between development and evaluation (in contrast to action design research, which requires the project to be based in an organizational setting and requirements to be inferred from practice), whereas the design of the artefact can be based on the initial practice and research requirements (Baskerville et al. 2009). Therefore, based on both practice related requirements and identified research gaps, we develop two artefacts (namely IDEM and INEM) and evaluate these by means of real-life business scenarios, to understand whether we captured the initial needs of practice and whether the proposed artefacts may provide an adequate solution to the problems the practical context is facing.

4.2 Research design process

The *design science research process model* by Peffers et al. (2007) is illustrated in Figure 23. The six proposed research activities serve as the basis for concretizing our research design, which is depicted in Figure 24. We detail the contents of each activity in the subsequent sub sections.

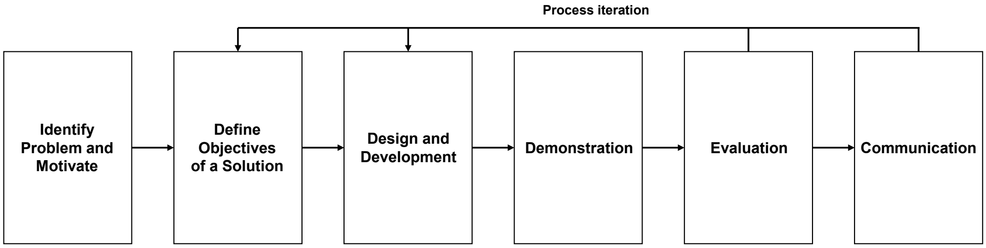

Figure 23: Design science research process model (adapted from Peffers et al. (2007))

4.2.1 Research problem and motivation

This activity concerned obtaining a thorough understanding of the state-of-the art literature available related to our research topic, and setting the scene for our research with respect to the research gap and scope (as highlighted in Chapter 2 and 3 of this thesis). This involved reviewing prior works to aggregate and synthesise key contributions with respect to *service-dominant business modelling*, *business model innovation* and *(service-dominant) business model evaluation*, to obtain a thorough understand of service-dominant business models and their characteristics and the recent advances on business model innovation and evaluation. We refer the reader to Chapter 2 for a detailed discussion on these concepts. As service-dominant business model evaluation is a significantly new research domain, we initially focused on business model evaluation as a superset of service-dominant business model evaluation. In order to position our work precisely and present clear research contributions, we conducted a *systematic literature review* (SLR) on business model evaluation in the context of business model innovation and to highlight existing research gaps in the context of service-dominant business models (Chapter 3). The results of our SLR illustrate that business model evaluation is catered to the characteristics of business model innovation, which features different evaluation challenges dependent on the timing in the innovation process. We moreover find that existing studies on business model evaluation are ill-suited to support service-dominant business model evaluation, as these do not adequately capture the need for a networked, holistic consideration of value creation and capture. Consequently, we contrasted the findings to service-dominant business (for which we leveraged the BASE/X framework) (Lüftenegger 2014; Grefen 2015) to provide a context framework for supporting service-dominant business model evaluation with respect to business model innovation, relating the innovation and evaluation challenges to layers of decision making presented for service-dominant business engineering. Accordingly, we concluded that in terms of service-dominant business model evaluation, the *ideation* *phase* and *integration phase* of the innovation process address the business model as unit of analysis and as such serve as scope and directive to our research.

4.2.2 Solution objectives

The research gaps identified and highlighted in Chapters 1, 2 and 3 and the resulting context framework (Figure 22) form the basis for the definition of objectives for the proposed design artefacts catered to the ideation phase and integration phase of business model innovation, as well as the need for an auxiliary technique to support the interface between business strategy and business models. The design artefacts are sequentially applied and contribute towards guiding service-dominant business model evaluation, whereas the technique ensures that alignment is established between business strategy and the service-dominant business model design. Although the design artefacts address distinct evaluation challenges in light of business model innovation, we can define a set of generic, overall objectives which should be addressed by both design artefacts:

Overall objective 1 – the design artefacts should be grounded on the premises of service-dominant logic

Rationale: As the proposed design artefacts should address the evaluation of service-dominant business models, we should ground the artefacts on the premises of service-dominant logic and their implications for business model conceptualisation and design (Kindström 2010; Clauß et al. 2014) such that the proposed artefacts adequately incorporate and address concepts essential to SDL such as value co-creation, value-in-use and service exchange. To do so, we build upon the axioms introduced in Chapter 2.

Overall objective 2 – the design artefacts should adopt a multi-stakeholder perspective for supporting service-dominant business model evaluation

Rationale: The complex nature of service offerings underlying service-dominant business models calls for business models that are networked in nature, for which each actor in the business network focuses on its core competencies and contributes value propositions towards the central value-in-use (Böhmann et al. 2014; Vargo and Lusch 2017). As a result, the sustained performance of service-dominant business models depends on the participation of all stakeholders in the business model network. Drop-out or substitution of a stakeholder in the network may result in a different value proposition, in turn affecting the central value-in-use offered by the business model design (resulting in a different business model). Therefore, the performance or success of a business model design depends on a holistic consideration of all involved stakeholders. As such, guiding service-dominant business model evaluation is a task that should consider and incorporate the preferences of each stakeholder mapped for a business model design. Accordingly, each design artefact should therefore accommodate this need for a multi-stakeholder consideration.

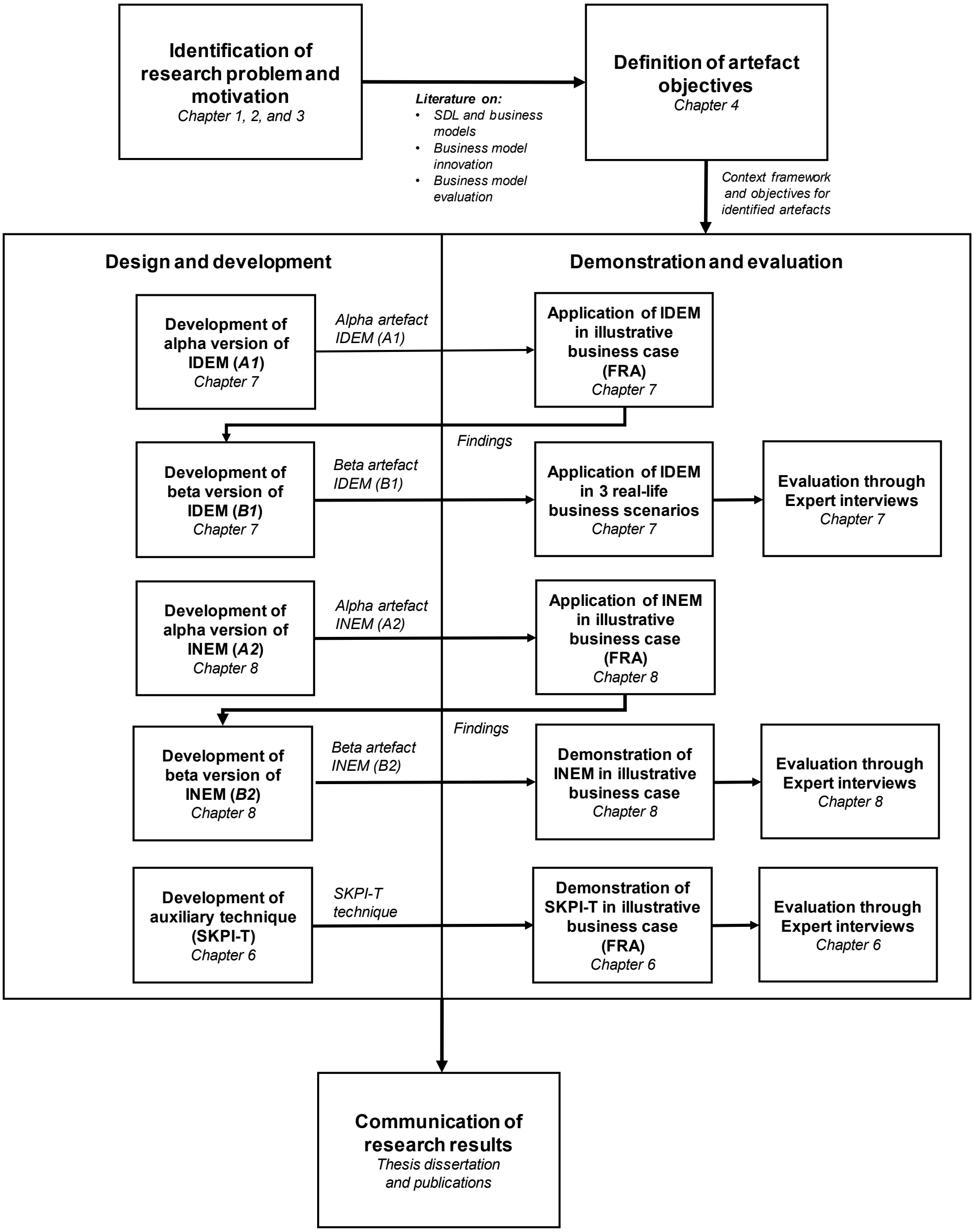

Figure 24: Research design

Overall objective 3 – the design artefacts should be easy-to-use and useful

Rationale: In line with design science research, our objective is to design meaningful and useful solutions to solve or address real-world problems (Hevner et al. 2004; Gregor and Hevner 2013). Our design artefacts are directed at users that face the challenges and complexity of decision making in the context of service-dominant business model innovation. Typically, these users are industry experts or practitioners from various disciplines or domains that potentially have limited experience in business modelling and their subsequent evaluation, further complicating this challenge. Accordingly, the objective for our design artefacts is twofold; our design artefacts should aid or guide users to evaluate service-dominant business models (validity, e.g. achieving its intended goals) and should be deemed useful and easy-to-use by the users (utility, e.g. its use should bring value outside of the development context) to be meaningful in light of the problem context.

Per design artefact, we identify the following objectives that should be satisfied on the basis of the highlighted research gaps and the proposed context framework for service-dominant business model evaluation.

IDEM objective 1 – IDEM should enable users to reflect on design decisions with respect to the business model design

Rationale: The ideation phase of the business model innovation process succeeds the initiation phase and concerns the generation and blueprinting of business model designs that satisfy the identified (strategic) problems or needs of the customer or end-user in the initiation phase (Frankenberger et al. 2013; Bonakdar and Gassmann 2016). The output of this phase typically entails one or more business model designs aimed at addressing these strategic objectives. Accordingly, the evaluation challenge for this phase is to assess whether a design structurally is valid with respect to business modelling conventions, service-dominant logic mindset and stakeholder preferences (e.g. does the structure establish the desired logic and results in the expected value created) (Clauß et al. 2014), and to understand whether the strategic goals that underlie the design of the business model are satisfied. Given this explicit evaluation challenge, the objective of the artefact is to support the user to verify the structure of service-dominant business model design and to reflect on design decisions made with respect to its initial strategic objectives. Therefore, the artefact should enable users to reflect on design decisions with respect to the service-dominant business model design.

IDEM objective 2 – IDEM should facilitate users to qualitatively evaluate the service-dominant business model design

Rationale: The general characteristic of innovation processes is that decision makers always have to cope with or manage uncertainty with respect to the outcomes of the object of innovation, which is even more apparent for early development or design phases of innovation (Khurana and Rosenthal 1998; Boer and During 2001; Chesbrough 2004). This is not different for business model innovation, which faces next to market uncertainty also uncertainty with respect to the technical and organisational feasibility of the proposed business model (Andries et al. 2013; Schneckenberg et al. 2017). As a consequence, data availability and data validity to support the evaluation is likely to be limited, especially for early phases of business model innovation (McGrath 2010; Simmert et al. 2019). This is even more apparent for *new to the organisation* business models (Schneider and Spieth 2013; Foss and Saebi 2017), Nevertheless, decision makers should still be able to assess whether a new business model design is acceptable or strategically valid. Given the results of our SLR, which indicates that generally techniques that facilitate a qualitative evaluation of business models are used to support the *ideation phase*, and the implications listed above, IDEM should facilitate users to qualitatively evaluate service-dominant business models.

IDEM objective 3 – IDEM should facilitate its users to evaluate a service-dominant business model design with respect to its structural validity, feasibility, viability and robustness.

Rationale: As described in Chapter 2, business model evaluation supports decision makers to better understand the outcomes of business models and as a consequence make more informed decisions with respect to the concretisation, design and continued investments for business models. Business model performance may pertain to different quality attributes of the business model, such as its *feasibility*, *structural validity*, *viability* or *robustness*. Especially in the ideation phase of business model innovation (due to its early position in the innovation process), a holistic consideration of these quality attributes should be adopted to understand whether the design decisions for the newly ideated business model make sense in terms of how it will perform, as the output of the ideation phase serves as a basis for the remainder of the innovation process. For instance, a lack of business model structural validity will have significant impact for further innovation and evaluation tasks, as decisions are made on the basis of an inadequate or illogical design. Therefore, we argue that IDEM should enable its users to evaluate a service-dominant business model design on the basis of these quality attributes.

For INEM, the following objectives are defined to guide the design of the artefact:

INEM objective 1 – INEM should facilitate users to quantitatively evaluate the value model of a service-dominant business model

The integration phase of the business model innovation process concerns the concretisation of business models, such that commitment of all stakeholders can be generated towards the implementation of the business model (Frankenberger et al. 2013). The value model or revenue model underlying the business model typically serves as a driver for business model participation or continuation (Morris et al. 2005). Although this does not imply that the feasibility or robustness of the design is of lesser importance, we scope our objective to focus on the viability of the service-dominant business model (we refer the reader to Suratno et al. (2018) for a method to support the operationalisation / feasibility analysis of service-dominant business models).

Accordingly, the evaluation challenge for this phase is to assess the viability of the business model and to understand whether all stakeholders agree to participate and implement the business model, based on the value model underlying the business model design. Accordingly, the objective of the artefact is to support the user to evaluate the viability a of service-dominant business model design, which should facilitate the quantitative assessment of the value model underlying service-dominant business models.

INEM objective 2 – INEM should support the decision-making process of actors to negotiate and concretise the value model of a service-dominant business model

Rationale: Although value co-creation is widely emphasized and studied in literature, both from a theoretical (Vargo and Lusch 2008; Vargo et al. 2008) as well as conceptual perspective (Böhmann et al. 2014), limited evidence or support is present on how value (in terms of costs and benefits) is or should be appropriated in collaborative networks (Hakanen and Jaakkola 2012; Jaakkola and Hakanen 2013). In any competitive business setting, disclosing company sensitive knowledge or data may put the organisation at risk of harming its competitive position (specifically regarding other business models). As collaborative networks are assembled and dissembled, this shared knowledge may aid competing organisations in strengthening their business activities. Nevertheless, the basis for value co-creation is the exchanges of resources or service between actors, which results in reciprocal costs and benefits and costs that should be appropriated (Vargo and Lusch 2017). Therefore, to be able to support the evaluation of the underlying value of service-dominant business model designs, the proposed artefact should support actors on how exchanged costs and benefits are negotiated and concretised, taking into account that organizational data or knowledge should be carefully exchanged.

With respect to the proposed auxiliary technique (SKPI-T) to support the interface between business strategy and business models, we define the following objectives to guide the design of technique:

SKPI-T objective 1 – SKPI-T should facilitate the translation of strategic objectives into business model catered key performance indicators (KPIs)

Rationale: Business models are typically considered to operationalise business strategy (Shafer et al. 2005; Casadesus-Masanell and Ricart 2010), making explicit how abstract, high-level strategic objectives of organisations are achieved by means of its concrete business activities conducted and logic followed. Given the interrelatedness between the concepts, it is important that alignment is established between business strategy and business models. Therefore, the evaluation of any novel business model design should be consider in light of the strategic objectives it has been designed for. However, as strategic objectives are abstract and high-level in nature, there is a need to translate strategic objectives into concrete business model specific performance indicators (Richardson 2008), such that the resulting KPIs capture the essence of the high-level strategic objectives and can effectively be used to support service-dominant business model evaluation.

SKPI-T objective 2 – SKPI-T should cater to both the *ideation* and *integration* phase of business model innovation

Rationale: The results from our SLR (Chapter 3) make explicit that the characteristics of decision making in business model innovation differ significantly depending on the innovation phase in which the business model design is currently positioned. Early phase business model innovation is often characterised by qualitative decision making as uncertainty with respect to the business model design is significant, whereas data is more likely to be absent. In contrast, as the business model design is increasingly concretised, late phases of business model innovation enable but also call for more quantitative decision making to thoroughly analyse and evaluate the outcomes of the business model design. At any of these phases, strategic objectives are needed that are catered to the characteristics of decision making at a respective phase to assess whether the business model design adheres to strategy. To support service-dominant business model evaluation, SKPI-T should therefore cater to both the ideation and integration phase of business model innovation, taking into account the characteristics of decision making for these phases.

4.2.3 Design and development

The design artefacts we propose to support service-dominant business model evaluation in the ideation and integration phase of business model innovation should provide normative guidance on how these artefacts may address the prevalent evaluation challenges at each of the respective phases. Accordingly, we can conceptualise our design artefacts as *methods*, which can be defined as a 'set of activities performed to support the system development, including the definition of its respective outputs' (March and Smith 1995; Brinkkemper 1996; Offermann et al. 2010). As illustrated by our context framework in Figure 22, the methods are sequenced and depend on inputs and outputs of the succeeding and preceding innovation phases, which also entails input from the initiation phase and implementation phase respectively. Although we do not consider these as part of our research scope, we will illustrate how IDEM and INEM depend on these phases and provide rules and deliverables with respect to the proposed design artefacts. We refer the reader to Chapter 5 for a detailed overview of the context of the proposed artefacts.

In line with Baskerville et al. (2009), we considered design and development to be episodic or iterative in nature, which therefore relies on the feedback received from demonstration and evaluation. For our research design, we considered two iterations of design and development. The first iteration features a tentative design (an *alpha* version) for both IDEM and INEM which is then applied to an illustrative business case generated from practice to assess its initial validity. Illustrative business case refers to a case drawn from practice but is used in a moderated, controlled environment. This illustrative business case is further detailed in Chapter 5. Based on the application of the methods and the findings obtained, we improved and refined the initial version to propose a final design (a *beta* version) for IDEM and INEM. To understand the validity of the proposed methods (Gregor and Hevner 2013), IDEM has been applied for three real-life business scenarios originating from the mobility and logistics domain, whereas we demonstrated the beta version of INEM by means of the illustrative business case to a set of industry experts, for which we afterwards interviewed experts with respect to the validity and utility of the artefact. The findings generated from these evaluations contribute to the finalisation of the artefacts. We discuss the evaluation of the artefacts in more detail in Section 4.2.4.

The proposed artefact should be applicable to any scenario or setting which deals with the challenges of service-dominant business model evaluation in the context of business model innovation (i.e. the ideation and integration phase). To guide the design of both artefacts and provide additional rigor the design process, we followed a *situational method engineering* (SME) approach (Brinkkemper 1996; Ralyté et al. 2003). While SME is often used to structure systems or tool development (to which *method chunks* or reusable method components are considered to be extracted from existing databases) (Ralyté et al. 2003), we do not aim to develop such systems for our research (as concrete models or tools), but rather use the logical flow and steps followed as a guidance to structure the development and design process for our conceptual models. An overview of this approach is presented in Figure 25. SME starts from the start node ('Start'), to which two strategies can be followed to derive the goals of the method at the subsequent node ('Set Method Engineering Goal'). The method-based strategy assumes that an existing method is present that can be enhanced or improved to fit the needs of the project, whereas the "from scratch"-strategy refers to a scenario in which no such method is yet present (and therefore is developed from scratch). Given the nature of the proposed artefacts, we have concluded that no methods exist that can be enhanced or extended to satisfy our research objectives. Accordingly, we selected the "from scratch"-strategy to guide the derivation of the needed objectives for IDEM and INEM. Our objectives are generated on the basis of the context framework we have generated Chapter 3, representing how service-dominant business model evaluation can be structured in the context of business model innovation. We refer the reader to Section 4.2.2 for a summary of the objectives, and to Chapter 5 for a more detailed overview of the context in which the proposed artefacts are positioned.

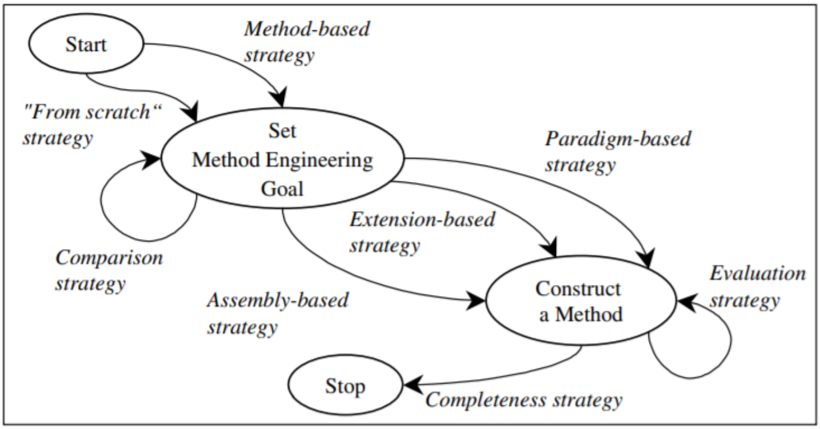

Figure 25: Generic model for situational method engineering (from (Ralyté et al. 2003))

The next node represents the construction of the method ('Construct a Method'), to which three (not mutually exclusive) strategies can be followed. The assembly-based strategy entails that the method can be constructed on the basis of existing methods, combining and adapting their characteristics and functionalities to satisfy the method objectives. The extension-based strategy assumes that an existing method can be taken as a basis and extended by means of extension patterns to cater to the needs of the project. Lastly, the paradigm-based strategy assumes that a paradigm-model or meta-model exists which can be used to instantiate a concrete method. For our research project, we see that the design of both proposed artefacts entails the integration of knowledge domains such as SDL, business modelling and business model evaluation. Each of these domains poses requirements on the design of these artefacts. Although we have demonstrated that various evaluation techniques have been used to support business model evaluation at different innovation phases, these existing evaluation techniques do not adequately address the characteristics of *service-dominant* business models. Therefore, we need to enrich these techniques such that they may guide users in conducting service-dominant business model evaluation. With respect to objective of IDEM, which calls for a holistic evaluation of service-dominant business models, we leverage a paradigm-based strategy to instantiate a method from theory on SDL, business models and business model evaluation into the form of a set of guiding questions that support service-dominant business model evaluation (Figure 26). Accordingly, our *product model* refers to the synthesised implications of SDL on business model design and evaluation, which we translate to a *process model* to operationalise these implications into a usable method (by means of the set of guiding questions and its related application procedure).

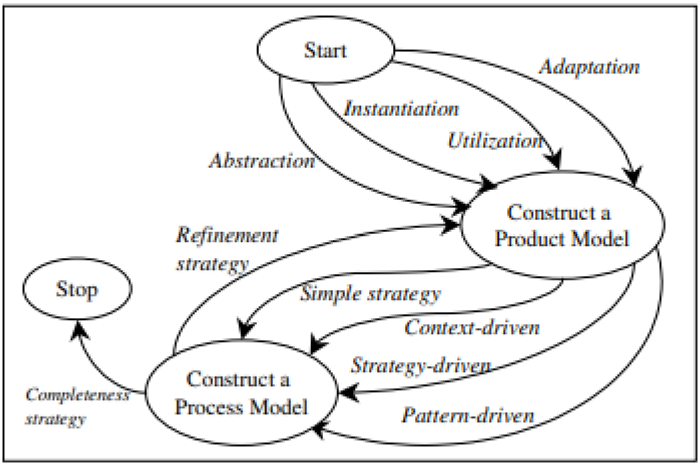

Figure 26: Paradigm based strategy for SME (from Ralyté et al.(2003))

For INEM, we follow the extension-based strategy (Figure 27) to guide their design. Accordingly, we take cost-benefit analysis as a base method for INEM, which is typically used to assess the viability of (traditional) business models (Magretta 2002; Morris et al. 2005). Consequently, we adopt a domain-driven strategy for our extension-based approach and draw upon theory with respect to SDL, business models and business model evaluation to extend / adapt the base methods to satisfy the respective artefact objectives. As per the evaluation strategy, method construction is evaluated to understand whether the objectives have been achieved (which will be explained in more detail in Section 4.2.4).

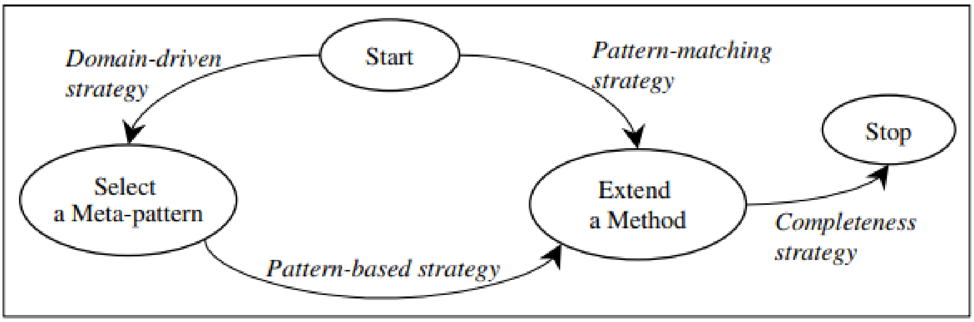

Figure 27: Extension-based strategy for SME (from Ralyté et al.(2003))

For SKPI-T, we followed a paradigm based strategy similar to IDEM (Figure 26) and build upon theory with respect to linguistic summarisation (Kacprzyk and Zadrozny 2005), service-dominant business models and business model innovation to develop a technique for the representation of strategic objectives into service-dominant business model catered KPIs to support business model evaluation, taking into account the need for both quantitative and qualitatively-oriented KPIs to accommodate the diverse characteristics of the innovation process.

4.2.4 Demonstration and evaluation

For demonstration and evaluation of the proposed design artefacts, we first applied the *alpha version* of the methods to an illustrative business case to understand the working of both methods and to obtain initial findings and feedback with respect the validity of these methods. The business case has emerged from a previous research industry project in the mobility domain and concerned the ideation of collaborative solutions by means of business models to address prevalent mobility challenges (Grefen et al. 2015). The end product of this business case entails a service-dominant business model design (modelled using the SDBM/R) that is used as the basis for application of the proposed methods. The business case as well as the resulting business model design are further detailed in Chapter 5. For the application of the *alpha version* of the methods, four researchers were involved with significant expertise on service-dominant business modelling to critically examine and evaluate the validity of the proposed methods. The resulting feedback and findings consequently were used to improve both methods (*beta version*).

With respect to the evaluation of the *beta version* of both artefacts, we adopted different set-ups per design artefact. For IDEM, we applied the *beta version* of the method to three real-life business scenarios to understand the validity and utility of the method. Selection of suitable cases was based on two prerequisites. First, we considered only cases originating from domains or contexts that are increasingly characterised or can be characterised by a service-orientation, to ensure that the resulting business model design provides a valid representation of the service-dominant business model concepts. We do so to ensure that the application of IDEM is meaningful and appropriate. Second, as IDEM requires a service-dominant business model design as input, we posited that a suitable case should take a service-dominant business model design as a starting point – often the end-product of a typical business model workshop. Consequently, IDEM is applied to evaluate or reflect on design decisions with respect to the service-dominant business model design. Although IDEM is considered to be tool-agnostic, as it draws upon generic implications of SDL for business model design and evaluation, we preferred cases that modelled service-dominant business models using the SDBM/R (considering the advantages of the proposed tools as highlighted in Chapter 2 and the experience present within our research team with respect to using the tool). In this end, this resulted in three real-life business scenarios to which IDEM was applied by practitioners to evaluate or reflect on design decisions made with respect to the service-dominant business model design. The business cases emerged from the logistic, mobility and pharmaceutical / biomedical domain respectively, which are increasingly characterised by a service-orientation (Lusch 2011; Turetken et al. 2019b). After application, we asked participants to fill in a survey to assess the utility of the proposed method in light of the evaluation challenge. We further elaborate on the evaluation of IDEM in Section 7.5

For INEM, we conducted a set of 3 online workshops in which we brought together a set of 11 industry experts to evaluate and assess the validity and utility of INEM. For the selection of industry experts, we posited that experts should have sufficient experience in business modelling and work in domains that adopt or are increasingly characterised by a service-orientation. For the online workshops, we demonstrated the working of INEM by means of application to the running case (Chapter 5), for which we asked industry experts to judge the validity and utility of the method in light of the problem context by means of semi-structured interviews. The sessions were recorded to use meaningful quotes of industry experts to support the findings, whereas we also asked participants to fill in a survey afterwards to provide feedback in written form (similarly to IDEM). More detail on the demonstration and evaluation of INEM is presented in Chapter 8.

In conjunction with the evaluation of INEM, we also evaluated the validity and utility of SKPI-T, drawing upon the same set of workshops and industry experts as described for INEM and adopting a similar evaluation approach. Therefore, we conducted semi-structured interviews with industry experts to judge the validity and utility of the proposed technique, focusing on how it addresses the challenges of explicating strategic objectives and goals in terms of concrete business models. More detail on the demonstration and evaluation of SKPI-T is presented in Chapter 6.

4.2.5 Communication

Communication of the research results occurs by means of this thesis and the research papers that have been published or are under review in academic outlets. An overview of these research works and how they support chapters of this thesis is presented in Table 1.

4.3 Chapter summary

In this chapter we have presented an overview of the research process followed to achieve our overall research objective. Our research follows a design science approach as elaborated by Peffers et al. (2007), which includes the research steps *problem identification, solution objectives, design and development, demonstration and evaluation* and *communication*. We summarise the activities conducted for each of these steps in Table 8.

Table 8: Elaboration on design science research steps taken for this research

DSR steps	Elaboration of activities conducted
Research problem and motivation	In light of the implications of SDL adoption with respect to business model design and the need for organisations to innovate their business models to remain competitive, emphasis is placed on guiding service-dominant business model innovation, for which the evaluation of service-dominant business models is essential. We conducted a systematic literature review to gain a deeper understanding on how business model evaluation is conducted (in terms of methods or techniques used), and how this can be related to the process of business model innovation (in terms of timing). We concluded on the basis of the literature review that limited support is available towards service-dominant business model evaluation. On the basis of this literature review and the implications of SDL, we devised a context framework for

	service-dominant business model evaluation. Considering business models as unit of analysis, we consider the evaluation of the *ideation* and *integration phase* as the scope of our research. Accordingly, we proposed the following research objective: *To support the evaluation of service-dominant business models in the context of business model innovation*
Solution objectives	Based on our systematic literature review, premises of SDL and the derived context framework, we have identified a set of objectives that should be satisfied by our proposed artefacts. These objectives are the following: **Overall objectives** *Overall objective 1* – the design artefacts should be grounded on the principles of service-dominant logic *Overall objective 2* – the design artefacts should adopt a multi-stakeholder perspective for supporting service-dominant business model evaluation *Overall objective 3* – the design artefacts should be easy-to-use and useful **IDEM objectives** *IDEM objective 1* – IDEM should enable users to reflect on design decisions with respect to the business model design *IDEM objective 2* – IDEM should facilitate users to qualitatively evaluate the service-dominant business model design *IDEM objective 3* – IDEM should facilitate its users to evaluate a service-dominant business model design with respect to its structural validity, feasibility, viability and robustness. **INEM objectives** *INEM objective 1* – INEM should facilitate users to quantitatively evaluate the value model of service-dominant business models *INEM objective 2* – INEM should support the decision-making process of actors to negotiate and concretise costs and benefits **SKPI-T objectives** *SKPI-T objective 1* – SKPI-T should facilitate the translation of strategic objectives into business model catered key performance indicators (KPIs) *SKPI-T objective 2* – SKPI-T should cater to both the *ideation* and *integration* phase of business model innovation
Design and development	To further structure the design of the proposed artefacts towards service-dominant business model evaluation, we followed the logical flow described for *situational method engineering*. The objectives we have derived from literature and the resulting context framework served as the goal for the design of proposed artefacts. For IDEM, as currently no suitable method is present to (partially) support our objectives, we instantiate the method from theory on SDL, business model design and evaluation following a *paradigm-based strategy*. Contrastingly, for INEM, we follow an extension-based strategy, for which we take cost-benefit analysis as a base method. Subsequently, we applied a *domain-driven strategy*, using theory on SDL and business model evaluation to cater cost-benefit analysis to the characteristics of service-dominant business models.

Demonstration and evaluation	We applied the *alpha version* of IDEM and INEM to an illustrative business case to understand the working of the methods and to generate initial findings and feedback with respect to the validity of the methods. For these applications, four researchers which significant expertise on service-dominant business modelling were involved to critically examine and evaluate the working of the proposed artefacts. Consequently, we improved the artefacts on the basis of this feedback. For the evaluation of the *beta version* of IDEM, we applied IDEM to two real-life case studies, originating from the mobility and logistic domain respectively. Stakeholders for these cases applied the method to reflect on design decisions and to qualitative evaluate their preliminary business model design. After application, we asked participants to fill in a survey to understand the validity and utility of the method with regards to support service-dominant business model evaluation For the evaluation of the *beta version* of INEM, we conducted three online workshops, bringing together 11 industry experts, in which we demonstrate the working of INEM with respect to the earlier mentioned business case. Consequently, we interviewed the industry experts to elicit their perceptions on the validity and utility of INEM. To further support the findings, the sessions were recorded and experts were asked to fill in a survey afterwards.
Communication	We communicate our full research by means of this thesis. We direct the reader to Table 1 to find a detailed overview of what chapters in large have been based on (published) academic papers.

Chapter 5

Context framework for service-dominant business model evaluation

5 Context framework for service-dominant business model evaluation

This chapter further describes the framework we have defined for guiding service-dominant business model evaluation in Chapter 3. Section 5.1 provides an overview of the framework and its context with respect to the process of business model innovation. Consequently, Section 5.2 and Section 5.3 describes the core artefacts positioning in the framework and their interrelationships, by zooming in on the respective phases we address for service-dominant business model evaluation. As service-dominant business model evaluation depends on strategic directives to interpret or understand its outcomes, we discuss in Section 5.4 how the proposed design artefacts should be supported by BM KPIs derived from strategy. We introduce the business case that serves as a running example for demonstrating of our proposed artefacts in Section 5.5. In Section 5.6, we describe the outlook for the remainder of this thesis. We conclude and summarise this chapter in Section 5.7.

5.1 Service-dominant business model evaluation: an overview

Business model innovation is far from a linear task, and may feature trial-and-error exploration, iterations and tests before a suitable business model design is found (McGrath 2010; Sosna et al. 2010; Zott and Amit 2015). Although it is therefore clear that business model innovation is a dynamic and complex process, its complexity can be reduced through providing normative guidance. To do so, structure must be created with respect to the activities to be conducted as well as key decision points (Bucherer et al. 2012).

The process orientation towards business model innovation proposed by Frankenberger et al. (2013) highlights the steps organisations go through to conduct business model innovation. As mentioned in Chapter 2, the process framework highlights four distinct phases, namely the *initiation phase, ideation phase, integration phase* and the *implementation phase*. Evidently, each phase features different challenges. To progress from one phase to another, these challenges should be satisfied. Accordingly, each phase should include an evaluation task, of which the results should either motivate the continuation of the innovation process or calls for a reconsideration of the decisions made, similar to the concept of innovation gates (Tesch et al. 2017). In the light of service-dominant business models, this implies that each actor that is represented in the business model design should *accept* or *perceive* the outcomes of evaluation to be positive, as the expected performance of service-dominant business models depends on the motivation and subsequent participation of all actors (Gilsing et al. 2018; Turetken et al. 2019b). Although evaluation is an iterative activity that may implicitly occur when actors set design parameters or take design decisions, we make this activity explicit in order to provide structure and direct normative guidance, and consider evaluation to be preceded by design. Therefore, with respect to the innovation process, we consider that each phase consists of an iterative design task and is always concluded with an evaluation of the respective phase. These evaluation tasks are the focus of our research. We should note that although the work by Frankenberger et al.

(2013) considers business model innovation to be an iterative task, the proposed process orientation is rigid and linear in use. Although this accordingly offers ample structure to subsequently guide business model evaluation, it does not cater well to more messy or learning-based processes towards business model innovation (Sosna et al. 2010; Andries et al. 2013; Berends et al. 2016).

As highlighted in Chapter 3, we keep the initiation and implementation phases of the business model innovation process out of our scope, as these phases consider a different unit of analysis with respect to their evaluation task (namely strategic objectives, and process models and related operational artefacts, respectively). Accordingly, we scope our research such that it focuses on providing support towards the ideation and integration phases of the business model innovation. However, we recognize that, as the innovation process has a 'linear' representation, these phases depend on or influence the preceding or succeeding phases. Therefore, we consider the interfaces to these phases to understand what inputs or outputs are required or generated for the preceding or succeeding phases. Moreover, by means of including feedback loops or iterations, we enable users to iterate over innovation phases (to also cater to more messy processes of innovation).

A high-level overview of the evaluation process, including design and evaluation tasks is presented in Figure 28. The overview makes an explicit distinction between strategic decision making and business model decision making. Business models are often considered as a concretisation and operationalisation of strategy (Magretta 2002; Shafer et al. 2005; Richardson 2008). Strategy represents the vision and even the identity of an organisation and can be considered as an abstract business model (Demil and Lecocq 2010). However, in going from an abstract business model towards a concrete, operational business model, many design decisions are to be made that largely depend on present market dynamics, taking the abstract business model or strategy as a directive. This mapping can be one-to-one (the organisational strategy is operationalised by a single business model) or one-to-many (the organisational strategy is operationalised by a portfolio of business models) (Casadesus-Masanell and Ricart 2010). Although strategy can be considered to take a long-term perspective, business models adapt based on the changing conditions in their environment. As a consequence, this decision making is considered to be on a different, subsequent level of decision making, in which strategy influences or verifies the decision that are made for business models (Casadesus-Masanell and Ricart 2010).

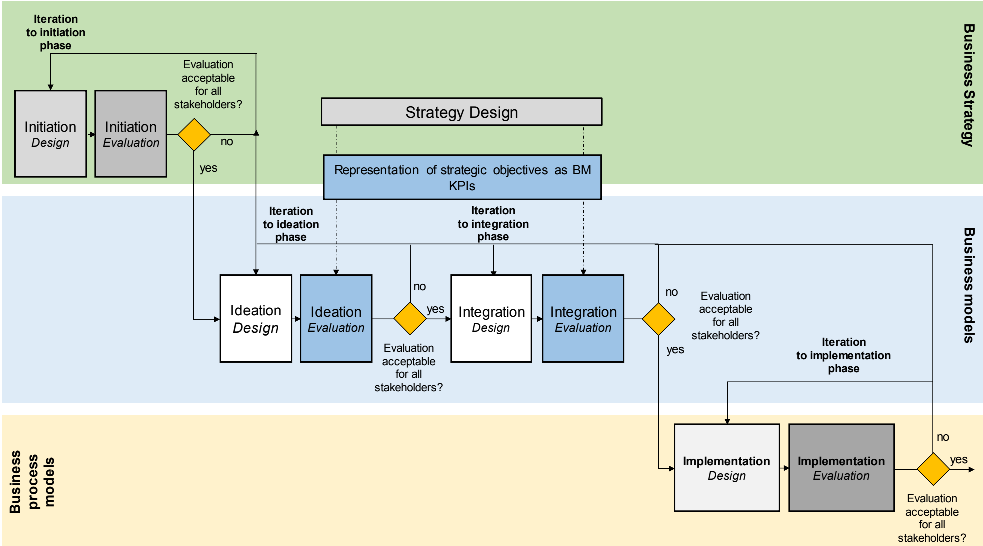

Figure 28: High-level overview of the evaluation process

We reflect the interrelationship between strategic and business model decision making in our overview by means of message exchanges between the strategy and business model level, which serve as input for the evaluation tasks. Although the evaluation takes business model designs as unit of analysis, the results of these evaluations should be appropriated or confronted by the strategy. Each actor in the business model design, therefore, assesses whether the results of business model evaluation fit their respective strategic goals. This is where we need, as indicated in Figure 28, support in terms of transforming strategic objectives into business model KPIs that can be used as directives for the evaluation tasks listed in the framework. We will discuss this need for BM specific KPIs derived from strategy in more detail in Section 5.4.

One can see that each sequence pair of design – evaluation tasks is concluded by a decision point, which assesses / checks whether the evaluation results were perceived positive by all actors. If all actors perceive the results of the evaluation to be acceptable or positive, the innovation process can progress to the next phase. If this is not the case -e.g., one or more actors consider the evaluation results to be unacceptable-, the process moves back by means of feedback or iteration loops, as this means that the prerequisite for the viability and feasibility of service-dominant business models is violated. The feedback loop facilitates the process to revert back to any of the preceding phases, depending on how the collaboration aims to mitigate the identified issues. An example per phase is presented below to when a certain feedback loop can be taken. Note that the aim is not to present a comprehensive set of options. Moreover, as we do not consider the implementation phase which succeeds the integration phase as part of our scope, we cannot take the feedback loop associated to the design task of the implementation phase into account.

- **Iteration loop to integration phase – design:**
  If the course of action is to change the value model underlying the business model, for instance in order to change the pricing model that determines how service exchange is valued (Timmers 1998), the process may revert back to the design task of the integration phase, which focuses on concretising the business model design and determining the value model.

- **Iteration loop to ideation phase – design:**
  If the course of action is to opt for redesign or the selection of a draft business model alternative, the process may revert back to the design task of the ideation phase, which focuses on the ideation and generation of business model designs.

- **Iteration loop to initiation phase – design:**
  If the course of action is to reconsider the selected strategic objectives that underlie business model ideation, the process may revert back to the design task of the initiation phase, for which new strategic objectives can be generated or different strategic objectives can be selected to drive business model ideation.

As also indicated by our structured literature review (Chapter 3), the process characteristics change significantly as innovation moves from ideation towards implementation. Early phases of the business model innovation often entail significant uncertainty. This is particularly the case for the innovation of 'new-to-the-firm business models' (Schneckenberg et al. 2017), as decisions with respect to the design of business models are subject to change (McGrath 2010; Schneider and Spieth 2013). As a consequence, any data that can be generated with respect to the business model design is prone to change or based on superficial or even invalid assumptions. As such, data availability in early phases of business model innovation is considered to be low, advocating the use of more qualitatively-oriented approaches towards business model evaluation.

In contrast to the early phases, as the business concretises and innovation process approaches to its late phases, decisions are finalised and -as a consequence- are less likely to change. Uncertainty with respect to the data used to support evaluation therefore decreases. Moreover, concrete business model designs facilitate the application of market studies and the development of preliminary prototypes, which can help foster the generation of additional data to support business model evaluation (McGrath 2010). As decision making in late phases becomes increasingly operational, resulting in data to support business model evaluation becoming more prevalent, quantitatively-oriented techniques or methods towards business model evaluation are advocated (Tesch and Brillinger 2017).

One should note that there is no distinct point at which qualitative- or quantitatively-oriented techniques or methods towards business model evaluation should explicitly be avoided, as also highlighted by our systematic literature review. Given the evaluation challenges that decision makers face, as well as the uncertainty and data availability that exist with respect to the business model design, qualitative and quantitative approaches can be combined to accommodate business model evaluation. However, it is argued that as the levels of decision making differ (e.g., from strategic to business model to tactical) (Al-Debei and Avison 2010; Casadesus-Masanell and Ricart 2010), the need for quantitative as opposed to qualitative evaluation support becomes increasingly evident (McGrath 2010; Tesch and Brillinger 2017).

To establish the composite use of the evaluation artefacts made explicit for the framework, we define what inputs, outputs and normative rules each artefact requires or possesses, as well as the bridge between the proposed artefacts. Accordingly, we zoom in to each phase, which therefore consists of a design and evaluation task, and elaborate on the inputs, outputs, objectives and rules associated to these phases.

5.2 The ideation phase – detailed perspective

The detailed perspective of the ideation phase, featuring the respective design and evaluation task, is presented in Figure 29. The initiation phase of business model innovation brings forth a set of strategic objectives, actor preferences and needs that drive business model ideation. Every business model design that is generated in this phase should take these strategic objectives as a basis or input (Frankenberger et al. 2013). The objective of the design task is therefore to address the strategic challenges and objectives that have been identified in the initiation phase by means of business model design. The design of service-dominant business models can be accommodated by any tool that takes service-dominant logic as a basis (we refer the reader to Section 2.3 for a detailed overview of service-dominant design tools).

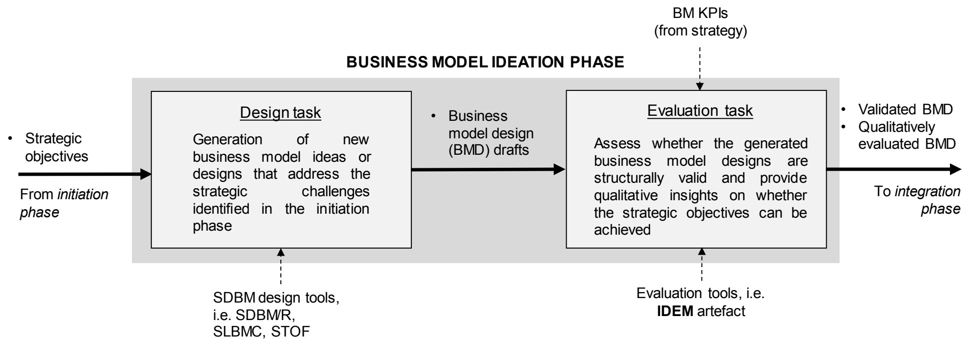

Figure 29: Ideation phase - inputs, outputs and objectives

The design task results in one or more business model design drafts (e.g., not validated with respect to structure or qualitative performance). The number of business model design drafts may depend on the type of innovation under consideration. In case of business model renewal or redesign (Saebi et al. 2017) it may occur that only a limited set of changes to the business model design is needed, resulting in a business model design draft that roughly reflects its initial design. Accordingly, exploration of many business model design alternatives is unnecessary and may slow down the innovation process. However, in cases of radical innovation or new-to-the organisation innovations, business model design is started from scratch, typically requiring many business model design alternatives before a concrete design is found.

Logically, the objective of the subsequent evaluation task is to assess the validity of the business model design to ensure that each design adheres to service-dominant logic. Moreover, the design should be assessed with respect to its fit with strategic objectives. To conduct the evaluation task, tooling is provided as input that guides or accommodates decision makers in evaluating business model draft designs that emerged from the design task. We propose the IDEM artefact as a means for guiding the evaluation of service-dominant business model designs in the ideation phase.

Given the relationship between strategy and business models (business models as an operationalisation of strategy), strategy should provide directives, conditions or requirements with respect to the business model design. These strategic directives should be catered to the business model design such these provide operationalised, goals for business model evaluation. Given the timing of the evaluation task and the uncertainty that exists with respect to the design at this phase, these KPIs or conditions are expressed qualitatively to provide flexibility with regards to the evaluation, and should be catered to the service-dominant business model design to be meaningful (e.g., these KPIs should be expressed in terms of the business model design, to confront whether the business model design adheres to or satisfies strategic concerns.

The execution of the evaluation task, taking into account the inputs and means to conduct the task, results in business model designs that are validated from a service-dominant perspective for which the performance or adherence to strategic goals of the stakeholders is assessed qualitatively. These business model designs consequently serve as input for the next phase, the integration phase. Any business model design that proves to be invalid or does not satisfy the directives provided by strategy requires to be reconsidered through iteration loops. For the ideation phase, this would result in an iteration loop to either the design task of the ideation phase or the design task of the initiation phase (as explicated in Figure 28).

5.3 The integration phase – detailed perspective

The detailed perspective of the integration phase is presented in Figure 30. For the ideation phase, we explained that validated and qualitatively evaluated business model designs are received that serve as input for the design task in the integration phase. The objective of this design task is to concretise the business model designs, to build the underlying business case or value model and as a consequence to motivate the participation of all stakeholders and drive commitment of the business model needed for implementation. Similar to the ideation phase, this task can be supported through service-dominant business model design tools to further concretise the business model design. Specifically, it should become apparent how value is co-created within the network, how this value is appropriated and what as a result each network actor captures in terms of value (Blaschke et al. 2019). Value here is considered as the costs and benefits that are generated as a result of service exchange. These costs and benefits can be financial, but also non-financial in nature (Turetken et al. 2019b) However, as business model designs may not explicitly define how value is exchanged between network actors (to reduce complexity), tools that explicitly explore these value exchanges (such as e3-value (Gordijn and Akkermans 2001), value network analysis (Allee 2003) or value mapping (Bocken et al. 2015)) may facilitate designers to understand and model how value is co-created and appropriated within the network.

