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Department of Mathematics and Computer Science Department of Industrial Engineering & Innovation Sciences

Master of Business Information Systems

Tooling the BASE/X framework

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Abstract

Currently, many business domains are transitioning towards a Service-Dominant Business setting where services are the basic mechanism for interacting with customers. BASE/X (Business Agility through Cross Organizational Service Engineering) framework is developed in the Eindhoven University of Technology, the Netherlands, with the objective to offer help for the business developers to transition towards a more Service-Dominant business setting. The design of business models is an essential component of the BASE/X framework, which uses the 'Business Model Radar' to graphically depict the model.

Despite the fact that the BASE/X framework has been used in several industry projects, there is still no tool that offers effective support for the use of the framework. Currently generic office tools, such as Microsoft Word and PowerPoint, are used to generate the graphical representation of the Business Model Radar.

Therefore, there is a need for a tool to provide support and guidance for the users of the BASE/X framework. This study aims to contribute to the fulfillment of this need in two ways. First, it offers a detailed requirement specification of the tool. Second, it provides a working prototype that satisfies majority of the requirements specified for the tool. The study also involves the evaluation of the working prototype. The evaluation is executed by comparing the output of an industry project to demonstrate the capability of the tool in handling real life cases, and to show the extended capabilities of the tool. In addition, the tool was evaluated by two users of the BASE/X framework for its usefulness, ease of use, and attitude towards using.

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Glossary

- Actor An Actor is an organization that is joining the project. With the Actor's Co-Production Activity, Value Proposition, and Costs the main goal of the project, Value-In-Use should be reached. Furthermore, the Actor can also get Benefits from the project.
- **Agile** Agile Business Models are created and dismissed as market circumstances change in a revolutionary way for a medium-term horizon.
- **Benefit** A Benefit is an advantage towards one or multiple Actors.
- **Business Model** Business Models describe market offerings in terms of customer-oriented solutions with a Value-In-Use and the associated Costs and Benefits. Business Models are Agile. Business Models are formulated in terms of concrete business relationships with other players.
- **Co-Production Activity** A Co-Production Activity is a high-level activity that realizes the Actor Value Proposition.
- Collaboration Management Collaboration Management are the overall ways to manage collaborations with partners in the service eco-system, allowing Business Models to be executed.
- **Core Partners** Core Partners deliver core services that are essential to the Value-In-Use ('must have').
- Cost A Cost is made by an Actor to benefit the entire project.
- **Customer** The Customer service is the final goal of the Business Models.
- **Enriching Partners** Enriching Partners deliver enriching services that are add to the Value-In-Use ('nice to have').
- **Focal Organization** The Focal Organization, or Orchestrator is the party that synchronizes the operation of the network. Often but not always, this is also the party that initiated the setup of the Business Model.
- Meta-Model A model C is called a metamodel, iff: its original is another model B (resulting from modelling an original domain A), the modeling operation B C implies placeholder projection.
- **Model** The term "model" is derived from the Latin word modulus, which means measure, rule, pattern, example to be followed.
- **Service Eco-System** Service Eco-System is the business environment that allows the creation of networks for Business Models, centered around focal organization.

Strategy Business Strategy describes the overall strategy of a service-dominant organization. Business Strategy is designed to exist in a market with other players, but is not formulated in concrete relationships with these.

Value Proposition Value Proposition is a part of the Value-In-Use contributed by the Actor.

Value-In-Use Value-In-Use is delivered as an experience to generalized Customers through high-level interaction.

Acronyms

B2B Business-to-Business.

BASE/X Business Agility through Cross Organizational Service Engineering.

BIS Business Information Systems.

BMC Business Model Canvas.

BSC Balanced Scorecard.

COBIT Control Objectives for Information and Related Technology.

CSS Customer Support Services.

DBPF Dynamic Business Process Formation.

GD Goods-Dominant.

IE&IS Industrial Engineering & Innovation Sciences.

IS Information Systems.

IT Information Technology.

PPA Praktijkproef Amsterdam.

PSS Product-Service Systems.

SD Service-Dominant.

SDBM/R Service-Dominant Business Model Radar.

SLM Service-Level Management.

SSC Services that Support the Customer.

TAM Technology Acceptance Model.

 $\mathbf{TU/e}\,$ Eindhoven University of Technology.

Chapter 1

Introduction

This master thesis is the result of the graduation project for the Business Information Systems (BIS) MSc graduate program at the Eindhoven University of Technology (TU/e). This is a combined program of the departments Computer Science and Industrial Engineering & Innovation Sciences. The project is carried out at the Information Systems research group of the department Industrial Engineering and Innovation Sciences (IE&IS).

1.1 Motivation

"Uber, the worlds largest taxi company, owns no vehicles. Facebook, the worlds most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbab, the worlds largest accommodation provider, owns no real estate. Something interesting is happening."

- Tom Goodwin, [8]

As can be seen in the above quote by Tom Goodwin, things are changing. Service-Dominant business markets are created, in which services are the basic mechanism for interaction. It is getting more and more important to become a Service-Oriented company to create better possibilities for the client side.

Another example is the new Dutch online supermarket 'Picnic' [21]. This supermarket does not have shops customers go to, there is a only a simple app. In this app, the customers can order their groceries in under 3 minutes. The groceries are delivered at your home at the times you decide, even in the evening or in the weekend. Due to having no shops, Picnic can guarantee the lowest prices. Connecting the suppliers, logistics partners, and the communication with the customer will generate a better service experience for the customer.

Grefen et. al. [12] explains the move from Product-Oriented to Service-Oriented. This creates Service-Dominant business markets where services are the basic mechanism for interaction. The Service-Dominant business paradigm is defined as the style of defining and implementing Business Models such that the following three characteristics apply:

- 1. Value-In-Use is the main entity that is exchanged (traded),
- 2. this Value-In-Use is encapsulated in a set of services, and
- 3. these services are offered to a market through a service delivery mechanism.

The Service-Dominant business paradigm is a way of thinking about doing business that uses the Service-Oriented paradigm as an underlying way of thinking about delivering business value [12]. The not-so-physical characteristics of Service-Dominant business markets give rise to high levels of dynamism. This places high demand on the agility of service providers operating in these markets [12]. These providers find their agility, however, heavily constrained by the Business and Information Technology platforms they use to deliver their services. Furthermore, Alonso et. al. [2] explain where the Service-Oriented paradigm is mainly about operations (How to do things, often related to Information Technology such as Web services), the Service-Dominant business paradigm adds thinking about business (Why to do things related to market dynamics) by Grefen et. al. in [12].

1.2 Problem Description

BASE/X, developed by Grefen et. al. in [12], is a business engineering framework that puts the service management at the forefront. It adapts a holistic view and covers the entire spectrum from high-level Business Strategy definition to business information system architecture design. This includes elements such as: Business Strategy definition, Business Model conception, Business Service specification, and business process modeling. The framework is used in this thesis project, including but not limited to the fact that the framework has been proven to work in other, real life, projects. Within the BASE/X framework an important part is reserved for the design of service-dominant business models. The framework facilitates the design of the business models through a creative template-like structure, called the 'Business Model Radar'. The radar incorporates the specific 'value' that the business model offers to a particular customer, the actors (parties) that contributes to this value, and their corresponding value propositions, co-production activities, costs, and benefits. The details of the components of the business model radar is explained in Chapter 2.

While it is easy to read and understand the depicted model, it is difficult to create a digital version of the business model radar, particularly in live settings. Currently, during BASE/X workshops, posters and Post-it's are mainly used to express the outcomes of the workshop. These outcomes can only be shared by making photo's of the poster. For the digital versions of the radar, typical tools, such as Microsoft PowerPoint or Microsoft Word are used. However, the resulting models act merely as static images, which do not permit performing any type of analysis over the models or establishing formal relationships between model elements. Therefore, there is a need to effectively support the development of the business model radars of the BASE/X framework in the digital environment. Accordingly, the research objective is as follows:

Research Question How to develop a tool as an aid for the service dominant Business Modeling design in the BASE/X framework?

