Research School for Operations
Management and Logistics

Service-Dominant Business Modeling in Transport Logistics

Report of the BESTFACT Exploration Workshops

Oktay Türetken, Paul Grefen

School of Industrial Engineering
Eindhoven University of Technology
21 December 2015

Version 1.0

Beta Working Paper series 496

BETA publicatie	WP 496 (working paper)
ISBN	
ISSN	
NUR	
Eindhoven	March 2016

Faculteit
Technologie Management

Service-Dominant Business Modeling in Transport Logistics

Report of the BESTFACT Exploration Workshops

Oktay Türetken, Paul Grefen

School of Industrial Engineering
Eindhoven University of Technology

21 December 2015

Version 1.0

Table of contents

1 Introduction

In this introduction, we first describe the context of the business modelling exploration initiative described in this report. Next, we describe the purpose of this initiative. After that, we explain the structure of this report.

1.1 Context of the initiative

Currently, many developments are taking place in the field of transport and logistics. Complex logistic paradigms are developed, such as multi-modal logistics and synchro-modal logistics. The environment is taken into account in Green logistics, sometimes exploiting new technology such as electric means of transport. New information technologies are embodied into logistic networks, such as the Internet of Things. Completely new transport paradigms are developed such as the Physical Internet.

Many of these initiatives, however, have a hard time finding their way to practical, large-scale exploitation. One of the reasons behind this is that the business model view on this exploitation is lacking. Many of the logistics developments have a technology-push character, where things are developed inside-out, with a focus on logistics concepts and technology from the very start and with some attention for actual business deployment at the end. This is in line with the asset-centered world of logistics, where prime attention often is with managing physical assets, like transportation vehicles, warehouses, cross-docking terminals and physical containers.

Consequently, a clear, explicit view on commercial exploitation is often missing in logistics developments. This situation is made worse by the fact that typical logistics scenarios involve a multitude of stakeholders, each of which has its own business interests. Consequently, 'easy' business models are typically not applicable - and 'complex' business models are not developed.

1.2 Purpose of the initiative

The purpose of the initiative described in this report is to perform a first exploration of advanced logistics with an outside-in business perspective, i.e., starting from the business models and the value they bring to logistics end-customers - moving only after that to core logistics concepts and technology. The goal is not to develop ready-to-use business models, but to explore the applicability of structured business model development in advanced, complex logistics scenarios, starting from the needs of logistics customers.

The approach is to perform the exploration in a hands-on setting with parties from practice that represent several classes of stakeholders in logistics. From this hands-on setting, first conclusions about applicability of business model reasoning can be drawn. These result in preliminary policy recommendations for enabling business model thinking in the logistics domain. The BESTFACT[1] project provides an excellent context for this purpose.

In order to not be caught in the 'asset-dominant trap' (i.e., to not implicitly start reasoning with an asset-orientation), an approach has been chosen that puts logistics services, seen from the perspective of the customer, at the explicit forefront of thinking. This is service-dominant logic, embedded in service-dominant business engineering (as explained in Section 2 of this report).

[1] http://www.bestfact.net

1.3 Structure of this report

The remainder of this report is structured as follows: In Section 2 we discuss how business can be engineered in a service-dominant world by introducing the BASE/X framework. We focus on a specific component of the framework that provides a conceptual tool for designing business models, and we discuss its application in the logistics industry domain. Section 3 presents the organization of the project work including the setup of the workshops conducted for the collaborative design of business model blueprints. In Section 4, we present the business model blueprints that are designed based on the results of the two workshops, and a brief analysis of the workshop results. In Section 5, we present our policy recommendations to help fostering the design of business models in multi-party logistics settings.

2 Service-dominant business in transport and logistics

In this section, we first discuss the concept of service-dominant business. Then we show how this concept is used in the formulation of service-dominant business models.

2.1 Service-dominant business

Business in many domains, including logistics and transportation, has transitioned towards a service-dominant setting where the provisioning of solution-oriented services to the customers is the focal point [12]. This can be compared to the traditional setting where the emphasis is on the delivery of products (assets) [10]. The services may require the deployment of products, but these products become part of the delivery channel of services, not the central point. This transition has shifted the emphasis from the value of the product to the value of the use of the product in an integrated context – the so-called *value-in-use* [9].

In a highly dynamic business environment, the customer expectations from solution-oriented services evolve faster than the capabilities of the underlying products. Customers expect coherent solutions (as opposed to stand-alone solution fragments), which require the integration of the capabilities of multiple service providers. This introduces the necessity of explicitly managed business networks [2], [4].

For a solution-oriented service provider, however, it is not only about what services to offer, but also about how to get them delivered. Managing service complexity and business agility requires a tight integration between the business strategy and models on the one hand and the structure of business operation and information management on the other hand. Truly agile service provisioning business is not achievable if these elements are treated in isolation.

BASE/X is a business engineering framework that puts the service management at the forefront [5]. It adapts a holistic view and covers the entire spectrum from high-level business strategy definition to business information system architecture design, including elements, such as business strategy definition, business model conception, business service specification and business process modelling. It distinguishes between (i) business goals (the ‘what’ of business) and business operations (the ‘how’ of business), and (ii) the stable essence of an organization (i.e. business strategy and business services) and its agile market offerings (i.e. business models and service compositions). This leads to a model with four layers as shown in Figure 1.

The top half of the pyramid covers business goal engineering, which contains two layers: the service-dominant business strategy and business models. The strategy describes the identity of an organization in a service-dominant market [8] [7]. The identity is relatively stable over time: the strategy evolves. A service-dominant business model describes a market offering in

the form of an integrated, solution-oriented complex service: they describe a concrete value-in-use. Business models follow fluid market dynamics and are agile: they revolve – they are conceived, modified, and discarded as required. Business models are specialized from the strategy as they implement part of the strategy in a more specific way. They operationalize the strategy as they are more concrete.

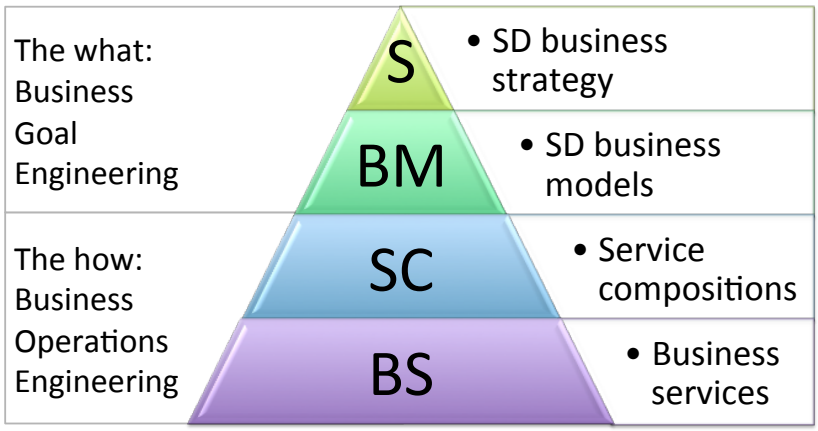

Figure 1. BASE/X Business Pyramid

The bottom half of the pyramid covers business operations engineering, which contains business services and service composition. Each business service encloses a core service capability of the organization. As these capabilities are related to the resources (covering both personnel and large-scale technical infrastructures), they are relatively stable over time: they evolve. In the service compositions layer, business services are composed to realize the service functionality required by a business model: they implement a concrete value-in-use. The composition includes business services from the organization's own set, but also business services of partner organizations in a business network. As service combinations follow business models, they are agile: they revolve with their associated business models [5].