The objective of the evaluation task is to quantitatively assess the business case or value model that underlies the business model design and to confront these results to the strategic objectives that each stakeholder pursues. We propose the use of INEM as a tool to quantitatively assess the value model underlying the business model design, and to guide decision makers to explore what-if scenarios with respect to the parameters of the value model.

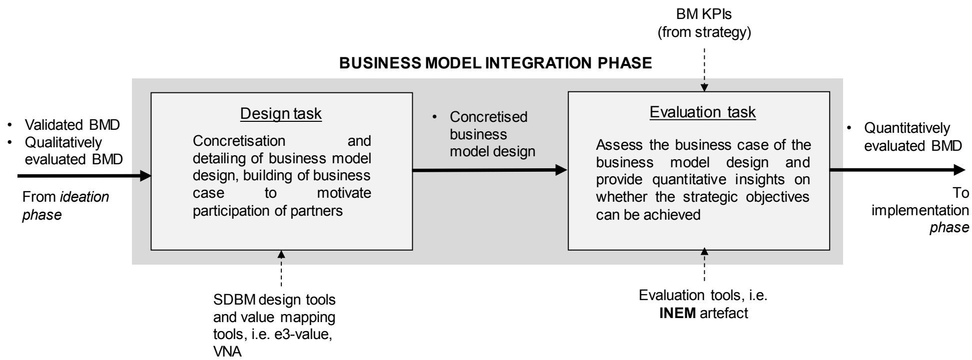

Figure 30: integration phase - inputs, outputs and objectives

Similar to the ideation phase, the evaluation task of the integration phase requires input from strategy by means of (business model specific) KPIs or directives. Given the nature of the evaluation, which is quantitative in nature, we expect these performance criteria to be quantitative.

Execution of the evaluation task of the integration phase results in a quantitatively evaluated service-dominant business model design, which serves as input for the next phase, implementation. Again, any business model design that does not adhere to the directives provided by strategy should be reconsidered through iteration loops. We refer the reader with respect to the operationalisation of service-dominant business models and subsequent implementation to BPMS to Suratno et al. (2018).

5.4 Representation of BM KPIs based on strategic objectives

As highlighted for both the ideation and integration phase, the evaluation task of both respective phases depends business model catered KPIs that are derived from strategy. These BM KPIs are used to confront the outcomes of the evaluation tasks (e.g., the outcome of service-dominant business model evaluation), and therefore to enable decision makers to assess whether these outcomes are meaningful in light of the strategic objectives a stakeholder in the business model design has with respect to the business model. Logically, each stakeholder participate in or develops a business model to achieve some strategic goals, as business models serve as the operationalisation of strategy (Shafer et al. 2005). For the evaluation of a business model design therefore, decision makers should reflect on whether these strategic goals are achieved. Accordingly, the strategic objectives set for a business model design for a specific actor should be represented as business model catered performance criteria to structure this assessment or analysis. As a service-dominant business model features and depends on many concurrent actors (Jaakkola and Hakanen 2013), these strategic motives or goals should be satisfied for all actors involved in the business model design. Once all stakeholders agree to the model structure, the innovation process can be advanced. A detailed perspective of how strategic objectives influence the listed service-dominant business model evaluation tasks is presented in Figure 31.

The characteristics of the innovation process influence how these BM KPIs should be specified to be effectively used. The ideation phase deals with the evaluation of typically abstract business model designs, for which the evaluation will result in qualitative output and insights and features significant uncertainty. Traditionally, KPIs are quantitatively-oriented (Parmenter 2015), which would make their application and use for this phase difficult, as purely quantitative KPIs are terse in use. Accordingly, there is need for more 'soft' or qualitative KPIs in this phase to support the strategic interpretation of the outcomes of service-dominant business model evaluation in this phase.

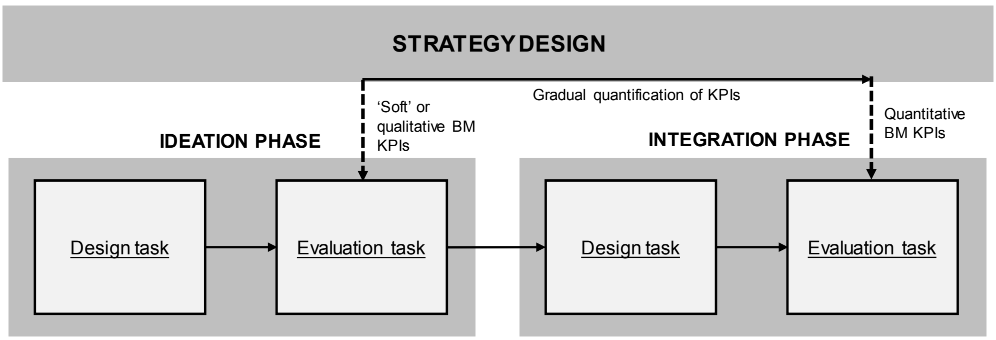

Figure 31: Representation of BM KPIs based on strategy to support service-dominant business model evaluation

Contrastingly, the integration phase concerns the evaluation and concretisation of the value model or business case underlying the service-dominant business model design. Evaluation for this phase results in quantitative outputs and insights, which implies that the KPIs defined for the ideation phase should gradually be quantified to be meaningful for this phase. Without business model catered KPIs, there is limited support in terms of what the outcomes of service-dominant business model imply and whether consequently the business model design or its structure makes sense.

5.5 The Running Business Case

As a basis to illustrate the application of the proposed evaluation artefacts that will be used for the remainder of this thesis, we now introduce a running, real-life business case. The business case emerged from a business modelling workshop in the smart mobility domain and has been documented and used in a several scientific publications (Grefen et al. 2015; Gilsing et al. 2018; Turetken et al. 2019b). This business case was selected as it strongly reflects the principles of SDL. Moreover, the SDBM/R tool was used in the workshop to represent the resulting business model design (presented in Figure 32).

The business case is related to the city of the Amsterdam, which expressed that it suffered from increased mobility problems in the inner-city during event-rich periods. Amsterdam features several large event locations, such as the Ziggo Dome, Johan Cruijff Arena and AFAS Live that host many large events such as football games, concerts and shows, often coinciding at similar start times close to rush hour. Similar to any large city or capital, the inner-city of Amsterdam is already characterised by significant traffic congestion during peak hours. As a consequence, the road infrastructure is often overloaded, resulting in traffic jams with limited traffic throughput during this time window. However, in cases when large events are held (concurrently) at similar times, the influx of event visitors by car that aim to attend these events causes the road infrastructure to become even more overloaded, generating severe traffic and mobility problems.

Rather than increasing the available road infrastructure (which is costly) or decreasing the number of events held in the city (which may hamper the attractiveness of the city), the city of Amsterdam sought after collaborative, service-dominant solutions aimed at decreasing or mitigating the effects on traffic during event-heavy periods. Relevant stakeholders, such as the road authority, event providers, event location providers, parking providers and retailers were invited to the business model workshop to brainstorm, explore and design solutions using the SDBM/R that address these challenges.

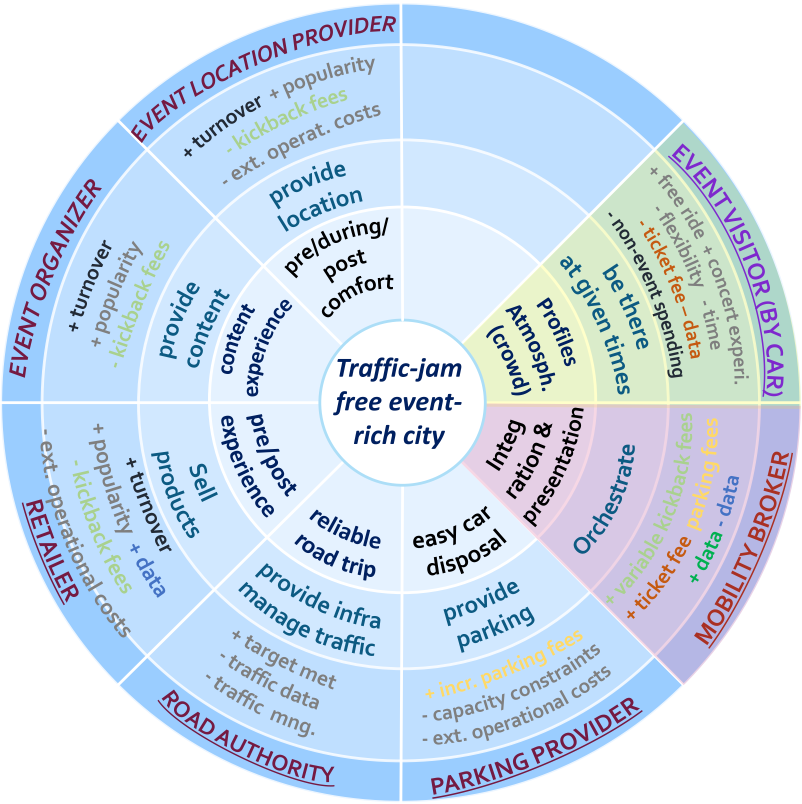

Figure 32: Service-dominant business model design to address mobility challenges in the city of Amsterdam

The solution constituted of an approach that would stimulate event visitors to come early to the city to enjoy free parking. As parking is often considered expensive in the inner-city of large cities (which is also the case for Amsterdam), receiving free parking tickets, even if this means arriving early to the city in anticipation of the event, may stimulate *event visitors* to follow up on the desired behaviour. Accordingly, a service platform was ideated (to be operated and maintained by a service provider or *mobility broker*) that *event visitors* can access by means of their event ticket. Consequently, through their event ticket, *event visitors* can apply for free parking tickets valid at designated arrival times at the parking lot. Based on current traffic data, which is provided by the *road authority* to the *mobility broker*, the arrival times can be set in such a way that it would balance the traffic load to the available road infrastructure. For instance, if weather conditions are expected to be poor, which often results in significant traffic jams and congestion during peak hours, the arrival times can be set to a time far in advance of these peak hours, such that event visitors will arrive early to the city and not further deteriorate the expected traffic conditions.

To support the service, the resources and capabilities of the *parking provider*, *event location provider*, *event provider*, *road authority* and *event visitor* were considered. The *parking provider(s)* contributes to the service solution by offering parking space or availability in parking lots and ensuring that the *mobility provider* can provide valid tickets to *event visitors*. As mentioned, the road authority provides traffic data to the *mobility broker* such that suitable arrival times for parking tickets can be set. Both the *event location provider* and the *event provider* contribute to the service by stimulating use of the service and by offering catered pre- or post-experience to visitors that arrive early or leave late. *Event visitors* contribute to the service by providing profile or personalised data to the *mobility broker*. Consequently, this data is forwarded to participating, advertised *retailers* in the city. On the basis of this personalised data, retailers can customise their offerings. In return, these *retailers* contribute to the service by means of financial support. The resulting service-dominant business model design (represented by means of the SDBM/R tool) is presented in Figure 32. Positioned as an output of the design task for the ideation phase, this business model design will serve as the basis for further evaluation tasks in the highlighted process (e.g. the evaluation of the ideation and integration phase).

5.6 Outlook

As explicated by means of the described context framework, we identify two evaluation tasks that are needed to support service-dominant business model evaluation and innovation, namely the *evaluation of the ideation phase* and the *evaluation of the integration phase*. The design artefacts we propose, e.g., IDEM and INEM, are catered to these phases and aim to address the evaluation challenges that prevail per these respective phases. We elaborate the design and contents of IDEM in Chapter 7, whereas INEM is further detailed in Chapter 8. As indicated, interpreting the outcomes of service-dominant business model evaluation strongly depends on the perceptions and strategic objectives of the stakeholder at hand. Preferably, these strategic objectives should be translated into business model specific performance criteria or operationalised KPIs (with respect to the business model design) to facilitate their effective communication and use in these collaborative business settings. Moreover, the resulting KPIs should be able to accommodate the shifting characteristics of the business model innovation process (e.g., shift in uncertainty, risk and data availability). To support the derivation of such KPIs from strategic objectives and to support the interpretation of the evaluation results of our artefacts, we propose a technique to derive business model specific KPIs from strategy. We further delineate this technique in Chapter 6.

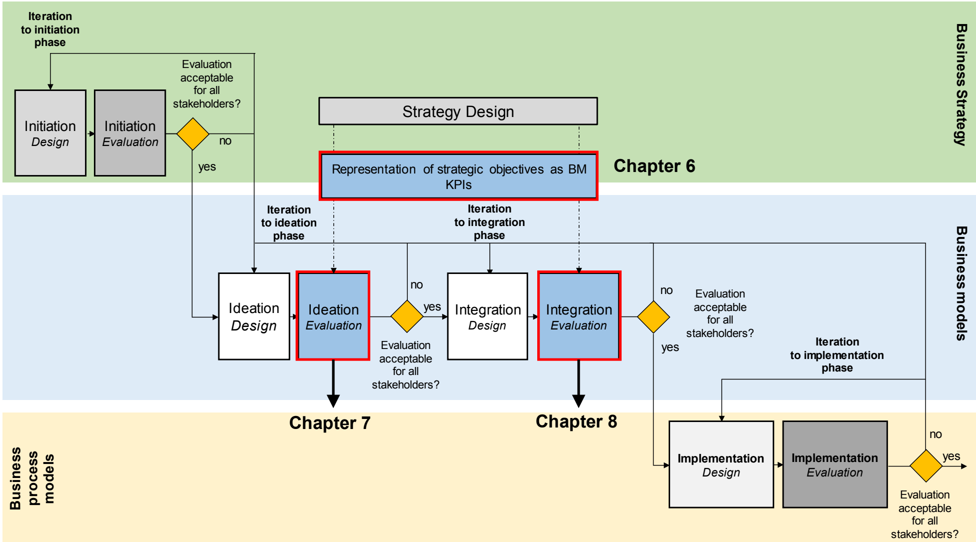

Figure 33: Outlook for the remainder of the thesis

5.7 Chapter Summary

In this chapter, we have described the context framework for supporting service-dominant business model evaluation in the context of business model innovation. As a basis to describe business model innovation, we have leveraged the process framework by Frankenberger et al. (2013), which structures business model innovation as linear process featuring four sequential phases, namely the *initiation, ideation, integration* and *implementation* phase. Drawing upon the structure of service-dominant business model engineering and the interrelationships between the concepts of strategy, business models and business process models, we argue that, taking business models as unit of analysis, the ideation and integration phases of the business model innovation process are positioned on the business model layer of service-dominant business engineering, whereas the initiation phase and implementation phase are positioned on the strategy and business process layer respectively. Each phase consists of a design task and an associated evaluation task which addresses the evaluation of the challenges prevalent at each phase. For the *ideation* phase, the goal is to translate the identified strategic objectives resulting from the *initiation phase* into novel service-dominant business model designs. Accordingly, the evaluation of the ideation phase should validate and evaluate whether the business model design is appropriate with respect to its underlying logic, decision decisions and strategic objectives. For the *integration phase*, the goal is to concretise the business model design resulting from the *ideation phase* such that commitment for all relevant stakeholders is established. Accordingly, the evaluation of the integration phase should accommodate the analysis of value model underlying the business model design, such that it becomes apparent how each stakeholder may benefit from participation. We have illustrated the inputs, outputs, rules and tools we expect for each of these phases and how these phases are linked. As a basis for the remainder of the thesis, we have illustrated a running case that will be used for the application of the proposed design artefacts.

Chapter 6

SKPI-T

6 SKPI-T: A technique to represent BM KPIs based on strategic objectives to support service-dominant business model evaluation

In this chapter, we propose a technique to support the representation of BM key performance indicators (KPIs) based on strategic objectives, which are needed to interpret the outcomes of service-dominant business model evaluation. As highlighted in Chapter 5, strategic objectives are required as directives to give meaning to the outcomes of business model evaluation tasks and to assess whether strategic objectives are achieved or satisfied. These strategic objectives should be presented in business model terms to be effectively used which should moreover be catered to the requirements and characteristics of the phases of the business model innovation process (e.g. data availability and uncertainty) to be effectively used. The technique we presented in this chapter, SKPI-T, facilitates users to translate strategic objectives into business model catered soft-KPIs and is tailored to the needs and characteristics of the business model innovation process. The structure of this chapter is as follows. In Section 6.1, we offer background on the use of KPIs to support business model evaluation, make explicit why traditional KPIs are difficult to apply for early-phase business model innovation and explain how service-dominant business model evaluation should be supported. Next, in Section 6.2, we introduce the technique (SKPI-T) to translate strategic objectives into a set of KPIs catered to the service-dominant business model design, taking into account the diverse and shifting characteristics of the business model innovation process, providing a high-level overview of how the technique is used for service-dominant business model evaluation. In Section 6.3, we further elaborate on the use of SKPI-T and describe the theory behind the technique, as well as illustrate how the technique can be formalised. In Section 6.4, we illustrate the use of the proposed technique by means of applying it to the Free-Ride Amsterdam business case, to demonstrate how strategic objectives can be translated into business model specific KPIs. To understand whether the technique can be valuable, we conducted three online workshops and elicited the opinion of 11 industry experts with respect to the utility created by the technique. We elaborate this evaluation in Section 6.5. We summarise and conclude this chapter in Section 6.6.

6.1 KPI support for service-dominant business model evaluation

As business models serve as an operationalisation of the business strategy (Shafer et al. 2005; Casadesus-Masanell and Ricart 2010), it is important to establish alignment between the abstract strategy and the more concrete business model an organisation deploys. Given this interrelatedness between the concepts, the evaluation of novel business models accordingly depends on the strategic objectives or motives that are set for the design of the business model. For instance, if the business model is designed to address strategic challenges such as 'increasing the customer base' or 'decreasing pollution', the business model evaluation or the expected outcomes of the business model design should reflect this. A mismatch between strategy and business models results in an inadequate operationalisation of the business strategy, which in turn may negatively impact the organisation (Magretta 2002; Shafer et al. 2005).

However, as strategic objectives tend to be relatively abstract, these strategic objectives are typically translated to more concrete performance criteria or KPIs to be able to better understand and measure whether these strategic objectives are achieved or satisfied (Richardson 2008). For instance, the popular Balanced Scorecard tool (Kaplan and Norton 1996), as well as derivate tools such as Strategy Maps (Kaplan et al. 2004) are used to translate abstract business strategy into more concrete strategic objectives, and to consequently link these strategic objectives to performance measurement systems to monitor and control business activities. Similarly, with respect to business model literature, we observe the use of KPIs or performance criteria to better understand whether the outcomes of business models are valuable in a strategic sense. For instance, Heikkila et al. (2016) propose an open repository of performance metrics relevant to or useful for measuring the performance of business models. In terms of the application of KPIs or performance metrics, we see that KPIs frequently are used to complement or detail the outcomes of business model performance measurement (Moellers et al. 2019). Example KPIs such as *degree of customer satisfaction*, *service quality* and *profit* may help organisations to better interpret the results or performance of business model in light of strategic needs and objectives. Techniques such as multi-criteria analysis or multi-criteria decision making (Ishizaka and Nemery 2013) can moreover aid organisations in weighing the relative importance of KPIs, such that more objective decisions can be taken (Daas et al. 2013).

Typically, KPIs are quantitatively-oriented such that they can adequately be used as directives for measuring the performance of projects, business models or even organisations (Parmenter 2015). However, especially early-phases of business model innovation are characterised by significant uncertainty and limited data availability, for which it is therefore difficult to accurately predict the outcomes of the business model design (McGrath 2010; Zott and Amit 2015). With respect to generating KPIs, it may be troublesome for organisations to express concretely the conditions for which a stakeholder is willing to participate, or the quantified goals or objectives that the stakeholders desire to achieve. Setting an inviable or unrealistic concrete target for KPIs may result in potentially viable or valuable business models being discarded as the performance or outcomes of the business model design could not accurately be measured or predicted. However, using purely intuition or qualitative unstructured statements would not help stakeholders to interpret the outcomes of business model evaluation. In such cases, there is need for support in terms of KPIs that possess ample flexibility in use (e.g., are not terse) and do not necessarily depend on quantification to be effectively used. This is relevant especially for early phases of the innovation process which typically are characterised by significant uncertainty and a lack of data availability.

If we examine the context framework for service-dominant business model evaluation (Figure 28), for which we present a closer view in Figure 34, we observe that both the *ideation phase* and the *integration phase* depend on strategic directives (in terms of business model KPIs) to interpret the outcomes of business model evaluation. The ideation phase focuses on the generation of novel business models, which brings together a set of stakeholders in a novel business network. As these new business models tend to be highly abstract or still vaguely specified, and therefore are subject to change, uncertainty is likely to be significant. As each stakeholder participates with certain strategic directives to the model, the evaluation of the service-dominant business model depends on these strategic directives to assess whether each stakeholder finds the business model acceptable (based on the outcomes of service-dominant business model evaluation). As explained, KPIs are used to capture this strategic intent, but given the characteristics of the ideation phase (which is typically uncertain) these KPIs should not be explicitly quantified, as this will prove to be difficult to use or to interpret the outcomes of service-dominant business model evaluation. Accordingly, there is a need for a structured technique that is able to represent strategic objectives or intentions as business model specific KPIs, taking into account the need to accommodate uncertainty that may be present at this phase in the innovation process.

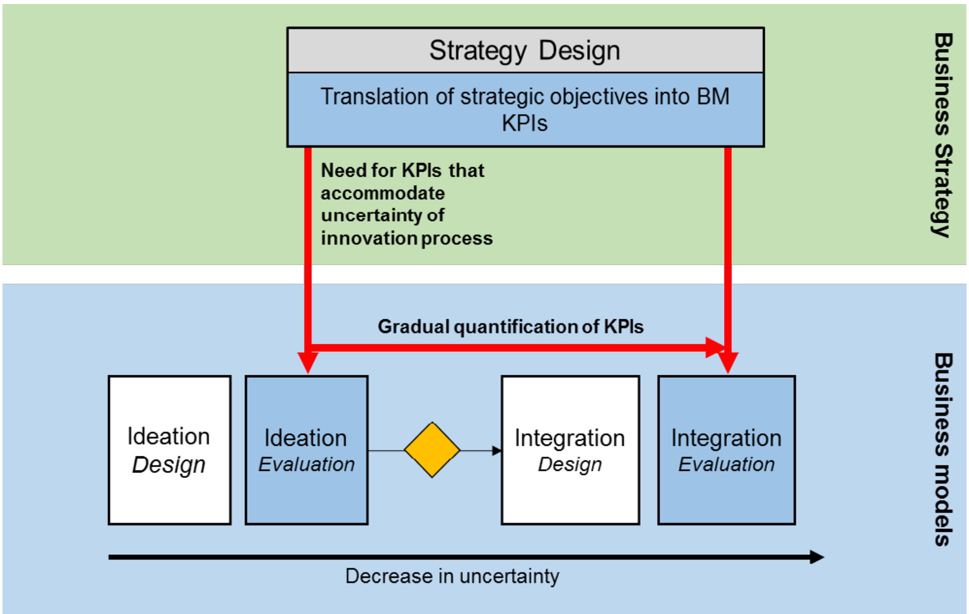

Figure 34: Need for KPI support for service-dominant business model evaluation

Similarly, the integration phase focuses on the concretisation of the business model, for which the stakeholders collaboratively work on further structuring and defining the business model design, such that stakeholders in the end agree upon a defined, ready to implement business model design. To concretise the business model design and to understand whether people agree on the parameter settings of the business model design (in light of their strategic objectives), strategic directives are again needed to confront the outcomes of service-dominant business model evaluation. However, the outcomes of service-dominant business model evaluation for this phase are more quantitative of nature. Accordingly, the KPIs defined for the ideation phase should also be used for the integration phase, and should be further specified and gradually quantified to cater to the characteristics of this innovation phase.

To support service-dominant business model evaluation and to examine the outcomes of business model evaluation in light of strategic objectives of stakeholders in the business network, there is thus a need for a technique that guides the generation of business model specific KPIs based on the strategic objectives or intentions of stakeholders, and that is able to accommodate the characteristics of the innovation process.

6.2 SKPI-T

In response to the aforementioned challenge, we propose a technique named SKPI-T (*soft-KPI technique)* that facilitates the generation of so-called *soft-quantified KPIs* or *soft-KPIs* catered to service-dominant business models used for the ideation and integration phase of service-dominant business model innovation. These KPIs are referred to as soft-quantified KPIs as these are not expressed in strictly quantitative terms (such as traditional KPIs), but rather summarise the strategic intentions or preferences of a respective stakeholder in natural language constructs or qualitative statements. Accordingly, these soft-quantified KPIs offer increased degrees of flexibility when used as opposed to quantitative KPIs (which are more terse in nature), and provide more structure as opposed to qualitative, often intuitive statements (Gilsing et al. 2020). We use fuzzy set theory and linguistic summarisation to structure the translation of strategic objectives into qualitative statements (which we will further elaborate in the next section).

The soft-KPIs are derived from the strategic objectives or intentions of stakeholders in the service-dominant business model, and describe in business model terms under what conditions a business model design is acceptable for the respective stakeholder (Figure 35). A stakeholder therefore, on the basis of the service-dominant business model design, translates strategic objectives into soft-quantified KPIs using the technique. Note that in order to comprehensively translate a strategic objective, multiple soft-KPIs may be used (similar to traditional KPIs). The set of soft-KPIs consequently is communicated across the network such that the business network collaboratively can examine whether, on the basis of the outcomes of service-dominant business model evaluation, each soft-KPI is achieved or reached (and thus the current business model design satisfies for each stakeholder its strategic objectives or intents). Once all soft-KPIs are achieved, the innovation process may progress to the next phase. Note that if a soft-KPI is not achieved, this indicates that for at least one stakeholder the current business model design is strategically not acceptable or desired, for which redesign or a reconsideration of the service-dominant business model is needed.

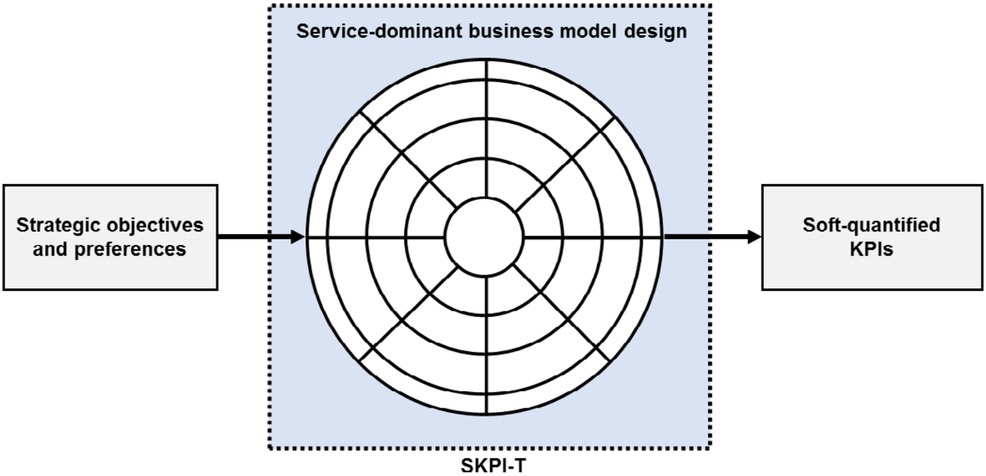

Figure 35: Using SKPI-T to transform strategic objectives into soft-quantified KPIs

As explained, the soft-KPIs are initially defined for the ideation phase of the business model innovation process. In this phase, the soft-KPIs are expressed in qualitative terms (Figure 34) to offer ample flexibility of use, as the ideation phase is typically characterised by significant uncertainty. Once the innovation process progresses to the next phase (the integration phase), the soft-KPIs defined can increasingly be quantified to support the more quantitative needs of this phase. Typically, the same KPIs are used, as strategic objectives are usually stable and long-term (Shafer et al. 2005; Casadesus-Masanell and Ricart 2010), although it may occur that depending on the structure of the business model design new KPIs are to be defined (indicated by the arrow from *strategy* to *evaluation of integration phase*). Again, the more quantified soft-KPIs are used for integration phase as directives to understand or interpret the outcomes of business model evaluation, and to assess whether strategic objectives are achieved.

We conduct the following steps to translate strategic objectives into soft-KPIs – it should be noted that this is still a prototype procedure based on initial application of the technique, which should be tested and further refined as future work:

Ideation phase

1. Each actor makes explicit what strategic objectives or needs the actors aims to achieve or satisfy through participation in the service-dominant business model design. To improve the usability of the technique, we typically consider the most important strategic objective per actor.

2. Per strategic objective, each actor generates one or more soft-KPIs that summarise the strategic objectives in terms of the service-dominant business model design. To improve usability of the technique, we usually limit the set of generated soft-KPIs such that the resulting total set of KPIs can be easily communicated and discussed upon for the business network.

3. Per soft-KPI, each actor selects elements of the service-dominant business model design that can be used to concretise or address the highlighted strategic objective:

    a. For the **customer**, we typically take the *value-in-use* and *its set of costs and benefits* from the service-dominant business model design as the basis for KPIs or the object of a KPI as the value-in-use (and its resulting costs and benefits) are explicitly linked to a customer segment.

    b. For **the remaining actors** in the business network, we use any business model elements that concretise or address their highlighted strategic objective (e.g., value-in-use, value proposition, value co-production activity, costs and benefits and stakeholders).

4. Each actor further specifies the soft-KPI by indicating in qualitative terms the frequency of occurrence and target of the soft-KPI (further elaborated in the next section), such that it becomes apparent under what conditions with respect to the business model design the actor would achieve its strategic objective.

5. The set of soft-KPIs is communicated across the business network, for which based on the outcomes of service-dominant business model evaluation (Chapter 7) it is assessed whether the strategic objectives per respective actor are achieved.

Integration phase

1. Depending on the need for increased strategic directives with respect to the concretised business model design, new or additional soft-KPIs may be defined to address this need, following the steps elaborated for the ideation phase.

2. The set of soft-KPIs is further quantified and concretised to accommodate the need for more quantitative support in the integration phase. Qualitative terms used are therefore increasingly translated into quantitative values (further elaborated in the next section).

3. The set of soft-KPIs is used to confront the outcomes of service-dominant business model evaluation (Chapter 8) to assess whether the strategic objectives per respective actor are achieved.

6.3 Theory and use of SKPI-T

To guide the structured translation of strategic objectives into qualitative business model catered KPIs, SKPI-T builds upon theory of fuzzy sets (Zadeh 1978) and its linguistic summarisation approach (Yager 1982; Kacprzyk and Zadrozny 2005) and takes the template of the SDBM/R (Lüftenegger 2014; Grefen 2015; Turetken et al. 2019b) as the basis for the design of service-dominant business models. We elaborate on how both elements are used for the technique in the following sections.

Linguistic summarisation is an approach that builds on theory of fuzzy sets to accommodate the structured summarisation of data into qualitative statements or natural language constructs, enabling users to better understand the meaning of large amounts of data such that it can be used more appropriately for future manipulation (Yager 1982). Linguistic summarisation offers a bridge between two extremes of data understanding, facilitating a more increased understanding and communication of data as opposed to undigested data, but being less terse or more flexible in terms of traditionally summarised data (in the form of variances, means or modes). Accordingly, users are able to communicate observations about data sets or the environment in a more useful and understandable manner (Yager 1982). We observe the application of linguistic summarisation in many domains and settings to facilitate communication and interpretation of data sets, such as explaining time series (Kacprzyk et al. 2008), sensor data (Wilbik et al. 2011) and business process behaviour (Dijkman and Wilbik 2017).

For our technique, we take advantage of these properties to summarise strategic objectives into soft-KPIs (expressed in natural language) to increase the flexibility of use of the resulting KPIs and to support their communication in the business network. Logically, we do not infer these KPIs from data (as we are dealing with desired or predicted outcomes) but summarise the quantitative, strategic intentions of stakeholders in the business model design in a qualitative form, using the same approach or steps as defined for linguistic summarisation. Use of linguistic summarisation typically results in a set of linguistic summaries which are statements presented in a specific format (template or protoform) that describe data in natural language constructs (Kacprzyk and Zadrozny 2005). Two protoforms are typically used to structure the generation of linguistic summaries, which we accordingly use to structure our KPIs and to guarantee that defined KPIs are always formulated in the same way:

- **a simple protoform** with structure $Q\ Y\ verbal\ relationship\ P$
- **an extended protoform** with structure $Q\ RY\ verbal\ relationship\ P$

For these protoforms, Y represents the *object of summarisation*, which we use as the object or focus of the soft-KPI. As a simplified example to illustrate how the concepts work, if we base a soft-KPI on sportscars, Y in this case can be labelled as “sportscars”. With respect to the extended protoform, R is used to control or further specify the objects we consider for the KPI. As an example, consider that sportscars can be of colours red, blue and green. Accordingly, by means of R (for which we would select *red*), only “red sportscars” are considered for our KPI. P in linguistic summarisation represents a *summariser*, and is usually related to or an attribute of Y considered together with a linguistic value. A relational verb is used to describe how P relates to Y. For the soft-KPIs, we use P to express the target of the KPI, for which we summarise strategic quantitative intentions of a stakeholder into qualitative terms. Considering the given example, sportscars have an attribute "speed" which can serve as the basis for the summariser (e.g., we want to set for the KPI a target with respect to the car's "speed"). Accordingly, using linguistic summarisation, we translate quantitative, strategic intentions deliberately in qualitative terms to increase the flexibility of use of the KPI. Therefore, we do not indicate that that the speed should be 200 km/h, but rather express this as a linguistic value such as 'high' or 'fast'. Lastly Q represents a linguistic quantifier (Kacprzyk and Zadrozny 2005), which is used to indicate the frequency for which the relationship between Y and P should hold. In terms of KPIs, this element therefore is used to indicate how often the KPI should hold. In light of our example, we may consider that it should hold that *some* red sportscars have a high speed. Accordingly, we generate the following linguistic summary which can be used as a generic soft-quantified KPI: "*some red sportscars have a high speed"*.

Note that although the soft-KPI is initially expressed in qualitative terms (to cater to the ideation phase), the soft-KPI can gradually be quantified once data increasingly becomes available in the innovation process (as explained in Figure 34). This is done by quantifying and concretising the linguistic values using their underlying membership functions (Zadeh 1978). A membership function of a fuzzy set X explains how *possible* (rather than probable) it is for X to correspond to a specific value F. As an example, to distinguish probability from possibility, someone may be able to eat more than 5 eggs a day (moderate possibility), but the likelihood of someone eating 5 eggs a day is typically low (low probability). The membership function therefore describes the possibility for values in a set to correspond to F. Considering the example of "red cars have a high speed", if a value of summariser P is set to "high", this refers to a fuzzy set of values for speed which corresponds to a "high". Logically, what is considered "high" then depends on the perception and preferences of the stakeholder responsible for the generation of the ILS. A certain stakeholder may deem a speed of 200-250 km/h to be "high" (Figure 36), whereas a different stakeholder may consider 180-300 km/h to be "high". Note furthermore that terms such as "moderate", "high" and "very high" may overlap, e.g., a speed of 240 km/h may have non-zero membership values for "high" and "very high", as the possibility for values in a membership function do not always have to be one, as indicated for Figure 36 (Yager 1982). However, the values for which the membership function is zero do describe when it is impossible for a value to be considered "high" or "very high". For instance, a for the example in Figure 36, given the current membership functions, a speed of 200 km/h can never be considered as "very high" (as it 200 km/h corresponds to zero for the membership function "very high"). Once uncertainty with respect to the business model decreases, the membership functions can be redefined to more concretely specify what "high" corresponds to (e.g. to reduce uncertainty with respect to what "high" entails) (Wilbik et al. 2020).

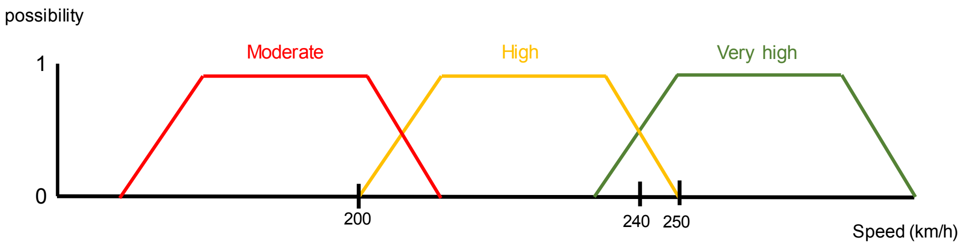

Figure 36: Relationship between membership functions and natural language constructs

We can formalise the use of linguistic summarisation for our technique as follows (Gilsing et al. 2020) (for which the full definition of the sets is presented in the Appendix B):

$$QS = < quant: QF, obj: \{OB\}, oqual: \{OQ\}, ochar: \{OC\} >$$

- *Quant* the quantifier of type QF, used to represent to frequency of occurrence of the KPI as represented by Q for the simple and extended protoform.
- *Obj* the set of objects of summarisation of type OB, used to represent the object of the KPI as represented by Y for the simple and extended protoform.
- *Oqual* the set of object qualifications, attributes or features of type OQ, used to define a subset of objects considered for the KPI as represented by R for the extended protoform.
- *Ochar* the set of *object characteristics* of type OC, used to define the target of the KPI as represented by P for the simple and extended protoform.

Logically, the KPI should be expressed in terms of the business model design (unlike the simplified example) to be meaningful in terms of the evaluation of business models, and to facilitate the communication of the KPIs in the business network (a KPI should therefore say something about strategic goals with respect to the costs and benefits or activities listed for a service-dominant business model design). To cater the generation of soft-KPIs to service-dominant business models, we should ensure that the elements we select for KPIs are based on elements represented for service-dominant business models. We take the SDBM/R technique as a basis here for representing and describing service-dominant business models (Lüftenegger 2014; Turetken et al. 2019b). Accordingly, the set of objects to choose from is represented by the set of objects described for a service-dominant business model (e.g., elements such as *value-in-use*, *costs and benefits*, *actor coproduction activities* and *actor value propositions*). This can be formalised as follows (Gilsing et al. 2020):

$$BMR = < name: L, value: ViU, cust: P, orch: P, parts: \{< part: P, core: BOOL >\} >$$
$$parts \neq \emptyset$$

- *name* the name of the business model from a set of labels L

- *value* the value-in-use of the business model design with respect to the value-in-use set ViU
- *cust* the *customer* belonging to the set of parties P
- *orch* the orchestrator or focal organisation from the same set P
- *parts* the other stakeholders or parties present for the business model where *core* denotes whether the party is core or not for the business model design.

Each individual stakeholder of the service-dominant business model consequently is formalised as follows (for which the full definition of the sets is presented in the Appendix B):

$$P = < name: L, avalp: \{AVP\}, acopa: \{ACA\}, aben: \{AB\}, acost: \{AC\} >$$

$$avalp, acopa, aben, acost \neq \emptyset$$

- *name* from set of labels L
- *avalp* the actor value proposition from the set AVP
- *acopa* the actor coproduction activity from the set ACA
- *aben* the actor benefits from the set AB
- *accost* the actor costs from the set AC

Any objects represented for these sets consequently can be used as object to the generation of a soft-KPI, depending on the strategic objective of the stakeholder that is under consideration. For instance, if the strategic objective of a stakeholder refers to 'generating a profit by participating in the business model', the objects selected as focus for soft-KPIs may pertain to costs and benefits (which express profit).

Given the formalisations specified for both linguistic summarisation and the SDBM/R, we can integrate both formalisations to provide a formal backbone to SKPI-T, combining the application of linguistic summarisation for the objects specified for service-dominant business models for the representation of soft-KPI and the generation of a soft-quantified business model radar (SQBMR). this can be formalised as follows:

$$SQBMR = < bmr: \{BMR\}, sq: \{QS\} >$$

The full integration of the formalisation of the SKPI-T is presented in the Appendix B elaborating how the formalisation of linguistic summarisation and the SDBM/R can be integrated to support the technique and how use of the technique is formalised.

6.4 Application of SKPI-T to running business case

In this section, we illustrate the use of SKPI-T by means of applying it to the introduced running business case (Chapter 5.5). Based on the most important goal or objective per stakeholder that drives their participation for the business model design (Figure 32), we generate qualitative statements or soft-KPIs that concretise this strategic objective and express this in terms of elements of the respective business model design. Consequently, these KPIs can be communicated in the business network.

For the stakeholders *mobility broker*, *parking provider* and *retailer*, we identified that the main motivation or strategic driver for them to participate in the business model is to generate increased profit. For instance, retailers contribute to the business model through a partial compensation of the parking tickets handed out to event visitors. The idea is that event visitors arrive early to the city and shop or eat in their spare time at the advertised retailers. They are not concerned with decreased traffic or satisfaction with the service. This scenario is only acceptable for the retailer if event visitors indeed visit the retail store and spend money for most of the events. Accordingly, their strategic objective explicitly can be described as *"making profit on most of the events"*.

The next step is to identify the focus of the KPI and its frequency and linguistic value (as represented for the protoforms). In light of the profit-oriented strategic objective, we focus for the selection of business model elements on the (financial) costs and benefits that are listed for these stakeholders. As an example, we select the role of stakeholder as focus of the soft-KPI, referring to the set of stakeholders pertaining to a specific role (e.g., *the mobility brokers*, *the parking providers*, *the retailers*). Depending on the strategic needs of the stakeholder generating the KPI, one can also take a lower or higher aggregation level (e.g., to summarise only for a single retailer or to summarise for the entire network). As the target of the KPI (the summariser), we select the set of costs and benefits listed per stakeholder role. We can aggregate this set of costs and benefits and denote this as *profit*. As the soft KPI should describe a desired state or scenario related to the strategic objective of the stakeholder, we can summarise the target of the KPI (in qualitative terms) as *acceptable profit* (e.g., a stakeholder should generate an acceptable profit). *Acceptable* here is a natural language construct for which its quantification depends on its underlying membership function, which in turn depends on the strategic preferences of a stakeholder. Hence, acceptable may be quantified differently through the eyes of the beholder. Lastly, to denote the frequency of the KPI (the quantifier of the protoform), we create flexibility with respect to the soft-KPI by stating that a stakeholder should generate an *acceptable* profit on *most events*. Accordingly, this soft-KPI does not have to be valid for all events, facilitating a more flexible application of the KPI. Again, *most* can be further quantified by means of its underlying membership functions.

By means of the protoform and the objects we have specified, we can generate the following soft-KPIs with regards to the highlighted strategic objective.

"**On *most* events, the mobility broker makes an *acceptable profit***"

"**On *most* events, the retailer makes an *acceptable profit***"

If we deem profit to be dependent on the number of customers that a stakeholder generates through participating in the business model design, we can generate the following soft-KPI for the parking provider:

"On *most* events, the parking provider has an *acceptable increase in customers*"

For the *event visitor*, the main strategic driver to participate is that the service should offer additional value with respect to visiting events. If the service does not sufficiently compensate the effort the event visitors invests to use the service by means of accrued benefits or utility, the event visitor ultimately will not participate in the business model design. As the service focuses on event visitors that aim to attend events, we can explicate this strategic objective as *"receiving increased event experience*". As mentioned before, to generate soft-KPIs for the customer we refer to the central value-in-use of the business model design and the costs and benefits that are related to this value-in-use. The service offered should motivate event visitors to arrive early in the city in exchange for free parking. Whilst event visitors give up some of their flexibility in terms of arrival time and some of their privacy in terms of data to use the service, they gain the benefit of free parking. They also do not have to endure traffic jams as a result of arriving early (which results in less stress while driving). These factors in turn may improve the event experience of the event visitors. If we consider these costs and benefits as focus of the KPI, we can generate the following soft-KPI for the event visitor:

"For *most* events, stress while driving is *low*"

"For *most* events, event experience is *high*"

For the stakeholders *event organizer* and *event location provider*, we consider the satisfaction of event visitors with respect to the hosted events to be the most prominent strategic driver. Both the event organizer as well as the event location provider are willing to contribute to the business model design if in return the business model design yields increased satisfaction for event visitors. Accordingly, their strategic objective can be explicated as *"increasing event visitor satisfaction"*. As focus of the KPI, we can select the event visitor role here, to account for all event visitors to an event or concert, which should enjoy increased event experience (summariser). Accordingly, we can generate the following soft-KPI for the *event organizer* and *event location provider*:

"**For *most* events, most event visitors enjoy *increased* event experience"**

Lastly, for the stakeholders *large city* and *road authority*, participation is largely driven by the effectiveness of the provided service. The business model design is instigated to decrease severe traffic jams during event-heavy periods in the inner city. Therefore, *large city* and *road authority* are concerned with how well the provided service decreases these major traffic jams. The resulting strategic objectives can as such be explicated as *"reducing major traffic jams as a result of events".* Accordingly, we select "events" as the focus of soft-KPI and the benefit item *decreased traffic jams* as summariser. This results in the following soft-KPI for the large city and road authority:

"***Almost none* of the events lead to a *major* traffic jam**"

Through the application of the technique, each stakeholder can translate their abstract strategic objectives with respect to the business model design into operationalised, business model specific statements that are used as KPIs. As the success of a service-dominant business model design depends on the participation of all stakeholders, these KPIs are communicated in the network to understand the needs and preferences of the involved stakeholders, and to use these KPIs as directives for business model evaluation. As these KPIs are initially expressed in natural language, communication of these KPIs can be improved which in turn may aid collaborative decision making. Note that the presented statements can be quantified by leveraging the underlying membership functions of the natural language constructs used.

6.5 Evaluation of SKPI-T

Although not positioned as a design artefact in light of the design science research set-up of this thesis, to understand whether the technique is valuable towards the context used (e.g., to translate strategic objectives into service-dominant business model specific (soft)KPIs, we evaluated the utility of the proposed technique by means of a set of three online workshops. In line with the core constructs used for the Technology Acceptance Model (TAM) (Davis 1989; Venkatesh and Davis 2000) we focused on the constructs *perceived usefulness, perceived ease of use* and *perceived intention to use* as operationalised constructs for its utility.

To evaluate the utility of SKPI-T, we organised three online workshops with industry experts to elicit their opinion on the usefulness, ease of use and intention to use of the technique for translating strategic objectives into service-dominant business model catered (soft)KPI. These workshops were structured as follows. First, we demonstrated the technique by means of an application, for which we used the Free-Ride Amsterdam business case (as described in the previous section). Consequently, guided by the interview protocol presented by Rowley (2012), we aimed to understand whether industry experts deemed the application of SKPI-T to be useful, easy-to-use and whether they would have the intention to use the technique. Ultimately, 11 experts took part in our set of online workshops. The online set of online workshops we organised fulfilled a dual purpose, for which we demonstrated and evaluated the utility of both SKPI-T and INEM (which will be further discussed in Section 8.6). Accordingly, the full-set up of the workshops is further elaborated in Section 8.6.1, whereas the plan of workshops and the distribution of industry experts are presented Table 19, whereas the background and business modelling experience of these experts is further detailed in Table 20. For each workshop, an interviewer (the author of this thesis), a moderator (to monitor time and moderate the discussions) and at least one other research member (to take notes) was present. Sessions were recorded to further support the capture of opinions, feedback and comments of the industry experts. The transcriptions of these sessions can be found in Appendix E.

To complement the feedback received from discussions in the online workshops, we asked the participating industry experts to fill in a survey afterwards. The survey was based on the TAM model, for which we used 4 items to address usefulness, 4 items to address ease of use and 2 items to address intention to use. At the end of each survey, we posed three open questions to facilitate respondents to indicate any additional feedback, positives or negatives they perceived with respect to the technique. The set of questions used to evaluate the utility of SKPI-T is presented in Table 9. From the 11 industry experts that participated, 9 eventually filled out the survey resulting in a participation rate of 81%.

Table 9: Set of questions used to evaluate the utility of SKPI-T

Evaluation construct	NR.	Statement
Perceived Usefulness	1	I think this technique contributes to supporting the evaluation of service-dominant business models
	2	Use of soft-KPIs would enable me to better communicate my strategic preferences and goals
	3	I do not see the added value of using this technique*
	4	Overall, the I did not find the technique useful to support the representation of strategic objectives as soft-KPIs*
Perceived ease of use	5	It would be easy for me to generate soft- KPIs using this technique
	6	It was not clear to me how I should use the technique to support the representation of strategic objectives as soft-KPIs*
	7	It would be difficult for me to apply this technique*
	8	It was clear to me how this technique should be used and what it is used for
Intention to use	9	I would use this technique to support the representation of strategic objectives into business model specific soft-KPIs
	10	I would not use this technique in favour of already known techniques to generate business model KPIs

Questions indicated with a star (*) are deliberately inversed.

6.5.1 Results of the utility evaluation of the SKPI-T

The results of the surveys are presented in Table 10. In the following paragraphs, we discuss the results per utility criteria in detail, and present meaningful quotes or statements derived from our workshops to support the findings. We used *content analysis* (Krippendorff 2018) to analyse these recordings and to identify meaningful quotes or statements.