The objective of this thesis study is two-fold: First, to develop a requirement specification of the tool that will provide support for the design of business models of the BASE/X framework. Second, to develop a working prototype that implements majority of the specified requirements. The prototype tool will help future BASE/X users in designing business strategies and business models.

Furthermore, the prototype tool gives the user a hand in verifying the current solution in the project, and whether this project is a fit within the framework. In order to evaluate the prototype and test the key features, we used it to digitally redesign a set of business models resulted from a real life industry project. In addition, we interviewed with two BASE/X users, who are currently working on designing BASE/X business models, to subjectively acquire their view on the usefulness and ease of use of the developed prototype.

1.3 Report Outline

Chapter 2 presents background information about the BASE/X framework and other Business Model Design approaches.

Chapter 3 describes the research method followed in the study.

Chapter 4 presents the prototype tool by going through its main functionalities. In order to show the requirements that were implemented, the list of requirements ends this chapter.

Chapter 5 presents the results of the evaluation that involved the use of the tool to redesign existing real-life business models and two BASE/X users were interviewed.

Finally, Chapter 6 will conclude this thesis project with an overview and limitations of the work and further research.

Chapter 2

Background

In this chapter, the BASE/X framework will be explained in Section 2.1. In Section 2.2, three different Business Model Design approaches will be compared.

2.1 Background on BASE/X

BASE/X stands for "Business Agility through Cross Organizational Service Engineering", which is mainly developed within the Eindhoven University of Technology. In this section the BASE/X framework will be further explained with information from the paper by Grefen et al. [13].

2.1.1 Service-Dominant Business Engineering and BASE/X

Ostrom et. al. [20] claims that, business in many domains has transitioned towards a Service-Dominant setting where the provisioning of Solution-Oriented services to the customers is the focal point. Lusch et al. [17], compares the traditional setting where the emphasis is on the delivery of products (assets) to the customers as a focal point. 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 product in an integrated context - the so-called Value-In-Use by Lusch et. al. [16].

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 [5].

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 fore-front by Grefen et. al. in [12]. It adapts a holistic view and covers the entire spectrum from high-level Business Strategy definition to business information system architecture design. This includes elements such as: Business Strategy definition, Business Model conception, Business Service specification, and business process modeling. Furthermore, BASE/X 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 2.1.

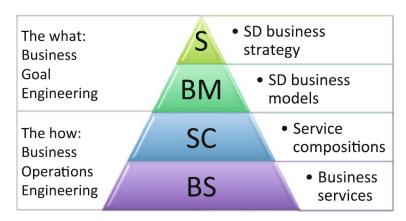


Figure 2.1: BASE/X Business Pyramid (from: [13]).

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 [14, 15]. 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 are operationalizations of the strategy as they are more concrete.

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 [12].

2.2 Other Business Model Design Approaches

There are other Business Model Design approaches, in [13] they are further elaborated, and are also shown in this section. 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 strategies, business processes, and information systems are crucial for any business organization to survive and to succeed [18].

Business Models can be designed using methods, such as the Service-Dominant Business Model Radar (SDBM/R) of BASE/X [12], Business Model Canvas (BMC) [19], or e³-value [9].

2.2.1 Service-Dominant Business Model Radar (SDBM/R)

Figure 2.2 presents the elements of the SDBM/R from the BASE/X framework. 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 proposes 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.

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 (template is shown in Figure 2.1). 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.

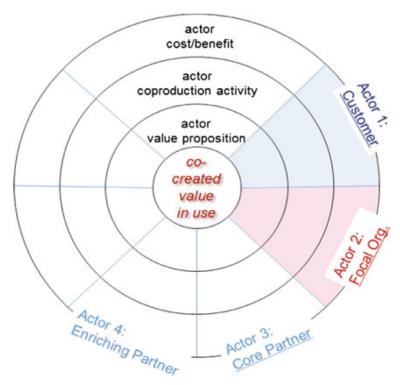


Figure 2.2: Service Dominant Business Model Radar (SDBM/R) Template (from: [13]).

2.2.2 Business Model Canvas (BMC)

BMC is a visual chart with elements describing a company's or product's Value Proposition, customers, infrastructure -including its partnerships, and financial aspects. In Figure 2.3 shows what the Business Model Canvas looks like. Although it considers cross-organizational relations and the importance of partnerships, BMC is an organization-centric model that reasons mainly from the perspective of a single company.

Strategyzer created an app for the Business Model canvas [24]. The video on their website nicely explains what the app can do, how you can work together with co-workers, and shows the benefit's of the tool. For example some of these benefits are: easy drag and drop of virtual post-it's, real-time collaboration with colleagues, and combining different projects with one user-account.

Unlike the SDBM/R, the BMC does not have a network-centric design at its core. This does not allow the composition of service design in multi-party business networks. The BMC does not define how the Actors (including Customers) in the business ecosystem participate in value Co-Creation and what the CostBenefits distribution is.

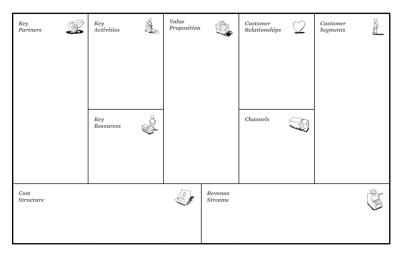


Figure 2.3: Business Model Canvas (from: [19]).

2.2.3 e³-value e-Business Model

Another approach to Business Model design is the e³-value e-Business Model, which describes the value exchanges among Actors of a business network [9]. The e³-value (from [10]) was based on concepts derived from economic and business science literature. Combining these concepts with formal systems theory ontology(from [3]). The following ontology was created (by [9]):

Actor - An Actor is an independent economic (and often legal) entity. By carrying out value activities, an Actor makes a profit or increases its utility. In a sound, viable, e-business model, each Actor should be capable of making a profit.

Value Object - Actors exchange value objects, which are services, products, money, or even consumer experiences. A value object is valuable to one or more Actors.

Value Port - An Actor uses a Value Port to show that it wants to provide or request value objects. The concept of port enables us to abstract away from the internal business processes and focus only on how external Actors and other components of the e-Business Model can be plugged in.

Value Interface - Actors have one or more value interfaces, grouping individual Value Ports. A value interface shows the value object an Actor is willing to exchange in return for another value object through its ports. The exchange of value objects is atomic at the level of the value interface.

Value Exchange - A value exchange connects two value ports with each other. It represents one or more potential trades of value objects between Value Ports.

- Value Offering A value offering is a set of value exchanges that shows which value objects are exchanged via value exchanges in return for other value objects. A value offering should obey the semantics of the connected value interfaces: Values are exchanged through a value interface on all its ports or on no ports at all.
- Market Segment A market segment is a concept that breaks a market (consisting of Actors) into segments that share common properties. Accordingly, our concept of market segment shows a set of Actors that for one or more of their value interfaces, value objects equally.
- Composite Actor For providing a particular service, several actors might decide to work together and to offer objects of value jointly by using one value interface to their environment. We call such a partnership a composite Actor
- Value Activity An Actor performs a value activity for profit or to increase its utility. The value activity is included in the ontology to discuss and design the assignment of value activities to Actors. As such, we are interested in collecting activities that can be assigned as a whole to Actors. Consequently, such an activity should be profitable or increase utility.

How the e³-value models can be used is shown in Figure 2.4. It focuses on the interactions between the Actors of the network in terms of the value exchanges. However, contrasting the SDBM/R, e³-value does not consider the alignment between the Business Strategy, model, process, and the information systems/technology as a harmonized package [1].