The BASE/x approach has been successfully applied in diverse industrial domains, including financial services [5], transport and logistics services [6], mobility, traffic management, and intelligent transportation systems (ITS) [13] [14]. More details about the BASE/X is available at [3].

2.2 Service-dominant business models

A business model describes the way in which an organization along with its providers and partners creates value for all its stakeholders [1]. Well-designed business models that ensure harmonization among business strategy, business processes, and information system are crucial for any business organization to survive and to succeed [11].

The business models in BASE/x are designed using the Service-Dominant Business Model Radar (SDBM/R). SDBM/R has a *network-centric* design at its core, allowing the composition of service design in multi-party business networks. It defines how the actors in the business ecosystem participate in value co-creation and what the cost–benefits distribution is.

Figure 2 presents the elements of the SDBM/R. The co-created value-in-use constitutes the central point in SDBM/R, framed by three concentric circles. The 'actor value proposition' frame defines a value proposition to co-create value by an actor to the solution for the benefit of the same or other actor within the ecosystem. Co-production activity defines the activities that each actor performs in the business for achieving the co-creation of value. The third frame –actor cost/benefits defines the financial and non-financial expenses/gains of the co-creation actors. Finally, the 'pie slices' represent the co-creation actors including the focal organization, core and enriching partners, and the customer. The focal organization propos-

es the business model and participates actively in the solution - typically as an orchestrator. A core partner contributes actively to the essentials of the solution, while an enriching partner enhances solution's added value-in-use. SDBM/R accommodates an arbitrary number of actors, suiting the network-centric character of service-dominant business.

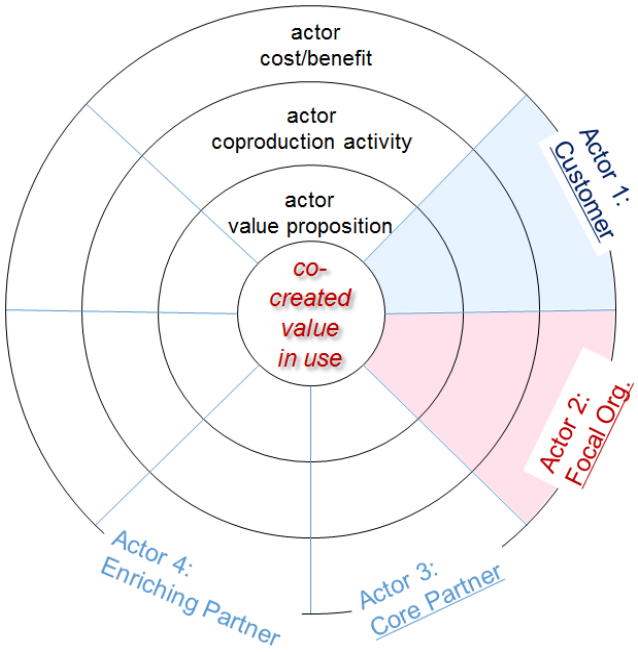

Figure 2. Service Dominant Business Model Radar (SDBM/R) template

Each business model is operationalized by a service composition in the third level; i.e., it is implemented by composing a number of services from the business services layer of the BASE/X pyramid (refer to Figure 1). The activities that take place in a service composition originate from or are tightly coupled with the 'actor coproduction activities' layer of the business model radar.

The objective is to select a prospective business scenario, and design blueprint business models using the SDBM/R as a guiding template. The effectiveness of these workshop sessions depends heavily on the ability of the *moderator* in engaging the stakeholders in active communication and collaboration for innovative ideas.

The initial step in using the SDBM/R is to define and agree on the co-created 'value-in-use'. This goes in line with identifying the customer of the service and the focal organization that orchestrates its provisioning. Next, core and enriching partners that contribute to the proposed value-in-use are discussed and identified. These parties offer their 'actor value propositions' and 'co-production activities' to achieve the co-creation of value. As a final step, parties identify the costs and benefits (monetary or non-monetary) involved in the creation of value-in-use.

3 Project organization and setup of the workshops

In this section, we explain the organization of this project (as an activity in the context of the BESTFACT project) and the setup of the workshops as discussed in the introduction.

3.1 Project organization

The project work was structured into the following tasks:

1. Scenario selection: A steering group (SG) chaired by PTV Group[2] of the BESTFACT selected two multi-party logistics business scenarios in port and road transportation contexts. The scenarios had a clear road transport component and a strong link to the BESTFACT context.

2. Workshops: Two half-day workshops were organized for each scenario, which brought together 12 experts from diverse industry companies operating in the transportation and logistics business domain. To capture a wide extent and diversity of the views of multiple stakeholders in this industry, the companies included large enterprises and authorities (such as the Port of Rotterdam), and those that offer software, information technology and consultancy services to the field (e.g. PTV, Ixolution).

3. *Refinement and consolidation*: All business models were completed and consolidated by the project working team. Next, they were checked with the corresponding stakeholders. The resulting set was analyzed by the team in a qualitative fashion. The resulting business model blueprints are presented in Section 4.

4. *Policy recommendations*: Based on the analysis, a set of policy recommendations was made by the working team of TU/e that provides suggestions for better fostering the development of business models in multi-party logistics settings. Section 5 of this report presents these recommendations.

3.2 Setup of the workshops

Each workshop constituted two phases. The first phase involved a tutorial on the concept of service-dominant business, BASE/X framework, and on the use of SDBM/R. The second phase comprised the core of the interactive design of a particular business model using the SDBM/R under the guidance of the project working team. Following a practical approach, large posters and 'post-its' were used to represent the SDBM/R blueprints and its specific elements. The blueprinting involved the analysis of the stakeholders (including the customer, the focal organization that orchestrates the service, and other required parties), their exact added value (in qualitative terms), and the cost/benefit structure in a business network of these parties. More details regarding the organization and administration of the workshops are given in Appendix A.

Each workshop was led by the working team of TU/e and attended by the representative experts of the main stakeholders (7 experts in workshop 1, and 5 in workshop 2) in the corresponding business scenario (see Appendix A).