Table 10: Responses to survey for SKPI-T

Criteria	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived usefulness	1	0%	0%	0%	77.8%	22.2%
	2	0%	0%	11.1%	77.8%	11.1%
	3*	0%	0%	11.1%	44.4%	44.4%
	4*	0%	0%	11.1%	66.7%	22.2%
Perceived Ease of Use	5	0%	22.2%	55.6%	44.4%	0%
	6*	0%	11.1%	0%	66.7%	22.2%
	7*	0%	22.2%	44.4%	55.6%	0%
	8	0%	0%	0%	88.9%	11.1%
Intention to Use	9	0%	0%	33.3%	55.6%	11.1%
	10*	0%	0%	11.1%	66.7%	22.2%

(*) Responses are reversed to account for the negative form of the question.
(**) Note that due to rounding, the sum of percentages for Q3 does not add up to 100%.

Perceived usefulness

From the results for the survey, we observe that with respect to perceived usefulness, most industry experts have found SKPI-T to be useful to translate strategic objectives into business model catered KPIs that can be used to communicate under what conditions a business model design is acceptable. This is also reflected by the majority of positive statements that highlight the explicit qualities of the technique:

"It is a very sensible approach" [Expert 3]

"I am very enthusiastic about this approach" [Expert 4]

"I think it is a valuable approach, because it helps structuring the steps from qualitative assessments (soft-quantified KPIs) towards more quantitative assessments (traditional KPIs)" [Expert 7]

"It is a logical step towards more hard facts, to keep investigating and supporting the business model" [Expert 9]

Especially the consideration of *soft-quantified KPIs*, rather than traditional KPIs is appreciated, as soft-quantified KPIs especially for early phases of the business model innovation process are argued to make more sense, whereas soft-KPIs help the communication of strategic objectives for the business model or network:

"We see that for many business initiatives we find it quite difficult to support these through KPIs, especially more quantitatively-oriented variants. That is why I would find it interesting to try out this technique once" [Expert 2]

"It indeed really does not make sense if you talk about new business models to discuss the details in a quantitative way already. I experience the same at our company. We have targets like 5% year on year savings or something like that for a given business time, you cannot quantify it from a given business case already years ahead, it does not make any sense. You can set the target but you cannot show that you realise it, it is not very easy" [Expert 5]

"I think it helps all participants to not focus on the numbers, because you are easily drawn into numbers and results, and that does not help this kind of network in the context of business model innovation"[Expert 6]

"This technique can be used very well to create alignment in the network and to better understand whether (strategic) value for all parties can be captured" [Expert 10]

However, industry experts do note that the definition of soft-KPIs strongly depends on the eye of the beholder, as in contrast to traditional KPIs this tends to be more subjective in nature, which requires a careful consideration when KPIs are communicated and shared across the business network.

"Making the KPIs objective in use is of course more difficult and could potentially lead to misinterpretations and unnecessary discussions (for one stakeholder it may be summarised as 'a lot', whereas for others this may imply 'some')." [Expert 4]

"It could lead to difficulties and differences in terms of interpreting the KPIs." [Expert 3]

Moreover, the KPIs defined through our technique predominantly focused on the costs and benefits captured from the business model design. Respondents indicated that it would also be interesting to examine process related KPIs or to understand the predictability of KPIs by linking KPIs to process related activities:

"It would be interesting to explore the predictability of the KPIs by connecting KPIs to the underlying process of the business model, or to explore predicting KPIs that define what business activities we will conduct. Accordingly, defined KPIs can be enriched or made more predictable by looking also at the process level" [Expert 1]

Perceived ease of use

The results of the survey indicate that SKPI-T predominantly was perceived as easy to use, although in contrast to perceived usefulness the results are more skewed towards *neutral*. Nevertheless, respondents indicated that the technique was intuitive and deemed that the technique could comfortably be applied in light of their own business initiatives, although given the shift in mindset from a traditional quantitative perspective towards a more qualitative orientation, to effectively use the technique they would require to practice a bit more with the technique or to see some best practices:

"I use the business model radar (i.e. the SDBM/R) myself as well for our current initiatives and I think this technique is well-applicable." [Expert 4]

"I think it is very applicable, I am curious to see how it works in practice." [Expert 6]

"I would have to work with this technique – a set of exercises would be good to get a better feeling for the technique." [Expert 1]

"Consider generating some best practices to make it even easier for users to use the technique." [Expert 5]

With respect to ease of use, we also investigated whether the level of aggregation chosen for the soft-KPIs made sense. For this, we presented two examples (e.g., to summarise over 'events' or to summarise over 'stakeholders' for the Free-Ride Amsterdam case), and asked which variant would be more sensible or which variant would be easier to use. Respondents indicated that although the stakeholder level is typically desired, this significantly depended on what the KPI was defined for:

"From that perspective I would be more on the stakeholder perspective, as it is easy for a stakeholder to relate it back to his or her business". [Expert 6].

"It depends a bit on who you are talking to, is it like a big retailer (stakeholder example) … or is it a person responsible for talking for many retailers, then it is also important to identify which of the retailers is going to profit from this model." [Expert 5]

As the technique does not specify what quantifiers or objects should be selected, both levels of aggregation can be used. This flexibility of use in turn benefits the usability of the technique as it can be catered to the preferences of the stakeholder at hand.

Although the representation of strategic objectives as BM KPIs is rather clear, some respondents indicated that it may be difficult to align the set of KPIs in the end, which should be collaboratively discussed upon and evaluated before decisions can be made with respect to the business model design. Such practices would help increase the usability of the technique (rather than solely the specification of BM KPIs).

"In such a model you obviously have multiple parties, for which each party of course in some way aims to optimise or maximise their personal gains. I get the need for a more relaxed focus on quantification, but there should be some guidance on avoiding 8 (stakeholders) maximums and working towards a single optimum for the business model."[Expert 10].

Perceived intention to use

With respect to intention to use, we see that the results of the survey typically are positive as well. The advantages offered by the technique (e.g., to not go into details to quickly but to summarise intentions into qualitative statements) are recognised by the respondents, which in turn increases the intention to use the technique.

"I think it is definitely worth it to try out this technique in the future." [Expert 2]

"I am very curious to get to know the technique better and to use it." [Expert 1]

Some respondents also indicated that they would like to try in different business settings then currently addressed, for instance to apply the technique within organisations (that feature business units that need to collaborate):

"I would be very interested in seeing how this technique would work within organisations. I feel a lot of organisations can already benefit from this technique internally before they deploy it in third-party contexts." [Expert 6].

6.6 Chapter summary

In this chapter, we have introduced a technique for the translation of strategic objectives into business model catered KPIs. Although effective to better understand or measure the performance of a business model design, traditional KPIs tend to be quantitatively-oriented which causes KPIs to be terse and inflexible in use. Moreover, early phases of the business model innovation process are often characterised by significant uncertainty, resulting in limit accurate data to be available or making it increasingly difficult to accurately measure the performance of a business model design. Using inflexible KPIs in such cases may lead decision makers to discard viable business models as these initially did not satisfy the targets set. Drawing on theory with respect to linguistic summarisation, we introduce a technique to generate *intentional linguistic summaries* as soft-KPIs that express the strategic motivation and objectives of stakeholders to participate in a business model design into operationalised qualitative statements with respect to the business model. The properties of linguistic summarisation facilitate quantitative targets or values to be expressed in natural language constructs to improve the flexibility and use of the resulting soft-KPIs, and to deal with uncertainty present in early phases of the innovation process. Once the KPIs can be quantified (depending on the structure and concreteness of the business model design), the underlying membership functions can be used to further concretise the

KPIs. We have illustrated the application of the technique by means of our running case study, whereas we have evaluated the utility of the technique by means of a set of three online workshops for which we were able to bring together 11 industry experts. Based on the survey results, industry experts deemed the technique to be useful, as it offers practitioners a more realistic and practical view on how to consider and support the evaluation of business models in early phases of the innovation process, as business collaborations in general tend to jump too quickly into the quantification of the business model design (which at these early phases is highly difficult). Using this technique, a more gradual progression from qualitative statements (well-suited for early-phase business model innovation) towards quantitative expressions (better-suited for later phases of business model innovation) is facilitated. In turn this may help collaborations to better evaluate their business model initiatives. However, industry experts indicated that care should be taken to carefully manage the interpretation of soft-KPIs, which as a result of the technique are more subjective than traditional KPIs. Nevertheless, the technique in general was deemed valuable by the participants for the online workshops.

Chapter 7

IDEM

7 IDEM – Ideation Evaluation Method

In this chapter, we will discuss the first artefact (as per the framework in Figure 28 that we propose towards service-dominant business model evaluation, named IDEM (**Id**eation **E**valuation **M**ethod). First, in Section 7.1, we briefly reintroduce the objectives central to our approach and define its scope. Next, in Section 7.2, we discuss the design process followed for IDEM and the building blocks that were used to guide its design. Section 7.3 introduce the method, which features a set of 21 guiding questions to support service-dominant business model evaluation from a qualitative perspective. We illustrate the application of IDEM by means of the Free-ride Amsterdam business case in Section 7.4. In Section 7.5, we discuss how we set up the evaluation of our artefact, and describe the results we have obtained that serve as the basis for improving our artefact. We summarise this chapter in Section 7.6.

7.1 Method objectives and scope for IDEM

Given our context framework (Figure 28), we have defined the need for evaluation artefacts, reasoning from a service-dominant logic perspective, related to the ideation and integration phases in the business model innovation process. In this chapter, we will focus on supporting the evaluation of service-dominant business models in the second phase of business model innovation – i.e., the ideation phase. As described in Section 4.2.2, we identified the following objectives for the design of IDEM:

IDEM objective 1 – IDEM should enable users to reflect on design decisions with respect to the business model design

IDEM objective 2 – IDEM should facilitate users to qualitatively evaluate the service-dominant business model design

IDEM objective 3 – The artefact should facilitate its users to evaluate a service-dominant business model design with respect to its structural validity, feasibility, viability and robustness.

Moreover, we have highlighted in Section 5.2 the inputs, outputs, tools and rules we expect for IDEM. We consider the input of IDEM to be a service-dominant business model design draft (e.g., a design which has not yet been validated or qualitatively evaluated). The output should be a service-dominant business model draft that is structurally valid and at this phase of the innovation process proves to be acceptable to all stakeholders in the business model design in a qualitative sense. Given that the business model innovation process is often characterised by limited data availability and significant uncertainty, especially in cases to which new-to-the-firm business models are devised, qualitatively-oriented evaluation techniques or tools are advocated (Tesch and Brillinger 2017). As such, our method focuses on a qualitative evaluation of service-dominant business models (see *objective 2*).

7.2 IDEM: design steps

As illustrated by the process representation for conducting situational method engineering (Figure 26), we constructed our method by following a paradigm-based strategy. We selected *expert judgement* as the technique that serves as our base method chunk, for which we aim to present a set of guiding questions and its subsequent application procedure as a method that facilitates stakeholders to evaluate service-dominant business model design decisions, which constitutes the proposed artefact (i.e., IDEM). By means of the application of a domain-driven strategy (Ralyté et al. 2003), we draw upon theory with respect to business model design, evaluation and service-dominant logic to understand what implications the adoption of SDL brings forward with respect to business models and their configuration, and to use these implications as patterns to drive the derivation of guiding questions. We then map these questions to business model quality attributes (used for business model evaluation) to structure the method, as well as offer procedural guidance on their application. To do so, we followed the step-wise design process presented in Figure 37. In the next sections, we will elaborate on the activities conducted for each step.

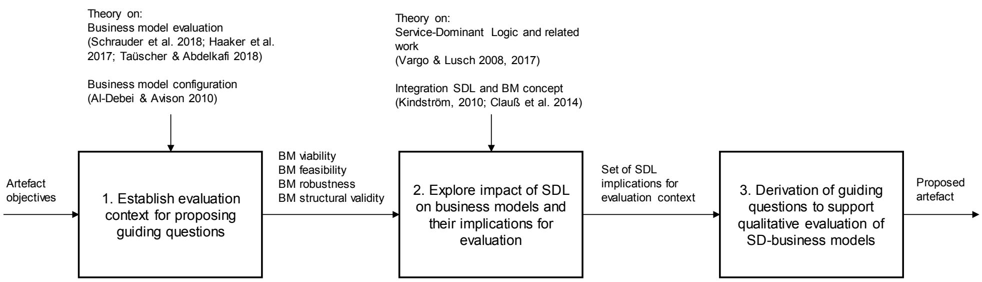

Figure 37: Step-wise design process followed for IDEM

Step 1 – Establish evaluation context for proposing guiding questions

As a first step, we established the evaluation context to which we propose guiding questions. This evaluation context is based on available theory with respect to business model evaluation and business model design. Using this context, we ensure that the questions we propose are directed at these concerns, and therefore address business model evaluation. As explained in Section 3.1, business model evaluation may be assessed through quality attributes such as *business model viability*, *business model feasibility*, *business model robustness* or *business model structural validity* (Ballon and Delaere 2008; Brea-Solís et al. 2015; Haaker et al. 2017; Schrauder et al. 2018; Täuscher and Abdelkafi 2018). Therefore, we use these quality attributes to structure the set of guiding questions we propose.

As the term structural validity has been coined to represent the logic and structure of the business model design, but as such has a limited underpinning, we further support and concretise this quality attribute by means of business model componentisations in literature. We select the componentisation described by Al-Debei & Avison (2010) and Al-Debei, El-Haddadeh, & Avison (2008), as it explicitly considers business models to entail business networks, which supports the service-dominant business perspective to which we aim to propose guiding questions. Accordingly, the following interrelated business model components are defined, as depicted in Figure 38 (note that *value finance* has been changed to *value capture* to offer a more neutral perspective on value appropriation):

Value proposition describes the service or product offered, the value elements or propositions contained with this offering, the customer segment it is offered to and how or why the offering may be beneficial.

Value capture describes the costs and benefit structure of the organisation.

Value network refers to the configuration of roles within the business network, and the means of governance and communication, as well as the relationships between network stakeholders.

Value architecture describes the organisational and technical configuration of the organisation, comprising the tangible and intangible resources deployed to generate value propositions.

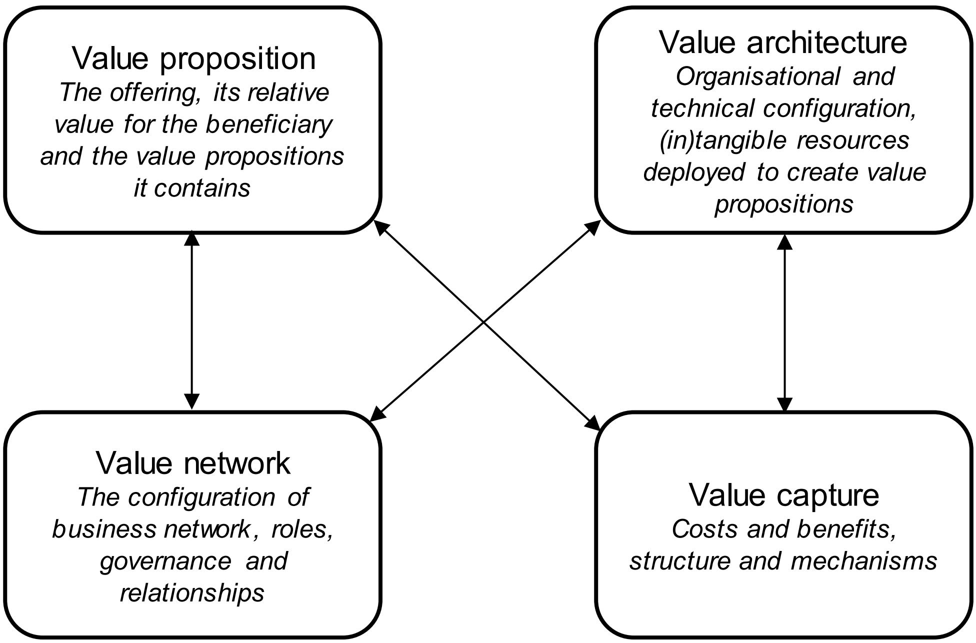

Figure 38: Business model componentisation (adapted from (Al-Debei and Avison 2010))

Step 2 – Explore the impact of SDL on business models and its implications for evaluation

Consequently, we explored and aimed to understand how SDL impacts business models, what changes can be observed with respect to 'traditional', goods-dominant business models and what implications this brings forth with respect to business model evaluation. As a starting point for conceptualising SDL, we take the axioms of SDL as a basis (see Table 3) (Vargo and Lusch 2017). These axioms summarise the implications of adopting SDL as opposed to traditional GDL. For each of the identified evaluation attributes, we then examined how each attribute is impacted by one or more of the axioms and to make these implications explicit. We support this process by related work on the integration of SDL and business models (Kindström 2010; Clauß et al. 2014). Accordingly, we are able to translate how SDL impacts business models and their configuration, and as such summarise the implications for designing and evaluating *service-dominant* business models (as a subset of generic business models).

Step 3 – Derivation of guiding questions to support the qualitative evaluation of service-dominant business models

On the basis of the identified implications of adopting SDL for business models, we derive guiding questions per quality attribute. The questions as such are aimed at verifying or assessing the extent to which the implications are satisfied or achieved. The mapping of how SDL axioms influence quality attributes (and as such the questions we propose) can be seen in Figure 39 (structural validity), Figure 40 (feasibility), Figure 41 (viability), and Figure 42 (robustness). In the next section, we elaborate on how each question has been derived and what their underpinnings are.

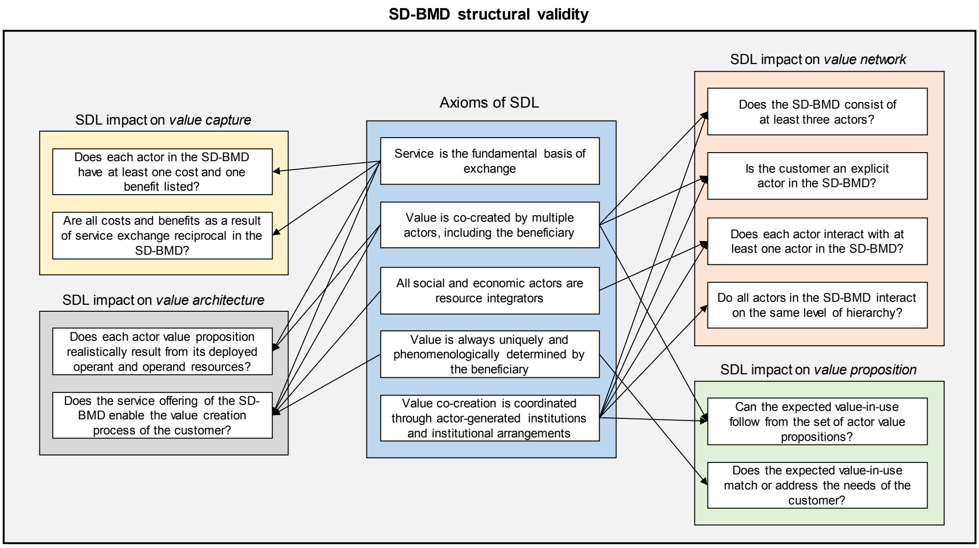

Figure 39: Impact of SDL axioms on service-dominant business model structural validity

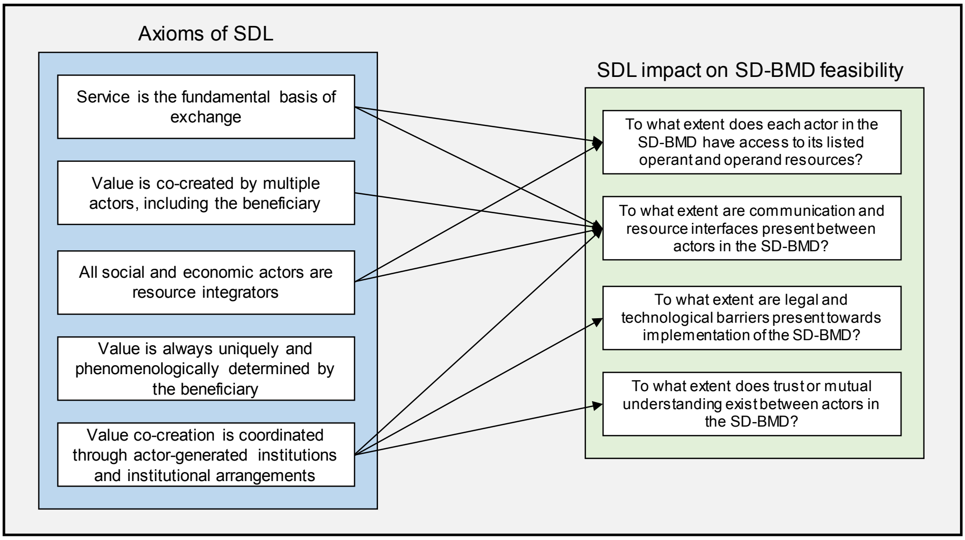

Figure 40: Impact of SDL axioms on service-dominant business model feasibility

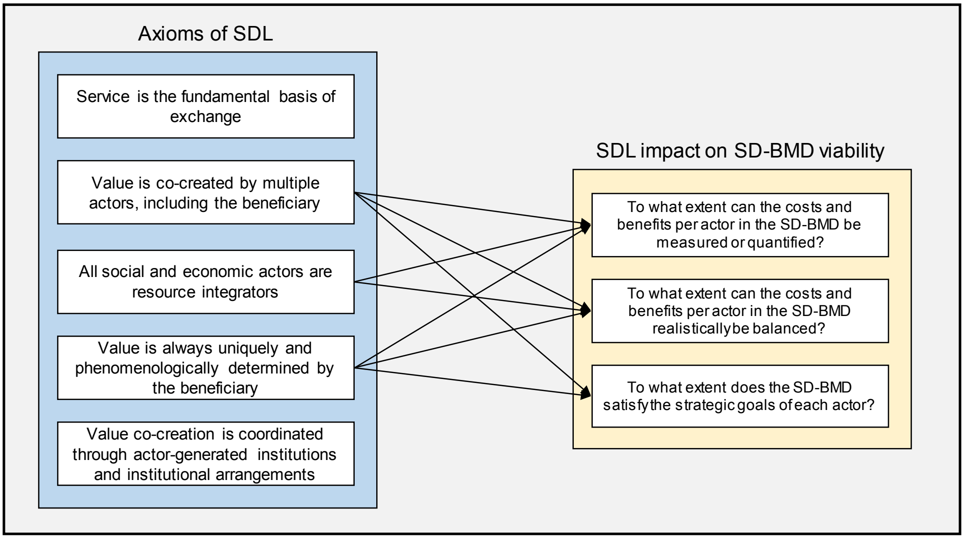

Figure 41: Impact of SDL axioms on service-dominant business model viability

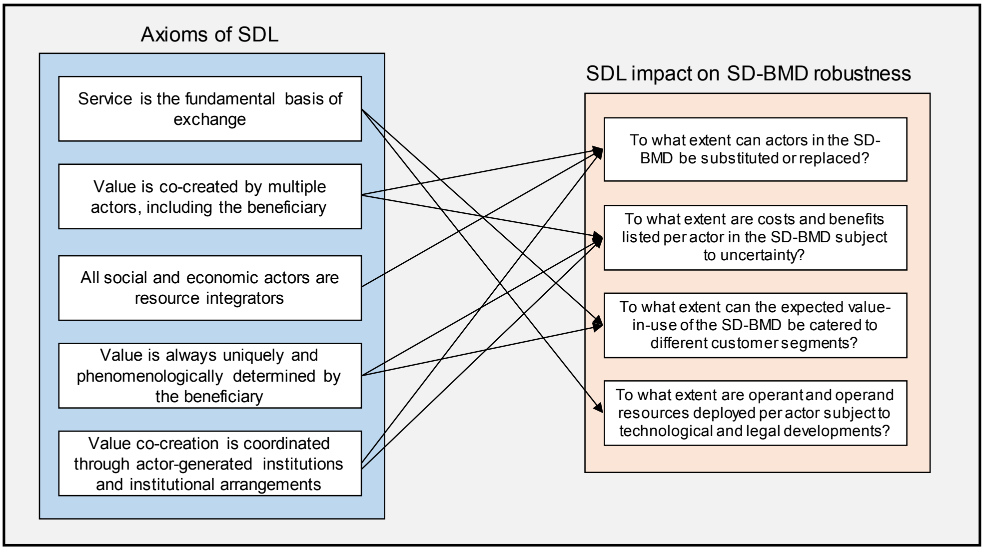

Figure 42: Impact of SDL axioms on service-dominant business model robustness

7.3 IDEM: design and underpinning

Through the design process illustrated in Figure 37, we have derived 21 guiding questions towards the qualitative evaluation of service-dominant business model designs (illustrated per quality attribute in Table 11, Table 12, Table 13, and Table 14). This comprehensive set of questions, joint by a procedure of application of the questions, constitutes IDEM, to which stakeholders collaboratively should discuss and agree on the outcomes of each question. We grouped subsets of questions based on the quality attribute of the business model evaluation they address (i.e., structural validity, feasibility, viability and robustness). In terms of its procedure, we pose that the evaluation of the feasibility, viability and robustness of a service-dominant business model design should be preceded by the evaluation of its structural validity, such that always a logically valid model is considered. Accordingly, the following procedural description, as illustrated in Figure 43, should be followed, constituting the use of IDEM. As such, a draft of a service-dominant business model design is first evaluated with respect to its structural validity, which should be valid as the subsequent evaluation should not be based on a logically invalid business model design. A lack of structural validity results in a need for either redesign of the business model or a reconsideration of the strategic objectives underlying the business model design (referring to the *initiation phase*). If the business model design is deemed structurally valid, the design is evaluated with respect to its feasibility, viability and robustness. This logically depends strongly on the preferences of the stakeholders (as will be further explained in the next section). If the business model design is accepted by all stakeholders, the design is qualitatively evaluated and can progress to the next phase (*integration phase*).

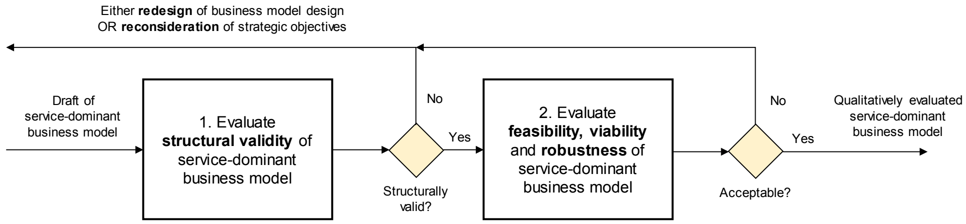

Figure 43: Procedure of application of IDEM

In line with the aforementioned procedure, we provide different degrees of freedom on how questions can be answered, based on the quality attribute they address. For structural validity, the questions focus on validating whether the service-dominant business model design draft adheres to SDL, and whether the logic represented for the business model is valid. Accordingly, questions related to the structural validity are stated in a *closed* form (in binary form, 'yes' or 'no'). Therefore, any negative answer for a structural validity question indicates a lack of adherence to the SDL principles or a logical invalidity in the design that has to be considered in the adjustment of the design. Note that, due to the interrelated nature of business model components, adjustments required in a certain business model design element (as a result of an application of the evaluation questions) can impact other design elements. This reflects the iterative nature of the evaluation task.

On the other hand, for the quality attributes of feasibility, viability and robustness, we provide increased degrees of freedom for the answers of related questions in the form of Likert items. The aggregated set of scores or responses to questions related to these quality attributes may serve as the basis for discussion, comparison or the selection between business model design alternatives, depending on the strategic objectives or goals set per actor in the business network. Note that a low score for either feasibility, viability or robustness does not always imply that the model is inherently bad or should not be pursued – a lack of current feasibility but a strong viability and robustness may drive decision makers to explore or experiment how feasibility can be improved. This comparison may even be accommodated by techniques such as *multi-criteria analysis*, based on the preferred weights for each of the quality attributes (Saaty 1988) and should be considered in light of the operationalised strategic objectives derived by means of our technique (SKPI-T) for defining service-dominant KPIs (see Chapter 6).

We will go through each of the quality attributes for business model evaluation in detail and explain the subset of questions we have derived per quality attribute and provide justification for their need and relevancy.

7.3.1 Structural validity

For structural validity, we assess whether the business model design draft is consistent in light of the implications of adopting SDL. We sub-divide the questions relevant to this quality attribute with respect to the componentisation of business models of Al-Debei & Avison (2010). The full list of questions is presented in Table 11.

Value network

A major implication of the adoption of SDL is that, as opposed to traditional supplier-customer relationships in which products are exchanged, organisations engage in networks of organisations or *service systems* (Axiom 2, Axiom 5), in which service is considered the basis of exchange (Axiom 1). Value is considered to be co-created by multiple, often concurrent actors including the customer (Grönroos and Ravald 2011; Jaakkola and Hakanen 2013; Böhmann et al. 2014; Vargo and Lusch 2017). As a consequence, the service-dominant business model, which represents how value is created, appropriated and captured, is always networked in nature, featuring the customer as an active co-creator (Nenonen and Storbacka 2010; Clauß et al. 2014). Accordingly, the service-business model design should feature *at least* three actors (reflected in Q1 in Table 11). Moreover, the customer should be explicitly considered as an actor in the business model design (Q2).

Especially in solution-oriented networks, actors concurrently exchange resources or service to co-create value for and with the customer (Hakanen and Jaakkola 2012). Each actor in service-dominant business models is therefore considered a resource integrator (Axiom 3), which requires actors to interact and exchange resources in order to generate value propositions and to co-create value (Vargo et al. 2008; Grönroos 2011). Hence, no actor can act in isolation in the service-dominant business model design (Q3), as this would not lead to value co-creation – the contribution of the actor in light of the business model design is redundant. Lastly, given the collaborative setting in which value is co-created, and given that service is the basis for exchange, actors in service-dominant business models should act on the same level of hierarchy to facilitate interaction (Q4) (Maglio and Spohrer 2013; Clauß et al. 2014). In contrast to traditional value chains, in which the customers of suppliers can be the suppliers of other customers (hierarchical relationships), the collaborative networked setting therefore requires hierarchical relationships between actors in the service-dominant business model design.

Value propositions

As service-dominant business models focus on value co-creation, each actor in the business model design contributes a piece of the value offering towards the customer. In light of Axiom 2 and 4, only the beneficiary can appropriate value (Vargo and Lusch 2008; Grönroos 2011). Therefore, actors can only offer *value propositions* to their beneficiary (Lusch et al. 2007). Accordingly, as for service-dominant business models multiple organisations engage in networks to co-create value for and with the customer, the set of value propositions should determine the value (or *value-in-use* if used in a certain context) that is created for the customer (Q5) (Hakanen and Jaakkola 2012; Böhmann et al. 2014). Logically, each of these value propositions or the set of value propositions should be considered in light of the beneficiary, and should therefore realistically address the needs of the beneficiary (the customer in a business model design) (Q6).

Table 11: Set of guiding questions to assess the structural validity of service-dominant business models

		Evaluation questions	Label	Response	
Structural validity	Value network	Does the SD-BMD consist of at least three actors?	Q1	No	Yes
		Is the customer an explicit actor in the SD-BMD?	Q2	No	Yes
		Does each actor interact with at least one actor in the SD-BMD?	Q3	No	Yes
		Do all actors in the SD-BMD interact on the same level of hierarchy?	Q4	No	Yes
	Value proposition	Can the expected value-in-use follow from the set of actor value propositions?	Q5	No	Yes
		Does the expected value-in-use match or address the needs of the customer?	Q6	No	Yes
	Value architecture	Does each actor value proposition realistically result from its deployed operant and operand resources?	Q7	No	Yes
		Does the service offering of the SD-BMD enable or support the value creation process of the customer?	Q8	No	Yes
	Value capture	Does each actor in the SD-BMD have at least one cost and one benefit listed?	Q9	No	Yes
		Are all costs and benefits as a result of exchange reciprocally listed in the SD-BMD?	Q10	No	Yes

Value architecture

For SDL, offering service is considered the fundamental basis of exchange and value co-creation (Axiom 1). As mentioned, the value-in-use offered to the beneficiary in composed of the set of value propositions of the actors in the business network, which are the result of actor-to-actor exchanges of service (Axiom 3) (Vargo et al. 2008; Hakanen and Jaakkola 2012; Böhmann et al. 2014). Each service consequently is composed of actor-specific *operand* (tangible assets, tools) and *operant* (intangible capabilities, knowledge and skills) resources deployed (Vargo and Lusch 2008; Grönroos and Ravald 2011). In light of the value propositions proposed per actor in the business model design, one should therefore assess whether the services offered and exchanged in the business model design can realistically be the result of the activities (i.e., resources deployed) each actor conducts (Q7). Moreover, as the customer is an essential co-creator of value, whom uses the offered service and derives and appropriates value in its own customer sphere as opposed to the supplier sphere (Axiom 4) (Grönroos 2011), the offered service should enable or support the customer in its value creation process (Q8).

Value capture

The nature of servicing or providing service (Axiom 1) calls for actor-to-actor exchanges which inherently are mutually beneficial, as opposed to traditional customer-supplier relationships (Lusch et al. 2007; Lusch and Nambisan 2015). Offering service requires the deployment of resources to propose value for the recipient, which should be acceptable or valuable to the recipient (Vargo and Akaka 2009). Consequently, the servicing actor is able to capture value in return. Accordingly, as actors should not act in isolation for service-dominant business models (see Q3), service exchange in business model design should always lead to at least some cost and some benefit per actor in the business model (Q9). Moreover, if service exchange leads to the integration and exchange of resources (Axiom 3), the service-dominant business model design should ensure that all transferred costs or benefits are reciprocal (Q10).

7.3.2 Feasibility

As defined previously, feasibility of business models can be explained as the access to resources, capabilities and interfaces that are needed to be able to operationalise or implement the business model design, as well as barriers or risks that may exist with respect to this task (Haaker et al. 2017). Examples of these resources may refer to technical capabilities or human competencies, but may also concern legal or social barriers that inhibit the application of these resources. As service-dominant business models are networked and feature many actor-to-actor exchanges and the integration of external and internal resources to propose value to the customer (Axiom 2, Axiom 3, and Axiom 5), one should verify to what extent the modelled business network represented by the service-dominant business model design possesses or may possess the properties to enable this. The full list of guiding questions to assess service-dominant business model feasibility is presented in Table 12.

As in the case for the evaluation of traditional business models, it is necessary to assess if the required resources are currently available to the organisations or to what extent organisations have access to these resources to support their respective activities (Q11). In addition, the structure of the interactions and relationships between actors in service systems should also be assessed. Specifically, exchanging services between actors to co-create value requires both information and resource flows and relevant interfaces to be established (Nenonen and Storbacka 2010; Hakanen and Jaakkola 2012; Maglio and Spohrer 2013).

Table 12: Set of guiding questions to assess the feasibility of service-dominant business models

	Evaluation questions	Label	Response				
Service-dominant business model feasibility	To what extent does each actor in the SD-BMD have access to its listed operant and operand resources?	Q11	Very low	Low	Moderate	High	Very High
	To what extent are communication and resource interfaces present between actors in the SD-BMD?	Q12	Very low	Low	Moderate	High	Very High
	To what extent are legal and technological barriers present towards implementation of the SD-BMD?	Q13	Very low	Low	Moderate	High	Very High
	To what extent does trust or mutual understanding exist between actors in the SD-BMD?	Q14	Very low	Low	Moderate	High	Very High

Therefore, the feasibility of service-dominant business models depends on to the extent to which these interfaces are available or can easily be established (Q12). Similarly, the extent to which the operationalisation of the business model is dependent on legal and technological barriers should be evaluated (Q13). Given the possibility that network actors are geographically dispersed, it might become important to evaluate the influence of legal or technologic barriers that may impede or hamper the operationalisation. Finally, the degree of trust between network actors or understanding of partner operations should also be evaluated (Q14) (Hakanen and Jaakkola 2012; Clauß et al. 2014). Although service systems can be collaborations of temporary nature, and are, therefore, not necessarily based on long-term relationships (Maglio et al. 2009; Böhmann et al. 2014), a lack of understanding of processes of partners or even a lack of trust may hamper information exchange within the network, which as a result may affect the feasibility of the business model.

7.3.3 Viability

Business model viability is largely considered as the business performance for actors involved or the perceived balance of benefits and costs that are captured by each actor through participation (Ballon and Delaere 2008; Haaker et al. 2017; Gilsing et al. 2018). It drives the willingness of actors to participate in the model. In contrast to traditional business models, the viability of service-dominant business models, given that all actors in the model contribute towards the solution or service offering for the customers (A2, A5), depends on whether *each* actor in the design perceives to capture more benefits than costs (Turetken et al. 2019b). Therefore, to assess the extent to which the business model (in a qualitative sense) is viable, one should assess or evaluate:

- the extent to which the respective actor's costs and benefits can be measured, quantified or in general known (Allee 2003, 2008) (Q15),
- the extent to which these costs and benefits per actor can realistically be balanced (Q16), and
- the extent to which the business model design pursues the strategic goals set per actor to participate in the business model in terms of captured benefits (Q17).

The list of questions to assess viability is presented in Table 13.

Table 13: Set of guiding questions to assess the viability of service-dominant business models

	Evaluation questions	Label	Response				
Service-dominant business model viability	To what extent can the costs and benefits per actor in the SD-BMD be measured or quantified?	Q15	Very low	Low	Moderate	High	Very High
	To what extent can the costs and benefits per actor in the SD-BMD realistically be balanced?	Q16	Very low	Low	Moderate	High	Very High
	To what extent does the SD-BMD satisfy the strategic goals of each actor?	Q17	Very low	Low	Moderate	High	Very High

7.3.4 Robustness

Lastly, business model robustness captures the uncertainty with respect to either business performance (viability) or technical performance (feasibility), usually accommodated through scenarios, probabilistic theory or risk analysis (Haaker et al. 2017; Täuscher and Abdelkafi 2018). We structure the questions to assess business model robustness along the components of the business model design (Al-Debei et al. 2008; Al-Debei and Avison 2010), to understand and assess the extent to which the changes in the design can influence either the viability or feasibility of the model. The questions are presented in Table 14.

Given the essential role of each actor modelled for service-dominant business model designs (each actor contributes a piece of the value offered to the customer) (A2), and the interdependencies of actors with respect to resource integration and service exchange to co-create value (A3), the composition of actors and roles should be assessed (Jaakkola and Hakanen 2013). With respect to the *value network*, we therefore assess the extent to which an actor in the business network can be replaced by a different, concrete actor, in case an actor seizes to participate in the business model design (Q18).

With respect to *value capture*, we assess the extent to which the costs and benefits obtained from participation in the model are subject to risk or uncertainty, taking a dynamic perspective on how the business model design may evolve (Q19). This may be the result of changes in pricing mechanisms or strategies, expected shifts in demands or usage of the service or uncertainty with respect to future investments.

To assess the robustness of *value proposition*, we pose Q20 to evaluate whether the service offering in the current business model design may accommodate different customer segments, such that flexibility or agility is created if the needs of customer segments change. Whilst a catered solution to customers may better support the value creation process of the respective customer segment, it may also inhibit the opportunity to address other customer segments to expend or scale business. Decision makers, therefore, should be wary of or understand the impact of the value of the current service offering.

Finally, for *value architecture*, which pertains to the resources deployed to generate value propositions, the technical and organisational architecture to exchange resources or communicate, we pose Q21 to assess the extent to which expected technological developments may impact the current resources deployed or may threaten the value of the current service offering. Similarly, we assess the extent to which market or legal developments, for instance to increase the scale by which the service is offered (which is relevant in cases of platform business models), can be addressed.

Table 14: Set of guiding questions to assess the robustness of service-dominant business models

	Evaluation questions	Label	Response				
Service-dominant business model robustness	To what extent can actors in the SD-BMD be substituted or replaced?	Q18	Very low	Low	Moderate	High	Very High
	To what extent are costs and benefits listed per actor in the SD-BMD subject to uncertainty?	Q19	Very low	Low	Moderate	High	Very High
	To what extent can the expected value-in-use of the SD-BMD be catered and offered to	Q20	Very low	Low	Moderate	High	Very High

	different customer segments?						
	To what extent are operant and operand resources deployed per actor subject to technological, market and legal developments?	Q21	Very low	Low	Moderate	High	Very High

7.4 Application of IDEM

In this section, we apply IDEM to support the qualitative evaluation of a service-dominant business model design, using the case (Free-Ride Amsterdam) which we have described in Section 5.5. To do so, we take the service-dominant business model design presented in Figure 32 as a basis and apply the guiding questions presented for IDEM to evaluate the business model design. Given the responses to the specific questions, the business model design is adapted to better address the design decisions of the stakeholders involved. Moreover, the outcomes with respect to feasibility, viability and robustness can be quantified to compare between business model alternatives. We conducted the application of IDEM in close collaboration with two of the involved stakeholders for the current design. One of these stakeholders acted as moderator of the business model design sessions that were conducted with the participation of all the representatives of the stakeholders in the business model design. The other stakeholder served as a representative of the perspective of the city / municipality, which was the prime driver behind the business model design workshop. Both stakeholders have over 5 years of experience in business model design and over 20 years of experience in information systems development.

Following the procedural description (Figure 43), starting off with the application of the guiding questions with respect to the *structural validity* of the business model design resulted in several directions for change or improvement to the design with respect to the logic and structure of the model. The initial business model design as well as the new design are presented in Figure 44. Specifically, Q5, which discusses the completeness of the set of value propositions to establish the offered value-in-use to the customer, highlighted that in order to implement the ideated service solution, additional (legal, financial and operational) support was needed to be able to operationalise the business model. Stakeholders deemed that this support could be offered by the large city. However, the large city was not considered as an explicit stakeholder for the initial business model design. As a result, based on further discussions, stakeholders decided that the large city should be included as an explicit actor in the service-dominant business model design. In conjunction with Q6, the large city was -moreover- positioned as the *customer* in the business model design, to which the service provider (e.g., the mobility broker) offers the more comprehensive service of "balancing the load of event visitors" (in accordance with Q8), resulting in a traffic-jam free event rich city (the expected value-in-use described for the new design).

Closer inspection of the initial service-dominant business model design, taking into account Q9 and Q10, revealed that some cost and benefit items were missing, whereas in some occasions the reciprocal nature of value exchange was not reflected by the design. For instance, as the large city now explicitly was considered for the business model design, to which it paid the mobility broker to operate the service, the *mobility broker* should have an explicit benefit item that reflects this part of the exchange. Similarly, a number of exchanges between actors (such as the event spending or retail spending of event visitors to the event location provider and retailer respectively), were not completely reflected by the initial business model design. Moreover, several additional sources of financial and non-financial exchange were identified or altered, such as the ticket fee being paid by the event visitor to the mobility broker in the initial model (changed to reflect a direct payment to the event provider), the need for clarity with respect to how customer data is exchanged (using the same cost / benefit tags), discounts offered by retailers to event visitors to promote use of the service and increased detail or clarity with respect to certain cost and benefit items (such as 'target met' -> 'less traffic jams').

Given these concerns raised with respect to the structural validity of the service-dominant business model (as a result of application of the questions), the service-dominant business model design was altered according to the procedure of application of IDEM (Figure 43). This renewed design is presented in Figure 44 (right), and was deemed valid after a second application of the questions pertaining to structural validity.

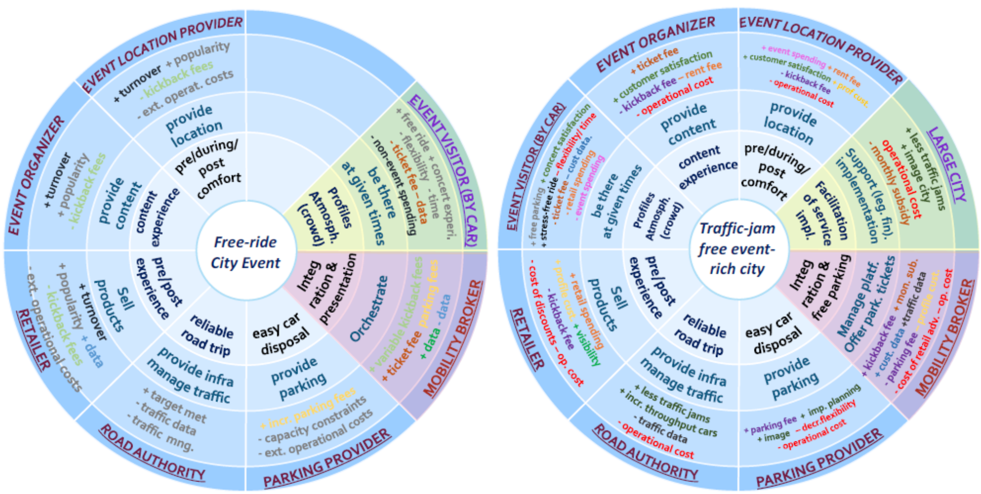

Figure 44: Initial business model design (left) and updated business model design (right, after application) to address mobility problems in Amsterdam

The design consequently was assessed, after the corresponding changes for structural validity, through the quality attributes viability, feasibility and robustness, to understand the 'performance' of the service-dominant business model design and to be able to select between business model designs or variants if needed.

In terms of *feasibility*, stakeholders indicated that the current business model design would not require the deployment or acquisition of many additional resources or capabilities that were currently deemed outside of the business network (and would as such hinder the operationalisation of the business model design). The role of the mobility broker, operating as a platform provider and integrator of customer data, however, was not yet fulfilled by a concrete stakeholder – this concrete stakeholder still had to be sought after and integrated into the business network before the service can be offered. The required resources relevant to this role were, therefore, still absent (decreasing the current feasibility of the business model). However, considering the prevalence of many platform providers in contemporary markets, this was not considered to be a significant issue, although care should be taken in finding the right partner.

Summarising, with respect to Q11, stakeholders deemed that access to resources was *moderate*. For Q12, stakeholders indicated that although the communication and resource interfaces currently were not present yet, establishing these interfaces would not result in significant difficulties. Accordingly, Q12 was deemed *high*. With respect to Q13, stakeholders indicated that, given the simplicity of the solution (a digital platform to accommodate the exchange of parking tickets and the analysis or integration of traffic data), limited barriers towards implementation were identified, which resulted in a response of *low* (inversed answer). Lastly, as the business model endeavour was considered to be strongly collaborative and solution-driven, limited competition and significant trust was established. Although actors were not necessarily aware of internal processes or needs at other actors in the design, a high willingness to collaborate was identified. Concluding, the overall feasibility of the current business model design was deemed as *high.*

With respect to the viability of the (structurally valid) service-dominant business model design, questions Q15 – 17 were used for discussion. For Q15, stakeholders indicated that, based on the improved cost and benefits items, almost all of the current financial costs and benefits were expected to be quantifiable, based on the expected resources to be deployed and the current financial exchanges mapped between actors in the business model design. With respect to non-financial benefits, stakeholders indicated that it may be difficult to accurately measure the traffic effects or to assess the increase in city image as a result of use of the service. Concluding, Q15 was considered to be *moderate* at this phase of the business model innovation process. In light of the difficulties highlighted in Q15, stakeholders posed that, although for most actors the costs and benefits can at least be balanced, the expected decrease in traffic congestion at this phase was still uncertain. Therefore, Q16 was considered to be *moderate*. Lastly, with respect to Q17, the highlighted costs and benefits per actor were aligned with the strategic intent for participation in the business model. For example, the motivation of the city to participate in the business model design was driven by the expected decrease in traffic congestion, which is listed as a prominent benefit for the city in the model. None of the actors indicated a severe mismatch in terms of strategic goals (resulting in Q17 being deemed *high*). The overall viability of the current business model design was deemed as *moderate*.

With respect to the robustness of the service-dominant business model design, questions Q18 – Q21 were used. With respect to Q18, stakeholders indicated that most of the roles represented in the business model design in practice represented a multitude of concrete stakeholders (for instance, the 'retailer role' was represented by a collaboration of retailers, representing many individual stores or chains). Accordingly, in case of a drop-out of a concrete stakeholder, several other concrete stakeholders could be included. The role of mobility broker, however, was deemed critical. Although in the digital era many platform providers exist, a different mobility broker would require an entirely new service platform. Nonetheless, Q18 was considered to be *high*. With respect to Q19, stakeholders did not expect any significant uncertainties with respect to cost and benefit items, other than (as mentioned before) the effectiveness of the service to mitigate traffic congestion. Contractual agreements on financial exchanges can be established to ensure that these exchanges do not change unexpectedly over time. Q19 as a result was considered to be *low* (*inversed*). Given the simplicity of the service solution and the prevalence of the actors listed in the business model design, stakeholders believed that the business model at hand could also be applied in different cities (other than Amsterdam) or even different countries barring legal requirements, thus scaling the current business model design to different customers (Q20 being *high*). With respect to Q21, stakeholders did not perceive, given the simplicity of the service solution, any technological, legal or market developments to be emergent that would potentially influence or threaten the technical infrastructure in the short run. As a consequence, Q21 was considered to be *high*. Summarising, the overall robustness of the service-dominant business model was deemed as *high*.