Requirement viewpoint	Stakeholders involved	Requirement viewpoint focus	Requirement viewpoint representation
Business value viewpoint	C*0's Marketeers Customers	Values, actors, exchanges	e ³ –value ontology and UCM scenarios
Business process viewpoint	Tactical marketeer, Operational management	Processes, workers, information, goods, and control flows	UML • Activity diagrams • Sequence diagrams • Interaction diagrams High-level Petri Nets
System architecture viewpoint	IT department	Hard/software, components, data and control flows, code organization	UML Class diagrams State transition diagrams Sequence diagrams Interaction diagrams Deployment diagrams Architecture description languages

Figure 2.4: Role of e³-value models (from: [9]).

2.2.4 Concluding the Business Model Design Approaches

As can be seen in the last three sections, SDBM/R, BMC, and e³-value, overlap on different topics.

The BASE/X Radar uses a circular design, while the other two do not. The BMC already has a working tool, but only looks at one company within the project. The e³-value does not create an alignment between strategy, model, process, and information systems/technology.

Chapter 3

Research Methods

In Chapter 1, we stated the objective of this study as to develop a tooling for the business model design of the BASE/X framework. We performed the following research steps in order to achieve this objective:

- 1. Specification of the tool requirements.
- 2. Development of the prototype as proof of concept for the tooling.
- 3. Evaluation of the prototype.

The following sections presents the steps performed in more detail.

3.1 Specification of the Tool Requirements

For the specification phase the Software Development Process evolutionary prototyping was followed. This process starts with an initial concept, followed by designing and implementing a prototype based on this initial concept. Following the process leads to refining the prototype until it is acceptable, and finally completing and releasing the prototype. Therefore, when developing a system using evolutionary prototyping, the system is continually refined and rebuilt. So it is an ideal process when not all requirements are well understood [23].

The information for the initial set of requirements was acquired from the BASE/X handbook [11]), BASE/X Business Agility through Cross Organizational Service Engineering [12], Creating Agility in Traffic Management [13], and Business Model Prototyping for Intelligent Transport Systems [25]. Throughout the project, these requirements were elaborated and concertized through regular face-to-face elicitation meetings with a researcher who is expert on the BASE/X framework.

The setup of the Requirements document was constructed by using the Volere Requirements Specification Template [22]. Furthermore, are a UML Class Diagram [26] and a Use Case Diagram [30] developed for the Requirements Document. Lastly are the functional requirements set with help of a flow of the tool diagram.

The validation of the requirements was done by demonstrating the prototype in regular meetings to a user of the BASE/X framework. Next was the validation by comparing the result with the tool and real life business models.

The result of the requirements is documented in the requirements document in Appendix C.

3.2 Development of the Prototype

When starting the process of creating the tool, Java-Script and JavaFX were compared to see which one of these tools will be the best fit for this project. Java-Script has an advantage as being online, and viewable in a (web)browser. JavaFX has the advantage of having an easy way of editing the user interface, as well as a way to save the projects on the computer, and be able to use them on other computers. Java-Script has the disadvantage of not being easy to save the projects in a database, while JavaFX could do this internally. Finally, JavaFX in Eclipse, was chosen to be the programming-language for this tool, because of the easy interface, saving projects and the internal database.

3.3 Evaluation of the Prototype

The prototype tool was evaluated in two ways; first, by executing the tool and using information from previously held workshops with the BASE/X framework, to compare the outcomes of the workshops and the outcomes of the tool. Secondly, interviews were held with people who are familiar the BASE/X framework. Interviewing techniques from the Technology Acceptance Model (TAM) were used in the interviews. TAM is used as a means to measure the perceived usefulness, perceived ease of use, and attitude towards using of novel technological tools.

Chapter 4

The Tool

This section provides an overview of the requirements of the tool and introduces the main functionalities by going through the prototype tool user interfaces.

4.1 Requirements

With the information gathered from the BASE/X Framework, the weekly meetings with the enduser, the earlier mentioned Requirements Document in Appendix C was created. This section contains the requirements list, gathered from the Requirements Document. The list contains the Requirements, with a \checkmark or \times to show whether this requirement was implemented in the prototype tool, explained in Section 4.2.

Table 4.1: List of Requirements.

Req 1	Requirement type: Event/Use case: Create New Project	~
1-1	Save project with all its contents into a file, with extension .bsx.	✓
1-2	Open projects from file.	✓
1-3	Create new black project.	~
Req 2	Requirement type: Event/Use case: Main BASE/X Pyramid	✓
	page	
2-1	Open Business Strategy.	✓
2-2	Open Business Models.	✓
Req 3	Requirement type: Event/Use case: Strategy	~
3-1	Maintain business strategy information.	~
3-2	Save business strategy.	~
Req 4	Requirement type: Event/Use case: Overview of Business	~
	Models	
4-1	View all Business Models.	~
4-2	View Actors in selected Business Model.	✓
4-3	View preview of Business Model Radar.	~
4-4	Open the selected Business Model.	✓
4-5	Delete the selected Business Model.	✓
Req 5	Requirement type: Event/Use case: Add Business Model	/
5-1	Maintain business model information.	/
5-2	Discard changes and return to view all business models.	/
5-3	Save changes and return to view all business models.	/

Req 6	Requirement type: Event/Use case: Maintain Existing Business	
1004 0	Model	
6-1	Maintain business model information.	/
6-2	Maintain information on selected actor.	/
6-3	Export the Business Model Radar image with the information of the Busi-	/
	ness Model.	
6-4	Return to view all business models.	/
6-5	Delete the selected Actor.	/
6-6	Verify and display information about the current Business Model.	/
6-7	Save the Business Model Radar as a PNG-file.	/
Req 7	Requirement type: Event/Use case: Maintain Actor	~
7-1	Maintain actor information.	~
7-2	Discard changes and return to view Business Model.	~
7-3	Save changes and return to view Business Model.	<u></u>
Req 8	Requirement type: Event/Use case: Maintain Costs and	<u> </u>
1004 0	Benefits	,
8-1	Maintain Cost/Benefit information	/
8-2	Discard changes and return to view Edit Actor.	<i>-</i>
8-3	Save changes and return to view Edit Actor.	<i>-</i>
Req 9	Requirement type: Event/Use case: Add Costs and Benefits	<u></u>
9-1	View all the Costs and Benefits in the Business Model	~
9-2	Discard changes and return to edit actor.	<u></u>
9-3	Add selected Cost/Benefit and return to edit actor	·
9-4	Add new Cost/Benefit to the current actor and current business model	·
Req 10	Requirement type: Event/Use case: Add New Cost/Benefit	~
10-1	Maintain Cost/Benefit information	V
10-2	Discard changes and return to view all Cost/Benefit.	
10-3	Save changes and return to view All Cost/Benefit.	
Req 11	Requirement type: Event/Use case: Verify Business Model	<!--</td-->
11-1	Check the rule "Value-In-Use has a valid name"	
11-2	Check the rule "Business Model has a valid description"	
11-3	Check the rule "Actors have valid Value Propositions"	
11-4	Check the rule "Actors have valid Co-Production Activities"	·
11-5	Check the rule "Actors have valid Descriptions"	
11-6	Check the rule "Actors are not Customer and Focal Organization at the	
11 0	same time"	*
11-7	Check the rule "Actors have at least one Cost"	
11-8	Check the rule "Actors have at least one Benefit"	·
11-9	Check the rule "Costs in this Business Model are also a Benefit in this	,
== =	Business Model"	
11-10	Check the rule "Benefits in this Business Model are also a Cost in this	/
	Business Model"	
11-11	Check the rule "There are at least 2 Actors"	/
11-12	Check the rule "There are multiple Actors being Customer"	/
11-13	Check the rule "There is one Actor Customer"	·
11-14	Check the rule "There is one Actor Focal Organization"	·
Req 12	Requirement type: Event/Use case: Save Image	<i>-</i>
12-1	Save the image with, user specified, name and location.	· /
Req 13	Requirement type: Event/Use case: View All Actors	×
13-1	View all the Actors in the Project	×
13-2	Discard changes and return to view the Business Model	×
102	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	