4 Results of the workshops

In this section, we present the result of the business modelling workshops. In the first two subsections, we present the business models that were developed in the respective workshops. In the last subsection, we discuss the feedback of the participants in the workshops on the business modelling approach - this to assess the fit of the approach for the transport and logistics domain.

[2] https://www.ptvgroup.com/

4.1 Business model: *Flexible On-Time Delivery*

In today's world, customers are expecting fast delivery of goods. Customer-facing companies, therefore, are in a major need for cost-efficient and reliable logistics services. However, these services offered by a chain of logistics and transportation companies should not only be fast and reliable, but also *flexible* to cope with rapid changes regarding the diverse attributes of customer orders. Flexibility should not affect other quality of service parameters in a negative sense.

Take as an example a container that needs to be delivered by truck to a large inland terminal for pick-up by a river barge. The barge operator (or terminal operator) can give beforehand an approximation of the optimal delivery time and location, but precise optimal delivery time (to have direct cross-docking) and location (to arrive at exactly the right dock) can only be determined closer to the actual cross-docking. To arrive at a balance between tactical planning and operational efficiency, resource reservations by all parties can be made in advance in an approximate way, and then be refined iteratively in a flexible way to 'zoom in' towards the most efficient operational situation. A similar example is the just-in-time delivery of materials to a manufacturing plant, where the optimal time is near-real-time influenced by the progress of the manufacturing process - e.g. in ship building.

The "Flexible On-Time Delivery" business model aims to provide customers with the much-needed *flexibility* in operational transport specification without compromising other key service characteristics- in particular the cost and reliability - as illustrated by the above examples. As we show below, this business model is service-dominant and is based on a collaborative network of partners in logistics that together create the value-in-use. Figure 3 presents the blueprint of this business model depicted using the Service Dominant Business Model Radar.

The model is built on the idea of *iterative order information processing* with involved parties, to allow fine-tuning of transport order parameters in order to obtain high levels of operational excellence. Based on transaction histories and current or expected trends, companies typically possess the capability to project near- or mid-future orders with roughly specified attributes. Sharing this information about the potential orders with involved parties of the network and iteratively completing this information with more precise order data may provide significant benefits to all parties in the chain. This would help logistics and transportation companies to better plan and utilize their resources, and to offer their customers the flexibility to pre-specify order attributes with ranges of values (such as the pick-up time).

In this scenario, the central value-of-use, i.e. the 'Flexible On-Time Delivery', will be enabled by a network of organizations, whose services will be orchestrated by the '*Door-2-door Forwarder'*. In other words, the *Door-2-door Forwarder* will act as the *focal organization* and ensure *on-time delivery* of the goods. The 'Retail Company', on the other hand, will contribute to the value-in-use as a *customer* with *timely orders*. The information about the orders is not only timely but also updated frequently starting with a rough estimate and gradually becoming more accurate towards the order date. In that sense the orders are in a *provisional* state until they are confirmed as *definite or final*. This will allow many service providers including the orchestrator to plan ahead and use their capacity more efficiently.

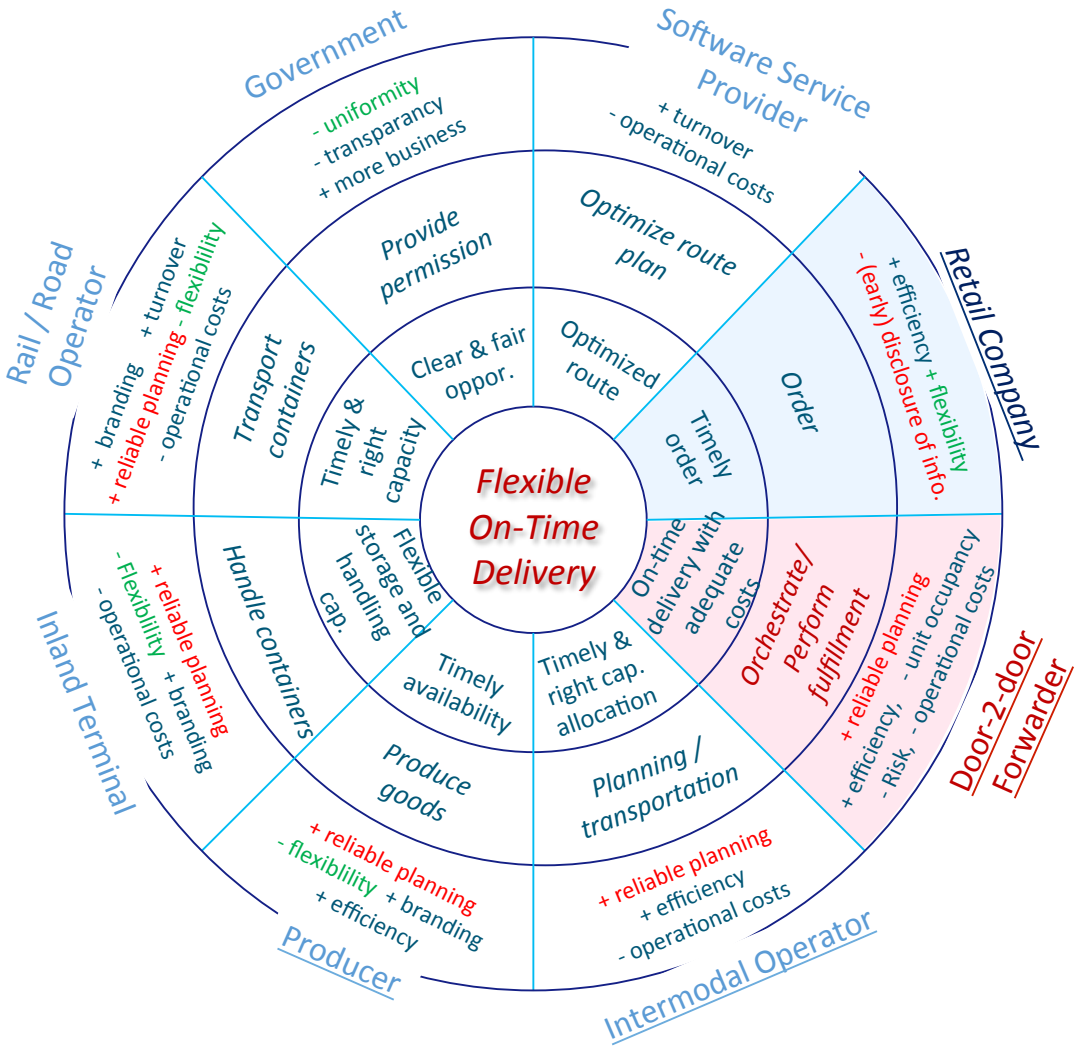

Figure 3. Service Dominant Business Model Blueprint for Business Model 1: Flexible On-time Delivery

In addition to the customer and focal organization, the network requires a number of core and enriching partners to create the intended value-in-use in this business model. The *Intermodal Operator* and the *Rail/Road Operator* enrich the value-in-use with *timely* and *right allocated capacity* of their transportation capabilities. This includes *iterative planning* of when and how the containers are *transported* from the terminal to the *Retail Company.* In addition, the *Inland Terminal* provides *flexible storage* and *capacity handling* of the containers in order to provide the Rail/Road and Intermodal Operators with timely delivered trucks for the pick-up. Furthermore, the *Producer* will contribute to the value-in-use by ensuring that the requested goods are available timely. At each receive of more accurate order information, the *Software Service Provider* will provide the Door-2-door Forwarder an optimized route plan service, which would help selecting the best route including the involved partner companies. Finally, in order to help network companies to better respond to changing customer's requests, the *Government* enriches the model with clear and fair opportunities ensured via rules and regulations –for instance, on the business hours and transportation possibilities of the involved parties.