The resulting outcomes for *viability*, *feasibility* and *robustness* can consequently be used to drive the selection and comparison of business model alternatives, taking into account the strategic preferences of the stakeholders for the models.

7.5 Evaluation of IDEM

In line with design science research, it is necessary to apply design artefacts in real-world settings to assess the quality of the design artefact and how it should potentially be improved (relevance), and to better understand and learn from the problem context to which the artefact is applied (rigor) (Hevner et al. 2004; Peffers et al. 2012). A design artefact should be evaluated with respect to whether it satisfies its purpose (*validity*), and whether it generates utility to users in the problem context for which it was designed (*utility*) (Hevner et al. 2004). Depending on the problem context and what methods or guidance is already available, this may require the comparison against existing techniques to demonstrate how the novel design artefact generates increased effectiveness or efficiency.

We have highlighted that limited qualitative support is present in existing research that addresses the evaluation of service-dominant business model designs, taking into account the implications of service-dominant logic on business models. Although qualitative methods exist towards the evaluation of business models, these methods do not adequately address the networked characteristics that underpin service-dominant business models, which as a consequence makes it difficult for business model designers to address and evaluate design decisions. Therefore, we position the evaluation of IDEM in light of how it generates utility with respect to the problem context, and how it satisfies the goals of its users (and omit the comparison of IDEM against other approaches).

Several techniques have been proposed to evaluate design artefacts, such as prototyping, simulation, dynamic analysis, scenario building or case studies (Peffers et al. 2012; Venable et al. 2016). Given the nature of the proposed artefact (a method featuring a set of questions and procedural guidance towards the qualitative evaluation of service-dominant business models), we leverage qualitatively-oriented evaluation techniques to support the evaluation of the design artefact. To this end, we have conducted three real-world business scenarios with practitioners to further assess the validity of the proposed artefact, and used interviews and questionnaires to understand what utility was created for the users through use of IDEM for these case studies. With respect to the validity of the artefact, we assessed whether the application of the evaluation questions would support users to evaluate or reflect on design decisions with respect to the service-dominant business model. Subsequently, we recorded the changes users made with respect to the design and examined how this related to one or more of the evaluation questions. The three business cases used have emerged from the logistic, mobility and pharmaceutical/biomedical domain respectively, for which the focal organisation or service provider at hand sought after collaborative solutions to solve or address identified business problems or challenges.

In the following, we first describe in more detail the business cases that have been used to assess the validity and utility of IDEM. For the validity of IDEM (Section 7.5.1), we illustrate how the application of IDEM contributes to the qualitative evaluation of service-dominant business models and illustrate what in what changes this has resulted with respect to the design. For the evaluation of the utility of IDEM, we surveyed the stakeholders present for the application of IDEM and elicited their opinions with respect to the usefulness, usability and ease-of-use of the method. We will discuss the set-up of the utility evaluation in more detail in Section 7.5.2.

7.5.1 Evaluating the validity of IDEM

As mentioned before, we applied IDEM in three real-life business cases in the Netherlands and assessed the use and applicability of the method in these settings to evaluate the validity of the proposed design artefact, examining whether the questions and procedural use part of IDEM would help users to evaluate their business model design and to provide evidence for the validity of IDEM. In contrast to the illustrative business scenario represented in section 7.4, stakeholders involved for these workshops did not have a significant background on service-dominant business modelling. As such, application of IDEM for these cases can further make explicit the validity of the proposed artefact.

The *first case* originated from the logistics domain and concerns *the efficient redeployment* of *used* products. In this case, the service provider (the *recycler*) sought after a collaborative, service-driven solution to satisfy the needs of its customer, which is a large clothing company. The clothing company expressed that it currently was unable to efficiently manage the return of *used products* of customers and to resell these products -if received in good condition- to new customers. In response, the service provider was asked to explore how the redeployment of used products could efficiently be managed.

The *second case* originated from a project on the exploration of a collaborative service solution that supports users (typically *travellers*) to comfortably and seamlessly travel around Europe. Currently, this is challenging for travellers, as many transport operators exist and each offers its own user application and interface to the customer. Moreover, language barriers may further impede the effective use of transport operators in different countries. Accordingly, the project investigated how this interconnectivity between transport operators could be stimulated or supported.

The *third case* originated from the biomedical domain and focused on an intra-organisational setting in which the company at hand explored the impact of the adoption of a novel technology and to contextualise how the implementation and use of the technology would be supported through the collaborative efforts of departments and stakeholders. Considering the offered solution as a service and to foster the collaboration between departments in a holistic sense, the company therefore desired to contextualise the novel scenario through service-dominant business modelling.

Each of the cases resulted in a collaborative, service-dominant business model design (draft) aimed at addressing the challenges at hand. However, the logic of the business model should be qualitatively evaluated to understand whether the design decisions are adequately reflected for the business model design, and to assess whether stakeholders perceive the business model design to be viable or feasible (in a qualitative sense). Accordingly, these service-dominant business model designs are suitable candidates to serve as the basis for the application of our method, and consequently are used to evaluate the validity and utility of the proposed artefact.

In the following sub-sections, we explain each business case in more detail and describe how the application of IDEM has facilitated the users to qualitatively evaluate the service-dominant business model design.

Application of IDEM for "Efficient Redeployment"

To increase the sustainability of business and reduce the impact that organisations may have on the environment, many organisations examine their ecological footprint to assess where opportunities or value-adding solutions may lie to reduce these negative externalities (van Hoek 1999). One such an approach to reduce environmental impact is the reselling of *used* or *second-hand* products to reduce material waste with respect to the products, and to reduce operational pollution as the products are already produced. However, as organisations tightly manage their operational capacity and warehousing to reduce costs, temporarily storing returned goods may not be possible, nor is it as cost-effective (as reselling of the products may often result in lower profit margins). As a result, many organisations struggle with the effective handling of reverse logistics (Srivastava 2008; Dekker et al. 2013).

In this business case, a large clothing company faced the problem that it was not able to efficiently redeploy *second-hand* or *used* products, and accordingly was not able to increase its sustainability. The clothing company invoked the services of a service provider (a *recycling company*) to seek after a collaborative solution that would support the efficient redeployment of used products. As the expected network structure for the business model was complex (featuring geographically distant stakeholders), the initial business model design was derived by means of focus groups instead of a business model workshop, which featured stakeholder separately rather than collaboratively (Kontio et al. 2004). Nevertheless, on the basis of the input of the stakeholders, the business model design represented in Figure 45 (left). The network features the *clothing company* as customer and the *recycling company* as the focal organisation. The *recycling company* orchestrates the network and offers the complete service solution to the customer. To do so, the *clothing company* provides order data to the *recycler*, either with respect to reverse logistics or the reselling of products on behalf of the clothing company. The remainder of the network is composed of a warehouse provider, postal service and the end-customer of the clothing company. The warehouse provider takes care of the temporary storage of the returned products, and assesses whether the products are still in acceptable condition. The warehouse provider also takes care of the outbound logistics to postal services. Consequently, the *postal service* (provider) takes care of the last-mile delivery and ensures the purchased used products arrive at the customer. The end-customer is included as it returns the *used* products but also receives *used* products (by different customers). On the basis of the proposed service solution that emerged from the focus groups, the high-level activities and value contributions were defined, whereas cost and benefits were specified in line with the strategic motives and preferences of the represented stakeholders.

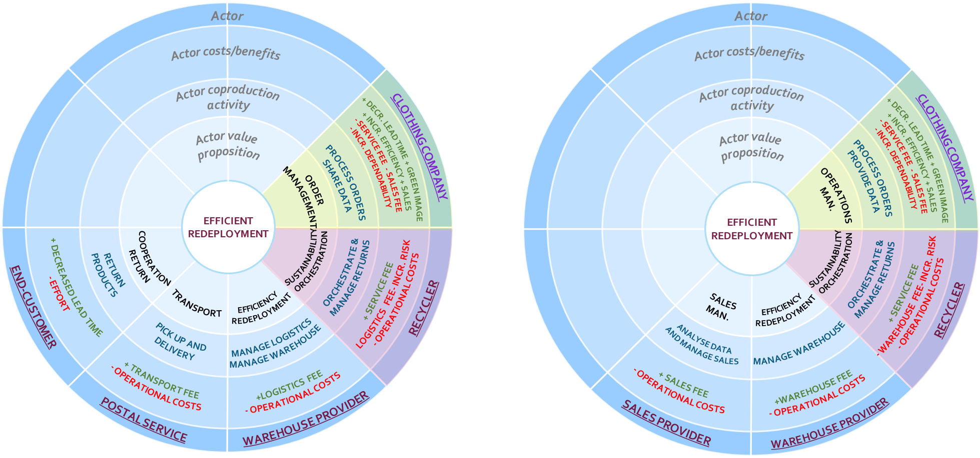

Figure 45: Changes in the business model design for "efficient redeployment" as a result of the application of IDEM

To support the qualitative evaluation of the service-dominant business model design, and to assess design decisions, IDEM was applied. To this end, two stakeholders belonging to the service provider were involved, for which we examined what questions triggered a need to redesign the service-dominant business model with regards to the structural validity. Both stakeholders had significant working experience at the service provider (tenure of 5-7 years) and were related to the development of business and product offerings at the organisation. As such, they were experienced in business modelling and were able to contribute valuable insights on the current value proposition of the business model and the relationships to other actors represented for the network. The question with respect to the value proposition (e.g., Q5) triggered a need for a redesign. The current set of value propositions was not deemed concrete with respect to the proposed value-in-use. Order management initially specified for the clothing company was considered too broad, which typically for large companies is split up into operations and sales. Accordingly, the stakeholders advocated that the clothing company role should be split up into a dedicated role for operations management with respect to the orders (collecting returned products and managing the orders) and a dedicated role for the sales and after sales related to reselling. As a consequence, the network structure was changed such that a sales provider (which in fact belonged to the same company) was included to make this value proposition explicit.

Moreover, both the postal service and the end-customer were removed from the model, as these did not contribute value with respect to the value-in-use (i.e. the value-in-use can exist without these stakeholders). These roles fulfilled either what happens before (e.g. the customer sending a product back) and after (any postal service delivering the *used product*) efficient redeployment. Accordingly, efficient redeployment can exist without the contribution of these stakeholders. The updated business model design is presented in Figure 45 (right).

Application of the questions regarding viability, feasibility and robustness yielded no further changes to the design. The structure of costs and benefits was deemed viable, although the stakeholders indicated that care should be taken with respect to 'hidden' costs that only become apparent once the business model is instantiated or operationalised. In terms of feasibility, limited threats were identified as almost all essential activities and resources were present per stakeholders whereas the represented partners had already collaborated before. The robustness dimension was not further explored for this case. Given the results, the use of IDEM enabled the stakeholders for this business case to qualitative evaluate the drafted service-dominant business model and to define more clearly how the business initiative should be structured, and whether it, in terms of feasibility and viability was considered to be acceptable.

Application of IDEM for "Enhanced Mobility Service Provisioning"
Increased globalisation has created an interconnected contemporary society, whereas rapid technology change has enabled us to travel at increasingly lower costs and through an ever expanding set of modes of transportation (Banister 2011). However, this expanding set of modes of transportation and the various amount of transport operators associated with these modes of transport make it increasingly complex for travellers to determine how to get effectively from start to end destination, to appropriately select which specific transport operators to use that best address the needs of the travellers, and to manage the handling of ticketing as each transport operator likely deploys its own service interface. Moreover, in cases of international or intercontinental travel, languages and policy barriers may even further increase the difficulty and complexity for the traveller to set out their travel itinerary.

In light of these challenges, a European Innovation and Technology (EIT) project sought after a service-dominant, collaborative solution to offer *seamless and optimised travel to customers*, integrating the resources of stakeholders such as cities, traffic authorities, mobility service providers (e.g. transport operators, but also transport providers) and insurance and transaction providers. To this end, a set of business model workshops were organised to ideate novel business models with the value proposition depicted above.

The resulting service solution entailed a platform on which mobility service providers can register and display their transport service. Moreover, services such as insurance, typically complementing travel services, were also included on the platform. Through the platform, insurance and mobility services accordingly can be interconnected. Moreover, the resources of municipalities and traffic authorities are used to comply with (local) standards and policies. Through use of the platform, end-users indicate their travel itinerary including travel preferences and consequently select or are recommended mobility services of mobility service providers, and if desired services of insurance companies, that would satisfy these inputs. Once the set of transport services is agreed upon, the platform handles the payment and management of the tickets, and offers this as a single ticket to the end-customer.

The business model was iteratively designed through a set of business model workshops, to which the scope of the service initially was set to the Netherlands (therefore, domestic travel). The resulting business model design is illustrated in Figure 46 (left). The business model takes the mobility service provider as the customer, who publishes its mobility service and to which enhanced mobility service provisioning is offered as value-in-use. The focal organisation or service provider is a platform operator, responsible for the integration of resources. The remainder of the network is composed of the municipality (responsible for setting mobility policies), the financial transaction provider (to smoothen and secure transactions between service providers), a technology provider (to maintain and scale the platform), traffic authority (to present traffic data) and an insurance provider (to offer additional insurance with respect to travel itineraries).

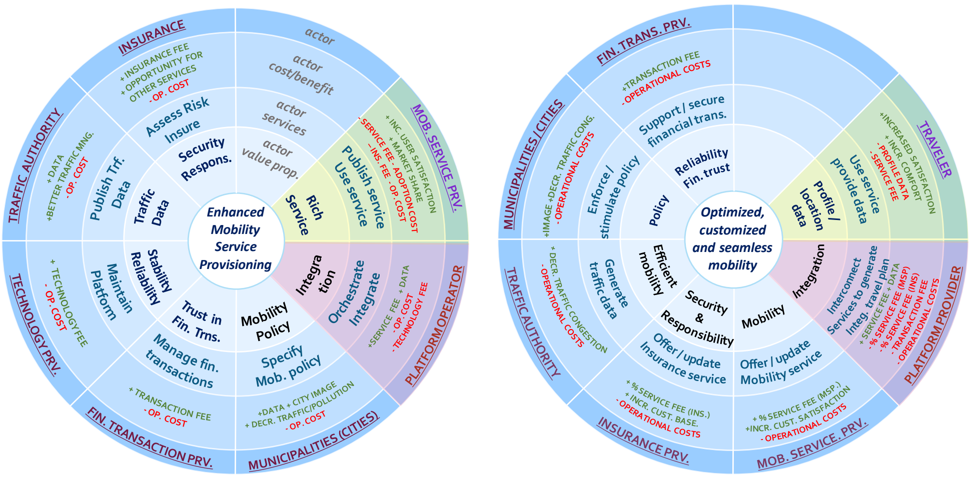

Figure 46: Changes in the business model design for "enhanced mobility service provisioning" as a result of the application of IDEM

To support the qualitative evaluation of the service-dominant business model design, and to assess design decisions, IDEM was applied. To this end, six stakeholders, related to and representative of the roles of the insurance provider, platform operator and municipality, were present. Application of the questions resulted in a need for redesign with respect to the value proposition and the value network (e.g., Q2, Q4, Q5 and Q6).

With regards to Q2 and Q6, stakeholders struggled with the customer role explicitly taken for the business model design. For the initial model, the mobility service providers were considered as customers to the service, as the platform initially was considered from a B2B business perspective – effectiveness of the platform was deemed to be strongly influenced by the generation of a critical mass or vast base of mobility service providers with respect to the platform. However, given the expected value the service solution was expected to generate (e.g. seamless and optimised travel to customers), this resulted in an ill-aligned expected value-in-use for the business model with respect to the targeted customer segment. Although generating the critical mass is important, the collaboration concluded that a business model focusing on the end-user (e.g., the traveller) would better reflect the value created by the service solution.

Accordingly, for the novel design (Figure 46, right), the traveller was taken as customer segment to which the platform offers the service of seamless, optimised and customised travel. With respect to Q4, the collaboration deemed that the *technology provider* initially included for the business model design operated through a bilateral, hierarchical relationship with the platform provider. The technology provider was initially included to support the deployment of the platform, and to maintain and scale the platform based on the development of the service solution (providing a value proposition of *reliability* and *scalability*). Given the role of the platform provider, the collaboration deemed that this value proposition of the technology provider is embedded in the value proposition of the platform provider (integration of services is based on a stable and reliable platform environment). Accordingly, the technology provider was considered as an outsourced party to the platform provider and removed from the business model design. Lastly, application of Q5 lead to minor revisions with respect to value propositions in the business model design – for instance, the traffic authority initially had a value proposition of "traffic data", but was later revised to *efficient* mobility (to better address the value-in-use listed).

Deployment of the questions with respect to feasibility, viability and robustness resulted in a number of discussions on the financial model and the degree of information sharing underlying the business model design. Leveraging Q16 and Q19, discussions arose with respect to the structure of the finance model (e.g., how is financial exchange structured) (Burkhart et al. 2011). Initially, the mobility service provider would pay the platform provider to publish their respective mobility service on the platform. However, the interactions with insurance and transaction providers would still be handled by the mobility service provider – in this scenario, the platform provider only serves as an interface to the end-customer. However, in line with the role foreseen for the platform provider as orchestrator of the model with respect to the value-in-use (integrator), the initial finance model was deemed inappropriate, especially in cases in which the services of many mobility service providers would be invoked (for example if a traveller opts for a comprehensive multi-modal trip). In such cases, it would be more effective to position the platform provider as a hub that takes care of transactions and interactions amongst stakeholders in the business network.

With respect to Q14, the collaboration had concerns with respect to whether mobility service providers would be inclined to give up their interface with the end-customer (via a smartphone or web application) to participate on the integrated mobility platform, and whether mobility providers would be willing to share this information. Although it did not yield any revisions with respect to the business model design (as the service solution's main intention is to connect the services of many concurrent mobility service providers), it raised awareness with respect to motivating mobility providers to participate (for example through generating a critical mass or through the inclusion of large mobility providers to attract other service providers).

Application of IDEM for "Improved process performance through smart glasses"
As a result of rapid technological change, many novel technologies emerge which may contribute towards improving the operational excellence of organisations, which in turn may enable organisations to sustain competitive advantage (Parida et al. 2019). However, the success of novel technologies introduced within organisations to contribute to process improvement strongly depends on the purpose for which these technologies are applied, the context within these technologies will be used, as well as the degree to which these technologies will be adopted (Kurkkio et al. 2011). Accordingly, one must understand what value such technologies may yield to improve or further support a business activity or set of business processes, taking into account the perceptions of stakeholders that will actively use such technologies or are affected by their introduction and deployment. Such a setting can be characterised as an *interdepartmental* setting, in which business units or stakeholders within an organisation are required to collaborate to satisfy the strategic goals and challenges of the organisation, whilst concurrently focusing on their own business objectives per department or unit. As business units often are formed or established based on sets of coherent functionalities, it is important to ensure that interdepartmental boundaries can be traversed and that goals of business units do not conflict but rather can be complementary. In such settings, a holistic consideration of how business units collaborate, taking the service-dominant, value-driven contextualisation at its core (e.g., to focus on how collectively value is created and appropriated) may shed light on how novel business initiatives fit within the organisation. In terms of service-dominant logic, each business unit therefore serves as an actor in a business model, explaining how a set of business units collectively co-creates value for an end-customer or different business unit. Accordingly, novel business initiatives (such as the implementation and provisioning of smart glasses) can be described by means of service-dominant business modelling, explaining what each business unit contributes and obtains from participation in the novel initiative.

Adopting such a service-dominant perspective, a pharmaceutical company aimed to understand the potential value of the introduction of smart glasses to improve both the training and operational performance of employees working in, so called, cleanrooms or isolators. Isolators are specialised chambers designed to preserve the quality of chemicals used to produce the desired pharmaceuticals, and offer room typically for a single employee. In the current business case, trainers, which operate outside the isolators, are required to overview the activities of trainees in the isolator, whom are executing process steps to work on the pharmaceuticals at hand, and make sure the process steps are executed correctly. In case errors or problems occur within the isolators, trainers are required to provide feedback to the trainees based on the problem at hand, such that the trainees can continue their activities. In the current setting, trainers are required to manually overview whether the processes are executed correctly per isolator. Therefore, in case of errors, a trainer has to *react* and move towards the respective isolator to communicate with the trainee and solve the issue, leaving other isolators temporarily unattended. Moreover, the problem solving activity is further complicated by the fact that the executed process steps within the isolators are typically complex, making it difficult for trainees to adequately describe what errors have occurred, further reducing the efficiency and effectiveness of the trainer.

To improve the current scenario, the pharmaceutical company, specifically the *chemical department*, considered the introduction and use of smart glasses for trainees, such that trainees can make visible what process steps they are working on or what errors have occurred for the process steps conducted in the isolator. This footage generated by trainees in the isolator is forwarded to a central platform that can be monitored by the trainer. Accordingly, the trainer can observe from a central position what process steps each trainee is conducting and proactively react to unexpected errors or problems within the isolators. Moreover, as the visibility of the problems in isolators is improved, the trainer can offer more precise and detailed feedback to the trainee such that the trainee can potentially resolve the issue faster.

However, the success of the smart glasses depends on how they are implemented in practice and what value is created for the stakeholders involved for their implementation. To further explore the value created by the smart glasses and to understand how this technology should be implemented, a business model workshop was orchestrated for which four potential stakeholders (two from the *IT department* and two from the *chemical department*) were present.

The initial business model design that emerged from this workshop is presented in Figure 47 (left), for which its central value-in-use entails *improved process performance through smart glasses*. One can see that the *chemical department* is modelled as the customer of the business model, which contributes to the central value-in-use by stimulating the use of smart glasses within the department to support its processes. In doing so, trainees make use of smart glasses and consequently can make visible or explicit what process steps are conducted in isolators. In turn, trainers can more effectively monitor the activities within the isolators and more timely and adequately steer the behaviour of the trainees. To understand what value is created for these roles, both the trainer and trainee are included as active stakeholders for the business model. One can see that the trainers contribute to the central value-in-use through their (improved) feedback, whereas trainees contribute value by means of participation (i.e., use of the smart glasses). Although trainees may suffer from decreased privacy and the need to learn using novel technologies, they in return benefit from improved feedback and consequently increased performance. On the other hand, the trainer benefits from a better overview of the activities conducted in the isolators, as well as increases its flexibility as he or she can more proactively react to unexpected issues. The remainder of the business model design is composed of the IT department (to establish the platform for the trainers to use) and the software/hardware provider (responsible for providing and updating the smart glasses).

To qualitatively evaluate the initial business model design, IDEM was applied. The same set of stakeholders present for the design of the model were also involved for its evaluation. Application of the questions with regards to the structural validity of the model resulted in a need to extend the set of stakeholders involved for the business model design (as a result of Q5) as well as the need to update the costs and benefits listed (Q10).

With regards to Q5, the stakeholders concluded that the current set of value propositions listed would not be sufficient to generate the central value-in-use for the chemical department. In the current business model design, the software/hardware provider is considered as an external service provider, offering smart glasses to the IT department and ensuring that these smart glasses are maintained and are equipped with the latest software. However, this provider does not offer any hands-on support *within* the organisation, which may complicate the central value-in-use (in case technological issues occur or further technical support is needed). Similarly, the IT department is responsible for establishing the platform and infrastructure such that the smart glasses can effectively be applied for the current context, but does not offer any support with respect to the use of the smart glasses. Stakeholders concluded that such capabilities (e.g. to provide hands-on support) resided at a different department, namely *technical support*. Accordingly, the stakeholder network was altered to explicitly include this role, such that hands-on support can be presented to both trainers and trainees with regards to the use of smart glasses. As such, its value proposition concerns the *continuity* and *usability* of the proposed solution.

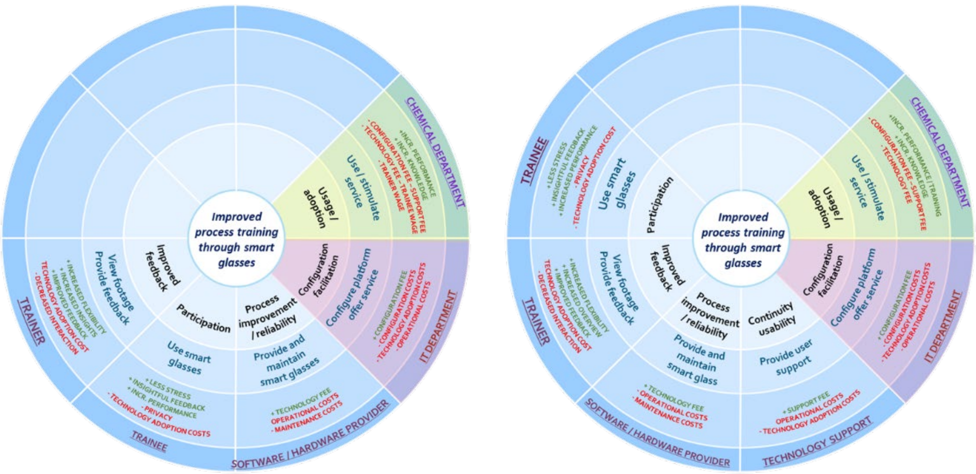

Figure 47: Changes in the business model design for "improved process training through smart glasses" as a result of the application of IDEM

With regards to Q10, stakeholders concluded that some of the costs and benefits were incorrectly modelled. For instance, the wages indicated as costs for the chemical department (e.g., trainee wage and trainer wage) were not represented as benefits for the trainer and trainee. However, as the trainer and trainee are essentially part of the chemical department, whereas these costs/benefits are only marginally related to the business model design at hand, stakeholders ultimately decided to remove these cost items entirely. The improved business model design after application of the questions with respect to structural validity is presented in Figure 47 (right).

Application of the questions with respect to viability, feasibility and robustness yielded no further changes for the business model design. In the current context arguably the most important, stakeholders indicated that the viability of the current business model design was high. Although both trainers and trainees would be required to learn how to use the smart glasses, whereas the smart glasses may create a sense of decreased privacy for trainees, stakeholders concluded that the benefits received from their use would exceed these costs. Performance for both trainees and trainers was expected to increase. Furthermore, the solution also may lead to decreased stress, as trainers can more timely and adequately support trainees in their activities. With respect to the feasibility of the business model design, stakeholders perceived the solution to be relatively easy to implement, especially as the proposed technology had already been used in different contexts for the organisation. For the robustness of the business model design, stakeholders disagreed to some extent on whether roles, particularly with respect to the IT department and software / hardware provider, could be easily substituted. Although the current structure and value-in-use offered by the current business model design could also be beneficial to different customer segments (e.g. other departments in which trainers or managers are required to steer a set of complex processes), the choice of what technology provider is used as well as the internal support offered could strongly affect the outcomes of the business model design. Ultimately, the robustness as such was considered to be *moderate*.

From the set of applications of IDEM, we see that through application of the method, the stakeholders were able to reconsider or re-evaluate design decisions with respect to the service-dominant business model design. Although not all questions have been used (although we see that questions regarding the set of value propositions and the network structure are frequently used), the application of IDEM demonstrated that it enables users, in a qualitative sense, to reflect on their business model design, taking a service-dominant logic perspective, providing evidence towards the validity of IDEM.

7.5.2 Evaluating the utility of IDEM

To understand the utility of IDEM, we discussed the results of the application of IDEM with the stakeholders involved for the introduced business cases, and used questionnaires to obtain written feedback with respect to the utility of the proposed artefact. To express utility, we focused on the constructs *perceived usefulness*, *perceived ease of use* and the *perceived intention to use* in line with the core constructs of the *Technology Acceptance Model (TAM). TAM* theory is commonly used to in the information systems and related fields to understand and predict the acceptance of new technologies or design artefacts (Davis 1989; Venkatesh and Davis 2000). *Perceived usefulness* refers to the perception of the user with respect to how the design artefact enables the user to enhance his performance in a given context. *Perceived ease of use* entails the perception of the user with respect to the degree to which use of the artefact would not require physical or mental effort (Davis 1989). Lastly, *intention to use* is determined by *perceived ease of use* and *perceived intention to use* and explains user acceptance of the proposed technology or design artefact. Accordingly, it can be used to explain what utility is created by means of use of the artefact. We used these three constructs to guide the further design of our interviews and questionnaires.

In line with Venkatesh and Davis (2000), we used 4 items or statements to assess perceived usefulness, 4 statements to assess ease of use and 2 statements to assess intention to use, adapting the wording of the statements to accommodate the assessment of the specific characteristics and objectives of the design artefact at hand (Moody 2003). For each of these questions, we used a 5-point Likert scale to understand the level of agreement of the interviewee with respect to the statement at hand, for which 1 represents '*strongly disagree'* and 5 represents '*strongly agree*'. Some of the statements have been deliberately presented in negated form or 'reversed' to prevent respondents to give monotonous responses to questions and to force interviewees to carefully consider each question. Accordingly, the results for these questions are interpreted in reversed form. Moreover, depending on the respective language proficiencies of the respondents, some of the questionnaires were directly translated to Dutch to facilitate respondents to answer in their native language. The set of evaluation questions used is presented in Table 15.

Table 15: Set of questions used to evaluate the utility of IDEM

Evaluation construct	**NR.**	**Statement**
Perceived Usefulness	1	I think this method helps to support the evaluation of service-dominant business models
	2	The evaluation questions of the method would facilitate me to reflect on design choices with respect to the service-dominant business model
	3	I felt I missed questions to effectively evaluate a service-dominant business model*
	4	Overall, the method did not seem useful to me to evaluate service-dominant business models*
Perceived ease of use	5	It would be easy for me to apply the evaluation questions to support the evaluation of service-dominant business models
	6	It was not clear to me what certain questions meant or how these questions related to the service-dominant business model*
	7	It would be difficult for me to apply the method to support service-dominant business model evaluation*
	8	It was clear to me how the method should be used
Intention to use	9	If I would design a new service-dominant business model, I would use the method to support the validation and evaluation of design choices
	10	I would not use this method to support the evaluation of service-dominant business models*

Questions indicated by a star (*) are deliberately reversed

At the end of each questionnaire, we provided respondents three open-ended questions with respect to the limitations/weaknesses of the method, its strong points, and any additional feedback that the respondents would like to give.

Out of the 8 stakeholders that took part in the evaluation workshops, 5 stakeholders (2 for *Efficient Redeployment* and 3 for *Optimised, customised and seamless mobility*) filled out the questionnaire. The results of the responses are illustrated in Table 16. The feedback given with respect to open questions is presented in Appendix C. With respect to *Improved process training*, the 4 stakeholders did not fill in the questionnaire, but rather the questionnaire was used as a basis for semi-structured discussions on the method (using the evaluation constructs as a basis).

Table 16: Responses to surveys for IDEM

Criteria	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived usefulness	1	0	0	0	2	3
	2	0	0	0	2	3
	3*	0	1	1	2	1
	4*	0	0	0	1	4
Perceived Ease of Use	5	0	0	1	2	2
	6*	0	0	1	2	2
	7*	0	0	0	3	2
	8	0	0	0	3	2
Intention to Use	9	0	0	0	2	3
	10*	0	0	0	1	4

For questions indicated with a star (*), the responses are reversed.

Perceived usefulness

With respect to *perceived usefulness*, the results illustrate that the stakeholders considered (the application of) IDEM to be useful, given the predominantly high values associated to these related questions. This was also motivated through some of the feedback given with respect to the open questions:

"Creating valuable insights into the working of the model and the stakes of each actor" [Expert 1]

"Good evaluation and validation" [Expert 2]

"A simple and quick check to validate the working and choices for the model" [Expert 3]

"The need to look at the business model from different angles which secures a more structured outcome for the evaluation" [Expert 4]

"I think it is very useful" [Expert 8]

However, we see that in terms of question 3 (*I felt I missed questions to effectively evaluate a service-dominant business model*) a wider spread of responses is given, which indicates that although we offer a set of 21 questions to evaluate design elements and decisions of service-dominant business models, more support may be provided. For instance, question 16 aims to evaluate whether the costs and benefits can be balanced. However, in this phase of the innovation process, it can be difficult to specify all costs and benefits, whereas some costs and benefits may be hidden until later in the process (as also described for the case study):

"So far all are listed. However, during the process of the designing a process model, more costs and benefits can be listed. Also, a more detailed quantitative cost/benefit analysis is needed to really address the problem correctly." [Expert 4]

Although this specific example addresses a concern outside of the scope of this method (e.g., quantitative analysis), the method should take away uncertainty or make explicit what stakeholders should be wary of with respect to the model. This need for information, particularly with respect to the future outcomes of the model, should be further fostered through our method, or through the deployment of multiple joint methods, such as scenario analysis (Tesch 2016) or roadmapping (Haaker et al. 2017).

With respect to the application of the method, respondents also indicate that it is important to have all relevant stakeholders present to effectively leverage the evaluation questions:

"Need for the participation of all stakeholders to create buy-in when applying the method" [Expert 1]

As the design of the model is a collaborative activity, design decisions with respect to all listed stakeholders should be evaluated, which should be considered in light of the strategic concerns or motives of the respective stakeholder. As such, the input of all relevant stakeholders is obviously important.

Perceived ease-of-use

With respect to *perceived ease-of-use*, the results are generally positive, although the average is lower than for perceived usefulness. This is also reflected by some of the quotes generated:

"Asking and scoring questions is familiar to people and as such easy to understand" [Expert 6]

"The strength of the method is in its simplicity, making it easy to understand" [Expert 7]

"The method is clear, the clarity and understandability in general are fine" [Expert 8]

With regards to the open feedback given, respondents indicate that the application of the questions was not always clear, affecting the ease-of-use of the method:

"It takes some time to fully understand the model and maybe it makes sense to have a more in-depth explanation with respect to the method" [Expert 4]

"There is a need for understanding the implications of the questions with respect to the model"
[Expert 5]

"Some of the questions are difficult which requires some to time to think how to respond"
[Expert 6]

"The ease of use is difficult to say. It largely depends on the clarity of the evaluation questions"
[Expert 9]

Given the terminology used and the novelty of the theory, some questions required changes in the wording used. For instance, *operand* and *operant* resources make limited sense to practitioners, whereas translating these constructs into more general terms such as capabilities, machines, skills, knowledge helped creating a deeper understanding of what the questions aimed to evaluate or reflect upon. In light of this, it is indicated that more background or case examples can help build support with respect to how questions should be applied, or that response options (such as low or high) can be concretised further or supported through examples:

"Some examples or cases would be helpful to help use of questions." [Expert 3]

"Extra information with regards to what response options mean to make these more concrete would help a lot, such that less interpretation is left to the individual" [Expert 9]

Perceived intention-to-use

Lastly, with respect to *perceived intention-to-use* the results generally are positive. Throughout our case studies, stakeholders in general noted that using such a method would help them to better understand and guide the design of their service-dominant business models.

Although the set of respondents is limited to draw conclusive results, we see that with respect to the utility of the method (addressing the evaluation of design decisions of service-dominant business models), generally positive results have been received. The initial set of results indicate that IDEM support the qualitative evaluation of service-dominant business models, and helps users to shed light on design decision made with respect to the business model and the business logic modelled. A validated service-dominant business model can consequently be used as the starting point for the further discussion and concretisation of the business model. However, to improve the usability of IDEM, additional support may be presented with respect to how the questions should be interpreted and what implications they may bring forward with respect to the business model design.

7.6 Chapter summary

As business model design typically is uncertain in early phases of the innovation process, there is need for support in terms of business model evaluation which is able to address the uncertain characteristics of business models designed in this phase. To this end, in this chapter we have proposed IDEM, which facilitates users to qualitatively evaluate service-dominant business models and to reflect on design decisions made with respect to the structure of the model. We have iteratively developed IDEM adhering to the design science research approach, for which we have followed a structured method engineering approach (to which we used an extension-based strategy) to guide the design of our method.

IDEM constitutes a set of 21 guiding questions and procedural guidance on its application, addressing both structural concerns of service-dominant business models as well as quality attributes related to business model evaluation. The questions have been inferred from literature with respect to the implications of SDL on business model design and evaluation. Any novel service-dominant business model design should first be evaluated with respect to its structural validity (to ensure that the design is logically sound and structured properly in terms of SDL). Structurally invalid business models should be reconsidered, either in terms of design or in terms of its underlying strategic objectives (which may drive design decisions). Once the service-dominant business model is structurally valid, the design should be evaluated with respect to its feasibility, viability and robustness. Depending on what the network of stakeholders deems important and the responses to the associated questions, the service-dominant business model can be considered acceptable (allowing it to proceed to the next innovation phase) or should be altered to better fit the needs of the included stakeholders.

We have demonstrated the application of IDEM by means of a business case, which considers a diverse set of stakeholders (with different motivations) in a networked setting. To evaluate the validity of the design artefact, we have applied IDEM in three real-life scenarios. To understand whether the design artefact has utility, we used a questionnaire to inquire from users whether they deemed the artefact to be useful and easy to use, and whether they would intend to use the method to support future evaluations of service-dominant business models. By means of the real-life scenarios, we have illustrated that IDEM enables stakeholders to reflect on their service-dominant business model design and the general business logic followed, and to evaluate design decisions made. In turn, this has resulted in several changes to preliminary business model designs to better cater to the strategic intent of the stakeholders, which can be profit-oriented but can also be driven by other motivations (such as environmental or social impact). The initial applications of IDEM make explicit that irrespective of the domain (e.g. mobility / logistic versus biomedical settings) IDEM can lead to changes or improvements to draft business models. Future applications of IDEM should support these claims. Moreover, the results from our utility evaluation hint that IDEM is perceived to be useful, although again the results should be expanded upon to truly draw conclusive statements. In this light, the usability of IDEM can be further improved as indicated by the results to further improve the utility of the method.

Chapter 8

INEM

8 INEM - Integration evaluation method

In this chapter, we elaborate the second artefact that we propose towards the support of service-dominant business model evaluation (in line with our context framework presented in Figure 28), namely, 'INEM' (**In**tegration **E**valuation **M**ethod). In Section 8.1, we briefly reintroduce the objectives central to our method and define the scope. In Section 8.2, we elaborate on the design steps followed, and the building blocks used to support the design. Section 8.3 present the artefact in detail, including the steps, rules and activities to be followed. To support automation and use of the artefact, we introduce an Excel tool based on our process description in Section 8.4. In Section 8.5, we illustrate the application of INEM by means of the Free-ride Amsterdam business case that is introduced in Section 5.5. In Section 8.6, we discuss the evaluation procedure followed for INEM and the results along the validity and utility dimensions. Finally, we summarise and conclude this chapter in Section 8.7.

8.1 Method objectives and scope for INEM

In Section 4.2.2 we have introduced the objectives for INEM. As described, INEM aims to support the evaluation of service-dominant business models in the integration phase of business model innovation. The goal of this phase is to *concretise the business model design and to understand and analyse the value model underlying the business model design*, *to generate commitment of stakeholders for implementation*. On the basis of the analysis of the value model, it becomes apparent how each actor captures value from collaboration and whether the resulting outcome may motivate actors to participate in the business model, shedding light on the viability of the business model design (Morris et al. 2005). However, in light of service-dominant business models, this value model will considerably change as it depends on the contribution and participation of all stakeholders represented in the business network. Given the timing of this evaluation (which precedes the implementation phase of business models), quantitatively-oriented methods are typically used to analyse cost-benefit structures (McGrath 2010; Tesch and Brillinger 2017). Given the identified challenges, the following objectives for INEM have been defined (as described in Section 4.2.2) to support service-dominant business model evaluation in the integration phase:

INEM objective 1 – The artefact should facilitate users to quantitatively assess the value model of a service-dominant business model.

INEM objective 2 – INEM should support the decision-making process of actors to negotiate and concretise the value model of a service-dominant business model (in terms of costs and benefits).

Referring to Section 5.3, we have defined inputs, outputs, tools and rules for INEM. Given the sequential nature of IDEM (Chapter 7) and INEM, qualitatively validated service-dominant business models emergent from IDEM are further concretized (as part of the design activity of the integration phase) and consequently serve as input for INEM. We consider that application of INEM generates a quantitatively evaluated and accepted SDBM design as output. This quantitatively-evaluated SDBM design serves as the basis for implementation (for which all stakeholders are committed to implement the business model design). In case the application of INEM makes explicit that the service-dominant business model design is not acceptable, this consequently sparks the need for business model redesign, using any of the identified iteration loops (Figure 28).

8.2 INEM: design steps

As described in Section 4.2.3, we follow an extension-based strategy to guide the design of INEM. We selected *cost-benefit analysis* as our base method, which is commonly used to evaluate the value or revenue model of business models (Magretta 2002; Morris et al. 2005). However, traditional cost-benefit analysis offers no guidance on how a value model should be elicited from a SDBM design, even more so in service-dominant business settings, which are characterized by a networked perspective featuring many concurrent exchanges of services between business network actors. Therefore, the value model underlying a *service-dominant* business model differs from traditional, goods-dominant business models (which are considered from the perspective of a single actor rather than the entire network). Therefore, following an *extension-based strategy* and subsequent *domain-driven strategy* (Ralyté et al. 2003), we extend *cost-benefit analysis* by means of knowledge on value co-creation and value capture relevant to networked, service-dominant collaborations such that INEM can be used to support the analysis of the value model underlying a service-dominant business model design. To facilitate this, we have followed the following design steps:

1. **Understand the implications of SDL with respect to value co-creation and value capture in business models**

In service-dominant settings, organisations increasingly focus on core competencies and engage in networked collaborations to integrate and exchange resources to reduce the increased challenges of service complexity and need for agility (Vargo and Lusch 2008; Vargo et al. 2008). As a consequence, service-dominant business models are networked, in which value is co-created by means of service exchange between actors in the network. Services are exchanged for mutual betterment, resulting in reciprocal costs and benefits for the actor providing and receiving the service (Lusch et al. 2007). These costs and benefits can refer to financial transactions (e.g. a payment to an actor in exchange for the right to use a service) or non-financial transactions (e.g. the right to use a service or the knowledge obtained from exchange). Obviously, stakeholders examine whether the costs and benefits as a result of exchange are balanced to motivate participation (Grönroos 2011). Moreover, the co-creation value central to this collaboration depends on the participation of all stakeholders, as different configurations of services exchanged may result in a different co-created value.

In business model terms, the balance of costs and benefits is typically captured by means of the revenue model or, more neutrally, value model underlying the business model design (Morris et al. 2005; Al-Debei and Avison 2010). Although for traditional business models this value model is considered from the perspective of the focal organisation, the value model underlying a service-dominant business model entails all actors in the business model design, as each actor contributes to the co-creation of value. Therefore, concretisation of the value depends on how and what services are exchanged in a service-dominant business model design, and what costs and benefits are generated from this exchange (Reypens et al. 2016).

To provide structure to the concretisation of a value model of service-dominant business models, we should deduce how costs and benefits are generated and concretise these accordingly. Value is co-created at the network level, and consequently captured and appropriated by means of costs and benefits at the stakeholder level (Reypens et al. 2016). Stakeholders offer resources and services towards the co-creation of value, which results in reciprocal costs and benefits for the stakeholders that participate in the exchange of the service. These costs and benefits are consequently appropriated or valued at the stakeholder level, taking into account the complete scope of costs and benefits accrued and valuing the accrued costs and benefits under consideration of strategic motives and objectives. Costs and benefits may therefore be valued differently by different actors depending on their strategic goals.

As service exchange results in reciprocal costs and benefits (e.g. a payment which is a cost for the providing actor and a benefit for the receiving actor), the concretisation of these costs and benefits depends on both actors that participate in this exchange. Although service-dominant settings typically are collaborative in nature to facilitate co-creation of value (Lusch and Nambisan 2015) for which information governance and sharing is deemed important (Clauß et al. 2014; Rasouli et al. 2016), we observe that especially in competitive markets (such as more typical supply chain oriented settings), it is naïve to assume that all sensitive or organisational specific information is readily shared between actors (Flint and Mentzer 2006; Anderson et al. 2011). Accordingly, the concretisation of the value model of service-dominant business models requires adequate structure to support information governance between network actors and if needed the subsequent negotiation of the costs and benefits as a result service exchange. We take these implications as the basis for extending cost-benefit analysis to accommodate service-dominant business model analysis.

2. Extend cost-benefit analysis to accommodate the elicitation and analysis of the value model of service-dominant business models

On the basis of the implications of value co-creation and capture in service-dominant settings, which advocates the need for structure with respect to information governance towards the concretisation of the underlying value model, we extend traditional cost-benefit analysis by means of a structured process to guide the exchange of knowledge towards the concretisation of value models in service-dominant settings, taking into account the need for privacy with respect to sharing sensitive information and the subsequent need to negotiate how exchange is valued.

As a business model design is descriptive in nature and does not necessarily explicate how costs and benefits are generated in the business network (as a result of service exchange), we precede our extended cost-benefit analysis approach by means of a value modelling approach, for which we use an adapted notation of *value network analysis*, which is frequently used in conjunction with business modelling (Allee 2008). The subsequent value capture diagram makes explicit how costs and benefits are exchanged and captured, and as such helps to clarify what information should be shared between actors to concretise the resulting costs and benefits.

8.3 INEM: method overview

Our method entails a guiding process description that supports users in eliciting, concretising and analysing the underlying value model of a service-dominant business model design, such that each user on the basis of the outcomes of applying the method can determine whether a SDBM design is acceptable or viable (in terms of costs and benefits) in light of the strategic objectives and preferences.

As described, the first step concerns the derivation of a value model on the basis of a SDBM design, which explains how costs and benefits are exchanged as a result of service exchange. The second step represent the activity of guiding parameter setting with respect to the value model, such that actors can judge whether the resulting value model is acceptable (which facilitates the service-dominant business model to advance to the next phase in the innovation phase) or not (requiring the process to revert back and changes to the SDBM design to be made). An overview of the process description is presented in Figure 48. In the following sub-sections, we explain the high-level process steps indicated for the figure.

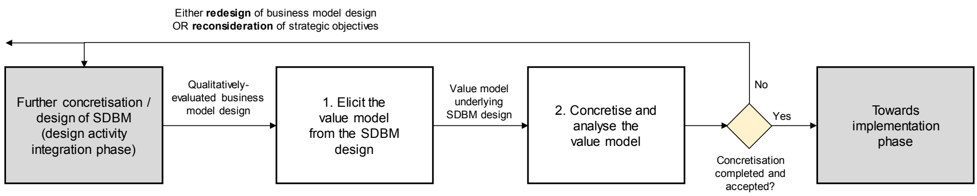

Figure 48: Stepwise process to support service-dominant business model evaluation in the integration phase

8.3.1 **INEM Step 1 – Elicit the value capture diagram from the SDBM design**

As the first step for INEM, we elicit/map the value model that underlies the SDBM, to understand how costs and benefits are exchanged in the service-dominant business model and which exchanged costs and benefits transactions may pose the need for further structure in terms of knowledge exchange and negotiation to be effectively concretised.

In order to do so, we adopt the value network analysis (VNA) approach as proposed by Allee (2003, 2008) to explore and map the value exchanges between actors for service-dominant business models. VNA considers exchanged objects to be either expressed in *tangible* (such as financial or capital resources) or *intangible* form (such as trust or tacit knowledge), and considers that the activity of exchange is either *contractual* (negotiated by both actors in the exchange, such that the effects of exchange can be monitored) or *non-contractual* (which helps to smoothen or support the exchange). It is argued that *tangibles* are always of a *contractual nature,* whereas *intangibles* can either be *non-contractual* or *contractual*. If desired, *intangibles* can as such be translated into *tangible* value outcomes (such as valuing knowledge in terms of monetary outcomes).

For the purpose of simplicity and the understanding of the value model of business models, we omit *non-contractual* exchanges, and focus on *contractual exchanges* between actors in the SDBM design, namely those that depend on the valuation of a single stakeholder or the negotiation and valuation of multiple involved stakeholders for the service exchange. Furthermore, we refer to *tangibles* as *financial value outcomes* (contractual and monetary, e.g. financial costs and benefits) and to *intangibles* as *non-financial value outcomes* (contractual, social or environmental costs and benefits) (Yunus et al. 2010; Bocken et al. 2015; Freudenreich et al. 2019), such that we can use the listed costs and benefits per actor in the SDBM design to explore how costs and benefits are exchanged and captured among network parties. We also note here that some costs and benefits may not be the result of exchange by actors in the design. We consider such costs and benefits as 'self-generated' (for instance, image of a company may not be the result of actor-actor exchange in the business model but a societal effect as a result of participation in the business model). For such cases, an object inflow is modelled (such as the service used) that is consumed by the respective actor to 'self-generate' these costs and benefits. We use the term object here to denote anything other than a non-financial or financial flow.