13-3	Add selected Actor to Business Model and return to view the Business	×
	Model	
Req 14	Requirement type: Event/Use case: Maintain Business Model	✓
	Information	
14-1	Maintain business model information.	~
14-2	Discard changes and return to view the Business Models	~
14-3	Save changes and return to view the Business Models	✓
Req 15	Requirement type: Event/Use case: Exporting and Importing	×
	Model Components	
15-1	Export a business model into a file	×
15-2	Import a business model in a file into an existing project	×

As can be seen in the requirements list, a large extent of the requirements are implemented in the prototype tool. All requirements are prioritized and some of the requirements that have lower priorities (such as 13 and 15) were left as functionalities to be implemented for future versions of the prototype.

4.2 Walk-Through of the Prototype Tool

This section presents a walk-through of the prototype tool by using the screenshots that are made with the examples gathered from the "Business Model Prototyping for Intelligent Transport Systems" by Traganos et. al. [25]. In this paper the information is gathered from three workshops on how to increase the mobility related to the Praktijkproef Amsterdam (PPA) Zuidoost project. More information about what the topic of these workshops was, is explained in Appendix B.

When the prototype tool is opened the main-screen is shown, see Figure 4.1. From this screen, and all other screens, the menu-bar can be opened to create a new project, open an old project, save the project and exit the tool. In the main page is the BASE/X pyramid, the colors of this pyramid were chosen by using www.colorbrewer2.org [4]. The color scheme that was chosen was Dark2, this is made for qualitative data, which is also print friendly and LCD friendly. Furthermore, the design of Figure 2.1 is used as model for the main-screen.

From the main page, more information can be found about Business Strategy and Business Models using the buttons on the bottom side of the screen. When clicking these buttons, Figures 4.2 and 4.3 will open, respectively.

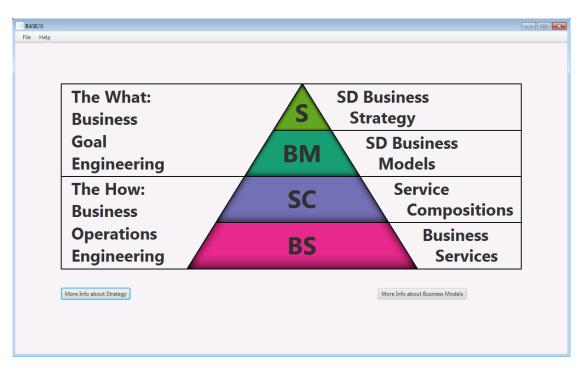


Figure 4.1: Screenshot Main.

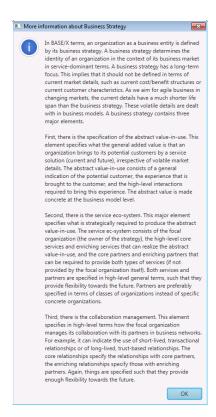


Figure 4.2: Screenshot Strategy Information.

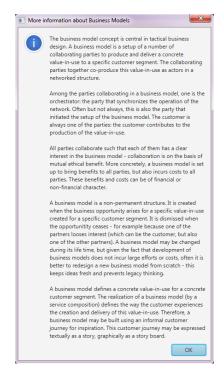


Figure 4.3: Screenshot Business Model Information.

From the main-screen, the user can go to the Business Strategy page, Figure 4.4. The user can get a step-by-step guide about what to do in this page by pressing the Steps-button.

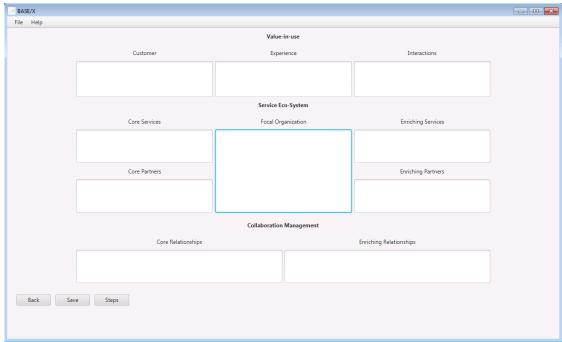


Figure 4.4: Screenshot Business Strategy.

Clicking this Steps-button in will display a pop-up screen, a screen-shot is shown in Figure 4.5. In the Business Strategy page the user can see an empty template of the Business Strategy. The user can enter information in the corresponding fields, save using the button on the bottom, and go back to the main-screen by using a back-button.

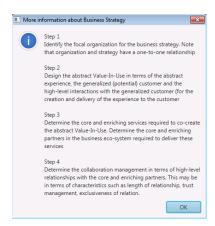


Figure 4.5: Screenshot Strategy Step-By-Step guide.

From the main-screen, the user can click BM or SD Business Models, this will open an overview of the Business Models currently in the project, a screen-shot is shown in Figure 4.6. If the user selects a Value-In-Use on the left-hand side, the list in the middle will display the Actors in this Business Model, and the Radar on the right-hand side will display the Radar for the selected Value-In-Use. Furthermore, the user is able to add, delete, and open the Business Models, or go back to the main-screen.

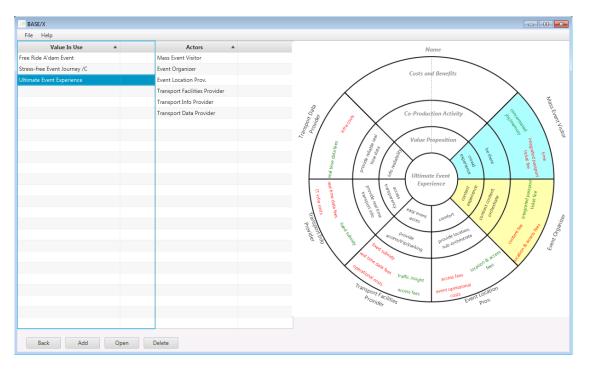


Figure 4.6: Screenshot All Business Models in Project.

When the user decides to add a Business Model and clicks the add button, a pop-up screen will be opened, a screen-shot of this is shown in Figure 4.7. This screen will give the user the opportunity to write the Value-In-Use, and the option to add a description. Furthermore, the screen gives an explanation on what a Value-In-Use is. After saving, the screen will go back to the All Business Models page.



Figure 4.7: Screenshot Add Business Models to Project.

When the user clicks delete in the Business Models screen, the selected Value-In-Use will be deleted from the project. When clicking the open button, the Business Model page will be displayed, a screen-shot is shown in Figure 4.8. In this Business Model page the user is able to add, edit, and delete Actors. Furthermore, the Business Model Radar is shown, and information about the current project. Moreover, when mousing over some of the texts, an explanation is given about that specific topic using tool-tips.

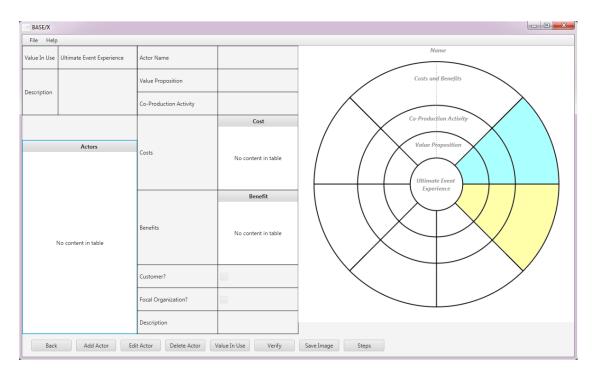
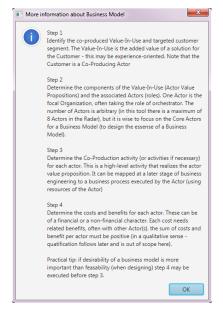


Figure 4.8: Screenshot Business Model.