The business model involves cost and benefits not only in the financial but also in non-financial forms. The *Door-2-door Forwarder* will experience increased *operational costs* for the orchestration of the network and *unit occupancy* because of the order fulfilment to the customer. However, it will benefit from *reliable planning* due to the availability of early order

information, and eventual benefit for increased efficiency through better capacity planning and order handling. This will be realized despite the certain level of uncertainty in changing orders, as this risk will be better managed in this scenario. The improved efficiency will be a benefit not only for the orchestrator –i.e. Door-2-door forwarder, but also for the *Producer, Intermodal Operator* and *Rail/Road Operator.* However, risk handling through more reliable planning incurs increased operational costs for many parties in addition to the orchestrator. This will include the *Intermodal Operator*, *Inland Terminal*, *Rail/Road Operator,* and the *Software Service Provider.* The increased attractiveness of the port and the area due to increased business will be a benefit not only to partner companies but also to the Government. The value-in-use will provide positive branding for several parties including the *Producer, Inland Terminal*, and *Rail/Road Operator.*

4.2 Business model: *Fast-Lane End-to-End Shipping*

Handling high volumes of deep-sea cargo in ports takes substantial time and effort. It is typical for deep-sea container vessels to be loaded without taking any priority schemes into account. This usually leads to long unloading times levelled randomly among containers. Where this may not be a major problem for large volumes of non-priority cargo, it may seriously hinder for smaller volumes of priority cargo that 'get lost' in a large stream of other cargo (the increasing size of container ships adds to this problem).

Take as an example an electronics producer (such as a smartphone manufacturer) in the Far East that wants to transport a container load of its products to Europe to meet a specific launch date of the product (as is typical with smartphones - possibly coupled to an event such as a trade fair). Using deep-sea shipping in a container may bring the risk of not meeting the deadline (which may significantly reduce the value of the product batch), unless the specific container can be handled with priority: at the departure port it is loaded such that it gets unloaded first at the destination port, custom facilities are reserved to have straight-through processing, and container pick-up is reserved with high availability guarantees. To enable transport of perishable goods (such as fruits or plants) by sea container, priority handling is important too. If executed in the right way, it may even provide possibilities to move some kinds of goods transport from other modalities (such as air transport) to sea transport, thereby significantly reducing both the costs and the CO_2 footprint of the transport.

The business model 'Fast-Lane End-to-End Shipping' emerges to address the need for a *faster* delivery for a selected set of high-priority containers that are shipped by a customer to the hinterland of the port of arrival. This business model is service-dominant and is based on a network of partners collaborating in logistics to co-create the value-in-use.

The fast delivery service would require careful operations by several partner companies. The *Logistics Service Provider (LSP)* will act as the focal organization bringing all network parties together to provide the value-in-use to the customer – i.e. the *Shipper*. LSP will be the customer interfacing company with the network knowledge and will integrate the operations of all parties. The *Shipper* (customer) also contributes to the value-in-use by specifying the priorities for containers.

The blueprint of this business model is depicted in Figure 4.

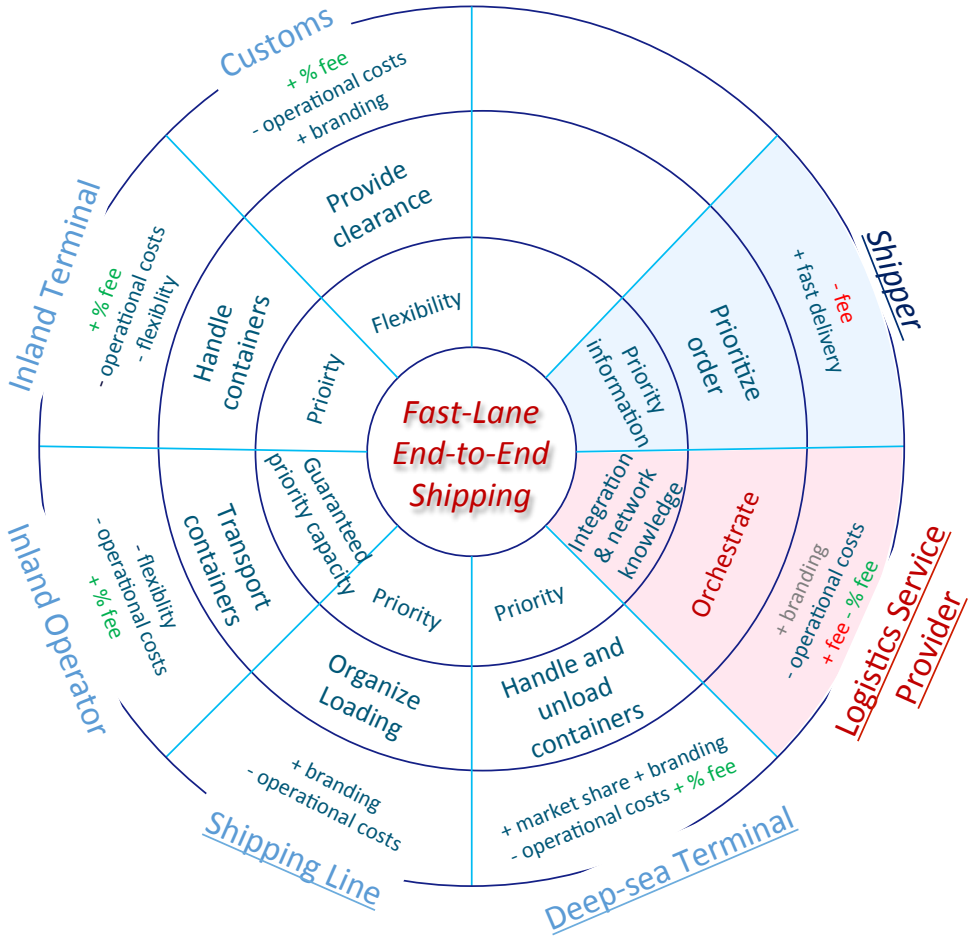

Figure 4. Service Dominant Business Model Blueprint for Business Model 2: End-to-End Fast Lane

In addition to the focal organization, the network requires other parties that are core to the value-in-use. First, the *Shipping Line* –informed about the list of containers with priorities, will respond by organizing the loading in such a way that the unloading can be performed more quickly and efficiently at the *Deep-sea Terminal* at the port of arrival. After the high-priority containers are ready for pick-up, the *Inland Operator* or *Inland Terminal* will ensure on-time arrival and will transport high-priority containers to the requested destination. Furthermore, in order to ensure that these containers are ready for pick-up directly after unloading, *Customs* will offer flexibility and precedence in processing these containers.