We use the notation depicted in Figure 49 to describe exchanges between actors, for which the arrows describe the direction of exchange.

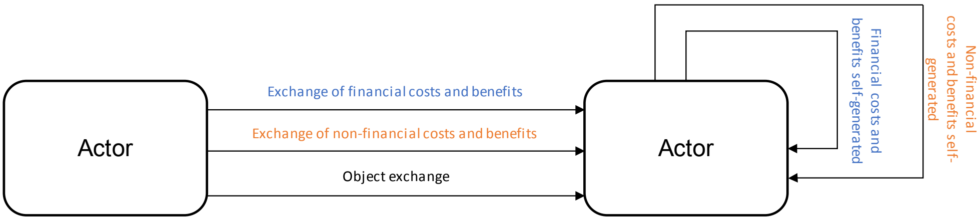

Figure 49: Notation for value capture diagrams

On the basis of the proposed concepts, we follow the steps listed below to generate the value capture diagram on the basis of a SDBM design:

1. *Map each actor participating in the SDBM design to the value capture diagram*
   In contrast to VNA, which may consider various internal and external actors depending on the business network, value capture diagrams focus explicitly on the SDBM design as the basis for generating the value model. Accordingly, we map each actor represented in the SDBM design to the value capture diagram.

2. *Map the exchange of financial costs and benefits between actors*
   On the basis of the costs and benefits listed in the SDBM design, we explore how financial value is exchanged between actors in the design. To do so, we exhaust the set of costs and benefits for the actors listed and map each financial value item (e.g., cost or benefit) that is exchanged as a result of participation. For simplicity, we consider any exchanged financial value as a cost for the provider and considered a benefit for the receiver (Vargo et al. 2008). Accordingly, this may require some financial costs and benefits listed for the SDBM design to be restated or reversed to accommodate this.

3. *Map the non-financial value exchanges between actors*
   On the basis of the costs and benefits listed in the service-dominant business model design, we explore how non-financial value is exchanged between actors in the design. Again, we exhaust the set of costs and benefits per actor and map each non-financial value exchange, focusing on those non-financial value exchanges that are contractual (e.g. for which the sole purpose is not to smoothen the exchange).

4. *Complete the value capture diagram*
   The costs and benefits listed for the SDBM design that have not yet been mapped should now be explored, to understand how these are generated or whether these costs and benefits are truly needed. In case the value outcomes are 'self-generated', object inflows should be modelled such that these can be consumed to generate the listed value outcomes. Any costs and benefits after this step that have not been mapped should be removed from the design (either as the costs and benefits proved not valuable, erroneous or unnecessary).

The resulting value capture diagram that is generated on the basis of an SDBM design consequently serves as the input for step 2, which focuses on the concretisation of the resulting value model / value capture diagram.

8.3.2 INEM Step 2 – Concretise and analyse the value model

Taking the elicited value capture diagram as input, the next step is to concretise and analyse the value model, such that the viability of the service-dominant business model design can be assessed (Morris et al. 2005; Osterwalder and Pigneur 2010). As indicated, there is a need for structure in terms of knowledge exchange and negotiation on value exchange to guide decision makers in concretising the value model, as costs and benefits on the basis of exchange are reciprocal and therefore influence value capture of the respective actors. Furthermore, in any competitive setting, sharing organisational knowledge or data is sensitive, requiring adequate governance in order to support collaborations (Flint and Mentzer 2006; Provan and Kenis 2008; Clauß et al. 2014).

In response, this step entails a structured process that supports the *financial* value appropriation and capture in collaborative business networks, taking into account the need for governance with respect to knowledge exchange. The process complements and extends traditional cost-benefit analysis to account for the networked nature of service-dominant business models and the need to include the preferences and perceptions of multiple concurrent stakeholders to concretise the value model. For the cost-benefit analysis, we focus on analysing the *financial* costs and benefits (e.g. those value exchanges that are expressed or can be expressed in monetary terms). Although non-financial costs and benefits may have significant implications for any business collaboration (Yunus et al. 2010; Bocken et al. 2015), the intangible nature of these value outcomes makes it difficult to provide structured guidance on how for instance environmental outcomes should be negotiated upon. To deal with non-financial costs and benefits, we first analyse the balance of financial costs and benefits, and consequently offset this balance to the listed non-financial cost and benefit items per stakeholder. For instance, a negative financial balance (which can as such be considered as an investment) may be offset by the non-financial benefits a respective stakeholder captures from participation. Therefore, stakeholders consequently assess whether the total set of costs and benefits is acceptable given their strategic preferences and objectives.

In the next sub section, we introduce the structure needed to support the governance of information to concretise the value model of service-dominant business models, taking into account the need for privacy and sensitivity. We identify levels of decision concerns and explain how these relate to the concretisation of the value model. Following this structural basis, subsequently we elaborate on the process of concretisation of the value model and the use of concern levels to accommodate this process.

Concern levels in business networks and related parameter types

Collaborations in networked environments are complex, in which decisions with respect to value creation and capture are made on both the network and actor level (Jaakkola and Hakanen 2013; Reypens et al. 2016). In line with Reypens et al. (2016), organisations in collaborative networks typically go through three processes of decision making from a network perspective, namely *coordination*, *consultation* and *compromise*, which form a closed loop with decision making processes on the individual level, namely *anticipation*, *assessment* and *application*. On the network level, collaborative networks *coordinate* the tasks and activities they will conduct to support (actors in) the business models and the value they expect to exchange, they *consult* network partners to understand their needs and requirements with respect to value capture and they *compromise* to seek after scenarios in which all actors obtain acceptable outcomes (Reypens et al. 2016). In parallel, actors individually *anticipate* what they expect to capture from these collaborations in terms of value, they *assess* the extent to which they are able to capture value under the current scenario or conditions of a collaboration and they *apply* resources or exchange value to ensure that this expected value can be captured. The closed loop is illustrated in Figure 50.

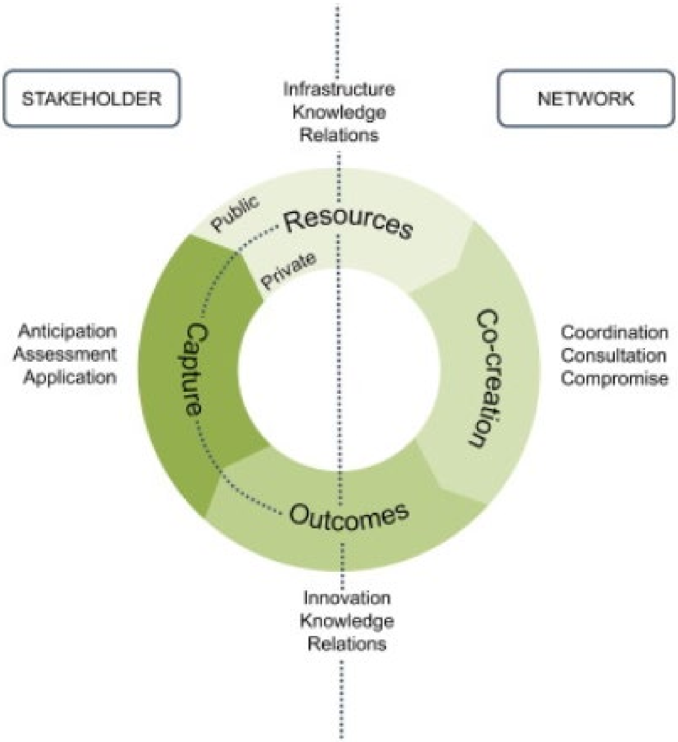

Figure 50: Decision making processes in networked collaborations (Reypens et al. 2016)

Based on Figure 50, we distinguish two concern levels related to the governance of information in service-dominant settings, namely the *public level* (information that *concerns* and is visible to the entire network) and the *private level* (information that only *concerns* and is visible to a single actor). It should be noted that information or knowledge exchange can occur between the *public* and *private level*. Actors may share private knowledge on the global level to support value co-creation or to stimulate innovation (Lusch and Nambisan 2015), whereas actors may draw from global knowledge to further improve internal processes or activities or to better understand how value is captured from the business model design.

Ideally, all information is exchanged on the network level to support decision making and trust, as network actors may use this knowledge to support service exchange or internal processes towards value co-creation (Vargo et al. 2008; Clauß et al. 2014). However, in a non-ideal world (such as competitive business environments), it is naïve to assume that all information is or should be shared on the network level. For instance, indicating the cost of internal operations or profit margins with respect to the collaboration may negatively influence the negotiation position of the organisation, as others in the network may use this knowledge to strengthen their positions. However, to concretise the value model, such knowledge may need to be shared to a *subset* of actors in the network, for example to negotiate on value exchange. Accordingly, we introduce a third concern level, namely the *restricted level* (information that *concerns* and is visible to a *subset* of actors that partake in value exchange).

We summarise the concern levels in Figure 51. The outer arrows describe the exchange from *private level* to *public level* (and vice versa), illustrating the knowledge dissemination between actors and the network. Individual actors may contribute new knowledge to the betterment of the entire business network, whereas these actors may draw from shared knowledge on the global level to improve internal operations or the exchange of services. The inner arrows describe the exchange between *public* and *restricted* level or *restricted and private* level, illustrating knowledge exchanged between network and subset of actors or subset of actors and individual actors respectively. As an example, outcomes of negotiations on the restricted level may be communicated to the global level, whereas negotiations on the restricted level require knowledge from the local level (individual actors) to support the negotiation process.

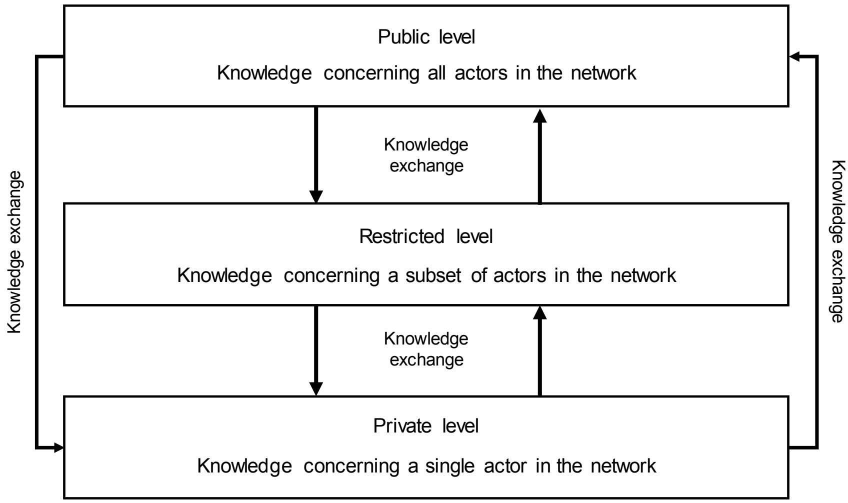

Figure 51: Levels of concerns in business networks

To accordingly support the concretisation of the value model of the SDBM design, we propose three types of parameters on the basis of the identified concern levels, namely *public parameters*, *restricted parameters* and *private parameters*. These parameters serve as the building blocks of the respective costs and benefits per actor.

Public parameters exist on the public or network level, affect all network actors, and as such are defined and concretised by all network actors jointly. Examples of *public parameters* can be the expected number of customers per time period or the number of service invocations per customer of the SDBM design. Typically, *public parameters* influence *restricted* or *private parameters*, as these provide the context in which these parameters are generated or exchanged (and may change on the basis of the context).

Restricted parameters only affect or refer to a *subset* of network actors and are related to the *restricted level*, typically part of service exchange. As a consequence, only the respective actors that engage in service exchange are able to concretise these parameters. Given the reciprocal nature of service exchange in terms of costs and benefits (Grönroos 2011; Maglio and Spohrer 2013), these parameters may require negotiation to be concretised. Examples of *restricted parameters* include the price of service exchange or the frequency of service exchange.

Lastly, *private parameters* influence only individual actors and as such can only be concretised by the respective actors. By definition, these parameters are not disclosed to other network actors. Examples of *private parameters* are the costs of operations or investments made to participate in the business model.

Process to support the concretisation of the value model

Following this conceptualisation of concern levels and the parameters that relate to these levels, we follow a stepwise process as presented in Figure 52 to support the concretisation of the value model by means of the identified parameters. The process is presented as a collaboration diagram (modelled using BPMN 2.0) that highlights the sequential steps taken to concretise the value model, featuring the interconnection and exchange of information between the *public*, *restricted* and *private* concern levels. In the following, we elaborate what each step entails.

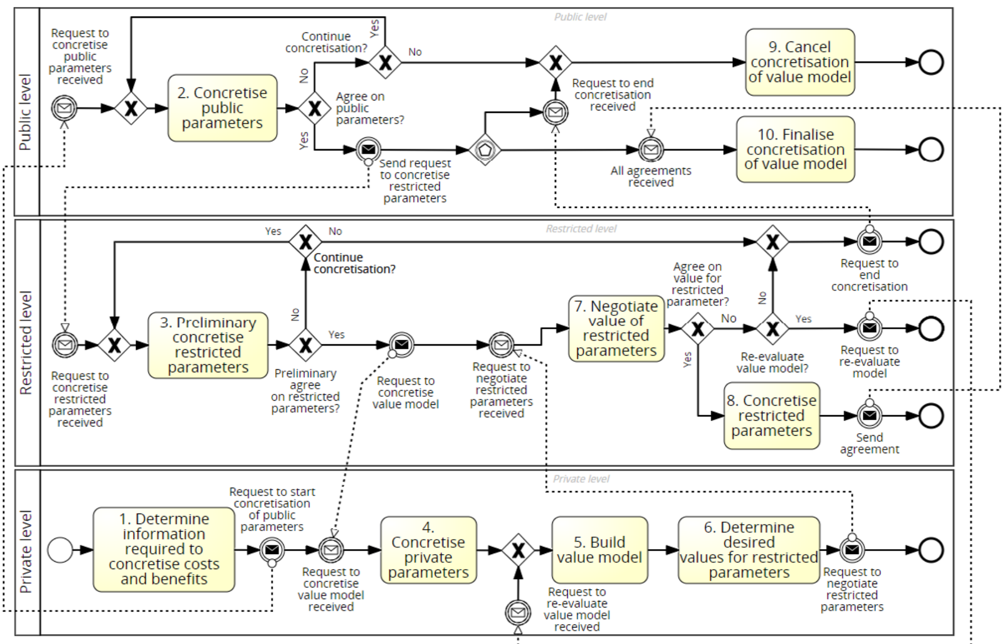

Figure 52: Step-wise process to support the concretisation of the value model of SDBMs

1. **Determine information required to concretise costs and benefits**

Description: The first step of the guiding process is for each actor to investigate and identify the information needed to concretise the costs and benefits that have been listed for the value capture diagram (which has been defined through the previous step of INEM). As explained, costs and benefits can be construed from restricted, private and if needed public parameters. Costs and benefits that are accrued on the basis of exchange are always modelled via at least restricted parameters, as the concretisation of these costs and benefits depends on the preferences and needs of actors involved for this exchange. In contrast, self-generated costs and benefits are modelled via private parameters, as these costs and benefits solely depend on the respective actor at hand. Some information to effectively concretise the costs and benefits may be shared and agreed upon on the public level – this knowledge is captured by public parameters and may be used complimentary to restricted or private parameters. For this step, each actor should obtain a detailed understanding of what information (in terms of public, restricted and private parameters) is needed to concretise the costs and benefits per actor (and accordingly the value model).

Output: Understanding of parameters needed to concretise the costs and benefits

2. **Concretise public parameters**

Description: For this step, the business network discusses and concretises the set of public parameters needed to concretise the value model, which typically describe information such as the number of customers expected for the business model or the amount of service invocations expected per time period, which may accordingly scale or influence the resulting costs and benefits. These parameters typically are the result of collaborative discussions rather than set by a single (private parameters) or subset of actors (restricted parameters) Positioned on the public level, actors therefore actively and openly share information to concretise these parameters.

We should note that identifying and concretising the public parameters may feature several iterations as illustrated for the collaboration diagram. This may either result in a set of *public parameters* that has been agreed upon by the entire network, or result in a termination of the collaboration if the network is not able to agree upon the set of *public parameters*. In such cases, business model redesign may be required. It may occur that during the process the need for additional or a reconsideration of public parameters is needed. However, for the simplicity and clarity of the process, we encapsulate this activity at the start of the process. Once the set of public parameters has been agreed upon, a message is sent to the private level to concretise the value model.

Output: Set of values for public parameters for concretising the value model

3. Preliminary concretise restricted parameters

Description: This step entails the preliminary concretisation of the restricted parameters, to understand how the restricted parameters will be structured (for instance what pricing model will be used?) and what initial value can be set for the parameters. This initial value consequently is used for analysing the value model. Note that this value is preliminary and that the concretised, agreed upon value for this parameter can only be set after negotiation, once it becomes clear how each actor involved for the specific exchange individually performs in terms of business model participation (and accordingly what value for the restricted parameters each actor involved for the exchange prefers).

With respect to the collaboration diagram, one can see that the preliminary concretisation of restricted parameters may take several iterations. If actors involved for a specific exchange are not able to agree on the restricted parameters, this may result in the termination of the concretisation process (as illustrated by the message exchange to the public level, Figure 52).

Output: Set of preliminary values for restricted parameters for concretising the value model

4. Concretise private parameters

Description: The private parameters should be concretised before the value model can be concretised. Based on what knowledge is needed to concretise the self-generated costs and benefits, private parameters should be defined and concretised. As this task is positioned for the private level, concretisation can be conducted by the respective actor (it does not depend on the perceptions or knowledge of other actors in the business network).

Output: Set of values for private parameters for concretising the value model

5. Build value model

Description: Based on the values for the *public* and *private parameters* and the initial values for the *restricted parameters*, the value model expressed in costs and benefits per actor can be concretised, drawing upon the structure identified in step 1 (in terms of parameters or knowledge needed). In line with traditional cost-benefit analysis, each cost-benefit item is quantified and typically transformed to a pre-determined frequency or unit of analysis such that the resulting balance of costs and benefits can be calculated (which express the financial performance of an individual actor in the business model design). Once the value model is defined and concretised by means of (preliminary) parameter values, the process progresses to the next step.

Output: Concretised value model to analyse the (financial) performance of the respective actor

6. Determine desired values for *restricted parameters*

Description: The next step involves determining the desired values for restricted parameters, which depend on negotiation and appropriation by multiple concurrent actors. By means of the concretised value model, each actor can assess their financial performance given the current settings of the *public, restricted and private parameters*. This financial performance should consequently be considered in light of strategic goals, but also be contrasted to the non-financial costs and benefits that result from participation for the respective actor, to understand whether the total balance of costs and benefits (e.g., both financial as well as non-financial) is acceptable in light of the strategic goals of the actor. For translating strategic goals into business model specific key performance indicators, the technique introduced in Chapter 6 is used. As the values for the restricted parameters are still preliminary (see Step 2) this step focuses on exploring and analysing what set of values for the restricted parameters yield an acceptable performance. Through what-if scenarios (for which the value of the restricted parameter is changed) each actor examines what values for the restricted parameters are desirable, which serves as the basis for negotiation. Accordingly, without the need to share information on private parameters, each actor can assess under what settings of the restricted parameters the business model design yields acceptable outcomes, which consequently is used as the basis for discussion to further concretise the restricted parameters.

Output: Set of desired values for restricted parameters per actor

7. Negotiate value of *restricted parameters*

Description: Taking into account the set of desired values for a respective restricted parameter, the "*actors*" part of this exchange (to which the respective restricted parameter pertains) negotiate what value for the restricted parameter should be set. This discussion happens on the restricted level, implying that this only concerns those actors that are relevant for this respective restricted parameter. Depending on the amount of service exchanges (and thus underlying restricted parameters) an organisation participates in, this step can loop to account for all restricted parameters. As the viability of an SDBM design depends on establishing a perceived positive balance of costs and benefits per stakeholder, negotiation for this step requires the understanding of the needs and goals of the receiving or providing actor (Reypens et al. 2016). These perspectives should be brought together to explore whether an acceptable scenario per actor participating for this restricted parameter can be achieved. This step may yield several results. In the ideal scenario, for which all *restricted parameters* can be agreed upon, the process moves to the next step. However, in case actors fail to form an agreement on the value of one or more *restricted parameters*, either a re-evaluation of the value model may be needed, or the collaboration ceases. For the former (e.g. re-evaluation), it is required to explore different settings of the current restricted parameter or to explore different value settings for other *restricted parameters* to compensate a deficit or loss accrued. Again, the goal is to find a set of values for the restricted parameters under which an acceptable scenario (in terms of performance) is established. This is illustrated by the message exchange "send request to re-evaluate value model" (see Figure 52) that feeds back to the private level, and facilitates the actor to re-evaluate its value model (on the basis of the novel insights). For the latter, the results of the step demonstrate that no acceptable set of values for the restricted parameters can be found. Accordingly, the process should be terminated (see step 6) and the business model design should be reconsidered.

Output: Either agreement on value of restricted parameters, request for re-evaluation of value model, or request for cancellation of concretisation of value model.

8. **Concretise value of restricted parameters**

Description: In case the negotiation is successful and an acceptable set of values for the restricted parameters is found, the values can be concretised. The formalised agreement on the service exchange as an output of this step consequently is communicated to the network. Note that this message exchange only indicates a successful negotiation and does not necessarily detail what set of values have been selected for the restricted parameters (such that sensitive organisational data is kept in the private or restricted level).

Output: Formalised agreement on value of restricted parameters

9. **Cancel concretisation of value model**

Description: If at any of the concern levels negotiations on parameter settings break down as actors either on the public level or restricted level are not able to agree on acceptable values for the elicited parameters (which as a result leads to an inviable business model design), the business network may choose to cancel the process of concretising the value model. As a result, the structure of the business model design should be reconsidered, improved or adjusted. This may entail a reconsideration of the value model (are costs and benefits missing or should these be measured or quantified differently?) or even a change in structure of the SDBM design. For the latter, the business model innovation process reverts back to the ideation phase to generate new design alternatives. We refer the reader to Chapter 7 which offers guidance on how to evaluate SDBM designs in this phase.

Output: Request for revision or adjustment of the SDBM design

10. **Finalise concretisation of value model**

Description: If negotiations with respect to the value of **all** restricted parameters are successful, which in turn leads to a perceived positive balance of costs and benefits for each actor (in light of strategic objectives with respect to participation), the decision-making process is finalised. Accordingly, the current settings for the SDBM design (along its parameter settings) are formalised, which may include activities such as contracting to establish short or long-term agreements. This moreover concludes the integration phase of business model innovation (each actor agrees to participate in the business model design) and marks the start of the implementation phase.

Output: Agreement of all actors to participate in the current service-dominant business model design.

Through application of the process description, actors participating in a SDBM design can guide the concretisation of costs and benefits (captured by the value model underlying the business model) and subsequently analyse whether the balance of costs and benefits accrued is acceptable with respect to their strategic objectives and needs.

8.4 Excel tooling to support quantitative analysis

To support the use of the concretisation process of actor respective value models and to illustrate the resulting financial performance per actor, we developed an Excel tool that provides automation to certain steps of the guiding process to concretise costs and benefits of the value model. A conceptual overview of this Excel tool, its functionalities and its mapping to the concretisation process is presented in Figure 53. As can be seen, the tool features three types of tabs, in accordance with the three identified levels of concerns (e.g., the *public, restricted* and *private* level). These tabs are the *public dashboard* (which applies to the entire business network)*, restricted dashboard* (applies to actors involved per service exchange) and *private dashboard* (applies to each actor individually) respectively. In the following, we will discuss each tab in more detail.

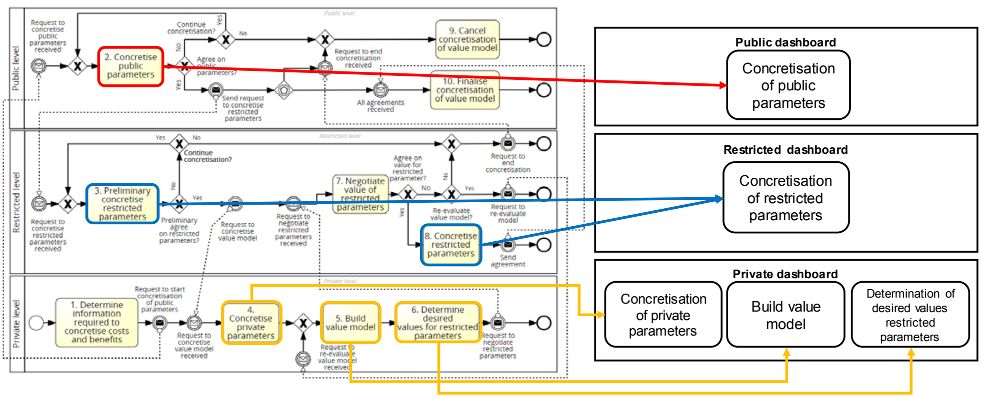

Figure 53: Conceptual mapping of process to functionalities of the tool

8.4.1 Public dashboard

The first tab represents the *public dashboard*, which is visible to the entire business network and serves as the starting point for discussion and concretisation of the value models per actor (Figure 54). The *public dashboard* displays information that concerns all actors in the business model design, and as such lists the relevant public parameters. Accordingly, all actors refer to the same public dashboard to share and obtain knowledge on public parameters. Parameters (not limited to public parameters) typically consist of the attributes *name*, *frequency* and *value*. The name refers to what object of knowledge the public parameter refers to. For instance, the public parameters already listed in Figure 54 refer to the number of service invocations (the use of the service underlying the business model design) and the number of users. One can further detail these objects by means of the value and frequency. The value logically is used to express the quantity or 'how much' of the object occurs for a given frequency. The frequency dictates how often this object occurs. For instance, for the current public parameters, "per day" indicates that the public parameter expresses the number of service invocations (object) per day (frequency). The frequencies listed in Table 17 are incorporated for the tool and can be used.

Public parameters		
Name	**Frequency**	**Value**
Service invocations	per day	1
Users	per invocation	1
Public parameter 3	per day	1
Public parameter 4	per day	1
Public parameter 5	per day	1

This tab serves to concretise the **public parameters.** All information needed by the network that can be publically shared is concretised here by means of the structure and value set for the parameters. We typically consider the following public parameters:

- Service invocation per time frequency: This refers to the number of times a service is used for a given time duration

- The number of users per service invocation: This refers to the number of individual users a service invocation may consist of

Depending on the knowledge needs of the network, other public parameters may be defined as well

Figure 54: Public dashboard represented in Excel tool for concretisation of value model

Table 17: Listed of frequencies included for the Excel tool

Item	**Description**
Per user	Expresses the parameter per user of the service **Prerequisite:** requires the number of users per service invocation to be specified as a public parameter
Per invocation	Expresses the public parameter per invocation of the service **Prerequisite:** requires the number of invocations per time unit to be specified as a public parameter
Per second	Expresses the parameter per second
Per minute	Expresses the parameter minute
Per hour	Expresses the parameter per hour
Per day	Expresses the parameter per day
Per week	Expresses the parameter per week
Per month	Expresses the parameter per month
Per year	Expresses the parameter per year

To use all frequencies in an automated way listed for the tool, the public parameters "Service invocations per time unit" and "users per invocation" should be present for the list of public parameters. This is a limitation of the use of Excel (which is not able to offer automated customised support), although we argue that these public parameters are typical concerns to any business model design (how many users do I expect for a service or how often do we operate our service in a given time dimension). The concrete settings selected for the public parameters (e.g., the frequency and value) are consequently forwarded to the *private dashboard* to be used for the cost and benefit concretisation.

Although the public dashboard is visible to all actors for a business model design, we need to specify which actor is responsible to concretise the public parameters (e.g., to specify the name, value and frequency of the parameter), to govern the flow of information, to improve usability of the public dashboard and to avoid scenarios for which multiple actors simultaneously concretise or edit parameter values. Accordingly, we pose that the *focal organisation* of the business network takes charge of the concretisation of public parameters. We select the focal organisation as it is typically considered as the initiator of the business model design and naturally serves as an information hub or integrator of knowledge within the business network (Clauß et al. 2014; Blaschke et al. 2019). Therefore, we posit that the network actors discuss outside of the tool's functionality the appropriate settings for the parameter, which consequently are concretised by the focal organisation in the network. Again, any public parameters are forwarded to the *private dashboard* to be used for cost benefit calculations (note that the lack of full automation requires the number of service invocations per time unit and the number of users per service invocations to be specified, in order to effectively use the 'per invocation' or 'per user' frequencies included).

8.4.2 Restricted dashboard

An overview of the restricted dashboard is presented in Figure 55, for which the restricted parameters are listed which pertain to actors that partake in service exchange in the business model design. As Excel does not feature account management or security, all restricted parameters are currently visible. Ideally, only those restricted parameters that are relevant to an actor, as the actor partakes in the respective service exchange for which the parameter is defined, should be visible for this actor. One can see that each restricted parameter consists of next to the attributes *name, frequency and value* also of the attributes: *provider* and *receiver*. These attributes indicate the provider and recipient of the respective restricted parameters, which facilitates the translation of these parameters to either costs or benefits, dependent on who is the provider and who is the receiver. The *provider* and *receiver* attribute should be therefore be concretised by means of the (company) name of actor. As the Excel tool is generic and accommodates up to 8 actors for a business model design, the names *'Actor 1', 'Actor 2' … 'Actor 8'* can be used. For example, if '*Actor 1'* is listed as the provider of '*Parameter 1*', then *Parameter 1* is displayed as the basis for the first cost item on the private dashboard of Actor 1. Similarly, if '*Actor 8'* is listed as the recipient of '*Parameter 5'*, then *Parameter 5* is displayed as the based for the fifth benefit item on the private dashboard of Actor 8. We illustrate this dynamic in Figure 56. The Excel tool accommodates up to 15 parameters to be specified.

Concretisation of these restricted parameters depends on the actors specified (provider and recipient). We posit that the focal organisation generates the initial restricted parameters, for which the provider and recipient consequently concretise the preliminary frequency and the initial value of the parameter. If actors are not able to agree on preliminary settings for the restricted parameters, the process is escalated to the public level (which may potentially result in termination of the concretisation process and may result in the need for business model redesign). Note that the final concretisation of these parameters occurs after individual analysis of the financial performance of actors on their *private dashboard* (which also includes costs and benefits that are *self-generated* rather than exchanged, and are captured by private parameters.

Restricted parameters				
Name	**Frequency**	**Value**	**Provider**	**Receiver**
Parameter 1	per day	1	Actor 1	
Parameter 2	per day	1		
Parameter 3	per day	1		
Parameter 4	per day	1		
Parameter 5	per day	1		
Parameter 6	per day	1		
Parameter 7	per day	1		
Parameter 8	per day	1		
Parameter 9	per day	1		
Parameter 10	per day	1		
Parameter 11	per day	1		
Parameter 12	per day	1		
Parameter 13	per day	1		
Parameter 14	per day	1		
Parameter 15	per day	1		

This tab serves to concretise the **restricted parameters.** Information with regards to these parameters is only visible to those actors to which a respective restricted parameter concerns (as the actor is part of the exchange for which the restricted parameter is specified). Note that as an actor may partake in several exchanges for the business model design, multiple parameters may be shown here.

Each restricted parameter has the attributes *name*, *frequency*, *value*, *provider* and *receiver*. The *provider* and *receiver* attributes are needed to indicate who is the recipient of the value of this parameters (therefore relevant to concretisation of benefits) and who is the provider (which corresponds to the concretisation of costs). Depending on the exchanges present for the business model design, any restricted parameters can be added here, which on the basis of the provider and receiver role are forwarded to the *private dashboard* (either the costs and benefits) of the respective actor.

Figure 55: Restricted dashboard represented in Excel tool for concretisation of value model

Restricted dashboard

Restricted parameters				
Name	Frequency	Value	Provider	Receiver
Parameter 1	per day	1	Actor 1	
Parameter 2	per day	1		
Parameter 3	per day	1		
Parameter 4	per day	1		
Parameter 5	per day	1		
Parameter 6	per day	1		
Parameter 7	per day	1		
Parameter 8	per day	1		
Parameter 9	per day	1		
Parameter 10	per day	1		
Parameter 11	per day	1		
Parameter 12	per day	1		
Parameter 13	per day	1		
Parameter 14	per day	1		
Parameter 15	per day	1		

Private dashboard

Costs based on restricted parameters				
Name	Frequency	Value	Yearly total	Total per month
Parameter 1	per day	1	365	30,41666667
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
Total costs of restricted parameters			365	30,41666667

Figure 56: Example for translating parameters from restricted to private dashboard

8.4.3 Private dashboard

An overview of the private dashboard is presented in Figure 57. The private dashboard represents an overview of the costs and benefits that are accrued from participation in the business model design on the basis of the current settings of public, restricted and private parameters. The private dashboard is divided into multiple sections, distinguishing costs and benefits that are the result of restricted parameters, costs and benefits that are self-generated (based on private parameters) and sections that accommodate users to conduct *what-if analysis*, to explore on the private dashboard how other settings for restricted parameters (either driving costs or benefits) may impact the resulting financial performance. Lastly, the private dashboards displays a results section, which describes the financial performance for the user under the current settings, as well as includes financial metrics such as NPV or break-even analysis typically used to further clarify financial performance (Mishan and Quah 2007). We will now zoom in for each of these sections and describe how these are used.

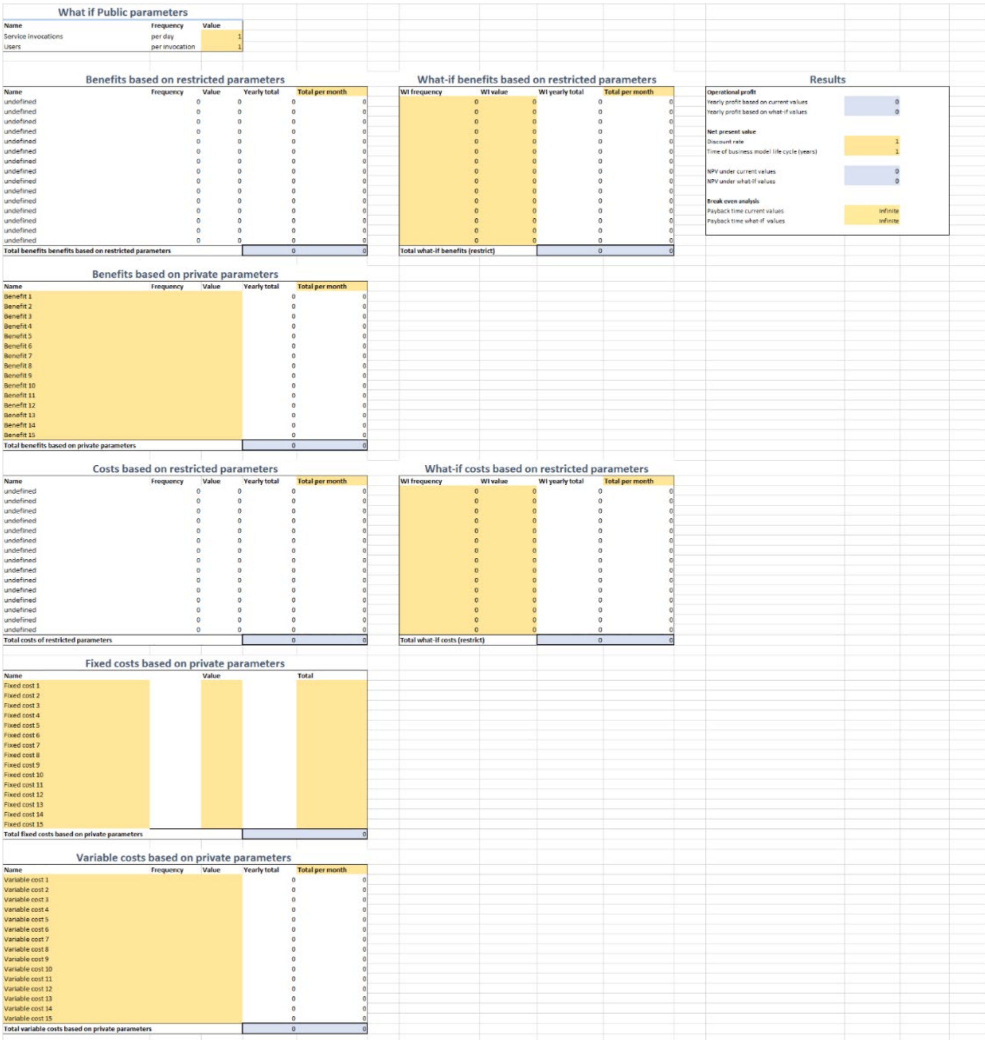

Figure 57: Private dashboard represented in the Excel tool for the concretisation of the value model

Benefits represented for private dashboard

Figure 10 provides a closer look on the benefits represented for the private dashboard. One can see that the benefits pertain to benefits that are based on restricted parameters (and therefore result from service exchange) and benefits that are based on private parameters (and therefore are self-generated or independent from other actors in the business model design). The settings selected for the restricted parameters specified for the *restricted dashboard* are forwarded to the 'benefits based on restricted parameters', if for these parameters the respective actor is indicated as recipient, as exemplified in Figure 58. Note that to include some form of automation, per actor specific private dashboard each row listed for this benefits section 'checks' whether for the corresponding row on the restricted dashboard the respective actor is listed, and if correct forwards the attributes *name, frequency* and *value* accordingly. These cells for the respective private dashboards should not be edited (as these depends on negotiation and agreement of both involved actors). The benefits listed contain two more attributes: *yearly total* (which transforms the frequency to 'per year') and *total per time unit* (currently specified as *total per month*). Through yearly total, all benefits are specified per year and consequently added to represent the total benefits based on restricted parameters (listed at the bottom). The attribute *total per time unit* can be edited (to values 'total per week', 'total per day', 'total per invocation' and 'total per user') and represent multiple perspectives of the total costs and benefits at different frequencies.

Benefits based on restricted parameters				
Name	Frequency	Value	Yearly total	Total per month
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
Total benefits benefits based on restricted parameters			0	0

Benefits based on private parameters				
Name	Frequency	Value	Yearly total	Total per month
Benefit 1			0	0
Benefit 2			0	0
Benefit 3			0	0
Benefit 4			0	0
Benefit 5			0	0
Benefit 6			0	0
Benefit 7			0	0
Benefit 8			0	0
Benefit 9			0	0
Benefit 10			0	0
Benefit 11			0	0
Benefit 12			0	0
Benefit 13			0	0
Benefit 14			0	0
Benefit 15			0	0
Total benefits based on private parameters			0	0

Figure 58: Benefits represented for private dashboard

The benefits based on private parameters depends solely on the knowledge of the actor at hand. These benefits can be freely expressed here by means of their frequency (which may draw on the settings of public parameters) and their value. Accordingly, per benefit, the yearly total and total per specified frequency are calculated and summed at the bottom of the section. The combined total for these sections represents all benefits that an actor accrues from participation in the business model design per time unit.

Costs represented for private dashboard

Figure 59 illustrates the sections pertaining to the costs accrued from participation. Similar to the benefits, we subdivide costs into costs that are the result of service exchange (influenced by restricted parameters) and costs that are self-generated (drawing upon private parameters).

Costs based on restricted parameters

Name	Frequency	Value	Yearly total	Total per month
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
undefined	0	0	0	0
Total costs of restricted parameters			0	0

Fixed costs based on private parameters

Name	Value	Total
Fixed cost 1		
Fixed cost 2		
Fixed cost 3		
Fixed cost 4		
Fixed cost 5		
Fixed cost 6		
Fixed cost 7		
Fixed cost 8		
Fixed cost 9		
Fixed cost 10		
Fixed cost 11		
Fixed cost 12		
Fixed cost 13		
Fixed cost 14		
Fixed cost 15		
Total fixed costs based on private parameters		0

Variable costs based on private parameters

Name	Frequency	Value	Yearly total	Total per month
Variable cost 1			0	0
Variable cost 2			0	0
Variable cost 3			0	0
Variable cost 4			0	0
Variable cost 5			0	0
Variable cost 6			0	0
Variable cost 7			0	0
Variable cost 8			0	0
Variable cost 9			0	0
Variable cost 10			0	0
Variable cost 11			0	0
Variable cost 12			0	0
Variable cost 13			0	0
Variable cost 14			0	0
Variable cost 15			0	0
Total variable costs based on private parameters			0	0

Figure 59: Costs represented for private dashboard

The costs based on restricted parameters follow a similar logic as their benefit counterparts and receive data from the *restricted dashboard* if a respective actor is indicated as 'provider' for a restricted parameter. Again, the value, frequency and name cannot be edited, and are translate to yearly costs in the 'yearly total' column. A preferred time frequency to express these costs can be set through the last column.

The costs based on private parameters comprise of *fixed costs* and *variable costs* and can be readily specified as these are not dependent on other actors. Fixed costs represent costs that have a one-time occurrence (such as a start-up investment) and therefore do not contain the attribute 'frequency'. The total investments therefore draw immediately upon the values specified per cost item. We specify these in detail as financial metrics such as NPV and break-even analysis depend on these type of cost items. The variable costs represent private costs that happen on a per event or time basis, and follow a similar structure as explained for the private benefits. Accordingly, users may specify the frequency of occurrence by means of the frequency attribute. Consequently, this is translated into yearly terms and summed. The total of 'costs based on restricted parameters' and 'costs based on private parameters' encompass the total costs of participation (per time unit).

What-if public parameters, benefits and costs

As we wish to avoid that actors are required to share sensitive or strategic information with respect to their accrued costs and benefits or strategic objectives, the private dashboard includes a set of *what-if* sections to accommodate what-if analysis on the settings of public and restricted parameters (Figure 60). Although public parameters typically are based on open and collaborative discussions, users may still desire to explore the effect of different settings for the public parameters (which may scale the costs and benefits). Accordingly, the section 'what-if public parameters' facilitates users to concretise (personal) public parameters without changing the collaboratively agreed upon public parameters and making this explicit to other actors in the business model design. The settings for these what-if public parameters consequently are used to scale the what-if costs and benefits (in a similar way to the original costs and benefits). As explained, the current functionality of the Excel tool demands the public parameters 'service invocation per time unit' and 'users per invocation' to be specified to effectively use the listed frequencies for the tool (Table 17).

What if Public parameters

Name	Frequency	Value
Service invocation	per day	1
Users	per invocation	1

What-if benefits based on restricted parameters

WI frequency	WI value	WI yearly total	Total per month
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
Total what-if benefits (restrict)		0	0

What-if costs based on restricted parameters

WI frequency	WI value	WI yearly total	Total per month
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
Total what-if costs (restrict)		0	0

Figure 60: What-if sections to explore parameter settings

As the restricted parameters require negotiation to be appropriately concretised, for which users explore under what settings of the restricted parameters a desirable balance of costs and benefits (in light of strategic objectives) is achieved. Illustrated for the overview of the private dashboard (Figure 57), these sections are positioned next to the original costs and benefits based on restricted parameters: each row for the what-if costs and benefits therefore refers to the original benefit or cost listed (if any). Users can accordingly use the attributes 'WI frequency' (following the listed options in) and 'WI value' to explore different settings for the restricted parameters without negotiation or discussion on strategic preferences, which consequently is translated to yearly what-if benefits and costs (and can be specified further using the attribute time . As the private parameters solely depend on the perception and knowledge of the actor at hand, the resulting costs and benefits for these parameters do not accommodate what-if analysis. Using these what-if sections, users can explore different settings for both public parameters and restricted parameters and as such can support negotiation and discussion without the need to share sensitive data or to communicate in detail strategic objectives.

Results of value model analysis

Figure 61 details the results section of the value model concretisation and analysis. The results section includes the operational (yearly) profit, as well as include two financial performance metrics to detail the outcomes of the value model, namely net present value or *NPV*, a project valuation metric that accounts for the time value of money, and *break-even analysis*, a technique that calculates the time until the net balance of costs and benefits is zero. To effectively use these metrics, the user should specify the value of the discount rate (range 0-1, 1 corresponding to 100%) and the expected life time of the business model design (in years). One can see that for each item, a distinction is made between outcomes based on original or current values / settings and outcomes based on what-if values / settings. Logically, results referring to current values draw upon current, (preliminary) agreed upon settings for the public and restricted parameters, whereas results with respect to what-if values draw upon what-if settings for the public and restricted parameters. This result section enables users to obtain a quick overview of the outcomes with respect to operational profit, NPV and break-even analysis. Exploring different settings for the what-if public and restricted parameters, users can compare how each scenario compares to the current, agreed upon values, and should determine under what conditions or settings participation in the business model design is acceptable. In terms of financial performance, the outcome for NPV should typically be higher than zero, as a negative NPV implies that participation in for the business model design is not profitable (although any actor should consider whether this negative financial performance may be offset by non-financial benefits). Similarly, from a financial perspective, the outcome for the break-even analysis should not be infinite (as this implies that costs incurred are never compensated) and should be considered in light of how quick investments should be compensated.

Results

Operational profit	
Yearly profit based on current values	0
Yearly profit based on what-if values	0
Net present value	
Discount rate	1
Time of business model life cycle (years)	1
NPV under current values	0
NPV under what-if values	0
Break even analysis	
Payback time current values	Infinite
Payback time what-if values	Infinite

Figure 61: Results represented for private dashboard

8.4.4 Use of the tool to accommodate the concretisation process

In this section, we provide a brief overview of how steps of the concretisation process are supported by the tool. We distinguish here between *automated tasks* (i.e. are fully supported by the tool), *user-oriented* tasks (i.e., require the user to give input for the tool to support the step) and *manual* tasks (i.e., occur outside of the functionalities of the tool).

1. Determine information required to concretise costs and benefits – *manual task*

The first step, to determine the information required to concretise actor-specific costs and benefits, is a manual task and occurs outside of the functionality of the tool. In this step, actors themselves investigate what knowledge or information is needed to correctly build costs and benefits on the basis of the set of design parameters (e.g., public, restricted and private parameters). Although the introduced parameter structure is relevant, the tool itself does not explicitly support understanding what knowledge is needed to construct the costs and benefits.

2. Concretise public parameters – *user task*

Concretisation of the public parameters is supported through the tools. As discussed, the network shares information on what public parameters should be selected and openly discuss how these parameters should be concretised, taking into account expectations with respect to the outcomes of the business model (e.g., the expected number of customers or the forecasted number of uses of the service solution). Consequently, these public parameters are concretised by the focal organisation for the tool on the *public dashboard*, such that each actor can use this data with respect to the concretisation of their respective value models (on the *private dashboard*).

3. Preliminary concretise restricted parameters – *user task*

In a similar fashion to the public parameters, the restricted parameters are preliminary concretised by means of the tool. On the *restricted dashboard*, actors relevant to the respective restricted parameter preliminary concretise the value of the restricted parameters, which consequently is forwarded to the *private dashboard* to be used for cost-benefit calculations by means of the *provider* and *receiver* attributes. Although the discussions on the restricted parameters occur outside of the tool, the outcomes of these preliminary discussions are made explicit for the parameters listed within the tool.

4. Concretise private parameters – *user task*

Analogously to the public and restricted parameters, the private parameters are also concretised by means of the tool. However, rather than listing the private parameters explicitly and separately, the private parameters for the Excel tool are immediately incorporated for the calculations of the private costs and benefits.

5. Build value model – *automated task*

Taking into account the settings specified for the *public, restricted* and *private parameters*, the tool automatically calculates the resulting costs and benefits per actor, and displays the yearly financial performance of the actor under the current parameter settings. If desired, the user can however specify to view the costs and benefits for different time frequencies (such as monthly costs or benefits).

6. Determine desired values for restricted parameters – *user task*

This step requires users to analyse or assess whether the settings currently used for the parameters are satisfactory or acceptable in light of strategic objectives and / or to explore the range of settings that are acceptable for the actor (to participate in the business model design). Using the what-if sections included for the tool, the user accordingly can use different settings for the public and restricted parameters and examine how these affect the financial performance (and consequently overall performance) of the respective actor in the business model. As this task is executed on the *private dashboard*, this is not visible to other actors. The outcomes of this task serve as the basis for discussion on restricted parameters.

7. Negotiate value of restricted parameters – *manual task*

Negotiation on the value of restricted parameters is not supported through the functionality of the tool. Supported by the output of the previous task (an understanding of what parameter settings work), actors should negotiate how the restricted parameters should be concretised and jointly work towards finding acceptable parameter settings for both actors, but also for all restricted parameters defined for the business model design (which obviously is not a trivial task).

8. Concretise restricted parameters – *user task*

If negotiations are successful, the corresponding settings for the restricted parameters are concretised by means of the tool (on the *restricted dashboard*) in accordance with steps 3-5. In contrast to the collaboration diagram, the Excel tool does not accommodate the communication of the outcomes of the negotiation to the network.