To view the step-by-step guide in the Business Model, the user can click the Step-button to view Figure 4.9.

When clicking the add-button in the Business Model page, a pop-up will open, a screen-shot is shown in Figure 4.10.



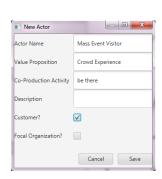


Figure 4.10: Screenshot New Actor.

Figure 4.9: Screenshot Business Model Step-By-Step guide.

The Add Actor pop-up gives the user the possibility to give the Actor the needed information. When an Actor is added to the Business Model, the Actor can be edited using the Edit Actor

button, a pop-up opens and a screen-shot of this is shown in Figure 4.11. In this screen two extra tables are added, these give the user the possibility to add, edit, and delete Costs and Benefits to the Actor. When clicking the add button, a pop-up will open, a screen-shot is shown in Figure 4.12. The information of the table in this screen will be filled with the Costs and Benefits from the Business Model.





Figure 4.12: Viewing all Cost and Benefits.

Figure 4.11: Screenshot Edit Actor.

To add a Cost or Benefit, the button New will be used, to open the pop-up new Actor, a screen-shot is shown in Figure 4.13. In this screen, the user can give the Cost or Benefit a name. The value Cost/Benefit is set to the value it was given from the edit Actor screen, although this can be changed in this screen. After entering the information, and the user clicks save, the user is back at Figure 4.11. An example of an edit Actor with entered information can be seen in Figure 4.14.

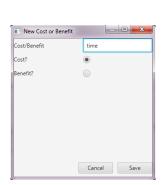


Figure 4.13: Screenshot New Cost/Benefit.



Figure 4.14: Screenshot Edit Actor (with information).

Figure 4.15 shows the Business Model screen with the information from the Ultimate Event Experience Business Model.

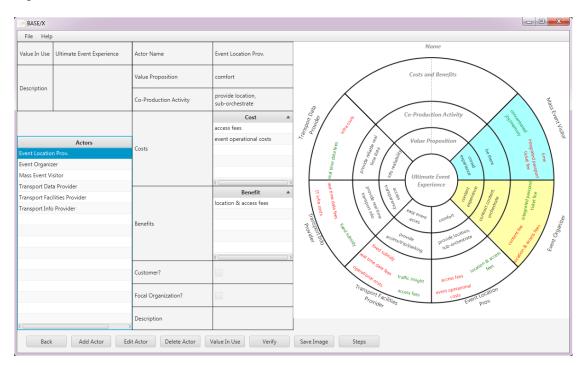


Figure 4.15: Screenshot Business Model (with information).

After clicking the Verify button, in the Business Model screen, a screen-shot of the pop-up is shown in Figure 4.16. There are multiple kinds of importance; 1. Very important, 2. Important, 3. Slightly important, and 4. Not important. With this scale the user can understand what needs more attention, and is able to find the specific verification checks to look at.

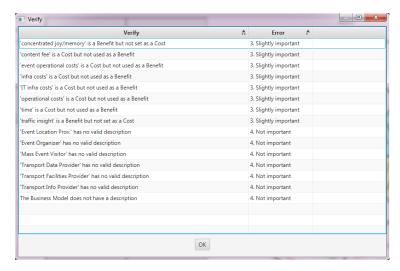


Figure 4.16: Verification of the Business Model.

Finally, when clicking the Save Image button in the Business Model screen, the radar is saved as a file with .png extension. The output for the Ultimate Event Experience, one of the workshops in the PPA project, is shown in Figure 4.17.

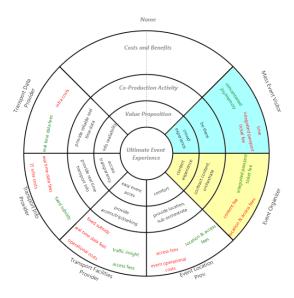


Figure 4.17: Output of the Tool with Ultimate Event Experience.

Chapter 5

Evaluation

The prototype tool was evaluated to understand if it can actually be an aid to the users of the BASE/X framework. The evaluation was performed in two ways. First, by executing the tool and using information from previously held workshops with the BASE/X framework, to compare the outcomes of the workshops and the outcomes of the tool, including the verification. Secondly, interviews were held with people who are active users of the BASE/X framework. The details of the evaluations are presented in the following sections.

5.1 Evaluation by Executing

In Chapter 4 the tool was explained by using the 'Business Model Prototyping for Intelligent Transport Systems. A Service-Dominant Approach' project [25]. This project contained three workshops. These workshops resulted in the following business models: Ultimate Event Experience, Stress-free Event Journey, and Free Ride A'dam Event. In these workshops the result for the customer is to have a great experience in one of the event locations in Amsterdam zuidoost. Moreover, there were a lot of thoughts on what to do with the parking hassle near these event locations. More information about this project can be found in Appendix B.

The workshops in this project ended in posters with post-it's on them, these are called the Original sketches. The sketches of the workshops Ultimate Event Experience, Stress-free Event Journey, and Free Ride A'dam Event are shown in Figures 5.1, 5.2, and 5.3 respectively.

To view the outputs of the three workshops and the three outputs of the prototype tool sideby-side, the outputs of the workshops are shown in Figures 5.4, 5.6, and 5.8, and the outputs of the prototype tool in Figures 5.5, 5.7, and 5.9.



Figure 5.1: Sketch of Ultimate Event Experience Business Model.



Figure 5.2: Sketch of Stressfree Event Journey Business Model.



Figure 5.3: Sketch of Free Ride A'dam Event Business Model.

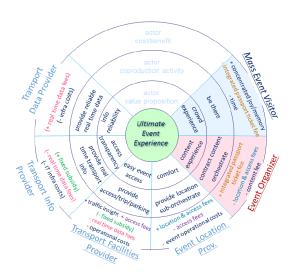


Figure 5.4: Original Result of Ultimate Event Experience Business Model.

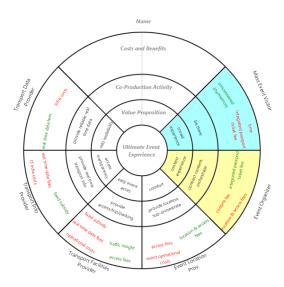


Figure 5.5: Output of Ultimate Event Experience Business Model in Prototype Tool.

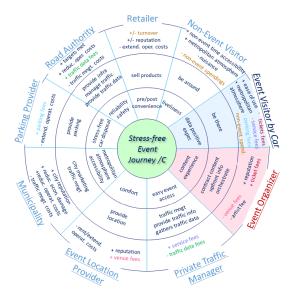


Figure 5.6: Original Result of Stress-free Event Journey Business Model.

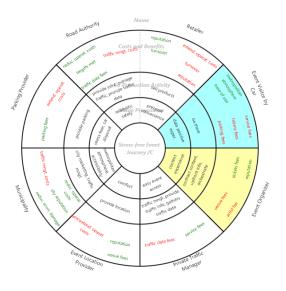


Figure 5.7: Output of Stress-free Event Journey Business Model in Prototype Tool.



Figure 5.8: Original Result of Free Ride A'dam Event Business Model.



Figure 5.9: Output of Free Ride A'dam Event Business Model in Prototype Tool.