Delivering this exclusive value-in-use to the customer would greatly enhance the reputation of many network parties, - particularly the LSP, Deep-sea Terminal and the Shipping Line- and may help increase their business volume and market share. However, “end-to-end fast lane” will incur increased operational costs to these parties, which will be covered through additional fee paid by the Shipper. This fee will be shared among network parties, including the *Customs*, with certain pre-defined amounts.

4.3 Participants’ feedback on the business modelling approach

After each workshop session, we gathered feedback from the participants regarding the use of the approach and its effectiveness. Participants agreed that following an explicit approach that structures the interactive design of business models fostered the creation of innovative

ideas. Participants indicated SDBM/R as an effective means for a diverse set of stakeholders to collaboratively design new business models. They further agreed that it created awareness on the value of agile, service-dominant business thinking and provided inspiration for collaboration with different stakeholders.

We also performed a short survey to investigate participant's view on the usefulness and easy of use of the approach that they practiced during the workshops. Appendix C presents the detailed results regarding each survey question. Briefly, participants considered the SDBM/R *useful* in designing business models (see Figure 7 Questions Q1-Q4). They indicated that using this approach would provide an effective solution to the problem of designing business models. They also agreed that using SDBM/R would make it more easy to communicate the business models to others. Furthermore, participants found the approach not only easy to use but also considered that it would be easy for them to become skilful at using the approach for business model design (see Figure 7 Questions Q5-Q8). Majority of the participants also indicated their intention to use this approach in practice (Questions Q9-Q10).

Figure 8 and Figure 9 in Appendix C presents further details about the participants regarding their domain experience, and their current position, as well as the size of the companies that they work for.

5 Policy recommendations

In the BESTFACT Implementation Action described in this report, we have focused on the use of multi-sided, service-dominant business models in the transport and logistics domain. We have set up and executed two business modelling workshops with a diverse set of stakeholders in the domain. The results of these workshops have been elaborated and analyzed as described before in this report.

We discuss our recommendations in three categories related to respectively the application of the service-dominant business paradigm in the transport and logistics domain, the use of multi-sided business models in the domain, and the importance of explicit treatment of non-financial costs and benefits in business models in the domain. We end this section with a short indication of possible practical implications.

5.1 The service-dominant business paradigm

The transport and logistics can be considered as an asset-centric business domain, in which business thinking often starts with consideration of assets. Assets can be equipment for transportation (including storage and cross-docking) as well as the physical goods to be transported. This often leads to a means-to-goals direction of thinking and an inside-out (provider-to-customer) perception of the market. End customers in the domain (such as shippers), however, are mainly interested in the *added value* brought by the execution of transport and logistics processes (such as the on-demand availability of goods at specific locations) - not so much in the means to accomplish these. In other words, customers are interested in the *value-in-use* obtained by the execution of transport and logistics services - they prefer the outside-in-view. Transport assets are of course required, but to customers, they are of secondary (indirect) interest only. The more complex a market gets, the more different the inside-out and outside-in views become. In the workshops described in this report, participants experienced the service-dominant approach as a fresh, new way to approach business in the domain.

The above observations lead to the following policy recommendations:

1. Promote the service-oriented way of thinking in the transport and logistics domain, i.e., promote thinking that starts from customer value instead of thinking that starts from transportation means.
2. Promote customer-centric design of business instead of provider-centric design of business, i.e., promote outside-in thinking.

5.2 Multi-party business models

Most business settings in the transport and logistics domain are multi-stakeholder settings. For example, in multi-modal, international logistics we see collaborative scenarios of shippers, logistics service providers, deep sea shipping companies, road transport companies, rail transport companies, cross-docking terminal handlers, custom services, and insurance companies. In traditional business settings, collaboration can be modelled and designed in bilateral settings, i.e., by considering pairs of organizations in their business relations. Here, more complex scenarios are created by nesting bilateral relations, typically by means of outsourcing. In contemporary logistics settings, complex business models often only become viable when analyzing them directly in a multi-party setting in which more than two parties collaborate at the same level (i.e., to design *multi-sided business models*). At this collaboration level, several value streams exist between parties that *together* form a viable business

system (see also the next subsection). Both business models developed in the workshops of this implementation action and described in this report illustrate this point: both have considerably more than two parties at the same collaboration level. Note that this does not mean that bilateral contracts become obsolete: multi-sided business models can be formalized in a set of bilateral contracts (typically between the orchestrator and each of the other parties).

From the above observations, we can derive the following policy recommendations:

3. Make models and techniques available in the transport and logistics domain for design and analysis of multi-sided business models.
4. Trigger organizations to experiment multi-sided business models in a light, explorative way with multiple stakeholders involved. Experience shows that business model prototypes can be collaboratively designed within a few hours, often leading to interesting new business ideas.
5. Practically explore the full-fledged application of multi-sided business models and their mapping to sets of bilateral contractual agreements.

5.3 Non-financial costs and benefits

In typical business thinking in the transport and logistics domain, the emphasis is on optimization in terms of financial costs. Sometimes, carbon footprint is explicitly considered, but in many cases this can be mapped onto financial costs (less CO_2 emission means less cost for fuel). However, other costs and benefits often are in play as well, which need to be considered to make a multi-sided business model work. For instance, there may be stakeholders that do not have a direct financial benefit in a business model but that are required to make it work; there may be stakeholders that have financial costs that may be offset by non-financial benefits. One example is formed by government organizations that have societal safety or ecological preservation as a non-financial benefit. Another example is formed by organizations that exchange financial costs for information benefits (i.e., business data) - this example becomes quickly more important with the rise of real-time multi-modal and synchro-modal logistics (where data availability is a basic requirement).

From this observation, we formulate the following policy recommendations:

6. Promote thinking in both financial and non-financial benefits in business models. Both types can be exchanged for each other where so required. In doing so, start thinking in a qualitative way to keep business model design open. Quantify non-financial costs and benefits in a later stage.
7. Develop concrete approaches/standards for the quantification of non-financial costs and benefits. Most directly, this is beneficial for information/data as benefit (certainly in real-time logistics) and ecological impact as cost (or reduction of ecological impact as benefit).