9. Cancel concretisation of value model – *manual task*

If at any step of the process negotiation or concretisation of parameter settings breaks down, the collaboration may choose to cancel the concretisation process. This step is not supported by means of the tool, but would require the collaboration to come together and discuss the next action steps (such as business model redesign or reconsideration).

10. Finalise concretisation of value model – *manual task*

If the concretisation of the value model is successful (e.g., all actors in the business model design agree upon the settings selected for the defined parameters), the concretisation is finalised. Typically, this step would involve setting up preliminary contracts to formalise the values set for the parameters, such that the collaboration can start the implementation of the business model design. Therefore, this occurs outside of the functionality of the tool, which primarily serves to support actors in exploring and evaluating parameter settings for the underlying value model of a business model design.

8.5 Application of INEM

We illustrate the application of INEM by means of the running case study Free-Ride Amsterdam (FRA) that we introduced in Chapter 5, which has also been used for the application and demonstration of IDEM (Chapter 7). As IDEM and INEM are sequential in nature, we use the output of IDEM (the revised SDBM design as illustrated in Figure 44) as the input for INEM. To apply INEM, we follow the steps presented in Sections 8.3.1 and 8.3.2 which entail (step-1) *elicit the value capture diagram from the* SDBM design (to capture the value model underlying the business model design) and (step-2) *concretise and analyse the value model* (to facilitate the analysis of the value model). We have conducted the application of INEM in close collaboration with two stakeholders that were involved in this mobility initiative.

8.5.1 Step 1 – Elicit the value capture diagram from FRA

Using the technique introduced in Section 8.3.1 and the notation illustrated in Figure 49, we have generated the value capture diagram for the Free-Ride Amsterdam case as illustrated in Figure 62. Following the steps indicated in Section 8.3.1, we first mapped each of the actors represented for the service-dominant business model design. Next, we mapped the financial costs and benefits, determining whether each cost and benefit is accrued on the basis of exchange (and thus should be modelled by means of an arrow between actors) or is self-generated. Next, we mapped the non-financial costs and benefits, following the same principle as for the financial costs and benefits. Lastly, as some financial and non-financial costs and benefits are self-generated, we completed the figure by means of a set of object exchanges.

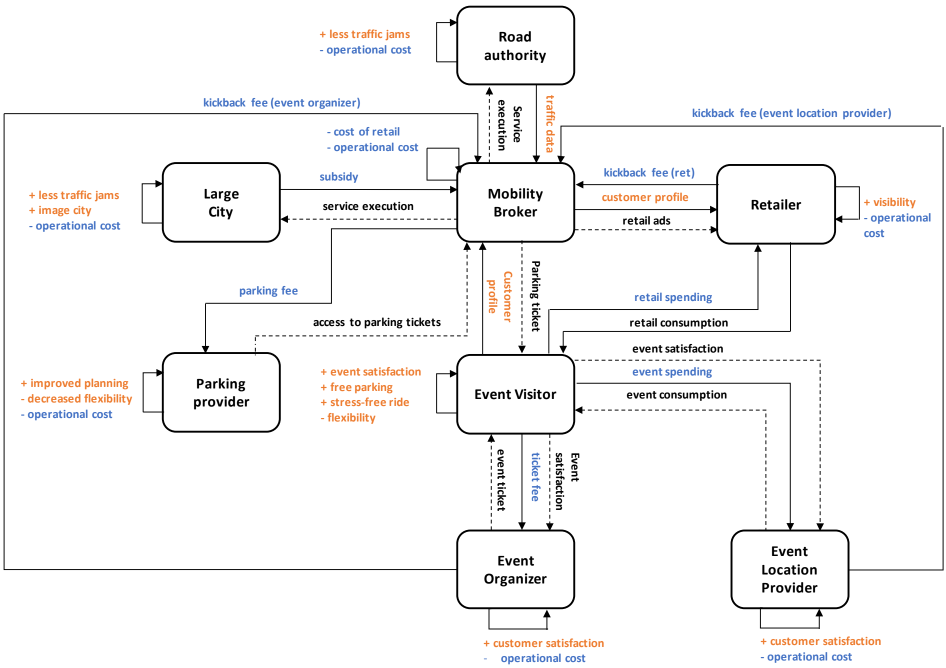

Figure 62: Value capture diagram for Free-Ride Amsterdam case

One can see that the all costs and benefits per actor (represented in the outer ring of the SDBM/R) have been mapped to exchanges for the value capture diagram to understand and make explicit the underlying value model of the service-dominant business model design. Accordingly, the value capture diagram makes explicit what costs and benefits are the result of service exchange, and what costs and benefits are self-generated. As described in Section 8.3.1, the technique distinguishes between *financial, non-financial* values and objects which are not directly valued (colour-coded by means blue, orange and black respectively). The exchange of objects is used to 'complete' the value capture diagram and to facilitate the self-generation of costs and benefits. For instance, the *mobility broker* implicitly offers *service execution* to the *large city* (which we present as the abstract object exchange), such that the large city is able to self-generate a decrease in traffic jams and an increase of the image of the city.

Given its orchestrating position, one can see that the *mobility broker* features for a large set of exchanges, serving as a hub for exchanging the service in return for financial compensation. This is modelled via the reciprocal exchange of *financial value* and *object / non-financial value*. As the end-user of the service, we also see that the *event visitor* too features for a significant number of value exchanges, whereas some actors (such as the road authority, large city or parking provider) only have bilateral exchange relationships with the mobility broker.

Through the value capture diagram, we can make explicit the set of financial transactions or exchanges that occur on the basis of service exchange, by taking into account only the blue exchanges (as inflows and outflows), which is highly relevant to the next step of INEM (e.g., concretise and analyse the value model), as these costs and benefits require *restricted parameters* to be modelled. An overview of these exchanges in terms of provider / receiver is presented in Figure 63.

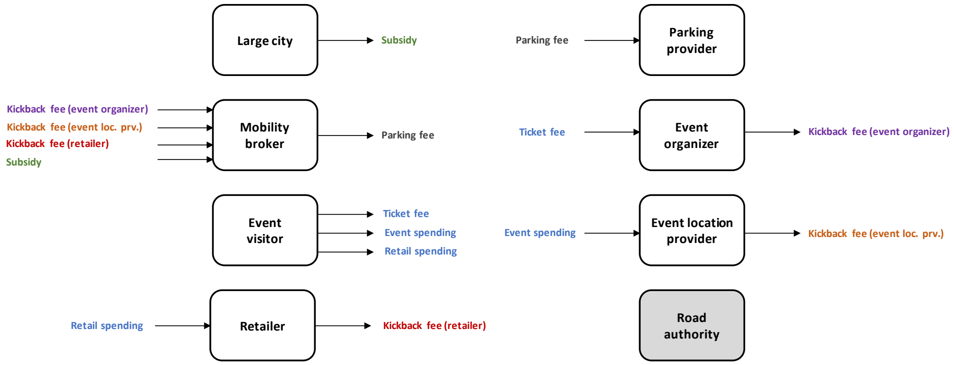

Figure 63: Breakdown of financial value in- and outflows of actors for FRA

One can see that the road authority, as a key contributor to the business model and the related service offering, is not involved in any financial exchange of value. This indicates that the viability of the business model design for the road authority depends on the non-financial benefits it accrues from participation, which should be measured and compared to the non-financial costs incurred. A similar case can be presented for the large city and event visitor, which, next to any self-generated financial and non-financial costs and benefits, do not feature any inflow of financial value. As such, viability for these actors depends on what benefits they receive or capture in terms of non-financial value outcomes. Again, we see that the mobility broker as the hub of the network is involved for many costs and benefits part of exchange, for which negotiation is needed to concretise the underlying parameters.

From the value capture diagram, we can deduce what costs and benefits each actor accrues from participation, and importantly what costs and benefits are exchanged, what restricted parameters -as a consequence- should be negotiated, and what benefits or costs are self-generated and can be considered private parameters.

8.5.2 Step 2 – Concretise and analyse the value model of FRA

As a next step, the value model is concretised and analysed, which should make explicit whether the SDBM design from a quantitative perspective is viable for the actors involved. To do so, we follow the process description depicted in Figure 52 to guide the concretisation of the value model per actor, and use the previously introduced Excel tool (Section 8.4) to support the process and to illustrate the results of the analysis. However, as FRA features a significant number of actors for which the concretisation would be rather time-intensive (as each actor should go through the entire concretisation process), we focus for this application solely on the perspective of the mobility broker, to illustrate the working of this step of INEM.

1. Determine the information needed to concretise costs and benefits

As a first step, each actor represented for FRA determines on the basis of their accrued financial costs and benefits what information is needed to concretise these costs and benefits. Given our indicated scope, we focus on the mobility broker of FRA, which accrues the financial cost and benefit items as indicated in Table 18 from participation in the business model design.

Table 18: Financial costs and benefits for mobility broker in FRA

Financial benefits	Financial costs
Kickback fee (retailer)	Parking fee (parking provider)
Kickback fee (event location provider)	Operational cost
Kickback fee (event provider)	Cost of retail advertisements
Subsidy (large city)	

Taking these financial costs and benefits as a basis, the mobility broker determines what information would be needed to effectively concretise these costs and benefits. As mentioned in Section 8.4.4, this step is not supported by the tool. The mobility broker determines that some of the costs and benefits (such as operational costs, parking fee and kickback fees) are dependent on the number of customers (e.g. event visitors) the business model will have or the amount of service invocations (e.g., events) per time unit will occur. For instance, the parking fee is likely to depend on the number of users of the service, as each user receives a free parking ticket which should be compensated by the mobility broker. Concretisation of the exchanged costs and benefits moreover depends on information with respect to price of the service and the frequency by which this price is paid. For instance, although the kickback fee of the retailer can be irrespective of the number of users for the service, a price per frequency should still be set to concretise this benefit for the mobility broker (and the related cost for the retailer). The operational cost and cost of retail advertisements in contrast are self-generated, and therefore are not dependent on the knowledge of other actors (modelled through private parameters).

2. Concretise the public parameters

The output of step 1 highlights the need to discuss collaboratively and specify public parameters related to the number of users expected for the business model design per time unit and the number of events per time unit. For the Excel tool, the public parameters as illustrated in Figure 64 are set, which consequently are forwarded to the *restricted* and *private dashboard* and used as to support the frequencies ‘per invocation’ (in this case, events) and ‘per user’ (in this case users of the service offering), to express costs and benefits using these public parameters. One can see that the events *per day* has been set to 1, whereas the number of users of the service *per event* has been set to 800.

Public parameters		
Name	**Frequency**	**Value**
Events	per day	1
Users	per invocation	800

Figure 64: Public parameters set for FRA

3. Preliminary concretise the restricted parameters

The preliminary concretisation of the restricted parameters concerns setting the frequency and preliminary or initial value for the restricted parameters for which the mobility broker is involved. To do so, actors relevant to a restricted parameter should come together to discuss these preliminary settings. As indicated, if no acceptable preliminary settings can be found (as it turns out that the preferred settings for the actors involved are significantly distant from each other), the setting of the restricted parameters may be terminated prematurely which leads to a termination of the concretisation process. In this case, the collaboration should explore how the SDBM can be redesigned. For the Excel tool, we have used the preliminary settings as depicted in Figure 65. Actor 1 corresponds to the *mobility broker*, Actor 2 to the *large city*, Actor 3 to the *parking provider*, Actor 4 to the *retailer*, Actor 5 to the *event location provider* and Actor 6 to the *event provider*. The restricted parameters have the following settings which are the result of initial negotiations between the respective actors. Note that the actual concretisation of these parameters occurs after the value model has been analysed. For the subsidy, a payment of 85.000 euro per month is initially set. Each kickback fee is set to a payment of 500 euro per event whereas lastly the parking fee is set to a payment of 5 euro per user of the service (e.g., the free parking ticket is compensated by a 5 euro payment). Based on the 'provider' and 'receiver' attribute, the settings are forwarded to the *private dashboard* as either costs or benefits.

Restricted parameters				
Name	**Frequency**	**Value**	**Provider**	**Receiver**
Subsidy	per month	85000	Actor 2	Actor 1
Kickback fee (retailer)	per invocation	500	Actor 4	Actor 1
Kickback fee (event location provider)	per invocation	500	Actor 5	Actor 1
Kickback fee (event provider)	per invocation	500	Actor 6	Actor 1
Parking fee	per user	5	Actor 1	Actor 3

Figure 65: Preliminary settings for restricted parameters in FRA

4. Concretise the private parameters

Private parameters for the mobility broker are related to the operational costs and the cost of retail advertisements. Although not indicated as a cost or benefit for the business model design, for demonstrational purposes we consider that the mobility broker also incurs investment costs as a one-time payment (e.g., a fixed private cost). As these private parameters are solely dependent on the mobility broker, the frequency and value of these parameters can be readily set. For the investment costs, the mobility broker considers a one-time expenditure of 50.000 euro to be needed. For the operational costs, a monthly expenditure of 500 euro is estimated to operate the service, whereas in terms of cost of retail advertisements 0.50 euro per user of the service is spent (for instance as ads on the platform the user of the services accesses to receive free tickets). For the Excel tool, these values are immediately translated to private costs on the *private dashboard*, as can be seen in Figure 66.

Fixed costs based on private parameters

Name	Value	Total
Investment cost	50000	50000

Variable costs based on private parameters

Name	Frequency	Value	Yearly total	Total per month
Cost of retail advertisements	per user	0,5	146000	12166,66667
Operational cost	per month	500	6000	500

Figure 66: Costs based on private parameters for the mobility broker

5. Build the value model

As explained in Section 8.4.4, the Excel tool automatically calculates the resulting costs and benefits for the mobility broker on the basis of the parameters set. An overview of the breakdown of costs and benefits for the current settings is illustrated in Figure 67, whereas the results or financial performance of the mobility broker for the current settings is illustrated in Figure 68.

Benefits based on restricted parameters

Name	Frequency	Value	Yearly total	Total per month
Subsidy	per month	85000	1020000	85000
Kickback fee (retailer)	per invocation	500	182500	15208,33333
Kickback fee (event location provider)	per invocation	500	182500	15208,33333
Kickback fee (event provider)	per invocation	500	182500	15208,33333
Total benefits benefits based on restricted parameters			1567500	130625

Costs based on restricted parameters

Name	Frequency	Value	Yearly total	Total per month
Parking fee	per user	5	1460000	121666,6667
Total costs of restricted parameters			1460000	121666,6667

Fixed costs based on private parameters

Name		Value		Total
Investment cost		50000		50000
Total fixed costs based on private parameters				50000

Variable costs based on private parameters

Name	Frequency	Value	Yearly total	Total per month
Cost of retail advertisements	per user	0,5	146000	12166,66667
Operational cost	per month	500	6000	500
Total variable costs based on private parameters			152000	12666,66667

Figure 67: Overview of the current total financial costs and benefits for the mobility broker

Results

Operational profit	
Yearly profit based on current values	-44500
Net present value	
Discount rate	0,05
Time of business model life cycle (years)	5
NPV under current values	-287161,7118
Break even analysis	
Payback time current values	Infinite

Figure 68: Results of the value model for the mobility broker for the current settings of parameters

One can see that for the current settings of parameters, the mobility broker (as indicated by the results section) incurs a yearly loss of 44.500 euro in order to participate in the business model design (note that the investment costs are not included here as these are fixed, rather than per year costs). On the basis of a discount rate of 5% and an expected life time of the business model design of 5 years, the net present value of business model design is expected to be -287162 euro. As a loss is incurred yearly, the payback or break-even time is logically infinite, as the investment costs are never compensated. The breakdown of costs and benefits illustrates that the parking fee paid weighs heavily for the total costs.

6. Determine the desired values for the restricted parameters

Considering the strategic intent of the mobility broker (which in Section 6.4 we have highlighted to be profit-oriented for which the operationalised KPI deems that participation in the business model design should yield an acceptable profit per event), the current settings of the parameters would not yield an acceptable business scenario for the mobility broker. Moreover, the mobility broker also incurs non-financial costs (such as the need to share customer data to the retailer) this may further negatively affect the overall perceived performance of the mobility broker. Accordingly, exploration of different settings or values for the restricted parameters is required, using the what-if sections included to the Excel tool. For simplicity, we do not alter the public parameters (using the respective what-if functionality), as the mobility broker deems the settings for the public parameters to be adequate. Moreover, for the purpose of demonstration we only focus on the restricted parameter *subsidy*, which involves the mobility broker and the large city. Note however that any of the restricted parameters can be used for this step.

For the current setting, the large city pays a subsidy of 85.000 euro per month to the mobility broker to facilitate the service, which amounts to 1.020.000 euro yearly benefits for the mobility broker in terms of subsidy. In turn the large city benefits in terms of an expected decrease in traffic jams and an expected increase in image of the city. Using the what-if functionality included in the tool (as described for the overview of the *private dashboard* in Section 8.4.3), the mobility broker explores different values for the restricted parameter subsidy, and finds that a subsidy of *90.000* euro per month (not adjusting any other settings) yields a yearly operational *profit* of 15.500, a NPV of 132.607 euro and a break-even time of 3.3 years (as illustrated in Figure 69). Assuming that this entails an acceptable profit for the mobility broker, under *these what-if* settings of the restricted parameters an acceptable business scenario for the mobility broker is created. The set of preferred values for the restricted parameters consequently serves as the basis for discussion and negotiation.

Results	
Operational profit	
Yearly profit based on current values	-44500
Yearly profit based on what-if values	15500
Net present value	
Discount rate	0,05
Time of business model life cycle (years)	5
NPV under current values	-287161,7118
NPV under what-if values	132606,8884
Break even analysis	
Payback time current values	Infinite
Payback time what-if values	3,3

Figure 69: Comparison of results for 85.000 (current) and 90.000 (what-if) euro subsidy

7. Negotiate the value of the restricted parameters

The output of step 6 serves as the foundation for discussion and negotiation towards concretising the restricted parameters. In this example, the mobility broker and large city should discuss whether a subsidy of *90.000 euro per month* rather than 85.000 euro per month is acceptable for the large city, which amounts to an increase of financial expenditures of 60.000 euro on a yearly basis for the large city. To do so, the large city should consider whether the total balance of costs and benefits (e.g., both financial and non-financial) is still perceived to be positive. Referring back to Figure 62 and Figure 63, we observe that the large city accrues non-financial benefits in terms of expected reduction of traffic jams and increased image of the city, and incurs expected costs related to subsidy and operational activities. The large city therefore should assess, in light of its strategic objectives, whether the expected reduction of traffic jams and increased image of the city can compensate the monthly costs in terms of subsidy and operational activities. In case the increase of subsidy payment is not acceptable, the large city should communicate to the mobility broker that these settings for the subsidy are not acceptable, and that either the mobility broker should re-evaluate its value model (using different restricted parameter settings) or should escalate to the public level that no suitable settings for all actors can found. However, in case this proposed increase in subsidy is acceptable (as for instance the traffic effects are highly desired or prove to be substantial in light of strategic objectives), the negotiations are completed and concluded. Note that for the business model to be fully concretised, all restricted parameters should be agreed upon, which may require several iterations of re-evaluating personal value models before suitable settings can be found. This indicates the complexity of this decision making and concretisation process.

8. Concretise the restricted parameters

Assuming the negotiation is successful and suitable parameter settings for both involved actors are found, the value of the restricted parameter can be concretised. The mobility broker accordingly refers to the *restricted dashboard* and concretises the restricted parameter *subsidy*. Consequently, this is reflected for the value model of both the mobility broker (as a benefit) and the large city (as a cost). Success of the negotiation should furthermore be communicated to the public level.

9. Cancel concretisation of the value model

If at any step of the concretisation process either discussions on public or restricted parameters break down, the collaboration can decide to cancel the concretisation process. Essentially, this implies that for the current SDBM design no viable business case can be found. However, for the example case, we consider that negotiations are successful. As such, this step is skipped.

10. Finalise concretisation of value model

Under the assumption that all actors for FRA are able to agree on the settings of the restricted parameters, and assuming that both the large city and mobility broker agree on a monthly subsidy payment of 90.000 euro, the concretisation of the value model is completed. It should now be apparent for each actor how they benefit from participation in the SDBM design, and should motivate each actor to commit to the business model design (the challenge for the integration phase of business model innovation). Accordingly, the collaboration can focus on the implementation of FRA.

8.6 Evaluation of INEM

In this section, we discuss the evaluation of INEM. Analogously to IDEM and in line with design science research (Hevner et al. 2004; Gregor and Hevner 2013), we evaluate the validity and utility of INEM. As the complete analysis of a service-dominant business model design is strenuous and requires significant effort (especially if multiple service exchanges are designed, which goes far beyond time and scope of a PhD project), we only evaluate the validity of INEM through a single illustrative case (which we have elaborated for the running case above). With respect to the utility of INEM, we organised and conducted three online workshops with industry experts to demonstrate the working and outcomes of INEM and to discuss and understand the usefulness, ease of use and intention to use of the proposed design artefact.

8.6.1 Evaluating the utility of INEM with industry experts

To evaluate the utility of INEM, we organised three online workshops [1] with industry experts to elicit their opinion on the *usefulness*, *ease of use* and *intention to use* (Davis 1989) of INEM to support the quantitative evaluation of SDBM designs. The online workshops entailed a demonstration of INEM with respect to the Free-Ride Amsterdam Case (illustrated in the previous section) to instantiate and elaborate on the method in a business case drawn from practice. Consequently, taking the guidance offered by Rowley (2012) to structure and support subsequent discussions, we aimed to understand whether workshop participants found the application of INEM to be useful, whether they deemed INEM to be easy to use and whether they would intend to use the method to address or support the quantitative evaluation of service-dominant business models. To structure the evaluation by means of online workshops, we followed the following set-up:

Planning the online business model evaluation workshops

The first step entailed the planning of the online business model evaluation workshops[1], and to invite industry experts to these workshops. To classify as an *industry expert*, we expected potential workshop participants to have reasonable experience in business modelling and business model design, such that they can effectively relate to and critically assess our proposed method and its related outputs with respect to their utility. However, we did not require participants to have a substantial background on *service-dominant* business modelling, as given the novelty of this different perspective this would prove to be too limiting. To this end, we preluded each online workshop with a brief introduction on service-dominant business

[1] Although physical workshops were initially planned, as part of the consequences of the coronavirus outbreak https://www.who.int/emergencies/diseases/novel-coronavirus-2019, these physical workshops were converted to online settings.

modelling – either as a means to refresh the knowledge of practitioners or to offer a novel perspective on why and how these business models should be designed.

To invite industry experts, we have drawn from a base of companies that are part of a larger research-practice collaboration, named the *European Supply Chain Forum* (ESCF) which is founded by and closely related to the Eindhoven University of Technology. For this set of companies, we focused on those companies that operate in practice domains that are increasingly service-oriented, such as the IT (Österle et al. 2016), mobility and logistics domain (Gilsing et al. 2018; Turetken et al. 2019b), or more traditional goods-dominant domains that increasingly seek the benefits of a service-orientation, such as the agricultural domain (Lusch 2011). We complemented this set of potential participants by a set of experts from our contact network that have hands-on experience with service-dominant business modelling or the SDBM/R. We sent out 29 invitations to industry experts related to 22 companies in these domains. Of these invitees, 12 accepted our invitation, for which 11 industry experts ultimately took part in our workshops.

For each workshop, the interviewer (the author of this manuscript), a moderator (to monitor time and moderate the discussions) and at least one other research member (to take notes during the workshop) were present. To keep each online workshop manageable in terms of discussion and interaction amongst participants, we limited the workshops to at most 5 participants. We also limited the duration of the workshop to 1.5 hours [2]. The online workshops were conducted via *Skype for Business*. Accordingly, we adopted the plan for conducting the online business model workshops as illustrated in Table 19.

Table 19: Plan of workshops and participation of industry expert

Workshop	**Workshop date**	**Industry experts present**	**Domain**
Workshop 1	03-04-2020	Expert 1	Consultancy (IT, Logistics)
		Expert 2	Agriculture
		Expert 3	Education
		Expert 4	Logistics
Workshop 2	06-04-2020	Expert 5	IT
		Expert 6	Consultancy (IT)
		Expert 7	Agriculture
Workshop 3	08-04-2020	Expert 8	Consultancy (IT)
		Expert 9	Consultancy (IT)
		Expert 10	IT
		Expert 11	Consultancy (IT)

The demographics of the industry participants are described in Table 20. As illustrated, most of the experts that participated in the workshops have significant practical experience, expect for Expert 4 (as illustrated by the generally long tenure indicated).

[2] It should be noted here that the workshops focused on the demonstration of two methods – one pertaining to the 'SKPI-T' (as presented in this thesis) and one pertaining to INEM. Accordingly, the demonstration and evaluation of INEM covered roughly 35 minutes.

Moreover, almost all industry experts indicated to be at least 'somewhat knowledgeable' on the topic of business modelling, which supports the relevancy and validity of the responses and feedback given.

Table 20: Demographics of industry experts

Expert	Tenure	Business modelling experience*
Expert 1	More than 10 years	Knowledgeable
Expert 2	7-10 years	Very knowledgeable
Expert 3	4-7 years	Somewhat knowledgeable
Expert 4	Less than 2 years	Somewhat knowledgeable
Expert 5	4-7 years	Somewhat knowledgeable
Expert 6	More than 10 years	Somewhat knowledgeable
Expert 7	More than 10 years	Very knowledgeable
Expert 8	More than 10 years	Knowledgeable
Expert 9	More than 10 years	Very knowledgeable
Expert 10	4-7 years	Very knowledgeable
Expert 11	More than 10 years	Very knowledgeable

(*) *The following scale was applied: not knowledgeable; somewhat knowledgeable; knowledgeable; and very knowledgeable*

Structure and design of the online workshop
In general, the set up and structure for each online workshop was as follows:

1. General introduction

The workshop kicked off with a round of introductions with respect to the research team and workshop participants, after which the topic and agenda of the online workshop were described. We asked consent of the participants to record the sessions, to which all participants agreed. The transcriptions of these workshops are presented in Appendix E .

2. Brief introduction on business model design through use of SDBM/R (± 20 minutes)

As a refresher or introduction to SDBM design, the application of the SDBM/R to support business model design was discussed, such that participants are able to effectively interpret the business model design used for the application of INEM. This step was concluded by introducing the Free-Ride Amsterdam (FRA) case in detail.

3. Elaboration and demonstration of INEM (± 20 minutes)

Elaboration and demonstration of INEM consisted of a discussion on the working of the method and its logical underpinning in parallel to a step by step walkthrough of how (elements of) the method is applied with respect to the business scenario. The demonstration was concluded by illustrating the associated tooling (Excel spreadsheet) to support the cost-benefit analysis. Respondents were free to ask questions when and if desired, although typically most of the discussion occurred after the demonstration of the method.

4. Discussion and elicitation of feedback of participants / industry experts (± 15 minutes)

After concluding the demonstration of INEM, participants were asked whether they had questions or remarks with respect to the method. Afterwards, each participant was asked whether they deemed the method to be useful, whether they have perceived it easy to use and whether they would intend to use the method in practice. The discussions were interactive to which all participants could contribute. The moderator, where needed, refocused the discussion or ended the discussion in case some of the abovementioned characteristics were ill-addressed. Once the time available for the meeting had run out, the workshop was concluded for which each participant could give their final remarks.

5. Written feedback / use of surveys

In addition to the feedback obtained from the interactive discussions, we asked participants to fill in a questionnaire to express their feedback and comments in written form. For developing this questionnaire, we followed the same structure and backdrop as for IDEM, rephrasing the questions in such a way that they address the characteristics and concerns of INEM. The questions used are presented in Table 21. From the set of 11 industry experts, 9 filled out the questionnaire, resulting in a participation rate of 81%.

Table 21: Set of questions used to evaluate the utility of INEM

Evaluation construct	NR.	Statement
Perceived Usefulness	1	I think this method helps to support the evaluation of service-dominant business models
	2	This method would enable me to derive and quantitatively analyse a cost-benefit model from a service-dominant business model
	3	I do not see the value of using this method to derive a cost-benefit analysis for service-dominant business models*
	4	Overall, the method did not seem useful to me to evaluate service-dominant business models*
Perceived ease of use	5	It would be easy for me to derive a cost-benefit model from a service-dominant business model using this method.
	6	It was not clear to me how the method should be applied or why certain steps were taken*
	7	It would be difficult for me to apply this method to support service-dominant business model evaluation*
	8	It was clear to me how the method should be used
Intention to use	9	If would use this method to support the quantitative evaluation of service-dominant business models
	10	I would not use this method in favour of existing evaluation techniques*

Questions indicated with a star (*) are deliberately inversed.

8.6.2 Results of the utility evaluation of INEM

The results of the questionnaire are presented in Table 22. In the following paragraphs, we discuss the results per utility criteria in detail, and relate these to statements we have identified with respect to our recordings. To analyse these recordings and derive meaningful quotes or statements, we have used a *content analysis* approach (Krippendorff 2018).

Table 22: Responses to surveys for INEM

Criteria	Question	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived usefulness	1	0%	0%	11.1%	77.8%	11.1%
	2	0%	0%	22.2%	66.7%	11.1%
	3*	0%	0%	11.1%	66.7%	22.2%
	4*	0%	11.1%	22.2%	33.3%	33.3%
Perceived Ease of Use	5	0%	22.2%	77.8%	0%	0%
	6*	0%	11.1%	33.3%	55.6%	0%
	7*	0%	22.2%	77.8%	0%	0%
	8	0%	11.1%	11.1%	77.8%	0%
Intention to Use	9	0%	0%	33.3%	55.6%	11.1%
	10*	0%	0%	33.3%	55.6%	11.1%

(*) Responses are reversed to account for the negative form of the question (**) Note that due to rounding, the sum of percentages for Q4 does not add up to 100%

Perceived usefulness

With respect to *perceived usefulness*, we see that most industry experts have found INEM to be a useful, interesting, and promising approach to guide quantitative SDBM evaluation - especially given the structured process followed to derive and concretise the value model.

"It's a useful approach as it provides insights on where the problems lie, but at the same time it is also a structured approach that helps to advance this and get things clear, it is therefore a good contribution, to use this approach to advance business case analysis processes." [Expert 9]

"it is super relevant. You make explicit what is needed to support decision making to be able to vote or decide on a business model design." [Expert 1]

"I like this approach a lot. I think it is well-structured and can be very helpful." [Expert 7]

"I think it is very valuable. It is a necessity for companies to work together, both horizontally and vertically, but how do you guide such a process which is very difficult up to now, I think such a model helps the process and helps you step by step gain insights in the benefits for the parties involved." [Expert 6].

The method is deemed relevant and adequately addresses the challenges of how information is shared amongst actors and how the analysis of exchanges between actors can be explored to seek optimal business scenarios, and as such to motivate business model participation and continuation.

"The introduced method connects well with practice, in which not all stakeholders freely share knowledge and information. It stays true to reality." [Expert 3]

"Addresses well to take into account the motives and desires of different parties in the business model." [Expert 4]

"Very explicit in terms of how the costs for one party are the benefits for another, and how you explore win-win scenarios here." [Expert 5]

"I think this method can really help to establish commitment in the network which is something you really need to push the 'start button' in the end." [Expert 10]

Although the overall results are positive, the survey responses show a considerable degree of variance in terms of perceived usefulness. This can partially be attributed to the perceived complexity of SDBM designs, which feature many concurrent actor-to-actor exchanges and interactions. Accordingly, methods aimed at supporting such complex decision making become inherently complex as well. As a result of this complexity (which we further discuss under *perceived ease of use*), the usefulness of the artefact might have been influenced by the complexity of the real-life case that was used for its application and demonstration. This feedback hints at the need for more significant automated tooling, to take away the burden of users with respect to complex calculations and cost-benefit structures, as well as the need to support the method by means of additional cases or best practices.

"I think it is an intelligent model, but as a result also quite complex." [Expert 3]

"Build up many concrete, real-life examples. The presented examples are clear, but real-life examples may present further trust." [Expert 11]

"The more I think about it and let it sink in, the more I realise how extremely difficult it is what you are trying to accomplish. We also notice this when we sit around the table with other parties to make decisions." [Expert 9]

Perceived ease of use

As presented in Table 22, while the method was perceived useful, respondents indicated that it suffers from complexity with respect to its application. This is also reflected by the responses to the surveys, which are predominantly neutral. In particular, respondents indicated that in any practical setting it is difficult to share information securely and effectively. Although respondents do indicate that this is addressed by the method, more support can be given to how actors part of an exchange collaboratively set parameters and accordingly exchange information.

"Although you took into account well that some parts are private and some parts can be made public, I still think it is quite complex. This is also reflected in the Excel tool." [Expert 2]

"I assume that all parties need to work with the same tooling, not really sure how that works in a complicated field with actors that are less and more involved so to say." [Expert 5]

"It is still unclear to me how to effectively use the process to generate results, without creating conflict between two parties which are detrimental to the business network."[Expert 11]

"I do think it is quite difficult in terms of what information you share to all parties, I can see various slides of the model that are open and transparent to understand each other's position, but to what extent do you share information between parties, (..) especially in highly competitive settings?." [Expert 6]

Given the generalisability and intention of the proposed method, which focuses more explicitly on the structure needed to guide information sharing to support the concretisation of the underlying value model, the method is considered to offer limited guidance with respect to how -for instance- highly competitive domains should share information, and what information should be shared. This largely depends on what information can securely be shared or shared with limited risk, which in turn depends significantly on the context in which the business model is positioned. Such guidance can be generated through the frequent application of the method, not only to demonstrate its usefulness or effectiveness, but also to learn from how or what information practitioners are willing to share, and to generalise over these results. Likewise, the method currently establishes and explains how actors for which costs and benefits are exchanged share desired values for restricted parameters to find under which scenario a positive outcome is achieved for both actors involved. Although we indicate what the effects of failing to reach an agreement are (e.g., redesign or restructuring of the business model), we offer limited real-life examples of what this implies. We understand this and believe that a large set of applications may further clarify the effects and outcomes of using the method to support decision making.

Perceived intention to use

With respect to perceived intention to use, we see that the responses to our surveys are predominantly positive. As quantitative business model evaluation is an essential and important task, but also a complex task for any organisation to conduct, most respondents were strongly enthusiastic to use the method to support the evaluation of personal case studies and to explore the workings of the method in more detail.

"For me, this method is actually the missing link, if you ask me is it applicable in practice, we are currently working on a collaborative business model and actually I would like to offer this business setting as a pilot or test case for your method." [Expert 4]

"We could definitely tie it into existing standards of the company and bring it in as the standard method as to how to evaluate new business models." [Expert 5]

"I am actually thinking right now whether maybe we have a case to which we can apply this method, because this is very concrete (…) that if we have cases to what extent we can work together to detail and analyse the case." [Expert 8]

"I first would like to explore whether one of our initiatives can apply to take the next step. In any case, I would be very interested and it certainly worth the effort to spend some more time to analyse a case through this method." [Expert 9]

"We are currently working on a pay-per-use business model (..) so I definitely want to try this method once."[Expert 10].

Other findings

With respect to the use of the method, which focuses explicitly on networked, service-dominant business models, featuring multiple concurrent, different stakeholders or organisations, respondents also highlighted that the method may provide support in different application context as well. For instance, some respondents argued in light of the challenges of sharing information in collaborative contexts that an application of the method *within* an organisation - considering organisations as a set of networked business units with typically a single overall strategy or objective - may facilitate organisations to support the generation of commitment and to support the internal alignment of business units within their organisational architecture.

"During the session I was thinking how you can apply this within organisations, especially in larger logistical companies which have a wide variety of services they offer, but do not work together internally. (…) for instance, DHL, these provide all kinds of solutions in warehousing and logistics but are very much silos within their organisations. (…). You have to have a certain size of course, where you can apply this. But I see a very good future for applying this within the companies itself, before applying this in external collaborations." [Expert 6]

Considering new business initiatives as business models with a value-in-use centred around the core proposition of the business initiative, the collaboration and co-creation of value amongst business units can be designed through service-dominant business models, and accordingly be analysed and evaluated by means of INEM. Such an internal, rather than external perspective and consideration of value co-creation may facilitate users to establish meaningful value propositions as a business, and to structure and align internal organisations with respect to strategic goals and objectives.

8.7 Chapter summary

As business models develop and become increasingly concretised, approaching later phases of the innovation process, there is a need to support decision making in terms of quantified insights, such that decision makers obtain a better understanding of whether resources should be committed towards implementation of these models and what concrete costs and benefits will be generated with respect to the model (McGrath 2010).

Given the characteristics of service-dominant business models, which are networked and feature many service exchanges, we see that the concretisation of the underlying value model of service-dominant business models depends on the perceptions and needs of many concurrent actors. Moreover, we typically cannot reason from an ideal world in which information is freely shared and exchanged to conduct the consequent analysis of the value model. As existing quantitative evaluation techniques generally take the perspective of the focal organisation (and can therefore concretise parameters to analyse the revenue model on the basis of internal knowledge), there is a need for a method that can accommodate the generation and analysis of cost-benefit analyses to support quantitative decision making taking a service-dominant perspective.

To this end, in this chapter we have introduced INEM as a method to support the quantitative, financial evaluation of service-dominant business models. As a basis to the method, we determine that three levels of knowledge pertinence and dissemination exist, which represent the three levels on which decisions in networked environments typically are made. Consequently, we introduce a step-wise process to make explicit the costs and benefits that are exchanged, and how both non-exchanged and exchanged costs and benefits can be constructed from cost and benefit parameters. Moreover, with respect to exchanged costs and benefits, we highlight how actors that partake in service exchange can collaboratively set parameters and how they can explore mutually beneficial parameter settings. To reduce complexity and to further support the method, we have developed a semi-automated tool that allows users to apply the method and analyse their associated revenue models.

In evaluating INEM, we have focused on the validity and utility of the design artefact. To this end, we have conducted three online workshops with industry experts, for which we have demonstrated the application of INEM and elicited the feedback of the participants with respect to the artefact's utility. Ultimately, we were able to bring together 11 industry experts to evaluate the utility of INEM. In general, most respondents considered the method to be useful and expressed intention to use the method. However, the method is considered complex, to which more support should be provided in terms of best practices and application guidance. As for the generalisability of the method, the set of applications should be expanded upon to understand whether INEM works in different business settings. Here it would be interesting to leverage cases that are more prominently driven by non-financial benefits (e.g., environmental or social impact) and to understand how these may compensate any financial costs incurred.

Chapter 9

Conclusions

9 Conclusions

Factors like rapid technology change and digitisation have stimulated the evolution of market places into highly globalised and interconnected business environments, offering organisations novel opportunities to create customer value. Already decades ago, we have seen that the emergence of the Internet has sparked many organisations and entrepreneurs to draw from the seemingly endless opportunities of this novel technology to pursue business success – often even without a clear business plan or strategy to be followed (Magretta 2002; DaSilva and Trkman 2014). Similarly, the increased support and deployment of the Internet of Things (IoT), in conjunction with emergent digital technologies such as artificial intelligence (AI), enable both organisations and private users more and more to improve and optimise every day processes or to leverage the data and knowledge generated to address or solve their respective problems (Atzori et al. 2010; Wortmann and Flüchter 2015).

However, a major implication of the digital world is that the market boundaries become vague or even entirely disappear, making them increasingly saturated and competitive (Lübbecke and Picot 2015). In such settings, it is often not enough for organisations to sustain a competitive position by merely focusing on the manufacturing and offering of goods and commodities; products offer limited opportunities to organisations to influence the value creation processes of customers (Vargo and Lusch 2008; Grönroos and Helle 2010), whereas the tangible nature of products gives rise to practices of imitation and piracy. In response, we see that many organisations adopt a service-orientation or even become full service providers, for which the service offerings, rather than product offerings, are at the core of value propositions (Nordin et al. 2011; Kowalkowski et al. 2017). Moreover, to either enhance offered service solutions or to reduce service complexity (Lusch and Nambisan 2015), we observe that many organisations engage in service systems or ecosystems in which resources and services are shared and integrated to create novel value with the customer (Böhmann et al. 2014; Beverungen et al. 2018).

Evidently, such a reconsideration of business perspective has significant implications for the business model that underlies these collaborations: these business models transitions from traditional, goods-dominant business models – oriented on the bilateral relationship between focal organisation and customer, towards networked service-dominant business models, oriented on the business network featuring many actor-to-actor exchanges and relationships (Clauß et al. 2014). More so, the innovation of service-dominant business models aimed at novel or renewed service ecosystems, given the apparent complexity of managing and structuring the contributions of many concurrent stakeholders, calls for an adequate and effective evaluation of service-dominant business models to support decision making. To do so, it should take into account the characteristics of business model innovation, as well as the need to clarify the diverse challenges faced for service-dominant business model evaluation. Improper guidance or evaluation support may cause many contemporary organisations to fail to seize the benefits of the modern era as the underlying business model is ill-evaluated against criteria such as feasibility, viability and robustness, or lacks adequate substance, structure and consideration.

The research described in this thesis aims to provide structured support to cope with the challenge of service-dominant business model evaluation. In this chapter, we conclude and reflect on the work that has been conducted for this research. More specifically, We:

- explain how the research objective and research questions have been addressed,
- discuss the scientific and practical relevance and value of the research outputs,
- express the limitations that should be taken into consideration with respect to our research,
- discuss the research gaps that still remain and the opportunities for future research, and
- conclude the thesis by means of the general takeaways.

9.1 Research summary

In light of the abovementioned challenge and problem context, we have followed a design science research approach to generate or provide a useful solution towards the problem illustrated, and defined our research objective accordingly:

To support the evaluation of service-dominant business models in the context of business model innovation.

To structure the path towards achieving this research objective, we decomposed our main research objective into a set of research questions, each question covering a different aspect of the challenge at hand (Chapter 10). In the remainder of this sub-section, we go through each question briefly and describe how we have addressed the research question.

RQ1. How does the existing academic literature address business model evaluation and what are the gaps that remain with respect to the support for the evaluation of novel service-dominant business models?

Our first research question served to generate a deeper understanding of the existing body of knowledge with respect to business model evaluation, and to position this is the context of service-dominant business models. Accordingly, we aimed to make explicit what research gaps remain with respect to service-dominant business model evaluation. Concretely, we first examined the background on business models and service-dominant logic, to obtain a thorough understanding of the characteristics of service-dominant business models and the challenges this may pose towards effective business model evaluation. As a next step, we analysed existing techniques used for business model evaluation in general, and to examine these techniques with respect to how well these techniques are able to address service-dominant business model concerns such as value co-creation and networked value appropriation. To do so, we conducted a systematic literature review on the existing work on business model evaluation, for which we identified 56 relevant studies on business model evaluation and were able to distil six comprehensive techniques used towards business model evaluation for these studies. From our analysis of these studies, we observed that limited support (in terms of methods, techniques) is present within these studies to adequately address the evaluation of service-dominant business models, taking into account the need for a holistic, networked consideration of how value is created and appropriated within these business models. As a consequence, it may hamper both practice and research to effectively evaluate novel service-dominant business model designs and to innovate their business models. Accordingly, there is need for support in terms of business model evaluation to guide practitioners and researchers to support decision making with respect to business model innovation.

RQ2. What context framework can be defined to structure service-dominant business model evaluation in the context of business model innovation?

As our research objective explicitly calls for a consideration of service-dominant business model evaluation in the context of business model innovation, the first task is to understand how business model evaluation supports the process of business model innovation. To this end, as part of the systematic literature review, we have explored at what phase of the business model innovation process, leveraging the process definition by Frankenberger et al. (2013), business model evaluation methods have been applied, and to learn from their application in terms of how they support decision making for the respective phase they address. Accordingly, we are able to better understand how business model evaluation can support business model innovation, and what evaluation challenges per phase exists.

On the basis of this, we have proposed an evaluation framework that can help practitioners to support business model evaluation in the context of business model innovation. Moreover, the set of evaluation methods applicable per innovation phase serve as the basis for the design of meaningful artefacts that address the challenges posed by each phase. As a next step, we have contrasted the resulting evaluation framework to the background on service-dominant business models and service-dominant business model engineering, for which we have used the BASE/X framework (Lüftenegger 2014; Turetken et al. 2019b), to examine how the proposed evaluation framework should be adapted in light of service-dominant business models. We have illustrated and argued that the business model is a related but a distinct construct as opposed to strategy or business process (Shafer et al. 2005; Al-Debei and Avison 2010; Casadesus-Masanell and Ricart 2010). This also applies to service-dominant business engineering, by which business agility is argued to be facilitated by a distinct but interrelated consideration of these constructs (Grefen 2015).

Consequently, we have made explicit that the business model innovation process takes into account tasks that reside on different decision levels of service-dominant business engineering – the *initiation phase* relates to strategic decision making that drives business model redesign, whereas the *implementation phase* relates to operational decision making that drives the implementation of a finalised and validated business model design. Accordingly, with respect to service-dominant business model evaluation in the context of business model innovation, we have proposed an adapted framework that positions the *initiation phase* on the strategic level and the *implementation phase* on the business process level of service-dominant business engineering. Contrastingly, the *ideation* and *integration* phases are positioned on the business model level, dealing explicitly with the design and evaluation of service-dominant business models. We elaborate on the interfaces between phases to enable iterations or feedback loops for business model innovation. This framework has been further elaborated in Chapter 5. The framework can be used for guiding service-dominant business model innovation. It explicates the challenges that exist with respect to the phases of the innovation process and how addressing these challenges by means of service-dominant business model innovation can advance the innovation process. Moreover, it indicates how the phases of the innovation process differ in levels of decision making which requires careful consideration in terms of how these are addressed.

Our context framework also makes explicit how service-dominant business model evaluation for the ideation and integration phase depends on the strategic directives or performance criteria derived from the strategy. By means of these performance criteria, decision makers are able to interpret the outcomes of service-dominant business model evaluation and can validate whether a business model design is strategically acceptable or desirable. We highlight that the characteristics of the innovation process (which tend to be uncertain for early phases of the process) influence how these performance criteria should be structured or quantified. Although not positioned as part of our design science research setup, we have introduced a structured technique to guide the representation of strategic objectives as 'soft-KPIs' which can be used as directives for business model evaluation in the ideation and integration phases of the innovation process.

RQ3. What method can be developed to support the qualitative evaluation of service-dominant business models?

In light of the challenges posed for the ideation phase, for which the strategic objectives that drive the pursuit of novel business models are translated into one or more business model designs, we have concluded that the support is needed for the qualitative evaluation of novel service-dominant business models. Newly ideated business model designs are typically uncertain in terms of the structure and outcomes, making it difficult to quantitatively assess and analyse the resulting business model design. Nevertheless, decisions should be made regarding the structure and concretisation of the business model, whereas decision makers should understand the extent to which the business model design is viable or feasible in order to advance business model innovation. This is even more apparent for service-dominant business models, which feature complex actor-to-actor interactions and depend on the concerns and perspectives of many concurrent stakeholders. Given its timing in the business model innovation process, qualitative decisions with respect to business models are advocated.

To this end, we have designed a method (IDEM) – a set of 21 guiding questions - aimed at the validation and qualitative evaluation of service-dominant business model designs, catered to these early phases of business model innovation. To structure the design of the method, we deployed a *situational method engineering approach* to which we followed a paradigm-based strategy. In doing so, we have drawn upon and combined existing literature with respect to service-dominant logic and its implications to business model design and business model evaluation to propose a set of guiding questions to evaluate service-dominant business model designs. The questions are structured along the highlighted quality attributes of business model evaluation – structural validity, feasibility, viability and robustness. In line with the guidelines of design science research, we have evaluated the artefact with respect to its validity and utility. We did so by means of three practical applications of IDEM in real-world business scenarios. The results demonstrated that IDEM may aid users to qualitatively evaluate service-dominant business models and that application of the method facilitates users to reconsider design decisions, resulting in business model designs which, in the eyes of the users, better align with their intentions. However, the method can be further improved by offering clear handholds with respect to the application of questions and its respective outcomes.

RQ4. What method can be developed to support the quantitative evaluation of service-dominant business models?

As business models progress through the process of business model innovation, the need for quantitative insights with respect to the viability and feasibility of the business model design becomes increasingly evident. The integration phase entails the concretisation of the business model design and the generation of commitment of mapped stakeholders to contribute to the business model. Such decisions are largely motivated by what costs and benefits stakeholders are able to capture from participation, taking into account both financial and non-financial costs and benefits (Jaakkola and Hakanen 2013; Akaka and Vargo 2014; Freudenreich et al. 2019). Traditional cost and benefit analyses are typically used as a method to support such decision making for which a positive balance indicates an acceptable business scenario. However, the networked nature of service-dominant business models poses increased challenges with respect to the application of cost and benefit analyses, as many of the costs and benefits are the result of service exchange, to which the cost of a certain actor is the benefit for another actor. Moreover, especially for competitive business environments, organisations are not always inclined to openly share organisational or performance related data, which further complicates the concretisation and analysis of cost-benefit models. Such challenges should be adequately addressed to effectively support the quantitative evaluation of service-dominant business models.