The results of the business models were verified, using the verification-button in the tool. For these business models, it is only in the slightly important and not important division. These slightly important errors are only when cost are not used as benefit or benefit not used as cost. The not important errors are mainly about the descriptions the actors do not have. The outcomes of these verification checks are shown in Figures 5.10, 5.12, and 5.11.

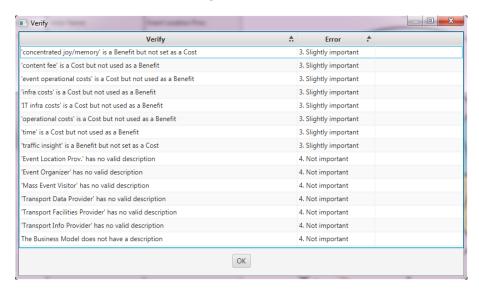


Figure 5.10: Verification of Ultimate Event Experience Business Model in Prototype Tool.

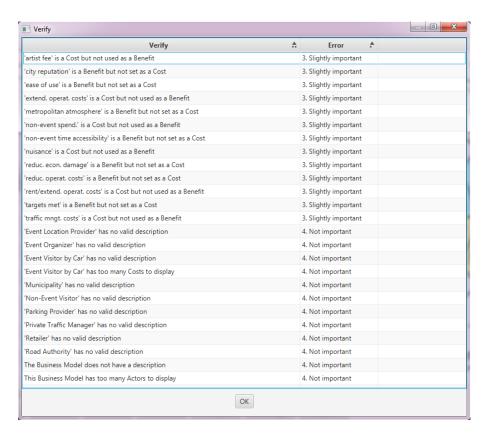


Figure 5.11: Verification of Stress-free Event Journey Business Model in Prototype Tool.

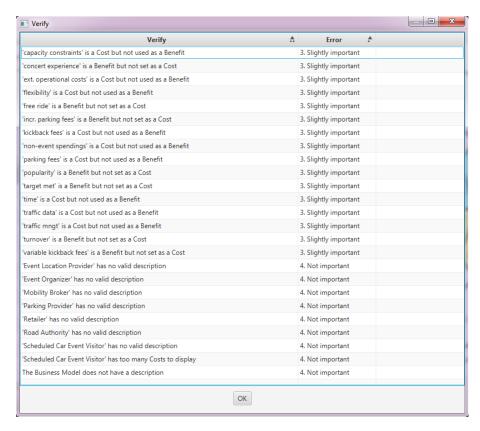


Figure 5.12: Verification of Free Ride A'dam Event Business Model in Prototype Tool.

As shown, the results of the workshops and the outputs of the prototype tool look similar. However, the Costs and Benefits do have a different extra feature in the original result. These Costs and Benefits are linked by using colors and it is easier to see which of these are linked to others. The output of the prototype tool gives every Cost the color green, and every Benefit red. By using the colors red and green the specific Costs and Benefits are found easier.

Furthermore, as shown in the verification screenshots the models showed no significant errors, but only warnings in the slightly important and not important division. Therefore, the tool also verified the syntactical quality of the three models.

5.2 Evaluation by Interviews

During the last stage of the creation of the prototype tool, two interviews were held about the prototype tool itself. Both the participants are well experienced with the BASE/X framework. After a short tutorial about the prototype tool, they had to use the tool to get a feeling about it. After using the tool the participants were asked questions to indicate how useful and easy to use they would consider the tool. The questions were built using a set of statements from the Technology Acceptance Model (TAM) (by [7] and [27]). TAM and its derivatives e.g. (by [28]) are the most commonly referred theories that predict and explain the acceptance and use of novel technological artifacts, such as software tools. TAM has been used as a theoretical basis for many empirical studies in the information systems field). The original TAM has three primary constructs: perceived ease of use, perceived usefulness, and intention to use (by [7]). Perceived usefulness refers to users perception on the utility of the artifact (software tool in our case) in providing gains to its user (by [28]). Perceived ease of use refers to "the degree to which a person believes that using a particular tool will be free from physical or mental effort". Finally, intention

to use can be defined as the extent to which a person intends to use a particular tool. Intention to use is the most proximal antecedent to the artifact use and believed to be determined by perceives usefulness and perceived ease of use.

5.2.1 Perceived Usefulness

Both the participants were enthusiastic about the prototype tool. Participant 1 expects some annoyance during a workshop when comparing the post-it's poster and the tool. This can be resolved by bringing an extra person to the workshop which will be working in the tool, while the participants are still working on the post-it's poster. Another solution can be that the participants are all working together in the same file of the tool.

Both participants claim that using this tool the creation of a Business Model Radar will be much easier. Participant 1 even stated that it would cost a lot less energy when using this tool. Furthermore, the tool gives a very structured view. Although the tool creates Business Model Radars with a maximum of 8 Actors, this can be overcome by just creating multiple Radars for the same Business Model.

Overall, both participants agreed that the prototype tool can save time and frustration, and can help to easily share and communicate the radar with all interested parties.

5.2.2 Perceived Ease of Use

Both participants agree that learning to use the prototype tool is easy. However, it is better when the user does understand the BASE/X framework, claimed by participant 1. Participant 2 stated it is much easier than designing with the posters.

The participants said that it is easy to become skillful in using the tool. Participant 1 stated, the tool would be mainly used after a workshop, to create the actual Radar. Participant 2 claimed that it becomes quickly easier to use the tool after a few trials.

The participants both claimed that the tool is not difficult to use for designing Business Models. Participant 1 said that it would be nice to be able to let the user decide the sizes of the cells in the Business Model Radar. Participant 2 added that without knowledge of the BASE/X framework, the tool might become difficult.

5.2.3 Attitude Towards Using

Both participants were interested in using the tool to design Business Models with the Radar. Participant 2 claimed that the prototype tool can make it easy to maintain the project, although the users still need the information from the businesses to define the solution.

Participant 1 does not really know other Business Model Design tools, she uses Microsoft Word to create the Radar. She argued that the tool is a lot better than Microsoft Word. Participant 2 does know the Business Model Canvas tool. She claims that this tool is mainly used for production, not really on analysis, and only for the Focal Organization. She believed that the BASE/X tool is more useful about the solution to the Customer.

The entire records of the interviews are available in Appendix A.1 and A.2.

Chapter 6

Conclusions

6.1 Overview

This project was executed to find a solution to the research question stated in Chapter 3:

How to develop a tool as an aid for the Service Dominant Business Modeling Design in the BASE/X framework?

To achieve this, several tasks were defined and completed. First of all the BASE/X framework was investigated to get more information about what the framework is able to do in Section 2.1. The framework helps business designers that want to do the transition towards a service-dominant business setting. Before the transition, business settings used to be centered on the delivery of products or individual services. After the transition, they will be centered on the provisioning of solution-oriented, composed services to customers [11].

Next a Literature research was conducted on other Service Dominant Modeling frameworks in Section 2.2. In this section the Service-Dominant Business Model Radar (SDBM/R) of BASE/X was compared to the Business Model Canvas (BMC) and e³-value e-Business Model. Both the BMC and the e³-value focus on the focal organization, not specifically on the other participants of the projects. Furthermore, the BMC already has a nice working tool.

To be able to answer the research question, three main research steps were performed. First, the requirements of the tool were specified and validated. Second, the tool was developed as a proof of concept. Finally, the tool was evaluated by recreating existing business models resulted from an industry project. The result was that the outcomes are similar, except for the Cost and Benefits look in the output images. This is however, something to look into in the future. Another part of the evaluation were the interviews with users of the BASE/X framework, Section 5.2. In these interviews the participants indicated positive responses for the usefulness and ease of use of the tool. They also indicated their interest in using the tool for their future projects.

6.2 Limitations of the Work and Future Research

To be able to define if the tool is really useful the tool should be tested in real life industry projects. Right now it is only tested with already finished projects and other examples.