5.4 Practical implications

Based on the above policy recommendations, we conclude with a few possible practical implications:

- We suggest to actively disseminate knowledge about service-dominant business thinking in the transport and logistics domain. This can be performed by making handbooks available to the domain, by organizing short courses for business practitioners, and/or have contributions on the topic in professional gatherings (such as trade fairs or professional congresses).

- The workshops organized in the Implementation Action described in this report were received very well by the participants but found *too short* to fully complete business model design (organization was constrained by availability of participants). Therefore, a follow-up action may be to organize a few more workshops with more room for design/discussion - this with the aim to broaden practical experience and generate a larger set of example business models (as inspiration for the field).

6 References

[1] M.M. Al-Debei, D. Avison, Developing a unified framework of the business model concept, Eur. J. Inf. Syst. 19 (2010) 359–376.

[2] L.M. Camarinha-Matos, H. Afsarmanesh, Collaborative networks: a new scientific discipline, J. Intell. Manuf. 16 (2005) 439–452.

[3] P. Grefen, Service-Dominant Business Engineering with BASE/X: Business Modeling Handbook, 2015.

[4] P. Grefen, Beyond e-Business, Routledge, 2015.

[5] P. Grefen, E. Luftenegger, E. v.d. Linden, C. Weisleder, Business Agility through Cross-Organizational Service Engineering - The Business and Service Design Approach developed in the CoProFind Project, Beta Working Papers, Vol. 414, Eindhoven University of Technology, 2013.

[6] P. Grefen, O. Turetken, K. Traganos, A. den Hollander, R. Eshuis, Creating Agility in Traffic Management by Collaborative Service-Dominant Business Engineering, in: Proc. 16th IFIP Work. Conf. Virtual Enterp. (PRO-VE 2015), Springer, 2015.

[7] E. Luftenegger, M. Comuzzi, P. Grefen, The Service-Dominant Ecosystem: Mapping a Service Dominant Strategy to a Product-Service Ecosystem, in: L.M. Camarinha-Matos, R.J. Scherer (Eds.), IFIP Adv. Inf. Commun. Technol., Springer Berlin Heidelberg, Berlin, Heidelberg, 2013.

[8] E. Luftenegger, P. Grefen, C. Weisleder, The Service Dominant Strategy Canvas: Towards Networked Business Models, in: L.M. Camarinha-Matos, L. Xu, H. Afsarmanesh (Eds.), IFIP Adv. Inf. Commun. Technol., Springer Berlin Heidelberg, Berlin, Heidelberg, 2012.

[9] R.F. Lusch, Service-dominant logic: reactions, reflections and refinements, Mark. Theory. 6 (2006) 281–288.

[10] R.F. Lusch, S.L. Vargo, The Service-Dominant Mindset, in: B. Hefley, W. Murphy (Eds.), Serv. Sci. Manag. Eng. Educ. 21st Century, Springer US, Boston, MA, 2008: pp. 89–96.

[11] J. Magretta, Why Business Models Matter, Harv. Bus. Rev. 80 (2002) 86–92.

[12] A.L. Ostrom, M.J. Bitner, S.W. Brown, K.A. Burkhard, M. Goul, V. Smith-Daniels, et al., Moving Forward and Making a Difference: Research Priorities for the Science of Service, J. Serv. Res. 13 (2010) 4–36.

[13] M. van Sambeek, F. Ophelders, T. Bijlsma, B. van der Kluit, O. Turetken, R. Eshuis, et al., Towards an Architecture for Cooperative ITS Applications in the Netherlands. BETA publication 485. Eindhoven University of Technology, 2015.

[14] K. Traganos, P. Grefen, A. den Hollander, O. Turetken, R. Eshuis, Business Model Prototyping for Intelligent Transport Systems: A Service-Dominant Approach, Beta Publication 469. Eindhoven University of Technology, 2015.

7 Appendix A. Details of the workshops

Below, you find the administrative details of both workshops executed in the exploration initiative.

7.1 Workshop 1

Location:	Eindhoven University of Technology, Eindhoven, Netherlands	
Date:	July 6, 2015	
Facilitators:	Paul Grefen,	Eindhoven University of Technology
	Oktay Türetken,	Eindhoven University of Technology
Participants:	Kornee Sterrenburg,	Ixolution
	Ton Stuit,	Ixolution
	Patrick van Aert,	Ixolution
	Matthias Hormuth,	PTV Group
	Dyon van Gaans,	PTV Group
	Niels van der Vlist,	SAMSKIP
	Tomas Tempelaars,	MOVE
	Maryam Razavian,	Eindhoven University of Technology

7.2 Workshop 2

Location:	RDM Campus, Rotterdam, Netherlands	
Date:	July 8, 2015	
Facilitators:	Paul Grefen,	Eindhoven University of Technology
	Oktay Türetken,	Eindhoven University of Technology
Participants:	Marten van der Velde	Portbase
	Marco Huijsman	Cofano
	Harmen van Dorsser	Port of Rotterdam
	Danny de Roo	Port of Rotterdam
	Arno van Rijn	ECT

8 Appendix B. Prototype business models

On the next two pages, we show photographs of the original business models that were interactively constructed during the two workshops. To be able to adjust the business model during discussion, color-coded post-its are used on a business model radar template by the session facilitators. The color-coding of the post-its is as follows:

- Yellow : business model value-in-use, actor value propositions.
- Blue : actor coproduction activities.
- Green : actor benefits.
- Pink : actor costs.
- Orange : actor identification.