In response, we have designed a method (INEM) towards the derivation and analysis of a cost-benefit analysis for service-dominant business models. We have followed a *situational method engineering approach* and subsequent extension-based strategy to extend traditional cost-benefit analysis to accommodate the *financial* analysis of the value model of service-dominant business models. We have drawn on the existing literature on value co-creation and value capture and extended the two levels of concerns currently used (e.g., the *public level* and the *private level*) by means of a third level named the *restricted level*, which accommodates the exchange of information with respect to service exchange and the concretisation of the costs and benefits that result from this service exchange. Accordingly, all knowledge that is openly shared is present on the *public level* of concern, whereas knowledge pertaining to organisational or personal costs and benefits, as well as the outcomes of the cost-benefit analysis reside on the private level. The restricted level is then used to bring together actors partaking in service exchange and to accommodate these actors to negotiate and concretise, drawing upon knowledge available at the public or private level, the costs and benefits that result from this exchange, without the need to share or disclose this with the rest of the network.

To provide further support towards the concretisation of the value model, we have introduced a process description as well as a set of design parameters (linked to the three levels of concerns) to concretise the costs and benefits that result from participation in the service-dominant business model design. Taking these design parameters as input, the process description effectively guides users in concretising the value model underlying a service-dominant business model.

We have evaluated the artefact with respect to its validity and utility by means of a set of online workshops in which we were able to bring together 11 industry experts. The results demonstrate that INEM contributes to offering structure towards the quantitative evaluation of service-dominant, collaborative settings and that the method is deemed valuable to support the establishment of commitment amongst potential network stakeholders. However, as service-dominant business model evaluation in general is complex, the method would significantly benefit from insights from best practices and explicit user guidelines to further strengthen the usability and usefulness of the method.

9.2 Contributions to research

Design science fundamentally is a problem-solving paradigm, aimed at finding novel solutions for identified organisational problems or to improve the efficiency or effectiveness of organisations in a given problem context (Hevner et al. 2004). The goal of design science research is to generate or improve utility, which is inseparable from the truth generated by behavioural science. Truth informs design whereas design informs truth (Hevner et al. 2004). Researchers draw from the existing base of knowledge (theory) to the design artefacts that are useful and purposeful to solve identified business needs. However, as technologies evolve and business needs gradually develop, this knowledge base may not extend to novel business needs or may not fully accommodate the establishment of appropriate design artefacts to address these needs. Only through the novel creation, combination or adaption of existing theory novel solutions or design artefacts can be created to solve or address these business needs. The consequent understanding of whether the proposed artefact generates utility for the identified problem context facilitates researchers to evaluate the implications of the application of the artefact and to generalise the outcomes into contributions to theory. In light of this observation, we make explicit how our research and the design artefacts we have proposed contribute to existing bodies of knowledge.

The proposed design artefacts address the evaluation of *service-dominant* or *service-oriented* business models, a concept which has up to this date received limited attention. Although researchers have shed some light on the design (Lüftenegger 2014; Zolnowski et al. 2014; Ojasalo and Ojasalo 2015; Turetken et al. 2019b) operationalisation (Suratno et al. 2018) and conceptual underpinning of service-dominant business models (Kindström 2010; Clauß et al. 2014; Blaschke et al. 2019), the *evaluation* of service-dominant business models remains largely unaddressed, resulting in a lack of clarity with respect to what challenges are faced to evaluate service-dominant business models, how service-dominant business model evaluation is conducted and how this may differ from traditional business model evaluation. Moreover, without evaluation support, it is difficult or even impossible to reflect on how service-dominant business models should be structured or how the design of the business model can impact its relative and perceived performance or with respect to how it satisfies or support either strategy or operational processes (Al-Debei and Avison 2010; Casadesus-Masanell and Ricart 2010). The research we have conducted and described in this thesis contributes as a step towards clarity and increased understanding on service-dominant business model evaluation, or even business model evaluation in general, for which research is still highly fragmented.

Our context framework establishes a high-level structure for leveraging business model evaluation in the context of service-dominant business model innovation, shedding light on the evaluation techniques used per innovation phase and the evaluation challenges or objectives these techniques aim to address per phase. Although preliminary in nature, it provides the foundation and ingredients for the development of a process-orientation towards business model evaluation, such that the diverse challenges of business model innovation during its course can be adequately addressed by means of business model evaluation to advance the innovation process (considering the evaluation challenges as ‘gates’ to advance to next phases of business model innovation). We increasingly observe in research that such a need for a process-orientation to support business model evaluation, featuring multiple steps towards evaluation, is resonated in the context of business model innovation (Hunke et al. 2017; Tesch et al. 2017; Simmert et al. 2019). In light of service-dominant business engineering, we make explicit by means of our framework the need to distinguish strategic concerns from business model or business process model concerns, which we relate to the phases of business model innovation.

As part of our context framework, we highlighted the need for business model catered strategic directives to interpret the outcomes of service-dominant business model evaluation for the ideation and integration phase and to validate whether a business model design is strategically acceptable or desirable. We have proposed a technique, SKPI-T, that may help users to represent these strategic objectives as, so called, 'soft-KPIs' that are catered to a service-dominant business model design and can be used to interpret the outcomes of service-dominant business model evaluation. Moreover, through using the properties of linguistic summarisation, these soft-KPIs can be expressed in a structured manner in explicitly qualitative terms, to accommodate uncertainty that is typically present in the early phases of the innovation process (McGrath 2010; Mateu and Escribá-Esteve 2019), which we be difficult to address by means of traditional, quantitatively-oriented KPIs. Accordingly, we bridge the gap between purely quantitative KPIs (which are terse in nature and ill-suited for early-phase business model innovation) and unstructured qualitative statements (which are high level in nature and almost depend fully on intuition) to support interpreting the outcomes of service-dominant business model evaluation.

With respect to IDEM, next to the proposal of a novel artefact to address the qualitative evaluation of service-dominant business models, we provide further support towards the conceptual integration of service-dominant logic, business models and business model evaluation (Clauß et al. 2014; Blaschke et al. 2019). By means of the set of guiding questions, we make explicit how service-dominant logic impacts business models and how this in turn affects the evaluation of business models. Although we cannot argue that the current set of questions is exhaustive, the questions enable users to better understand the characteristics and working of service-dominant business models based on the structure of the business model design. By mapping the implications of service-dominant logic to the identified quality attributes for business model evaluation, we moreover offer a more holistic consideration of the business model concept then typically considered in research.

With respect to INEM, next to the proposal of a novel artefact to address the quantitative evaluation of service-dominant business models, we further conceptualise the value capture dimension of service-dominant business models by making explicit the concern levels needed to effectively support the concretisation and analysis of the underlying value model of service-dominant business models. Next to the *public level* (or network level) and *private level* (stakeholder level) (Reypens et al. 2016), we advocate the need for a third level, the *restricted level*, to help structure how information is shared and how costs and benefits are concretised that are the result of service exchange. Although often the mutually beneficial nature of service provisioning is stressed (Vargo and Lusch 2008; Grönroos and Helle 2010), emphasizing the collaborative and solution-driven nature of service (eco)systems (Böhmann et al. 2014), it is naïve to assume that information or organizational knowledge, especially in highly competitive environments, is openly shared as it may negatively affect the competitive position of the respective actor. By inclusion of this third level, which draws upon information shared on the public and private level, it enables actors that partake in service exchange to share, negotiate and concretise the resulting costs and benefits without the need to communicate or share this information with the rest of the business network. Taking this perspective as a basis, it enables researchers to explore in more detail how value is co-created, exchanged and captured within networked, service-dominant business models, taking into account the aforementioned practical challenges and concerns.

9.3 Contributions to practice

Next to contributions to research, this work has several important contributions to practice. As a starting point, the proposed design artefacts address the challenge of complex decision making with respect to the structuring, analysing and concretising networked, service-oriented collaborations. Ever growing competition and shifting customer needs drive organisations to seek novel opportunities for value creation to which increasingly the resources of multiple concurrent organisations are used and integrated. As a consequence, the success or performance of the business model does not solely depend on the focal organisation anymore but rather on the perceptions, needs and preferences of the entire network, generating ample uncertainty and complexity with regards to business model decision making. Accordingly, decision-making can significantly benefit from tools, guidelines or norms that are aimed at reducing these factors, to help organisations pave the way for novel business collaborations (McGrath 2010). Our proposed artefacts address these concerns and support practitioners to evaluate service-dominant business models. IDEM explicitly addresses the difficulty of service-dominant business model design and evaluation in early phases of conceptualisation, summarising the implications of SDL on business model evaluation by means of a limited set of guiding questions. As such, it can be used both as a reference point for practitioners to guide the design of service-dominant business models, and as an evaluation support to reflect on design decisions and to support design decision-making.

Similarly, INEM addresses the challenge of concretising and analysing the value model of service-dominant business models, providing guidance on how in competitive business scenarios the underlying value model can be concretised and analysed, a challenge which is typically at the forefront of any business endeavour – i.e., is the business model viable? The semi-automated tool that we have developed to support the logic of INEM can provide further support for practitioners in conducting cost-benefit analyses. In particular, it can help accommodating the concretisation and negotiation of costs and benefits as a result of service exchange for which actors typically have opposing preferences and needs. We make explicit what costs and benefits demand a more restricted or private consideration in terms of knowledge exchange and how this exchange can be structured in an appropriate way.

9.4 Research limitations

Although design science research enables researchers to develop novel solutions towards solving ever changing business needs, the resulting output is subject to the creativity, intuition and problem-solving capabilities of the researcher (Hevner et al. 2004). Whilst we have demonstrated that the results of our research are practically applicable and generate utility in the context of the highlighted business need, we have to live up to several limitations with respect to our research design and the decisions made that may affect the external validity of our findings.

As a basis to our SLR and the subsequent derivation of a context framework to support business model evaluation, we have used the process description for business model innovation proposed by Frankenberger et al. (2013), which offers a structured view on the phases of business model innovation and the associated challenges. Although this work emphasizes that innovation is an iterative task which involves processes of cognitive learning and experimentation (Sosna et al. 2010; Berends et al. 2016; Schneckenberg et al. 2017), the resulting process description is relatively rigid and linear in nature, for which it is argued that business model innovation typically follows the phases of *initiation, ideation*, *integration* and *implementation*.

Although this offers decisions makers a more structured overview of the generic phases and associated challenges faced with respect to business model innovation, which enables business model evaluation to be explicitly linked to business model innovation, it does not cater well to settings for which business model innovation is based on processes of learning or trial-and-error (to which the process model may be shorter but more frequently conducted) or to settings for which the business model is already defined (in cases of business model renewal rather than innovation) (Schneider and Spieth 2013). Accordingly, as our subsequent context framework is based on the more linear consideration of business model innovation, it remains uncertain whether our proposed artefacts would bring forth similar utility and practical value in such business settings in which business model innovation is less structured, hampering the generalisability of our outcomes.

In a similar vein, we have selected the BASE/X framework as the basis for guiding the derivation of the proposed context framework for service-dominant business model evaluation. Although the BASE/X framework is one of the few research frameworks that adequately addresses from a service-dominant perspective the interrelatedness between core business concepts such as strategy, business models and operational process models to guide the engineering of service-oriented businesses, it remains to a large extent conceptual in nature and lacks thorough validation (in terms of the relationships and interfaces between business concepts used) at the time of writing this thesis. Although by leveraging the BASE/X framework, we can support our design decisions in terms of service-dominant business engineering, we base our decisions on foundations which may still evolve over time. Although we believe that the introduced design artefacts can effectively be applied to support the needs in any given service-dominant business setting, care should be taken to relate the outcomes to strategic or operational concerns.

With respect to the evaluation of our research output, we highlight some important limitations. First and foremost, our work represents a process-orientation to guide service-dominant business model evaluation. Although we make explicit that the research artefacts we propose to address this challenge are sequential in nature, listing and linking the expected inputs, outputs and rules per phase, we were unable as of yet, due to the throughput time of the project and the availability of cases, to conduct a sequential evaluation of service-dominant business models, in which we guide the practical evaluation of a service-dominant business model from ideation towards quantitative evaluation. Such a sequential evaluation would grant us a deeper understanding of the synergy between the introduced methods as well as provide further empirical evidence on the validity and utility of the entire service-dominant evaluation process.

With respect to the set-up of the evaluation for both IDEM and INEM, we conclude that both IDEM and INEM suffer from limitations. For the latter, we used workshops in which we demonstrated the working and application of INEM to a business case derived from practice. We have done so as it a strenuous and complex task to guide the full quantitative evaluation of service-dominant business models, especially if the real-life business model design under consideration suffers from significant uncertainty (e.g. in terms of quantification, acceptance of stakeholders). Although through this set-up we were able to generate a more substantial amount of feedback as opposed to IDEM (as it typically is easier to orchestrate a demonstration workshop than a practical workshop), it results in a more limited understanding of the practical use and usability of the proposed method. Experts have to draw on their personal intuition and gut feeling to assess whether the method is usable or easy to use. This is also why some experts indicated that the use of multiple case studies would further advocate the value of the method. On the other hand, IDEM concerns a far more explorative task of business model innovation, for which even preliminary business model designs can be considered, facilitating its practical application. Regrettably, this more practical set-up for IDEM yielded only a limited set of real-life applications. Although the presented feedback is a direct product of application, it is limited in quantity. As such, care should be taken when interpreting the results. Accordingly, both cases would benefit from a more thorough investigation of the validity and utility by means of additional, hands-on case studies. In light of this, it would also be valuable to draw from cases from other business domains than currently presented.

9.5 Opportunities for future research

The contributions this research brings forward offer the stepping stone for novel research in the domain of service-dominant business models and service-dominant business engineering. As a conclusion to this thesis, we list some of the challenges and tasks that are still ahead for this domain:

- The concept of service-dominant business model is still very much in its infancy, for which limited conceptual underpinning currently is available (Clauß et al. 2014; Blaschke et al. 2019). Given the increased importance of the concept to describe or conceptualise contemporary networked business settings, research should focus on further underpinning the concept at hand, to which findings presented in this thesis can be used. To further support the use of the concept, it would be valuable to explore and support the relationships and interfaces between service-dominant business models and other business engineering concepts such as strategy and operational process models. Work by Suratno et al. (2020) and Lüftenegger et al. (2017) may serve as a starting point here. Moreover, research should investigate the relationship between *service engineering* and *business model engineering* to gain a more thorough understanding of the microlevel of business models which encompass a service solution at their core (Engel and Ebel 2019). This in turn would yield a more comprehensive consideration of collaborative service ecosystems, describing both its context (business models) and content (service solution) and how these perspectives may influence each other.

- As highlighted in Chapter 1, the business model life cycle consists of more than just the business model innovation phase. Although business model evaluation serves a prominent role in structuring decision making and reducing uncertainty, which largely pertains to early phases of the business model lifecycle (*ex-ante evaluation*), its role for structuring decision making with respect to operational business models *(ex-post evaluation)* should not be diminished. Monitoring and being aware of the performance of a business model is crucial to foster business agility, such that an organisation can more rapidly and adequately react to internal and external changes of the business model. The need for such capabilities seemingly is even more evident for service-dominant business models, which depend not only on the focal organisation but the entire business network. A significant challenge here is that *ex-post* business model evaluation entails the analysis and monitoring of the actual performance of interconnected, networked business operations (spanning the boundaries of more than one organisation) (Suratno 2020). This requires service-dominant business settings to deal with sharing potentially sensitive market data to effectively monitor this performance. Therefore, research should explore how business model evaluation can support operational service-dominant business models, to understand how these business models can be renewed or how the organisation can prepare itself for a change in business model, taking into account the challenges and characteristics of these complex models.

9.6 Takeaway

Organisations in the modern era can significantly benefit from service-orientation, as it offers organisations novel opportunities for value creation and enables them to establish more intimate and long-term relationships with customers – characteristics that are highly desired in fast-paced, competitive economies. Although an explicit service-orientation as such holds great potential for organisations, it also imposes challenges on organisations to cope with increased service complexity and the need for responsiveness or business agility. Addressing these challenges requires a thorough understanding of the business model that encapsulates novel business endeavours, explaining how business activities are structured and supported and how value is created and captured, and to steer these business models accordingly such these endeavours can live up to expectations. Although this generally is a complex and highly iterative task, normative guidance and structure in terms of service-dominant business model evaluation can help both researchers and practice to support this task. The work presented in this thesis is aimed at doing just that, elaborating on the structure and contents of service-dominant business model evaluation to advance the design and concretisation of novel service-driven business endeavours. Specifically, the context framework proposed can be used to clarify the process of service-dominant business model innovation, to help structure what decisions should be made to advance or innovate service-dominant business models. In addition, we offer both qualitative and quantitative methods to guide the evaluation of these business models and to generate insights on the performance of these business models, whereas we offer a technique to represent strategic objectives that underlie participation in a business model design into useful business model performance criteria.

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Appendix

Appendix A – Set of primary studies identified for the systematic literature review (SLR) and classification scheme deployed

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[S31.] Brea-Solís H, Casadesus-Masanell R, Grifell-Tatje E (2015) Business Model Evaluation: Quantifying Walmart's Sources of Advantage. Strateg Entrep J 9:12–33

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[S52.] Bouwman H, Heikkila J, Heikkila M, et al (2018) Achieving agility using business model stress testing. Electron Mark 28:149–162

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[S55.] Zoric J (2011) Connecting business models with service platform designs: Exploiting potential of scenario modeling. Telemat Informatics 28:40–54

[S56.] Brandt T, Wagner S, Neumann D (2017) Evaluating a business model for vehicle-grid integration: Evidence from Germany. Transportation Res Part D 50:488–504

Classification scheme deployed for set of primary studies

		Type of paper			Techniques identified for business model evaluation						Mapping to BMI phases				Network orientation	
#	**year**	Journal	Conf.	Book Chapter	Expert judgement	Scenario analysis	Multi-criteria analysis	Financial CB analysis	System Dynamics	Simulation	Initiation	Ideation	Integration	Implementation	Network	Focal Org.
S1	2016	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1
S2	2016	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1
S3	2016	0	1	0	1	0	0	1	0	1	1	1	1	0	0	1
S4	2016	1	0	0	0	1	0	0	1	0	0	0	0	1	0	1
S5	2016	0	0	1	0	0	1	0	0	0	0	0	1	0	0	1
S6	2010	0	1	0	0	0	0	0	1	0	0	0	0	1	0	1
S7	2008	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1
S8	2013	1	0	0	0	1	0	0	1	0	0	0	0	1	0	1
S9	2007	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1
S10	2008	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1
S11	2013	1	0	0	1	1	0	0	0	0	1	1	1	0	1	0
S12	2005	0	1	0	1	0	0	1	0	1	0	1	1	0	1	0
S13	2008	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1
S14	2009	1	0	0	1	0	1	0	0	1	0	1	1	0	0	1
S15	2013	1	0	0	1	1	1	1	0	0	0	1	1	0	0	1
S16	2007	0	1	0	1	0	0	0	0	0	0	1	1	0	1	0
S17	2008	0	0	1	0	1	0	1	0	1	0	0	0	1	0	1
S18	2009	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1
S19	2013	1	0	0	1	0	1	0	0	0	0	1	1	0	0	1
S20	2016	1	0	0	0	0	0	0	0	1	0	0	1	0	0	1
S21	2008	0	1	0	1	1	0	0	0	0	0	1	0	0	1	0
S22	2013	0	1	0	0	1	0	1	0	1	0	0	0	1	0	1
S23	2008	1	0	0	1	0	1	0	0	0	0	1	1	0	1	0
S24	2009	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0
S25	2013	0	1	0	0	1	0	1	0	1	0	0	1	0	1	0
S26	2010	0	1	0	1	1	0	1	0	0	0	0	1	0	0	1
S27	2013	1	0	0	0	1	0	1	0	0	0	0	1	0	0	1
S28	2016	0	1	0	1	1	0	0	0	0	0	1	0	0	0	1
S29	2010	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1
S30	2014	0	0	1	1	1	1	1	0	0	0	0	1	0	0	1
S31	2014	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0
S32	2017	1	0	0	1	1	0	1	0	1	1	1	1	1	1	0

S33	2014	1	0	0	0	1	0	1	0	1	0	0	0	1	0	1
S34	2015	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1
S35	2017	0	1	0	1	1	0	0	1	0	0	0	1	0	0	1
S36	2014	1	0	0	1	0	1	0	0	0	1	1	0	0	1	0
S37	2015	1	0	0	0	1	0	1	0	1	0	0	1	0	0	1
S38	2002	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1
S39	2004	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0
S40	2004	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1
S41	2005	0	1	0	1	0	0	0	0	0	0	1	1	0	1	0
S42	2018	1	0	0	1	1	0	1	0	0	0	1	1	0	0	1
S43	2017	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1
S44	2018	1	0	0	0	1	0	0	1	0	0	0	1	0	0	1
S45	2017	1	0	0	0	1	0	0	1	0	0	0	0	1	0	1
S46	2017	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1
S47	2018	0	1	0	1	1	0	0	0	0	0	1	1	0	0	1
S48	2019	1	0	0	0	0	0	1	0	0	0	0	0	1	0	1
S49	2019	1	0	0	1	0	1	0	0	0	1	1	0	0	0	1
S50	2019	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1
S51	2019	0	1	0	1	1	0	0	1	0	0	0	1	0	0	1
S52	2018	1	0	0	1	1	0	0	0	0	0	1	0	0	0	1
S53	2018	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1
S54	2019	1	0	0	0	1	0	0	0	1	0	0	1	0	0	1
S55	2011	1	0	0	1	1	0	0	0	1	0	0	0	1	0	1
S56	2017	1	0	0	0	1	0	1	0	1	0	0	1	0	0	1

Appendix B - Formalisation of SKPI-T

In this section, we describe the groundwork for the formalisation of SKPI-T. We do this by formalising the two main elements of the technique: business model radars (SDBM/R) and linguistic summarisation, which we refer to as *intentional linguistic* summaries (ILS) to make it distinct from the traditional, data-driven approach. In Chapter 6, we integrate these two formalisations to become the 'formal spine' of SKPI-T.

Formalising the SDBM/R concept

To formalise the SDBM/R concept (which we call *business model radar* or *BMR* from now on for easy readability), we identify that this concept has an overall structure that is independent from the number of involved parties, and a structure per party. Hence, we provide the formalisation in two steps: the radar and the parties.

A *business model radar* (BMR) is a business model specification with the following formal type and constraint:

$$BMR = \langle name: L, value: ViU, cust: P, orch: P, parts: \{\langle part: P, core: BOOL\rangle\}\rangle$$

$$parts \neq \emptyset$$

Here, *name* is the name of the business model from the set of *labels* L, *ViU* is the set of *values-in-use*, *cust* is the *customer* from the set of *parties* P, *orch* is the *orchestrator party* from P, and *parts* is the set of *other parties* of type $\{\langle P, BOOL\rangle\}$, i.e., a set of pairs of parties and an indication whether a party is a *core party* in the business model. The structure states that exactly one customer party is present and exactly one orchestrator party. The additional constraint specifies that at least one other party must be present – this to make it a true networked business model and not a dyadic relation.

A BMR instance b therefore has the following format:

$$b = \langle l, viu, p_1, p_2, \{\langle p_3, b_3\rangle, \cdots, \langle p_n, b_n\rangle\}\rangle$$

$$n \geq 3$$

A *party* is the specification of a role in a business model radar with the following type:

$$P = \langle name: L, avalp: \{AVP\}, acopa: \{ACA\}, aben: \{AB\}, acost: \{AC\}\rangle$$

$$avalp, acopa, aben, acost \neq \emptyset$$

The set *avalp* contains the set of *actor value propositions* of a party (a party can have more than one actor value proposition), *acopa* the set of *actor coproduction activities* (a party can have more than one activity), *aben* the set of *actor benefits*, and *accost* the set of *actor costs*. All of the four sets need to be non-empty for a business model to be viable: each actor needs to contribute to the central value-in-use, each actor needs to perform at least one activity to generate this contribution, and each actor needs to have both benefits (its reason to participate in the business model) and costs (not to be a 'free rider' to the other parties).

Formalising the ILS concept

To use it in the business model context, we operationalize the concept of intentional linguistic summary (ILS) into the concept of *intentional soft quantified statement* (ISQS). In general, an ISQS specifies a desired characteristic of a set of objects of a specific type in a universe of discourse (UoD) in soft quantified terms. We first discuss the overall formal structure of the ISQS concept. Then, we detail each of its components.

The set of ISQS QS has the following type (following the structure of a protoform of linguistic summaries as described in Chapter 6):

$$QS = \langle quant{:}\, QF, obj{:}\, OB, oqual{:}\, OQ, ochar{:}\, OC \rangle$$

Here, *quant* is the set of *soft quantifiers* of type *QF*, *obj* is the set of *quantified objects* of type *OB, oqual* is the set of *object qualifications (features)* of type *OQ*, and *ochar* is the set of *object characteristics (features)* of type *OC*. Object qualification *oqual* can be a feature describing all objects in a UoD.

An ISQS instance *qs* therefore has the following format:

$$qs = \langle qf \in QF, ob \in OB, oq \in OQ, oc \in OC \rangle$$

In the above specification, *QF* is the enumerated set of *soft quantifiers*, which state the intended fraction of the set of quantified objects. Usually relational quantifiers are used (i.e., describing the proportion within the set), like *most*, indicating *above 50%*. Seldom, absolute quantifiers (i.e., referring to the absolute object count) are used, e.g., *around 5*, *more than 7*. An often used set of soft quantifiers is the following, which we use for soft quantification of business models:

$$QF_{ou} = \{ALL, ALMOSTALL, MANY, SOME, FEW, ALMOSTNONE, NONE\}$$

We use only a part of the expressiveness of the linguistic summaries model to stay pragmatic. Therefore, we define the elements of QF_{ou} to have a fuzzy ordinal relation denoted with the fuzzy comparison operator $\succ$:

$$ALL \succ ALMOSTALL \succ MANY \succ SOME \succ FEW \succ ALMOSTNONE \succ NONE$$

The elements of *QF* indicate the *desired proportion* of a set, modelled using a fuzzy set. An *actual proportion* of a subset may therefore satisfy two adjacent soft quantifiers, where adjacent is defined by the fuzzy ordinal relation specified above.

The set of quantified objects OB is the powerset of objects in the UoD over which we want to state soft quantifications:

$$OB = \{\{O \in UoD\}\}$$

Consequently, a *set of quantified objects ob* is a set of elements in the UoD:

$$ob = \{o \in UoD\}$$

A *feature* of an object is a tuple of type F that contains the feature label and the set of linguistic value labels:

$$F = \langle featureLabel: FL, \{linguisticValue: LV\}\rangle$$

Linguistic value labels can be made precise and represented as fuzzy sets, with $\mathbb{M}$ as the membership function:

$$\mathbb{M}: OB \times FL \times LV \to [0,1]$$

The membership functions do not have to be defined for intentional soft quantified statements at the early design stage, allowing the linguistic value labels to have more intuitive definition and meaning and be made more precise in later design stages.

The set of features of an object is given by the function *ofeat* that takes an object:

$$ofeat: UoD \to \{F\}$$

Every feature is associated to an enumerated set of possible values. In principle, a feature can possibly have multiple values with different membership values – but we abstract from them. For example we take object $c \in Cars$:

$$ofeat(c) = \{\langle "color", "red"\rangle \langle "speed", "fast"\rangle\langle "class", "luxury"\rangle\}$$

The set of *object qualifications OQ* consists of pairs of a feature label and a linguistic value. More complex situations are allowed, where multiple feature labels and linguistic values can be combined with conjunctions. For pragmatic reasons, we focus only on the simple case in this work.

$$OQ: FL \times LV$$

We have a function *oqmem* which for the sets of objects in the *UoD* and a feature combined with a linguistic value identifies subsets of the *UoD* of which the elements have the same type, plus a feature label and a feature value:

$$oqmem: \mathbb{P}(UoD) \times FL \times LV \to \mathbb{P}(UoD)$$

An *object qualification oq* is applied to a set of qualified objects to constrain this set to a subset under consideration.

The last element in the ISQS structure is the set of *object characteristics OC*. *OC* contains pairs of a feature label and a linguistic value, similar to OQ. In general case, more complex expressions of feature labels and linguistics values are possible, but for reasons of pragmatism, this is beyond scope of the current formalisation.

$OC: FL \times LV$

OC is intended predicate over QF objects resulting from $oqmem$.

With the above formalism, we can precisely describe an ISQS in a structured way that is fit for tooling. To make things easier to interpret, we can obviously generate a textual representation of an ISQS, using the natural language format that is typical for linguistic summaries. An ISQS instance $qs_1 = \langle qf, ob, oq, oc \rangle$ can for example be:

$qs_1 = \langle MANY, Cars, \langle color, red \rangle, \langle speed, fast \rangle \rangle$

This can be textually represented as "MANY red cars ARE fast". A simplified ISQS instance $qs_2 = \langle qf, ob, oq, oc \rangle$ can for example be:

$qs_2 = \langle SOME, Cars, \langle any\ feature, all\ values \rangle, \langle speed, fast \rangle \rangle$

In this case <any feature, all values> is a feature describing all objects in a *UoD*. This can be textually represented as "SOME cars ARE fast".

Integration of formalisations of SDBM/R and linguistic summaries as formal backbone of SKPI-T

To generate intentional linguistic summaries for specifying intentions of business models, we use ISQS templates that represent typical characteristics of business models. The templates presented in this paper are important representatives of this class, but the presented set is certainly not yet complete. For instance, we wish to expand this set such that it covers all elements of the business model design. Moreover, we aim to explore what operation elements per ISQS suit best under what conditions.

Given a BMR instance b (following the structure introduced in the previous section):

$b = \langle l, viu, p_1, p_2, \{\langle p_3, b_3 \rangle, \cdots, \langle p_n, b_n \rangle\} \rangle$

we want to specify ISQS instances over this BMR instance and create a soft-quantified BMR with the following type (which combines the two formalisations of the previous section):

$SQBMR = \langle bmr: BMR, sq: \{QS\} \rangle$

So in short, an instance s of the type *SQBMR* is a soft-quantified business model radar, i.e., the next step after drafting a non-quantified BMR in the ideation process of creating new business models. The set of soft quantifications sq attached to a business model b contains a number of ISQSs that describe the desired soft-quantified behavior of b when it will be executed in practice.

This formalisation allows the precise specification of the nature of these ISQSs to obtain a structured soft-quantification and to reason about the set of ISQSs. To do so, the ISQSs are organized in categories that we describe in the subsections below in detail: the customer with its value-in-use, its benefits and its costs, and the core parties with characteristics that vary by the nature of the party. As the orchestrator essentially also represents a core party, we can use the same templates for this role. For now, we do not include characteristics of enriching (non-core) parties in the set of ISQSs for business model evaluation, as these parties are not essential for the operation of the business model. After we have described the categories of ISQSs, we present an initial discussion on the soft-quantified intentional validity of business models.

Customer

From a customer-oriented perspective, we create a set of ISQS templates that describe the most important aspects of a business model from the customer perspective, i.e., the value-in-use, the benefits and the costs. Note that on the basis of this template the respective stakeholder (in this case the customer) can select the objects that are most appropriate to express its strategic goals or motivation to participate.

Value-in-use. We create a soft quantification over the value-in-use for the set of customers of a business model, stating that the majority of customers indeed receives this value-in-use:

$$qs_1 = \langle qf, p_1, \langle any\ feature, all\ values\rangle, f(viu)\rangle$$

$$with\ qf \in \{ALL, ALMOSTALL, MOST\}$$

Note that the value $\langle any\ feature, all\ values\rangle$ for the object qualification function means that all objects are included. *f(viu)* is a linguistic label for a feature of the value-in-use.

For the running example of Section 3, the value-in-use is *traffic-jam free event rich city*. A feature of this value-in-use is the amount of traffic jams and their classification. Traffic jams can be characterized by, e.g. three linguistic labels into three classes: heavy, medium and small. In this case, the ISQS can be as follows:

$$qs_1 = \langle MOST, large\ city, \langle any\ feature, all\ values\rangle, \langle few\ traffic-jams, heavy\rangle\rangle$$

which can be transformed to textual format for easy reading:

qs_1: Most large cities have few heavy traffic-jams caused by the events.

where *most* is the quantifier (*qf*), *large city* is the customer (p_1), and *few traffic-jams caused by the event* is the feature label for the value-in-use, and *heavy* is its linguistic label.

Benefits. We create a soft quantification over the benefits for the customer, stating that desired benefits occur often:

$qs_{2a} = \langle qf, p_1, \langle any\ feature, all\ values\rangle, f(p_1.aben)\rangle$

$with\ qf \in \{ALL, ALMOSTALL, MOST\}$

For the running example we use the above template to create the following ISQSs describing the benefits of the customer (large city):

$qs_{2a} =$

$\langle MOST, large\ city, \langle any\ feature, all\ values\rangle, \langle less\ traffic - jam, heavy\rangle\rangle$

$qs_{2a'} =$

$\langle MOST, large\ city, \langle any\ feature, all\ values\rangle, \langle more\ events, big\rangle\rangle$

$qs_{2a''} = \quad \langle MOST, large\ city, \langle any\ feature, all\ values\rangle, \langle image\ of\ city, positive\rangle\rangle$

Those ISQSs can be represented in textual form as:

qs_{2a}: *Most large cities have less heavy traffic jams.*

$qs_{2a'}$: *Most large cities have more big events.*

$qs_{2a''}$: *Most large cities have positive image of the city.*

Costs. We make a soft quantification over the costs for the customer, stating that unacceptable costs do not occur often:

$qs_{2b} = \langle qf, p_1, \langle any\ feature, all\ values\rangle, f(p_1.acost)\rangle$

$with\ qf \in \{NONE, ALMOSTNONE, FEW\}$

For the running example this can be the following ISQS

$qs_{2b} =$
$\langle NONE, large\ city, \langle any\ feature, all\ values\rangle, \langle monthly\ subsidy, large\rangle\rangle$

and in textual format:

qs_{2b}: *None of the large cities is paying a large monthly subsidy.*

Through use of the template, a customer consequently is able to translate strategic motives into concrete, business model specific conditions to participate, which can be used for evaluative purposes.

Core parties

The core parties are essential for the functioning of a business model. Consequently, we make soft quantifications over the costs/benefits for each core party, stating that an acceptable cost/benefit ratio occurs often:

$qs_k = \langle qf, p_k, oq, f(p_k.aben, p_k.acost)\rangle$ *for* $3 \leq k \leq n$ *if* b_k

$with\ qf \in \{ALL, ALMOSTALL, MOST\}$

For the running example (the Free-Ride Amsterdam Case presented in Section 5.5 we have created a set of example statements. For the parking provider an ISQS is:

$$qs_{k1} = \langle \begin{matrix} MOST, parking\ provider, \langle any\ feature, all\ values \rangle, \\ \langle parking\ planning, significantly\ improved \rangle \end{matrix} \rangle,$$

or in a textual format:

qs_{k1}: Most parking providers have significantly improved planning on most events.

The retailer is mostly focused on the financial aspect, therefore a good ISQS is:

qs_{k2}: All retailers makes an acceptable profit on most events.

For the visitor the concert experience and memories are the most important, leading us to the following ISQS:

qs_{k3}:Most visitors have a very high concert satisfaction.

For the event organizers and the event location providers the focus is also on customer satisfaction:

qs_{k4}:All event organizers (location providers) have a high customer satisfaction on most events.

Again, each stakeholder can change the set of objects of the introduced templates to generate ISQSs that express its strategic motives or goals. Please note that in the summaries presented above, the focus is on the stakeholder, e.g., the summaries describe the retailers, visitors and event organizers. A different set of summaries can be obtained, if we put the operation, in this case an event, in the focus of linguistic summaries. Currently we are working on normative guidance towards what level of the operation should be used as focus of the linguistic summaries, given the preferences of stakeholders and the context of the BMR.

Given all the above ingredients for the formal representation, we can specify the soft-quantified business model as:

$$sqbm = \langle TJFERC, \{qs_0, qs_{1a'}, qs_{1a''}, qs_{1b}, qs_{k1}, qs_{k2}, qs_{k3}, qs_{k4} \rangle$$

Soft-quantified intentional validity of business models

Once an initial business model design is generated, the ISQSs can be compared amongst stakeholders or domain experts who can judge whether these statements are acceptable and achievable. This can be used using the linguistic value scale <*not feasible, rather not feasible, not sure, rather feasible, feasible*>.

To allow for automated reasoning about the validity of soft-quantified business models, we can formalise this as well. Formally, a business model is intentionally valid from a soft-quantified perspective if all ISQSs for that BMR are above the fuzzy 'truth value' T $\in$ $\mathbb{M}$, where T can be chosen depending on the 'strictness' of business model evaluation:

$$FValid(b) \Leftrightarrow \big((FTruth(qs_1) > T) \wedge (FTruth(qs_{2a}) > T) \wedge \ (FTruth(qs_{2b}) > T) \\ \wedge (FTruth(qs_3) > T) \wedge \cdots \wedge (FTruth(qs_n) > T)\big)$$

If we define *FValid* in terms of a complete SQBMR instance *sqb*, we get:

$$FValid(sqb) \Longleftrightarrow (\forall s \in sqb.sq)(FTrue(s))$$

Appendix C – Survey set up and results for IDEM

Om te begrijpen hoe waardevol de methode (IDEM) gepresenteerd in de workshop is voor het evalueren van service-gedreven business modellen vanuit een praktisch oogpunt, willen wij u graag vragen de volgende vragenlijst in te vullen. De vragenlijst bevat 9 vragen (op een 5-punt Likert schaal) met betrekking tot de bruikbaarheid, gebruikswaarde en toekomstige intentie tot gebruik met betrekking tot de methode. Middels deze feedback kunnen we de inhoud en het gebruik van deze techniek verder verbeteren. Aan het einde bieden we nog ruimte voor het geven van additionele feedback (middels 3 open vragen). Het invullen van deze vragenlijst duurt ongeveer 3 minuten.

Informatie over respondent					
1. In welk domein / branche werkt u?	Open vraag				
2. Hoe lang bent u actief in dit domein?	<2 jaar	2-4 jaar	4-7 jaar	7-10 jaar	>10 jaar
3. Wat is uw functie bij uw bedrijf?	Open vraag				
4. Hoe bekend / bedreven bent u met business modelleren?	Niet bedreven	Een beetje bedreven	Bedreven	Zeer bedreven	
Vragen over de 'checklist aan ondersteunende vragen' voor het valideren en evalueren van service-dominant business modellen (IDEM)					
5. Deze methode draagt bij aan het ondersteunen van de evaluatie van service-dominant business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
6. De evaluatievragen zouden mij in staat stellen om te reflecteren op gemaakte ontwerpkeuzes met respect tot het service-dominant business model	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
7. Ik had het gevoel dat ik vragen miste om effectief het business model te kunnen evalueren	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
8. Over het geheel vond ik de methode niet erg nuttig voor het evalueren van service-dominant business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens

9. Het zou makkelijk voor mij zijn om de evaluatievragen toe te passen ter ondersteuningen van de evaluatie van service-dominant business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
10. Het was niet duidelijk voor mij wat sommige vragen inhielden of hoe deze vragen relateerden tot het service-dominant business model	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
11. Het zou moeilijk zijn voor mij om deze methode toe te passen ter ondersteuning van de evaluatie van service-dominant business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
12. Het was helder voor mij hoe ik deze methode dien toe te passen.	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
13. Als ik een nieuw service-dominant business model zou ontwerpen, dan zou ik deze methode gebruiken ter ondersteuning van de validatie en evaluatie van het model en de gemaakte ontwerp beslissingen.	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
14. Ik zou deze techniek niet gebruiken voor het evalueren van service-dominant business modellen.	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
15. Welke positieve kanten kun je aanstippen met betrekking tot het gebruik van deze methode voor het valideren en evalueren van service-dominant business modellen	Open vraag				
16. Zijn er negatieve of onduidelijke punten die je zou willen aanstippen, of zaken die wellicht	Open vraag				

onduidelijk waren met betrekking tot de methode?	
17. Welke additionele feedback zou je nog willen geven?	Open vraag
Bedankt voor het invullen van deze vragenlijst!	

Feedback received through surveys and semi-structured discussions for IDEM

- Quotes in **bold** are used (in translation form) as statements to support the findings -

Name	Positives	Negatives	Additional
Expert 1	**Creating valuable insight in stakes of different stakeholders and working of the model**	**you need more sessions when evaluating stakeholders who were not present, to create buy-in**	
Expert 2	**Good evaluation and validation**	No	No
Expert 3	**A simple and quick check to validate the working and choices for the model**		**Some examples or cases would be helpful to help use of questions**
Expert 4	**The need to look at the process from different angles which secures a more structured outcome.**	**It takes some time to fully understand the model and maybe it makes sense to have a more in depth explanation**	**Some questions may still be difficult to answer at this development stage. For instance, so far all costs and benefits are listed. However, during the process of the designing a process model, more costs and benefits can be listed. Also, a more detailed quantitative cost/benefit analysis is needed to really address the problem correctly.**
Expert 5		**The need for understanding on implications of questions on the model**	

Name	Usefulness	Ease-of-use	Intention to use
Expert 6	**It definitely helps you progressing and understanding. So whether something like this is useful? Yes, most certainly.**	**Asking and scoring questions is familiar to people and as such easy to understand** **Some of the questions are difficult which requires some time to think how to respond**	
Expert 7		**The strength of the method is in its simplicity, making it easy to understand** Everbody can use the method	
Expert 8	**I think it is very useful.**	**The method is clear, the clarity and understandability in general are fine**	If we want to start using it, it would be good to have templates which are easy to handle.
Expert 9	I think it is well put together.	**The ease of use is difficult to say. It largely depends on the clarity of the evaluation questions** **Extra information with regards to what response options mean to make these more concrete would help a lot, such that less interpretation is left to the individual**	

Appendix D – Survey set up and results for SKPI-T and INEM

Om te begrijpen hoe waardevol de evaluatie technieken gepresenteerd in de workshop zijn voor het evalueren van service-gedreven business modellen vanuit een praktisch oogpunt, willen wij u graag vragen de volgende vragenlijst in te vullen. De vragenlijst start met 4 vragen over uw algemene bedrijfsachtergrond. Antwoorden hiervoor zullen worden geanonimiseerd en enkel voor academische doeleinden worden gebruikt. Vervolgens zullen we per evaluatie techniek 10 vragen stellen (op een 5-punt schaal) met betrekking tot de bruikbaarheid, het gebruiksgemak en de toekomstige intentie tot het gebruiken van de gepresenteerde technieken. De eerste set aan vragen zullen zich richten op het 'representeren van zacht-gekwantificeerde KPIs' (SKPI-T), de tweede set aan vragen zal zich richten op het 'afleiden, analyseren en concretiseren van een service-dominant kosten-baten analyse' (INEM). Aan het einde van elke sectie bieden we ruimte voor het geven van additionele feedback middels enkele open vragen. Het invullen van de vragenlijst duurt ongeveer 10 minuten.

Informatie over respondent					
18. In welk domein / branche werkt u?	Open vraag				
19. Hoe lang bent u actief in dit domein?	<2 jaar	2-4 jaar	4-7 jaar	7-10 jaar	>10 jaar
20. Wat is uw functie bij uw bedrijf?	Open vraag				
21. Hoe bekend / bedreven bent u met business modelleren?	Niet bedreven	Een beetje bedreven	Bedreven	Zeer bedreven	
Vragen over het generen van zacht-gekwantificeerde KPIs (SKPI-T)					
Om ons te helpen om te begrijpen hoe waardevol de aanpak met betrekking tot genereren van zacht-gekwantificeerde KPIs is voor het evalueren van service-dominant business modellen, en om ons te helpen om de methode te verbeteren, stellen we de volgende 10 vragen met betrekking tot de bruikbaarheid, gebruiksgemak en de toekomstige intentie tot gebruik.					
22. Deze techniek draagt bij aan het ondersteunen van de evaluatie van (service-dominant) business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
23. Het gebruik van zacht-gekwantificeerde KPIs zou mij in staat stellen om beter mijn strategische voorkeuren te communiceren met	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens

betrekking tot het business model					
24. Ik zie niet de waarde van het gebruik van deze techniek	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
25. Over het geheel vond ik de techniek niet erg bruikbaar ter ondersteuning van het definiëren van BM KPIs	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
26. Het zou makkelijk voor mij zijn om zacht-gekwantificeerde KPIs op te stellen middels deze techniek	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
27. Het was voor mij niet duidelijk hoe ik deze techniek dien te gebruiken voor het opstellen van BM KPIs	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
28. Het zou moeilijk zijn voor mij om deze techniek toe te passen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
29. Het was helder voor mij hoe ik deze techniek zou toepassen en met welk doel	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
30. Ik zou deze techniek gebruiken voor het genereren / representeren van BM KPIs op basis van strategische voorkeuren	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
31. Ik zou deze techniek niet gebruiken ten faveure van al bij mij bekende technieken voor het opstellen van BM KPIs	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
32. Welke positieve kanten kun je aanstippen met betrekking tot het gebruik van deze techniek / het genereren van zacht-	Open vraag				

gekwantificeerde KPIs?						
33. Zijn er negatieve of onduidelijke punten die je zou willen aanstippen met betrekking tot de techniek?	Open vraag					
34. Welke additionele feedback zou je nog willen geven?	Open vraag					
Vragen over het afleiden, analyseren en concretiseren van een service-dominant kosten-baten analyse (INEM)						
Om ons te helpen om te begrijpen hoe waardevol de aanpak met betrekking tot het afleiden van een kosten-baten analyse is voor het evalueren van service-dominant business modellen, en om ons te helpen om de methode te verbeteren, stellen we de volgende 10 vragen met betrekking tot de bruikbaarheid, gebruiksgemak en de toekomstige intentie tot gebruik.						
5. Deze methode draagt bij aan het ondersteunen van de evaluatie van (service-dominant) business modellen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens	
6. Deze methode stelt mij in staat om een kosten-baten model af te leiden, te concretiseren en kwantitatief te analyseren op basis van een service-dominant business model	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens	
7. Ik zie niet de waarde van het gebruik van deze methode	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens	
8. Over het geheel vond ik de methode niet erg bruikbaar ter ondersteuning van het evalueren van service-dominant business models	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens	
9. Het zou makkelijk voor mij zijn om middels deze methode een	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens	

kosten-baten model af te leiden en te analyseren					
10. Het was voor mij niet duidelijk hoe ik deze methode dien toe te passen of waarom bepaalde steppen werden ondernomen	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
11. Het zou moeilijk zijn voor mij om deze methode toe te passen voor het evalueren van service-dominant business models	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
12. Het was helder voor mij hoe ik deze methode dien te gebruiken	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
13. Ik zou deze methode gebruiken voor het kwantitatief evalueren van service-dominant business models	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
14. Ik zou deze techniek niet gebruiken ten faveure van al bij mij bekende evaluatie technieken	Sterk oneens	Oneens	Neutraal	Eens	Sterk eens
15. Welke positieve kanten kun je aanstippen met betrekking tot het gebruik van deze methode?	Open vraag				
16. Zijn er negatieve of onduidelijke punten die je zou willen aanstippen met betrekking tot de methode?	Open vraag				
17. Welke additionele feedback zou je nog willen geven?	Open vraag				
Bedankt voor het invullen van deze vragenlijst!					