On a different note, the interviews were held with only two participants. To create more valuable findings on the usefulness, ease of use, and attitude towards using, more interviews need to be carried out.

Similarly, the requirements elicitation sessions were only with a single BASE/X key user. Even though there were several demonstrations performed to foster the creation of a complete set of requirements, there is still a chance that some additional enriching features are missed. So, including such requirements from additional BASE/X key users, improving the functionality of the tool remains as an additional future task.

As mentioned in Chapter 4, there are additional requirements that were not implemented and thus not evaluated within the prototype tool. Furthermore, to complete the requirements for the BASE/X framework tool, they need to be expanded with the Service Compositions and the Business Services parts of the framework. These parts were left out of the scope of the project.

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Appendix A

Tool Interviews

During the last stage of the creation of the prototype tool for the BASE/X framework, two interviews were held about the usage of the tool. In these interviews the tool was presented to the interviewees. Both are users of the BASE/X framework, and therefore know the framework very well. After a short introduction about the tool, they got to explore the it. While the tool was not completely finished, it really showed it's full potential. The interviewees were very enthusiastic about the tool, and the way it could help during their projects.

After the walk through and the exploration, the real interview started. The statements that were asked come from the Technology Acceptance Model [6] (TAM). These TAM-statements help in finding the Perceived Usefulness, Perceived Ease of Use, and Attitude Towards Using. When the Perceived Ease of Use, Perceived Usefulness, Attitude Towards Using, and Behavioral Intention to Use are there, the actual system will be more likely to be used. A graphic example on how this works is shown in Figure A.1.

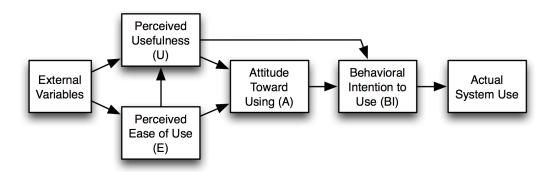


Figure A.1: Technology Acceptance Model (from: [6]).

In the next two sections the statements are in **bold**, followed by the answers of the participants.

A.1 Interview 1

Participant 1 is working for a company which help disabled people. Helping them, but also arranging all kinds of activities for their clients. In the project for this company she is using the BASE/X framework, and therefore has experience with it.

A.1.1 Perceived Usefulness

I think this tool provides an effective solution to the design of Service-Dominant Business Models

Definitely! Post-It's might be easier when collaborating with other people. But for creating a deliverable of the Business Models this would definitely be an effective solution. During a workshop it might be annoying when the participants want to collaborate, now using the Post-It's, everyone of them can join in and add their Post-It to the Business Model Radar. It could be a possibility for everyone to be able to edit the Business Model Radar, but that might be more confusing. Another possibility is to do the workshop with not only a facilitator, but also with a clerk who will need to keep up with the Post-It's that would still be used.

Using this tool would make it more difficult to communicate the Business Models to others

The tool gives a very structured view. This will give the same result as when not using the tool. It will cost a lot less energy in creating the Business Model Radar with this tool. Co-Production activity might be a little small in the Radar, since I have projects with lots of text for in this little field. In my project I have a Business Model with 27 Actors. These 27 will not all be able to be in one Radar, for myself I created 3 Radars with the Actors divided over the 3. There could be an option to be able to have this in the tool too. You can keep the Focal Organization and Customer in every Radar, or just use the entire Radar for the other Actors (after the first Radar).

Overall, I found the Business Model Design Tool useful.

It is an add-on to the BASE/X Framework, makes it more simple. Gives the possibility to enter all the gathered information. This will save time and, most definitely, frustration.

A.1.2 Perceived Ease of Use

Learning to use this tool for designing Business Models would be easy for me

Definitely! If you understand the BASE/X framework, you will be able to use this tool. Finding out what everything does, and how everything works is easy.

It would be easy for me to become skillful at using this tool for designing Business Models

Yes, definitely. But mainly for developing the actual Radar after a workshop. I will not bring it into the workshop, or bring another person to do the typing and editing in the tool.

Overall, I found this tool for designing Business Models difficult to use

No. What could be done is a double-click into the Actors-table to go to the edit Actor screen. Some circles in the Radar could be bigger to be able to contain more information. What would be nice if these lines can be moved within the tool. It is very easy that you can click on the text in the radar and the edit screen pops up. Maybe, for the Costs and Benefits, use color coding to show where the Costs are related to the Benefits.

A.1.3 Attitude Towards Using

I would use this tool to design Business Models

Yes, to use this after workshops, to elaborate further on the Business Model. Even for the cases where there are more than 8 Actors this still works great! Using multiple images for the Radar for example. Do not use the abbreviations in the legend of the Radar. It makes it unreadable for the people who are not that into the BASE/X Framework.

I would intend to use this tool for designing Business Models in preference to another tool, if I had to design Business Models in the future

I don't know of any other Business Model Radar tools. In comparison to Microsoft Word, that I am using right now, this is definitely better.

A.2 Interview 2

Participant 2 is working at a company in the harbor of Rotterdam. This company is already implementing BASE/X on several projects.

Before the interview questions, the participant already gave the following feedback about the tool. In the Strategy screen it would be nice to be able to add multiple answers per topic, now every topic only has the possibility to add one answer. There could be an option to add constraints to the Strategy information. What can be nice is to get the Focal Organization from the Strategy screen, and immediately add this to the Business Model Radars, since they need to be added anyway. It would be nice if there was a way to output the Strategy, for example to a PDF file. What if, after you add a new Business Model, you immediately open the new Business Model? But, like this it also works just fine. What could be a difficult thing to check is, when a user adds a Co-Production activity, this should start with a verb. But that might be too difficult. The prefilled screens in, for example, the add new Actor, can be not prefilled, this would create uncertainty for the user. It would be a smart thing to do, to add a User Manual.

A.2.1 Perceived Usefulness

I think this tool provides an effective solution to the design of Service-Dominant Business Models

The tool is user friendly, with a nice intuitive interface. This tool is easier than the post-it's poster to create the Business Models Radar.

Using this tool would make it more difficult to communicate the Business Models to others

This tool will make it much easier. A small legend would be nice, as well as an User Manual.

Overall, I found the Business Model Design Tool useful.

Very useful, easier since it is electronic. Easy shared with others, and to be able to work on the same Radar.

A.2.2 Perceived Ease of Use

Learning to use this tool for designing Business Models would be easy for me

Yes, definitely. Much easier than with the posters. All the changes are made easier.

It would be easy for me to become skillful at using this tool for designing Business Models

After 3 or 4 tries it is very clear on how to use this tool. Maybe in the future more slices can be added to the Radar. Although this might become too big for one image.

Overall, I found this tool for designing Business Models difficult to use

No it is not difficult, since I have a great knowledge on the BASE/X Framework. Without BASE/X knowledge it might be difficult. To explain the BASE/X Framework a User Manual would be nice.

A.2.3 Attitude Towards Using

I would use this tool to design Business Models

Yes, I definitely would, it is very easy. You still need the information from the businesses to define the solution. It is nice that you can store, and reopen the projects. After creating a digital version of the framework, maintaining the projects is easy. When something would change in the market it is easy to re-adapt the project to the new situation.

I would intend to use this tool for designing Business Models in preference to another tool, if I had to design Business Models in the future

There is the Business Model Canvas (BMC) tool, this tool is mainly for production. BMC is brief on analysis, and it is only for the Focal Organization. No Costs and Benefits for the end customer. BMC is not very clear of defining a solution to the customer. The BASE/X tool is more useful about the solution to the customer.