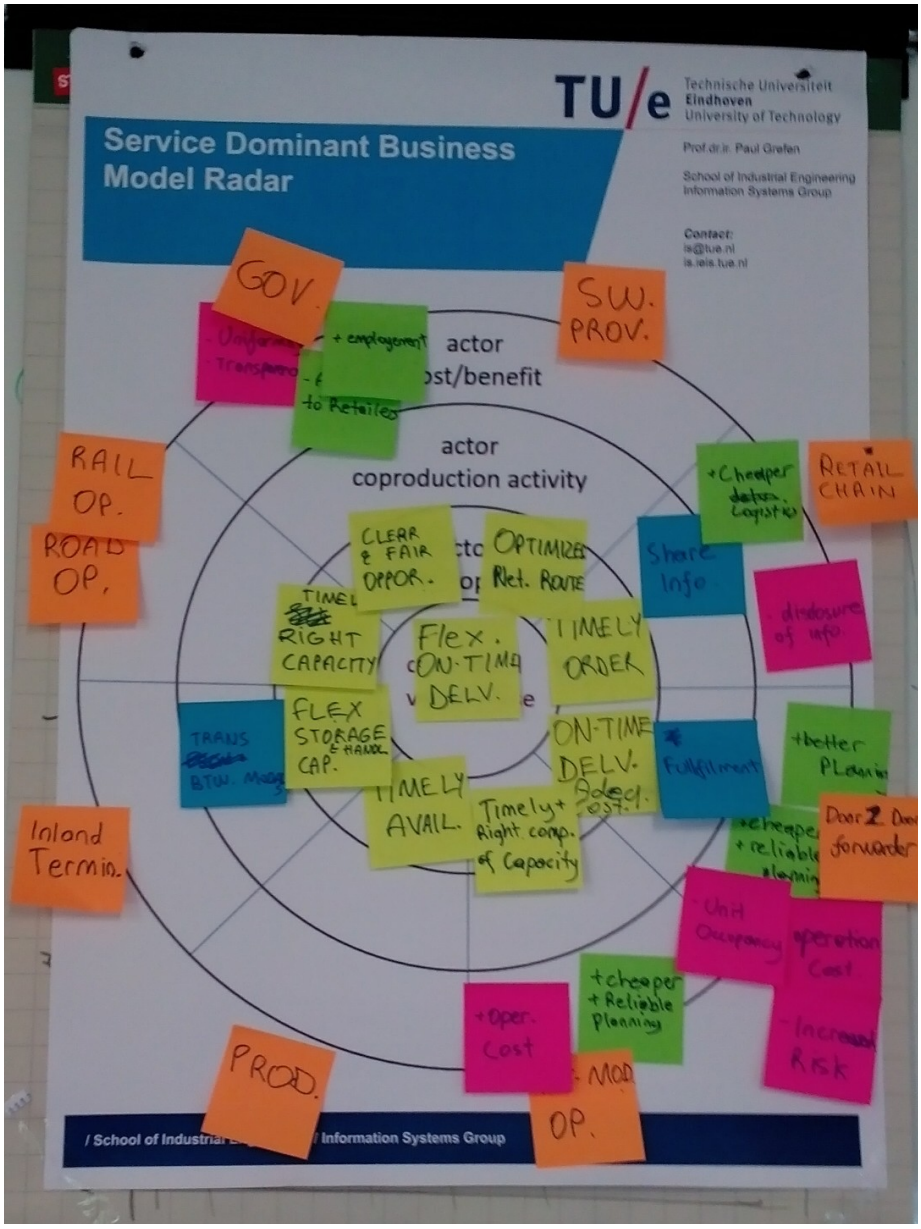

Figure 5: interactively constructed business model for Flexible On-Time Delivery

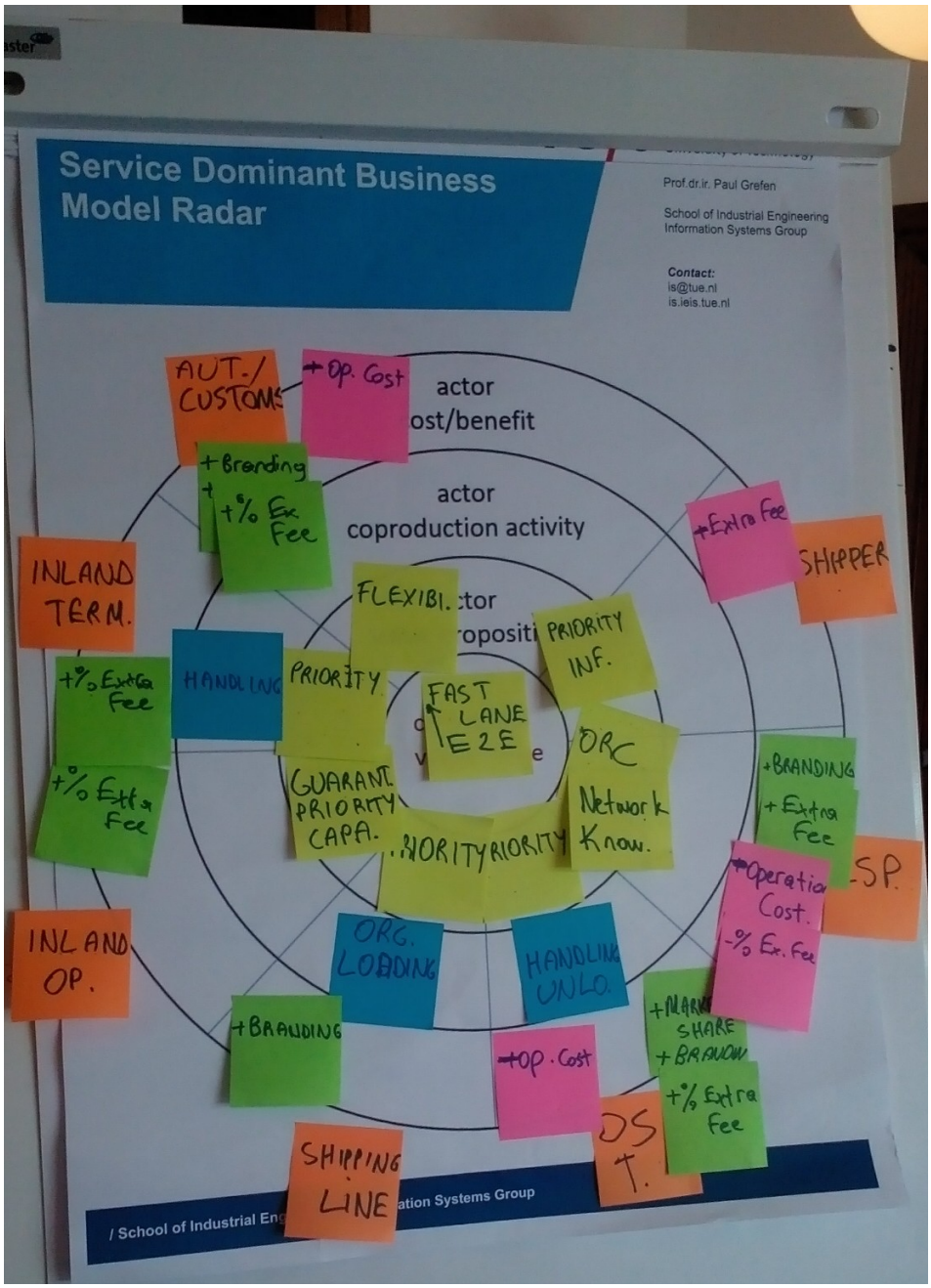

Figure 6: interactively constructed business model for Fast-Lane End-to-End Shipping

9 Appendix C. Results of the questionnaire on the business modeling approach

Q1	I think this approach provides an effective solution to the problem of designing business models.
Q2	Business models designed in this way would be easy for users (colleagues, partner companies, etc.) to understand.
Q3	Using this approach would make it more easy to communicate the business models to others.
Q4	Overall, I found the business model design approach in this workshop to be useful.
Q5	Learning to use this way of designing business models would be easy for me.
Q6	I found the way the business models are designed as (un)clear and easy to understand.
Q7	It would be easy for me to become skilful at using this way of designing business models.
Q8	Overall, I found this way of designing business models easy to use.
Q9	I would use this method to design business models.
Q10	I would intend to use this way of designing business models in preference to another design approach, if I have to design business models in the future.