Feedback received through surveys for SKPI-T

- Quotes in **bold** are used (in translation form) as statements to support the findings -

Name	Positives	Negatives	Additional
Expert 1	De vraag voor mij is of dit KPIs zijn of dat je hiervoor een ander woord moet kiezen. Het zijn een soort besluit / afwegingsvragen die je wellicht in geld of andere factoren uitdrukt. Interessant is om de koppeling naar niet resultaat-KPIs te zoeken. Het blijft op dit niveau daarin 'hangen'.		Ik zou er graag meer erover willen begrijpen en het beter verkennen.
Expert 2		Nee	Goede workshop! En probeer deze techniek nog vaker uit in de praktijk.
Expert 3	Sluit beter aan bij de praktijk de zacht-gekwantifceerde opzet.	Kan leiden tot interpretatieverschillen.	
Expert 4	Draagt bij aan communicatie, focus en commitment	Objectivering is natuurlijk lastiger en kan oeverloos discussie oproepen en haal je misinterpretaties eruit (voor de een is het veel, voor de ander matig)	Ik moet er mee werken, oefenen. Hele lading aan voorbeelden / oefeningen zou goed zijn voor mij.
Expert 5	**Bij nieuwe business modellen is het ondoenlijk om KPI verbeteringen hard te kwantificeren**	Nee	**Helder verhaal. Wellicht ook nog werken naar best practices die de aanhoorders kennen en gebruiken.**
Expert 6	De term 'zacht' is terecht en past prima in de fase van het proces waarin	Mijn gevoel zegt dat dit model sterk afhankelijk is van deze persoon (namens de initiërende	**Ik ben zeer geïnteresseerd hoe dit model binnen organisaties kan**

	stakeholders (het netwerk) elkaar leert kennen en gezamenlijk toewerkt naar waarde voor alle deelnemers.	partij) die stakeholders met elkaar moet gaan verbinden. Het vereist verschillende kwaliteiten zoals drive, ervaring, senioriteit om deze rol goed in te vullen.	**werken. Veel organisaties kunnen hier intern al baat bij hebben alvorens ze dit met derde partijen gaan opzetten.**
Expert 7			
Expert 9	**Een logische tussenstap naar hardere feiten, welke de mogelijke samenwerking blijft onderzoeken en ondersteunen**		
Expert 11	Definieren van belangen stakeholders op een 'uniforme' wijze	**The devil is in the detail: Mogelijk schuif je lastige discussies vooruit.**	Ik had de indruk dat er op een gegeven moment de link zou worden gelegd tussen het Large-City verhaal én de zacht-gekwantificeerde KPI"s. Dan is het verhaal gemakkelijker te begrijpen.

Feedback received through surveys for INEM

Name	Positives	Negatives	Additional
Expert 1			
Expert 2	**Goed rekening gehouden met verschillende belangen van partijen in het model**	**Excel is nog vrij complex**	Goede workshop, benieuwd of het lukt om dit een keer echt te kunnen inzetten
Expert 3	**Ook dit onderdeel sluit goed aan bij de praktijk waarin niet alle stakeholders hun informatie willen prijsgeven**	**Intelligent model en daardoor best complex**	Waarde kan zich alleen in de praktijk bewijzen.

Expert 4	Draagt bij aan communicatie, focus en commitment	Subjectiever	Veel doen.
Expert 5	**Heel expliciet gemaakt dat de kosten voor de een de baten voor de ander zijn en hoe daar een win-win uit te halen.**	Hoe de verschillende KPI's met elkaar vergeleken kunnen worden	**Helder verhaal. Wellicht ook nog vragen naar best practices die de aanhoorders kennen en gebruiken.**
Expert 6			**Het is voor mij lastig dit model te vergelijken t.o.v. bestaande modellen. Bestaande modellen zijn veelal georiënteerd op op 1 entiteit / stakeholder.**
Expert 7			
Expert 9			
Expert 11	Inzicht in verschillende parameters (public, restricted & private)	**Onduidelijk: Proces om resultaten te halen, zonder dat er belemmeringen ontstaan tussen twee partijen, die funest zijn voor het netwerk.**	Bouw veel concrete voorbeelden op. De gegeven voorbeelden zijn duidelijk, maar waarheidsgetrouwe voorbeelden zorgen voor vertrouwen.

Appendix E – Interview transcripts used for SKPI-T and INEM

Workshop 1 – General information

Name	Workshop 1
Date of workshop	03-04-2020
Length of entire workshop	01:31:03
Language of workshops	Dutch
Industry expert present	[Expert 1] , [Expert 2], [Expert 3], [Expert 4]
Tenure	E1 >10y; E2 7-10y; E3 4-7y; E4 <2y;
Business modelling experience*	E1 K, E2 VK, E3 SK, E4 SK
Name of interviewer	[Interviewer]
Name of moderator	[Moderator]
Name of research member	[Research member]
Subject of workshop	SKPI-T and INEM

VK, very knowledgeable; K, knowledgeable; SK, somewhat knowledgeable;

- Quotes highlighted in **bold** are translated or / and used as evidence or supportive statements -

Workshop 1 - Transcript of discussion on SKPI-T

[INTERVIEWER] “Ik denk dat dit een goed moment is om een evaluatie van de voorgestelde techniek te doen. Wat is jullie mening over deze methode? Is het duidelijk wat we hebben gedaan? Denk je dat het nuttig kan zijn om in een praktische context toe te passen?

[MODERATOR] “Misschien mag ik jullie al 4 (deelnemers) even kort vragen. Expert 1, wat vind jij hiervan? Is dit nuttig? Is dit bruikbaar?

[EXPERT 1] “Ik vind het heel interessant. Ik werk 20 a 25 jaar alleen maar met KPIs dus, ik vind wel dat je heel erg in de resultaat KPIs blijft zitten dus de koppeling, dan ga ik het even meteen abstract maken, van de derde laag in het model waar we het vandaag over hebben, met de eerste en de tweede laag, waar je daadwerkelijk dingen doet, dus de koppeling naar het proces, de voorspelbaarheid van KPIs, die is er wel, ook in de gewone wereld van nu en dat zou ik interessant vinden om verder te verkennen. **It would be interesting to explore the predictability of the KPIs by connecting the KPIs to the process.** Dus *ROI*, en *klantentevredenheid* en *profit* is allemaal, ik zeg altijd *de koe in zijn kont kijken*, wat zijn de voorspellende indicatoren ook nu in de bedrijfsvoering die bepalen wat je gaat doen **or to explore predicting KPIs that define what business activities we will conduct.**, en die oorzaak-gevolg relaties die zijn er, ook in dit model. Het model op zich vind ik heel aansprekend, want het is wel de toekomst richting digitalisering dat mensen in een netwerk of platform moeten samenwerken, dus hoe gaan we waarde creëren samen in de keten, dus wat dat betreft ben ik heel benieuwd naar de andere lagen."

[MODERATOR] "Oké, dank je wel, Expert 2?"

[EXPERT 2] "Ja interessant, we lopen bij initiatieven ertegenaan dat het juist heel lastig is om KPIs ergens aan vast te hangen, en dan ook echt de harde KPIs. Dus ik denk zeker dat het het proberen waard is om een keer deze nieuwe manier uit te proberen. ***We see that for many business initiatives we find it quite difficult to support these through KPIs, especially more quantitatively-oriented variants. That is why I would fit it interesting to try out this technique once".***

[MODERATOR] "Oké, dank je wel, Expert 3?"

[EXPERT 3] "Ja voor mij is het, ik heb er eigenlijk nog nooit op deze manier over nagedacht, maar nu jij dit verhaal zo vertelt *Interviewer* denk ik dit is eigenlijk heel logisch dus dit is voor mij dan ook een trigger, oké, ik begrijp dit heel goed, ik vind het logisch, dus dit is wat mij betreft goed bedacht en dat laatste element van het bespreken van de KPIs met andere stakeholders dat is ook iets heel anders dan wat je zou verwachten in een traditionele lange keten, op het moment dat je dit eigenlijk visualiseert als een keten is dat eigenlijk ook een logisch element. Voor mij is het logisch. ***It is a very sensible approach***"

[MODERATOR] "Oké, dank je wel, Expert 4?"

[EXPERT 4] "Ja ik word er heel enthousiast van, want ik gebruik het model (*de business model radar*) ook in de situatie waarin wij zitten, en ik denk dat het uitstekend toepasbaar is, **I use the the business model radar (i.e. the SDBM/R) muself as well for our current initatives and i think this technique is well applicable,** ik word er oprecht heel enthousiast van. ***I am very enthusiastic about this approach***"

[MODERATOR] "Oké, *interviewer*?"

[INTERVIEWER] "Dat is positief om te horen. Ik begrijp dus dat jullie het in die zin nuttig vinden of in ieder geval een meerwaarde vinden. Is het duidelijk hoe we het hebben afgeleid? Is er daarnaast wellicht een voorkeur met betrekking tot welk niveau van aggregatie hier wordt gehanteerd? Bijvoorbeeld, in eerste instantie gaan we uit van *evenementen*, maar dat we bijvoorbeeld ook een hoger of lager aggregatie niveau kunnen aannemen, dat dat wellicht makkelijker is om te communiceren of wellicht informatiever is. Wat denken jullie daarover?

[EXPERT 1] Ik denk dat het daar wel goed zit, ook met betrekking tot het samenwerken wat je doet, is het interessant voor de retailer of je bijvoorbeeld 15.000 mensen op dat uur, er zitten onderliggende indicatoren achter, of bijvoorbeeld het percentage mensen dat het niet lukt in een half uur te parkeren, want dat zijn toch dingen die gebeuren. Er zitten dus allerlei onderliggende indicatoren achter die deze zin (*KPI*) weer voorspelbaarder maken. En dat kan natuurlijk niet in de ontwikkelfase (*vroeg stadium business model ontwerp*) maar ik kan me voorstellen dat we nog 10 events gaan proberen en vanuit daar gaan leren en dat we vanuit daar gaan zeggen ja dit business model werkt; dit business model heeft zijn waarde bewezen en kunnen we toepassen. Dus in die zin is het niveau wat je hebt goed, maar je kan daarnaast het model naar beneden toe (*process laag en value laag*) nog beter verrijken met voorspelbare KPIs. **Accordingly, defined KPIs can be enriched or made more predictable by looking also at the process level or value layer**"

[INTERVIEWER] "Helder."

Workshop 1 - Transcript of discussion on INEM

[INTERVIEWER] "Wellicht dezelfde aanpak als voor de eerste methode, wat vinden jullie van deze methode?"

[MODERATOR] "Ik begin even met *Expert 3*. Wat is jouw mening hierover?"

[EXPERT 3] "Ik denk dat het een intelligent model is, best complex overigens, **I think it is an intelligent model, but as a result also quite complex,** zeker hoe zich dit op het eind uit werkt, het is een rond model waarbij je in het midden die gezamenlijke, die gerealiseerde en toegevoegde waarde hebt, daar zit wellicht een beetje een idealisme achter, maar ik vind de manier waarop dit (*techniek 2*) uitgewerkt is, dat kwantitatieve element, dat is eigenlijk heel reëel, waarbij je ook eigenlijk gewoon aangeeft nou er zijn bepaalde dingen, die deel je gewoon niet, dus daarom denk ik dat dit, en dat is eigenlijk ook wat je nastreeft met een model, een model wat de werkelijkheid goed benaderd." **The introduced method connects well with practice, in which not all stakeholders freely share knowledge and information. It stays true to reality.**

[MODERATOR] "Dank je wel. *Expert 1*?"

[EXPERT 1] "Ja ik vind het super interessant, ik zou hier graag meer over willen lezen en in contact blijven. Het is super relevant, je maakt het concreet wat nodig is voor de besluitvorming om in te kunnen stemmen met een business model dus ik denk goed gedaan." **It is super relevant. You make explicit what is needed to support decision making to be able to vote or decide on a business model design.**

[MODERATOR] "Denk je dat het bruikbaar is in de praktijk?"

[EXPERT 1] "Zeker, ja."

[MODERATOR] "*Expert 2*?"

[EXPERT 2] "Ja ik sluit me grotendeels aan bij wat *Expert 3* zei, ik moet zeggen dat ik in het begin had van ja het is inderdaad moeilijk om te verwachten dat mensen of bedrijven transparant denken of aangeven wat precies hun kosten en baten zijn, ik denk dat jullie daar goed op ingespeeld hebben. Waar ik me bij aansluit is dat ik het nog steeds wel vrij complex vind, maar wel dus goed rekening hebt gehouden met dat je altijd een stukje privé hebt en een stukje dat je deelt. **Although you took into account well that some parts are private and some parts can be made public, I still think**

it is quite complex. Dus ja, een goede aanpak daarin. Ik ben zeker geïnteresseerd in het vervolg of in ieder geval in de huidige methode."

[MODERATOR] *"Expert 4*?"

[EXPERT 4] "Voor mij is dat laatste eigenlijk een soort *missing link*, als je vraagt is het in de praktijk toepasbaar, wij zijn bezig met zo'n collaboratief business model om het meest duurzame stukje varkensvlees in de markt te zetten, waarbij we over de gehele keten moeten samenwerken, en ik wil dat eigenlijk gewoon aanbieden als *pilot* of *test case* voor deze methode." **For me, this method is actually the missing link, if you ask me is it applicable in practice, we are currently working on a collaborative business model and actually I would like to offer this business setting as a pilot or test case for your method.**

[INTERVIEWER] "Dank je wel".

Workshop 2 – General information

Name	Workshop 2
Date of workshop	06-04-2020
Length of entire workshop	01:39:35
Language of workshops	English
Industry expert present	[Expert 5] , [Expert 6], [Expert 7]
Tenure	E5 > 4-7y; E6 > 10y; E7 > 10y;
Business modelling experience*	E5 SK; E6 SK; E7 SK;
Name of interviewer	[Interviewer]
Name of moderator	[Moderator]
Name of research member	[Research member]
Subject of workshop	SKPI-T and INEM

VK, very knowledgeable; K, knowledgeable; SK, somewhat knowledgeable;

- Quotes highlighted in **bold** are translated or / and used as evidence or supportive statements -

Workshop 2 - Transcript of discussion on SKPI-T

[INTERVIEWER] That for now concludes the first technique, if there are any questions, feel free now to ask, we also of course have some questions for you with respect to discussion and some feedback.

[MODERATOR] Expert 5?

[EXPERT 5] Yeah I was wondering, because typically the KPIs for these actors are often kind of known right? Because they kind of have their own KPIs. Is it not more that you want to fit their KPIs more on such a new business model? Instead of deriving them from the business model? Maybe I misunderstood.

[INTERVIEWER] Yeah, so, indeed on the strategic level you have some motivation to participate in the model which might already translate to some KPIs but we want to facilitate that you translate these KPIs in accordance with your model and therefore is usable by everyone because everybody has worked on developing the business model. And the second addition there is that we want to support generating qualitatively-oriented KPIs, to support discussion and flexibility of use in the early-phases.

[EXPERT 5] Yeah that I see is very useful. Because it does not really make sense if you talk about new business models to discuss the details in a quantitative way already.

[MODERATOR] When we were actually developing these business models in the Amsterdam project, that was actually something that was hindering. People would say does it work, do you need 90% or 92% or 88% of the car drivers and nobody knew and that is where the discussion stopped.

[EXPERT 5] **Yeah I experience the same at *company*, we have targets like 5% year on year savings or something like that for a given business time, you cannot quantify it from a given business case already years ahead, it does not make any sense. You can set the target but you cannot show that you realise it, it is not very easy (*in early-phases*).**

[INTERVIEWER] So in general, what did you think with respect to the method? Do you think it makes sense? Was it clear how we went through the process, are the steps taken are they clear? And would you find it useful?

[MODERATOR] Expert 6? What is your opinion?

[EXPERT 6] Well I think it is very clear, and **I think it helps all participants to not focus on the numbers, this innovation, because you are easily drawn into numbers and results, and that does not help this kind of network in the context of business model innovation. So I think it is very applicable, and I am actually very curious how this will actually work *within* organisations itself**, we have enterprise-size organisations that have to come up with new business models as well from within their organisation.

[MODERATOR] We see this in organisations that actually divide the organisation in more or less autonomous parts, I know that for instance ABN AMRO has been experimenting with that, even that strict SLAs between organisational parts, we have not tried that yet. But it should probably work more or less the same, yes.

[EXPERT 6] Interesting.

[MODERATOR] Expert 7, what is your opinion?

[EXPERT 7] **I think this is a valuable approach, because it helps structuring the steps from qualitative assessments to quantifying,** in that sense I like this, I think it is quite still difficult for the participants and the stakeholders to define the value that you would focus on. Overall, I like this approach, what I am wondering a bit is when you have such an adjoint propositional business model it requires some confidence and trust in information sharing processes being quite okay, and here underlying is of course a certain moral hazard or problem.

[MODERATOR] You are exactly right Expert 7, but that is exactly when we get more quantitative, and *interviewer* will explain this in a minute, we actually have many strategies to deal with that.

[EXPERT 7] Okay, that is very good because that is quite truthful of course in this setting because you bring stakeholders together whom not always work together on a regular base, so this is a big issue. Okay.

[MODERATOR] We will address that in a minute.

[EXPERT 7] Thank you.

[INTERVIEWER] I have a final question with respect to the type of KPIs that we use. Consider *these* (*illustrated in the presentation*) KPIs that are here at the bottom, so *many events lead to an acceptable profit* or *many retailers have or make an acceptable profit*, which level of aggregation would you prefer? Would it rather be on the *event* basis, which is very much related to the centre of this business model, or would it be more informative or usable perhaps to use it on the *stakeholder* perspective. Or maybe these are equally as valuable?

[MODERATOR] Expert 6, what is your opinion?

[EXPERT 6] **Well from that perspective I would be more on the *stakeholder* perspective, because it is easy for the specific stakeholder to relate it back to his or her business.**

[MODERATOR] Okay thank you, Expert 5?

[EXPERT 5] **Yeah it depends a bit on who you are talking to I guess, is it like a big *retailer* (*stakeholder example*) that is very close to this *Arena (Amsterdam)* that you are sure that that retailer is going to profit from this, then it is mainly focusing on the events, I think, however if it is a person responsible for talking for many retailers then I think it is also important to identify which of the retailers, who will actually make money, and then of course many of the retailers.**

[MODERATOR] Thank you, Expert 7?

[EXPERT 7] I am not sure yet but I think the blue ones are qualifiers as I saw the description in six classes or something like that, and I think that is quite a lot for these events, that for retailers this indeed is a bit more differentiated, like we just said before in terms of distance or other characteristics.

[INTERVIEWER] Okay, thank you.

Workshop 2 - Transcript of discussion on INEM

[INTERVIEWER] That was everything for the second method. If there are any questions, feel free to ask, given the time, let us first start with Expert 7.

[MODERATOR] Expert 7?

[EXPERT 7] **First of all I like this approach a lot, it is quite well-structured,** some comments and questions. A comment is maybe it is also good to, you have this pie with the pieces of the pie, maybe it is an idea, because in reality some stakeholders have a larger part whereas others have a smaller part of the pie, and at the same time when it is all, it can be very essential to have this whole proposition valued so, a share of the pie can differ. Also, in some elements regarding what is the type of the decision to make. It is not only whether the plus is larger than the minus or the benefits are larger than the cost, but sometimes it can be just how much investment do I need to make to realise a tipping point, almost by itself. So I can also depend on the type of decision, but in essence the structure of the method would still work for this. Last remark, I like this a lot, and I would definitely like to talk about it later in a setting in which we have more time, and if there is already some background with regards to this information or part of this presentation I would really appreciate it.

[INTERVIEWER] Yes so in any case, everyone will receive the presentation. We are working on generating some background for this approach in terms of publications, of course if we have them we will share them around with those that are interested.

[EXPERT 7] Perfect. And from my point of view again **I am very positive about this, this can be helpful** and I am open to in one of the coming weeks to spend some time together to discuss it in more detail.

[INTERVIEWER] Okay, that would be great.

[MODERATOR] Okay, thank you very much Expert 7.

[MODERATOR] Expert 5, what is your impression?

[EXPERT 5] Yeah I also think it is quite promising, a couple of challenges of course which may be less in a company such as *company name*, because if you say you have an Excel now and you want to have some automated tooling, **I assume that then all parties in the network need to participate with the same tooling, not really sure how that works in a complicated field with actors that are less and more involved so to say**.

[INTERVIEWER] Yes, so ideally everyone would participate and actively build their own model and if needed negotiate amongst actors. It would work with less participants, but then you would have to make assumptions with respect to other parties as well which is not ideal.

[EXPERT 5] **Right, but for *us* (*company*), it can be very promising because we are a group that is setting these standards like how do we do benefit management, how do we do requirement engineering, how do we do strategy deployment and all these kind of things, so we could definitely tie it into that and bring it in as the standard method as to how to evaluate new business models.** So yeah, very promising and also looking into tooling for the things that I just mentioned, maybe also good to have a follow-up session once to see if that matches in some way.

[INTERVIEWER] Okay, that would indeed be very interesting.

[MODERATOR] Yes so Expert 5, we plan to invite all the people that have participated in our series of workshops into a physical workshop, so I guess you might be interested, but would you also be interested in having a more private discussion with *interviewer*?

[EXPERT 5] Yeah pick me on these models and maybe the tooling you are developing and see if it fits, maybe we can see if in some way we can make a use case out of this in *company name*.

[MODERATOR] Okay, thank you. Expert 6?

[EXPERT 6] Well first of all thank you very much for sharing this information. **I think it is very valuable. It is a necessity that companies work together, if you look at the supply chain, logistics, the area we work in that companies need to work together, horizontally or vertically, but how do you guide such a process, so that is rather difficult until now, and I think such a model helps the process and helps you step by step gain insights in the benefits for all parties involved. I do think it is rather difficult in what information do you share to all parties involved, I can see various slides of the model that are very usable, open and transparent to understand each other's position very well, but too what extent do you share information between parties?**

[INTERVIEWER] That is of course something that each party has to determine for themselves, and it depends also very much on the network that you are in. If it is a very trusted network in which you actively collaborate with partners, then I can assume that you would be quite willing to share information and actively try to help each other. In case you have parties that you do know or perhaps are there but only on the background, it might be more complicated and that is indeed something we do not necessarily guide in this method, we for example provide some examples of public parameters but this is far from complete I would say, and that is indeed something that people or organisations should decide for themselves.

[EXPERT 6] Yeah and I can imagine that this goes very well with all different players on board, but for example if you look in logistics, if you for example have to work in ASML in providing various warehousing and logistic solutions and you have three logistic companies on board then it becomes more difficult comparing to your example in which you have a variety of players, with less overlapping interests.

[MODERATOR] Yes you are quite right Expert 6, actually I know the logistic domain quite well, I am a board member of a logistic supply chain forum, actually in our last workshop we had someone from *company name*, they are also in logistics, and of course when there is a direct set of direct competitors involved it gets much more troublesome, and it is a hard domain in that respect, it is a *dog world*. But on the other hand collaboration within the logistic domain does not move forward because of this distrust.

[EXPERT 6] I know, and therefore I think that especially for certain companies this will work and to guide them through this process and all the soft aspects of this process. **I do think it is very promising, and during the session I was thinking how you can apply this within organisations, especially in larger logistical companies which have a wide variety of services they offer, but do not work together internally.**

[INTERVIEWER] That would definitely be an interesting area of application, to consider how it works in a kind ecosystem, in which everyone has the same strategy but still is disconnected.

[MODERATOR] So Expert 6 you are thinking of companies such as DHL, that have this problem?

[EXPERT 6] **Yes for instance DHL but also companies that we help such as *company names*, these provide all kinds of solutions in warehousing and logistics but are very much silos within their organisations.**

[MODERATOR] Yes I have worked with *company name* in a previous project using the *BASE/X approach*, but not in this communication within their own company.

[EXPERT 6] Well they are competing very much these days, because they have an expedition department now and a control tower, and they are competing with their international transport division, just to give you one of the examples. So they are competing internally. **You have to have a certain size of course, where you can apply this. But I see a very good future for applying this within the companies itself, before applying this in external collaborations.**

[INTERVIEWER] It is an interesting idea, I agree.

[EXPERT 5] Maybe to add to you first comment, we are actually changing the business model related to the 3PO parties related to our network at the moment within *company name*, and there we have a couple of providers and they are competitors obviously, but we are also working together in that network to get that business model change done. So even if you are talking about competitors I think it is still possible to do these kind of business model analyses, also with competing partners.

[EXPERT 6] Like I mentioned, it is a necessity, you have to work together and to provide services to companies like *company name*, but it is still rather difficult (*sharing information*).

[MODERATOR] The emotional threshold is high.

[RESEARCH MEMBER] So let me say, about Expert 6's first remark, I think about the private and public variables and to what extent companies share information and to what extent companies keep this information to themselves; what we tried to do is in fact to give companies flexibility to hide information that they consider to be rather sensitive, it is per a case basis to be honest, in one case it could that you share more information than you would compared to another case. So this approach and together with the tool that we are still in the process of building what we wanted to give is maximum flexibility to decide what you would like to share and what you do not want to share, that is very important in fact. To use such tools to give you the flexibility such that you can trust the other parties.

[MODERATOR] Yes, to create a sort of accepted trust. Any further remarks from your side, experts?

[EXPERT 6] No, once again thank you for this opportunity, it was very clear so far, I will evaluate this and send you feedback and if anything pops up I will get in contact. Thank you.

[MODERATOR] Thank you all.

Workshop 3 – General information

Name	Workshop 3
Date of workshop	08-04-2020
Length of entire workshop	01:03:33 (introduction and background on SDBM/R was not recorded)
Language of workshops	Dutch
Industry expert present	[Expert 8] , [Expert 9], [Expert 10], [Expert 11]
Tenure	E8 > 10y; E9 > 10y; E10 4-7y; E11 > 10y;
Business modelling experience*	E8 K; E9 VK; E10 VK; E11 VK
Name of interviewer	[Interviewer]
Name of moderator	[Moderator]
Name of research member	[Research member]
Subject of workshop	SKPI-T and INEM

VK, very knowledgeable; K, knowledgeable; SK, somewhat knowledgeable;

- Quotes highlighted in **bold** are translated or / and used as evidence or supportive statements -

Workshop 3 - Transcript of discussion on SKPI-T

[INTERVIEWER] Dit was de eerste techniek, mochten jullie vragen hebben dan stel ze uiteraard gerust, en wij hebben daarnaast ook nog enkele vragen met betrekking tot de techniek voor jullie.

[EXPERT 8] Ja ik wil wel een vraag stellen, Expert 8 hier, ik zie logisch natuurlijk nog geen verwijzing naar literatuur of iets dergelijks maar hebben jullie dit zelf bedacht of hebben jullie hier verwijzingen voor gevonden in de buitenwereld, dat dit een werkende logische eerste stap zou kunnen zijn?

[INTERVIEWER] Wij hebben wel gemerkt binnen applicaties dat mensen heel erg snel in de kwantitatieve details treden, en zeker als je een eerste workshop hebt georganiseerd is het heel erg lastig om daar kwantitatieve uitspraken over te kunnen doen. Maar mensen willen graag wel het model evalueren, ze willen weten werkt dit in de praktijk of gaat dit wellicht werken in de praktijk. Zoals aangegeven, *research member 2* werkt heel veel in data science, zij werkt ook op het gebied van wat heet *linguistic summarisation* wat sterk uit probeert te gaan van het samenvatten van kwantitatieve data in termen van kwalitatieve termen, dat je de communicatieve eigenschappen hiervan meer kan versterken in die zin. En gegeven die inzichten hebben we dat gekoppeld aan de evaluatie van business modellen, waaruit uiteindelijk deze techniek is ontstaan.

[EXPERT 8] Maar wellicht concreet mijn vraag, hebben jullie ook bewijs gevonden dat dit ook kan werken, dat dit ook een stap is die mensen blijkbaar mentaal kunnen maken.

Want wat ik ervaar is dat mensen snappen dat *radar* over het algemeen wel en raken er ook wel enthousiast over, maar dan is het net alsof er een soort drempel of iets dergelijks opdoemt van zou dat nou werkelijk kunnen werken, moeten wij nu samenwerken om tot resultaat te komen en kan ik er dan ook op vertrouwen dat het straks klopt, dat we er goed aan hebben gedaan om aan dit model te werken dat we er allemaal beter van worden en op onze eigen manier kunnen doen. En wat ik vraag is of je daar al voor bewijs geleverd hebt gezien.

[MODERATOR] Expert 8, wellicht even heel kort, *research member 2* werkt al heel lang aan linguistic summaries, in andere velden hebben *linguistic summaries* allang hun waarde bewezen, maar dat is voor het beschrijven van data die al bestaat, en wat we hierin doen wat we noemen *intentional linguistic summaries* zijn eigenlijk *summaries* die beschrijven wat je in de toekomst wil. Welke data die je wil dat geproduceerd gaat worden. Dus het geeft de intentie. Dat is nieuw en de combinatie met business models is ook nieuw dus we zijn nu bezig om dit te gaan testen. We hebben inmiddels wel al de eerste internationale publicaties dus wetenschappelijk is dit, begint dit geaccepteerd te worden. We staan op twee belangrijke conferenties dit jaar, maar als je vraagt van, hebben jullie jarenlange ervaring of dit in de praktijk werkt voor het evalueren van business models? Nee dit is echt het nieuwste wat we aan het verzinnen zijn en we zien nu, we doen het eigenlijk op de snede van de vooruitgang zo gezegd.

[RESEARCH MEMBER] Perhaps one more addition, I participated in one workshop where people were making business model radars as an observer with just one purpose, to see, people new nothing about linguistic summaries and I was listening how they are communicating their wishes, how they are communicating building the model. And I noticed that in a few cases, they were using the structure of this linguistic summary or intentional linguistic summary in a natural way. And this is something that we think that, if introduced, can be very helpful.

[MODERATOR] In andere woorden, als je naar business model workshops gaat zie je dus vaak dat mensen zeggen van nou we willen wel dat de meeste van onze klanten behoorlijk tevreden worden, en dat soort uitspraken passen dus eigenlijk precies in onze structuur (*van de methode*). En op het moment dat iemand gaat zeggen, nou ik wil dat 79% tevreden wordt over 93% van de waardepropositie dan begint iedereen te soebatten over of het 93 of 95 moet zijn. En dat willen we dus juist voorkomen.

[EXPERT 8] Ja eigenlijk begeven we hier dus een beetje in de wereld van de psychologie zal ik zeggen, kijken hoe het menselijk brein werkt en als ik het goed vond dan zijn we geneigd de volgende stap te steppen, maar dat is mijn samenvatting.

[MODERATOR] Ja maar vooral om in eerste instantie, wanneer je in de conceptiefase van business models zit om niet alleen maar over heel concrete getallen te gaan spreken en dat is wat we in de praktijk heel vaak zien, dat we zien hé als het concreet wordt, wordt het beter maar zo lang je nog in die conceptie fase zit is het beter om niet al te concreet te worden want je kent die getallen niet, dus die hele discussie is zinloos.

[EXPERT 9] Ik heb nog een andere vraag, de voorbeelden die je geeft zijn eigenlijk allemaal gefocust op de benefit kant van de medaille. En ik vroeg me af of je dit ook doet voor de kosten kant van de medaille, want ik denk dat waar je uiteindelijk naar opzoek bent is de motivatie die iedere partij heeft om die participatie zeg maar in die zin te mobiliseren en zijn resources in te gaan zetten, en dat komt er uiteindelijk nog op neer of er een positieve balans is tussen de kosten en de baten.

[INTERVIEWER] Zeker, stel we nemen het voorbeeld van de *retailer*, daar hebben we ze eigenlijk samengepakt, dat we zeggen dat er een winst gemaakt moet worden, maar dat zou je ook uit kunnen drukken in de set kosten en baten moet positief zijn, waarmee je het al wat neutraaler probeert weer te geven. Je zou ook kunnen zeggen dat de operationele kosten, als je dat als element pakt van je KPI, dat je zegt dat voor de meeste evenementen de operationele kosten laag dienen te zijn, en dat je het dus probeert om te draaien en dat je juist in plaats van een hoge target zet een lage target zet omdat je uiteraard je kosten in de regel laag hoopt te houden. Dus je kan het in die zin ook omdraaien, en je kan ook andere elementen kiezen die passen bij datgene wat je strategische motivatie is. Dus je probeert het heel erg af te leiden uit datgene wat voor jou belangrijk is en dat te koppelen aan elementen uit het business model.

[EXPERT 9] Ja, dat snap ik. Dus als het gaat over de winst van de retailer dan is dat inderdaad een soort van *bottom line*, winst en kosten, het voorbeeld vanuit de stad geredeneerd, van we willen eigenlijk weinig traffic jams hebben dat is alleen aan de opbrengsten kant, dus dan zou je ook ergens een vervolg krijgen, dat zou je eigenlijk aan moeten vullen met een semi-kwantificatie van wat is het je waard. Dus wat kost het je nu, en hoe belangrijk is het dat je van die kosten afkomt.

[MODERATOR] Dat bespreken we zo meteen in de tweede techniek, dan gaan we ook precies daar naar kijken, ik stel voor dat we gezien de tijd even doorgaan.

[EXPERT 10] Ik zou er graag nog een laatste vraag over stellen. Je hebt in zo'n model natuurlijk meerdere partijen, en iedere partij zal voor zichzelf natuurlijk een winst optimalisatie of een winst maximalisatie zoeken. De retailer die je net noemt, die zegt ik wil zo veel mogelijk winst maken, in hoe verre helpt dit mee met het tot elkaar brengen van die partijen, want eigenlijk maakt de som van alle winsten en verliezen die maakt het succesvol toch? Ik herken wat jij zegt *moderator* dat wanneer je over KPIs praat je meteen 42,2 of 42,3 krijgt, die discussie krijg je. Maar ik denk dat je naar een optimum moet werken in plaats van acht maxima in zo'n model. **In such a model you obviously have multiple parties, for which each party of course in some way aims to optimise or maximise their personal gains. I get the need for a more relaxed focus on quantification, but there should be some guidance on avoiding 8 (stakeholders) maximums and working towards a single optimum for the business model.**

[MODERATOR] Wat we proberen is juist middels deze techniek dat door juist niet al te kwantitatief te worden we juist een stukje transparantie tussen deelnemers op zeker niveau kunnen bewerkstelligen maar ook kunnen uitdrukken wat je van elkaar verwacht, maar wanneer we dan naar de volgende stap gaan, dat is de tweede techniek die we zo meteen gaan zien, zul je zien dat een aantal KPIs met elkaar gaat delen maar dat je ook een aantal KPIs, bijvoorbeeld je eigen operationele kosten lekker voor jezelf gaat houden, of alleen met een partij gaat uit onderhandelen. Dat gaan we zo meteen zien. Het is dan juist wat mensen als een beetje 'wollig' ervaren dat is juist deze eerste fase, die wat mij betreft niet eens wollig is alleen minder kwantitatief en dan de overstap kunnen maken naar laten we dan even echt naar de cijfers kunnen kijken maar wel op een gestructureerde manier. Als je de tweede techniek ziet, zul je zin dat ze elkaar complementeren in dat opzicht.

[EXPERT 10] Ja want de truc moet zijn dat al die partijen in zo'n business model eruit springen.

Workshop 3 - Transcript of discussion on INEM

[INTERVIEWER] Dat was heel kort wat onze tweede techniek behelst, wederom als jullie vragen hebben dan stel ze gerust, en we hebben ook nog een aantal vragen voor jullie.

[MODERATOR] Experts?

[EXPERT 8] Ja ik heb eigenlijk geen vragen, ik zit meer te bedenken misschien hebben wij wel een case waarop we dit een keer los kunnen laten, want dit is natuurlijk heel concreet**, I am actually thinking right now whether maybe we have a case to which we can apply this method, because this is very concrete**, want waar wij vaak tegen aan lopen is dat wij vaak nieuwe *values* proberen te ontwikkelen, en dat met name dit natuurlijk heel belangrijk is met betrekking tot gaat het werken, zijn partijen bereid in te stappen en zijn ze bereid mee te gaan, wat zijn dan de verdien modellen. Dat laatste lijkt natuurlijk ook heel erg op de bedrijfstak, dan ga je ook heel erg zitten rekenen, dan ga je ook hoe een ondernemingsplan maken, dat is eigenlijk een beetje wat je aan het doen bent. Dat je het vertrouwen krijgt of dit gaat lukken of niet. Dus ik weet niet in hoeverre, dat is misschien meer mijn vraag, in hoeverre als we cases hebben dat we dit een keer samen kunnen uitwerken, of dat jullie ons kunnen vragen waarbij wij kunnen helpen of zo. **That if we have cases to what extent we can work together to detail and analyse the case**

[INTERVIEWER] Ja dat is zeker eigenlijk de insteek van de fysieke workshops die we eigenlijk later willen plannen, dat we inderdaad met een *hands-on* case, want dit is met name illustratief, dat we *hands-on* proberen te kijken nou hoe werkt dit dan in de praktijk en dat we echt concrete data hiervoor kunnen gebruiken. En dat zou inderdaad zeer interessant zijn met betrekking tot de applicatie.

[EXPERT 11] *Interviewer*, ik heb nog wel een vraag. Heb je deze techniek, want je hebt drie jaar meegewerkt aan *project*, is deze techniek ontstaan omdat in het project de onderhandelingen wel of niet soepel liepen, of heb je dit toegepast daaraan. Want ik kan me voorstellen je hebt het belang van het hele netwerk, en je hebt bepaalde onderhandelingen met betrekking tot die *restricted parameters*. En als een van die partijen of een van die onderhandelingen er niet uit komt, heeft het hele netwerk er last van. **If one of the parties or one of the negotations fails, the whole network suffers. How does this work or can this be managed?** Heb je al ervaring daarmee met hoe dat werkt?

[INTERVIEWER] Ik moet eerst zeggen ik ben zelf niet betrokken geweest bij het *project*, dat was volgens mij in het eerste jaar dat ik startte, dus in die zin heb ik met name meer de output of deliverables van dit project gebruikt. In die zin hebben we nog niet heel veel concrete ervaring er mee met wat gebeurt er nou in zo'n scenario wanneer iemand er totaal niet uitkomt. En dat zijn dingen die we ook heel graag aan de hand van praktische case studies willen zien. We hebben wel gemerkt vanuit de praktijk dat mensen wel huiverig zijn dat ze niet altijd alle kennis met betrekking tot hun eigen activiteiten willen delen, en daar hebben we met name zo veel mogelijk op proberen in te spelen door zo veel mogelijk flexibiliteit te geven aan partijen om al dan niet kennis te delen. Maar toch op die manier een bepaald vertrouwen binnen het netwerk te creëren. Natuurlijk is het zo dat als partijen er echt niet uitkomen dat dan het enige alternatief is om het business model in ieder geval qua structuur deels aan te passen, wellicht te kiezen voor andere stakeholders of een hele andere opzet daarvoor kiezen.

[MODERATOR] Wat heel belangrijk is, we hebben heel veel ervaring met de toepassing van BASE/X in het algemeen, nog niet deze specifieke technieken, maar dat we dit in heel veel domeinen, we hebben dit toegepast in de logistiek, zowel de nationale als internationale logistiek, we hebben het toegepast in urban mobility, we hebben het toegepast in smart manufacturing, we hebben het onder andere met *company name* toegepast in de financiële dienstverlening, is dat wat je ziet als je over complexe business modellen gaat praten, je ziet dat A, mensen heel snel met de grote stapel aan *nee's* beginnen te werken, redenen waarom het waarschijnlijk wel niet zal werken en dus ophouden met de discussie, en heel snel vastlopen met we willen geen gegevens met elkaar uitwisselen. Dat zie je in de logistieke branche heel erg, bijvoorbeeld in het ecosysteem van de haven van Rotterdam, en wat we hier faciliteren is A, door eerst met de zachte kwantificatie een *bootstrap* te geven om met elkaar toch in gesprek te blijven zonder te veel informatie prijs te geven of keiharde gegevens te hoeven uitwisselen, en dan met de tweede techniek waarbij je een aantal financiële parameters hebt die je publiek maakt, een aantal parameters hebt die je alleen met je directe uitwisselingspartners bespreekt en een aantal die je voor jezelf kunt houden om daar mee de zaak wat bespreekbaarder te maken. Dus het ontwerp van deze aanpak is wel heel erg geïnspireerd door de problemen die we al jarenlang in de praktijk zien, alleen we zijn nu pas begonnen om, en daar zijn deze workshops onderdeel van, dit aan de praktijk te toetsen.

[EXPERT 9] Het is een boeiende, de initiatieven waarbij wij betrokken zijn die kenmerken zich door een initiatiefnemer eigenlijk, iemand die zegt ik heb eigenlijk het goede idee om hier een nieuwe dienst bij te betrekken en heeft daar andere partijen bij nodig, en dan ook de houding van de initiatiefnemer, ik ben op zoek naar partijen die daarbij willen helpen. Maar voor iedere participant die deel wil nemen aan de discussie zijn er ook nog anderen die in de wachtkamer zitten. En ik denk dat dat ook bijdraagt aan dat gebrek aan vertrouwen om informatie te delen. Dat is zeer lastig, want als jij dan gevraagd wordt om gegevens te delen dan weet je ook dat als jij er niet uitkomt of de ander ziet dat hij het ergens goedkoper kan krijgen dat ie dan met jouw gegevens vervolgens naar de ander toestapt.

[MODERATOR] Wat mij voorstaat is dat als we naar dat soort samenwerkingsverbanden kijken en we hebben daar best leuke ervaringen mee, ik ben ooit ingevlogen om een impasse in een innovatieproject in de energiesector op te lossen, dat was een innovatief project waarbij een heel aantal traditionele energieleveranciers betrokken waren, zeg maar elektriciteitsbedrijven en bedrijven zeg maar digital currencies op het gebied van energie, dat we probeerde om tot een overeenkomst te komen maar voortdurend bleven steken om in de details te praten. Ik heb toen eerste een halve dag naar het onderlinge gevecht gekeken om te begrijpen waar de angel zat, en toen met behulp van BASE/X te kijken laten we dit nu eens collaboratief met elkaar bekijken en het met elkaar erover hebben wat de kosten en baten zijn en binnen een halve dag waren we eruit, daarbij waren nog niet alle details opgelost maar zijn we wel zo ver gekomen dat mensen zijn gaan exploreren en dat is vaak waar het blijft steken. Dat mensen heel snel doorschieten naar wat zijn mijn kosten en baten, en als ik die niet nu al kan zien dan ga ik niet meer aan tafel zitten. Het tweede is wat wij propageren is dat je niet in één business model moet zitten, niet al je eieren in een mandje moet leggen, maar eigenlijk je moet diversifiëren op basis van dezelfde capabilities, je eigen resources op verschillende manieren in de markt te brengen en op het moment dat een business model niet zo goed is als je dat gehoopt had dat dat niet het einde van de wereld is, omdat je dus een variëteit aan business models hebt.

[EXPERT 9] Hoe meer ik hier nu van hoor en hoe meer ik het laat inzinken hoe meer ik me ook realiseer hoe verschrikkelijk moeilijk het is wat je probeert te doen. Dat merken wij ook als we met andere partijen om tafel zitten. **The more I think about it and let it sink in, the more i realise how extremely difficult it is what you are trying to accomplish. We also notice this when we sit around the table with other parties to make decisions.** Een tweede complicatie is dat wij veel met partijen praten die gedeeltelijk een overlappende dienstverlening hebben. Dat maakt het ook niet echt makkelijk, omdat je dan ook nog de discussie voert wie gaat het stukje van de dienstverlening het beste kunnen leveren en waarom dan.

[MODERATOR] Wat het leuk maakt *Expert 9*, we hebben deze business models, we hebben denk ik in de orde van 100 sessies gedaan inmiddels, in heel Europa, letterlijk tot het gemeentehuis van Kopenhagen, dat we complete novices, met een uurtje inleiding en met een uurtje aan tafel zitten toch een business model schets kunnen maken, en met partijen die de techniek wat beter kennen zetten we in een middag 4 verschillende business models neer, en zeggen we van nou laten we vrijdenkend eens een aantal mogelijke samenwerkingen op tafel leggen, dan zeggen van hé deze lijken het beste en laten we een stukje verder gaan uitdiepen. Maar dat betekent eigenlijk dat je het heel vrijblijvende heel innovatief gaat uitproberen. Maar in de traditionele kant zie je juist dat mensen heel snel denken van deze kant moet het uit en we gaan gewoon rechtdoor, en als dat niet werkt dan houden we op. Het exploratieve karakter zie je weinig.

[EXPERT 9] Ja dat ben ik met je eens, er zijn heel veel cases waarbij de business case eigenlijk 'zonneklaar' is, waarbij de *revenue* en ook voor de consumer, dat is gewoon 'zonneklaar', en de dienstverlening van de partijen is dan ook heel helder maar alsnog komen partijen er niet uit. En ik denk dat juist in die situaties waarin je het eigenlijk hebt over het verdelen van de welvaart, er zit zo veel potentie in de business case, dat we met zijn alle vinden dat we gek zijn dat we het niet in koppen. Ja in die situaties is deze aanpak lijkt mij erg nuttig omdat het goed inzicht biedt in waar de pijn zit en waar de schoen wringt en waar gelijktijdig ook een aanpak biedt om daar gestructureerd verder te komen en dingen duidelijker te krijgen, dus mijn inschatting is dan ook dat dit een goede bijdrage is om middels deze aanpak weer in die processen verder te komen. **It is a useful approach as it provides insights on where the problems lie, but at the same time it is also a structured approach that helps to advance this and get things clear. It is therefore a good contribution, to use this approach to advance business case analysis processes.** Maar wat ik ook net zei, het geeft ook weer meer inzicht in hoe moeilijk het ook is omdat je niet met twee partijen aan het onderhandelen bent maar gelijktijdig met 4 of 5 partijen bent aan het onderhandelen. En wat de een betaalt, dat hoeft de andere natuurlijk niet te betalen, dat maakt het wel complex.

[MODERATOR] Ook in de vorige workshops hebben we gezien dat een aantal deelnemers die complexiteit als een probleem aandroegen, maar als je gaat nadenken over die service-dominant business scenario's, die zijn inherent complex. En als je die complexiteit niet absorbeert dan kom je er dus ook niet uit. Neem het voorbeeld van BMW. Het verkopen van auto's via een traditionele dealernetwerk is veel eenvoudiger dan een *car sharing* samenwerking met *SIXT* en een aantal *maintenance* partijen en een aantal verzekeringspartijen, financieringspartijen en dat soort zaken, om aan dat *car sharing* programma te gaan werken. *Expert 10* kent de situatie met *company name*.

[EXPERT 10] Ja wij zijn heel erg bezig met de *pay-per-use* business, **we are currently working on a pay-per-use busines model ...,** en het mooie van deze twee staps-techniek of deze twee technieken in twee stappen, de eerste kun je heel goed gebruiken om alignment binnen het netwerk te krijgen om eerst te begrijpen of er voor ieder wat te halen is **Can be used very well to create alignment within the network to understand whether for each party value can be captured**, het kwalitatieve stuk, en het tweede kan juist heel erg helpen om commitment te krijgen, want dat heb je uiteindelijk nodig om op de startknop te kunnen duwen, dat iedereen ook committed is, en dat kan je ook met die tweede techniek doen. **I think this method can really help to establish commitment in the network which is something you really need to push the 'start button' in the end.** Dus ik wil het best een keer proberen. **So I definitely want to try this method once.**

[MODERATOR] Experts, nog *final words* van jullie kant?

[EXPERT 9] Ja ik heb ze net al gegeven eigenlijk, ik denk dat het een hele goede stap is. We hebben zelf al wat gespeeld met de radar en te plotten op de initiatieven waar wij mee bezig zijn en liepen inderdaad tegen dit soort vraagstukken aan, dus wat dat betreft komt het ook qua timing wel goed uit eigenlijk dus ik ga zeker nog met *Expert 8* en *Expert 11* nog nabespreken want we zijn met drie initiatieven gelijktijdig bezig, of een van deze initiatieven zich leent om deze stap al mee te zetten. Hoe dan ook, zeker geïnteresseerd en zeker de moeite waard om een keer wat meer energie in te steken. **I first would like to explore whether one of our initiatives can apply to take the next step. In any case I would be very interested and it certainly is worth the effort to spend some time to analyse a case through this method.**

About the author

Rick Gilsing was born on June 12th, 1992 in Roermond, the Netherlands. He obtained a Bachelor's degree in Industrial Engineering from the Eindhoven University of Technology in 2013. This was followed by the pursuit of a Master's degree in Innovation Management at the same university, ultimately obtained in 2016, focusing on the topic of establishing interdepartmental strategic alignment between research and development in order to foster the adoption and throughput of product and process innovations in organizations.

From 2016 to 2020, Rick has worked as a Ph.D. researcher as part of the Information Systems Group at the Eindhoven University of Technology, on the topic of service-dominant business model evaluation in the context of business model innovation, of which the results are presented in this dissertation. Part of his work has been presented at the International Conference on Information Systems (ICIS) 2018, the working conference on Exploring Modeling Methods for Systems Analysis and Development (EMMSAD) 2020, and the European Conference on Information Systems (ECIS) 2020. As part of his Ph.D., Rick has also worked on project deliverables with respect to business modelling for the C-MobILE project (Accelerating C-ITS Mobility Innovation and Deployment in Europe, part of EC's Horizon 2020 programme) and the UMOS project (EIT Urban Mobility), both focused on supporting the contextualization and implementation of novel (smart) technologies in practice to address mobility challenges in Europe.

His research interests lie in understanding and analyzing collaborative business models and the development of practical methods and approaches to guide and support their conceptualization and innovation. In such business settings, it is key to understand and balance the needs and goals of each networked stakeholder to arrive at viable and feasible business solutions. As such, his research efforts span domains such as Business Engineering, Information Systems and Innovation Management. He is open-minded but pragmatic in nature, with a drive and motivation to structure complex problems to increase their understandability and to offer practical, actionable solutions towards these problems.

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