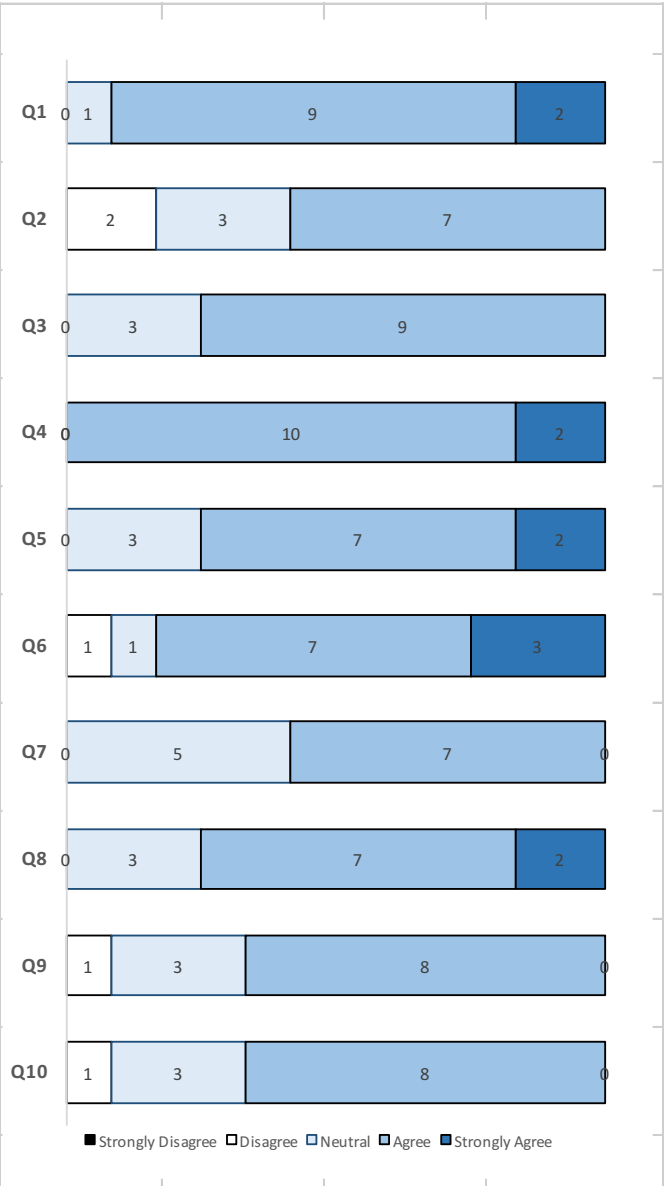

Figure 7. Participants' view on the usefulness and ease of use of the business modeling approach

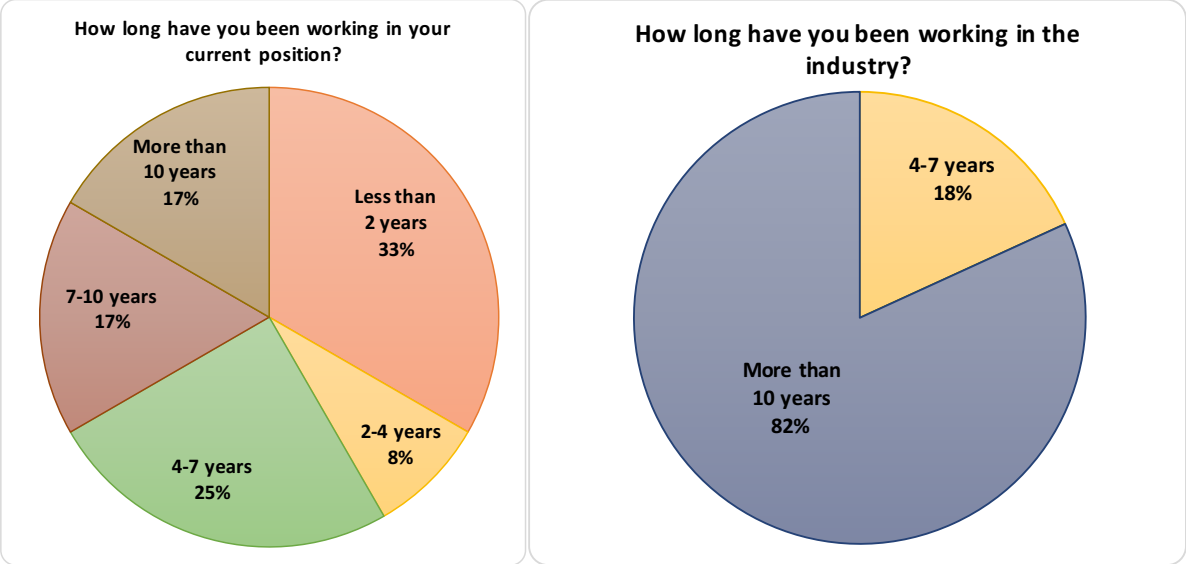

Figure 8. Participants' experience in the domain

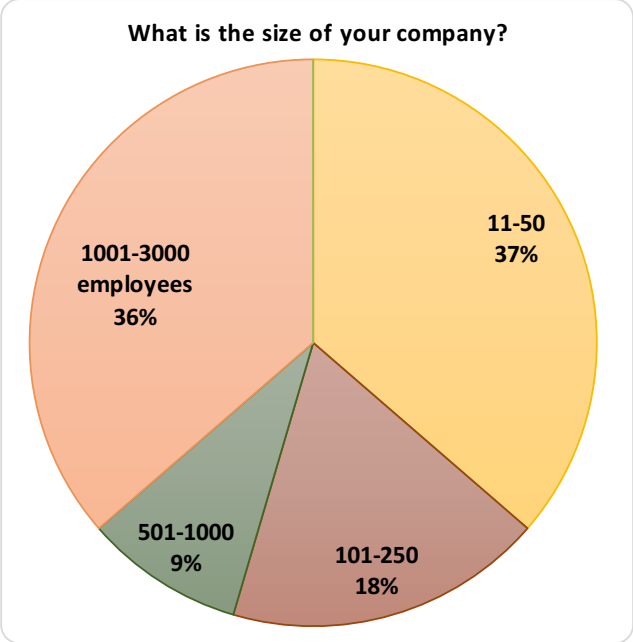

Figure 9. Size of participating companies