Appendix B

Case Study for Praktijkproef Amsterdam

This appendix shows an excerpt of the results of the three workshops for the Case Study for Praktijkproef Amsterdam Fase 2, Deelproject Zuidoost. These workshops resulted in: Ultimate Event Experience, Stress-free Event Journey, and Free Ride A'dam Event. In all three of these workshops the result for the customer is to have a great experience in one of the event locations in Amsterdam zuidoost. Moreover, there were a lot of thoughts on what to do with the parking hassle near these event locations.

Based on the results of the workshops, the ideas of the participants were processed in order to complete the business model radars. The results are presented in the next sections.

B.1 Business Model 1 - Ultimate Event Experience

The identified Value-In-Use of this business model is the *Ultimate Event Experience* for visitors of an event in the area of Amsterdam Zuidoost. An Event Organizer can play the role of a focal organization with the experience they have in the event content. They undertake the role to orchestrate all related activities among all Actors of the business models and of course to arrange any content contract. The customer is the Mass Event Visitor who is part of a crowd coming to the area. An Event Location Provider is a core partner since most of the events are held in specific premises/facilities. Their coproduction activities are both providing the location and sub-orchestrating activities among Actors, aiding in that way the Event Organizer. A Transport Facilities Provider will enrich the Value-In-Use by providing easy access to the event. This role includes all types of transportation, like train, bus, tram and even a parking operator. Note here that an event visitor can choose one type of such a provider, i.e. either parking operator for those coming by car or public/private transport for the rest. A Transport Info Provider will add access transparency by providing real time transportation information. This information can be generated by reliable, real time raw data that are gathered by a Transport Data Provider, e.g. a Road Operator.

The main benefit for the customer will be a concentrated joy and good memories from the experience of visiting the event he/she desired to, while on the other hand he/she has to sacrifice his/her time. In monetary terms, this will incur an integrated passport ticket, including both the event ticket price and any transportation/parking tickets (we assume that the Event Organizer will charge for any transportation/parking service so the event visitor does not have to care for any extra tickets).

The integrated passport ticket is paid to the Event Organizer, while in turn they have to pay any content fees (e.g. artists/music bands) and fees for renting the location of the event. We assume also that the transportation/parking services are sub-orchestrated by the Event Location Provider, so the Event Organizer has to pay access fees to them.

The Event Location Provider will receive the location renting and access fees, but they have to pay the Transportation Facilities Provider for the access fees. These include any public/private transport ticket or parking ticket for car visitors. Of course, the event will incur additional operational costs.

The Transport Facilities Provider (public/private transport company or parking operator) will receive the access fees from the Event Location Provider. As another benefit from the upfront information on how visitors will travel to the event, is the insight in traffic flow in a specific area, in a specific time range. Their main costs, apart from the operational costs, are the fees they have to pay to the Transport Data Provider for real time traffic data. We can also make the assumption that they pay a fixed subsidy to the Transport Information Provider who for example provides a website/mobile application for transport information without any advertisement support. The Transport Information Provider will receive the fixed subsidy we mentioned above (presuming that this is the main source they earn money from). To provide their services however, they have to pay for real time traffic data from the Transport Data Provider and of course they incur any IT infrastructure costs.

The Transport Data Provider will receive the fees for the real time traffic data they provide to other stakeholders as mentioned above. Their main costs are infrastructure costs which will probably be increased due to the happening of events.

The Business Model Radar is presented in Figure B.1.

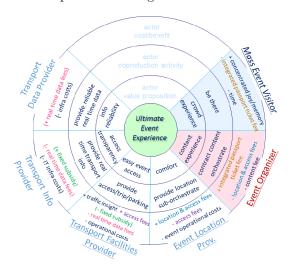


Figure B.1: Business Model 1 - Ultimate Event Experience.

B.2 Business Model 2 - Stress-free Event Journey

Event visitors want to have a good time and positive experience without having to care much about transportation and any event related issues. A business model with a *Stress-free Event Journey* Value-In-Use will contribute to that direction. We focus, however, in this business model on visitors by car, making an explicit separation from a business model for visitors by public transport means.

The Event Organizer undertakes the role to orchestrate the other parties like the Private Traffic

Manager who provides easy access to the event, the Event Location Provider, who provides comfort, the Municipality, who contributes to a metropolitan atmosphere and provides accessibility, the Parking Provider, who provides parking services so the visitor does not have to care about his car while enjoying his favorite music band, the Road Authority who provides reliable and safe traveling to the event. Retailers are also part of the business model since they contribute to customers experience with pre- and post-event convenience (shopping, eating, etc.). Apart from people who are visiting an event, we care also about those who are using the same road network and visit the area around Amsterdam Zuidoost during the event, adding liveliness to the area, the Non-Event Visitors.

The main coproduction activities of the Event Organizer, except the orchestration, are the arrangements of any content contract and the provision of upfront information to other stakeholders since they have the data for the exact number of visitors.

A Private Traffic Manager undertake the role to gather traffic data, both from Road Authorities and floating car data, and provide an traffic management and enhanced traffic information to road users on how to reach the event venue.

The Event Location Provider provides the venue facilities while the Municipality of Amsterdam has to perform marketing activities to promote the area and provide traffic management during an event. The Parking Provider has the task of providing parking services while the Road Authority provides the road infrastructure, traffic data and manages the traffic with their expertise. The role of the Retailer is rather obvious, to sell their products to people visiting their store.

The Event Visitor will take advantage of the provided solutions when visiting an event and experience the metropolitan atmosphere. On the other hand, he will pay the ticket for the event, the parking costs, service fees for the traffic information he gets and any other money in the shops/bars he will visit.

The Event Organizer will receive the ticket fees and also will increase their reputation by providing a stress-free experience. To do so, they have to pay rent to the Event Location Provider and of course pay for the organization of the event (the artists, etc.).

The Private Traffic Manager has to pay Road Authorities in order to get traffic data. On the other hand, they charge road users for the enhanced traffic information they provide (service can be charged on a per-contract basis or on a fixed yearly fee). We make here the assumption that in-vehicle traffic information is provided to the customers of Event Organizer who are the Event Visitors. In this case, Non-Event visitors are being charged for any service.

To be part of this business model and reap the benefits, like increased reputation and venue fees, the Event Location Provider has to increase its operational costs for providing more and of better quality services.

The Municipality of Amsterdam will increase its reputation as being a city with high accessibility and nice atmosphere in busy events areas. The reputation will consequently attract more visitors, help to reduce any economic damage and the deployed intelligent transport systems will further decrease operational costs. However, they traffic management they have to perform will incur some costs.

The benefits for the Parking Operator are the parking fees that they get from car visitors. Their monetary costs are any extended operational costs.

The Road Authority will also benefit of that business model since such a solution will help them meet their targets on traffic management. Moreover, they get fees from the traffic data they sell to the Private Traffic Manager. Traffic management costs are still there but intelligent transport systems will eventually lead to reduced operational costs.

Regarding the Retailers, the turnover is an issue that needs further financial analysis whether it will be positive or negative. This is because the spending of the event visitors may be equilibrated by the fact that less people who are not visiting the event will go for shopping, drink or dinner

during the event in order to avoid the crowd. The same goes for the reputation of these stores. On the other hand, Retailers have to spend more on extended operational costs in case it requires to stay open for extra hours due to an event.

Finally, for Non-Event Visitors, the advanced traffic solutions will help them in the accessibility to the area and the experience of the metropolitan atmosphere. However they will have to endure the nuisance that the event visitors cause. And of course, non-event spendings should be counted as their main monetary costs.

One main remark we can make about this business model is that it is close to the current situation with the respect to the roles that the identified stakeholders play. Moreover, we can say that Actors are loosely connected and are not tied so much to the focal organization, as was the case in the first business model of the Ultimate Event Experience, in which the idea of an integrated passport ticket required a more explicit and better orchestration of Actors.

The Business Model Radar is presented in Figure B.2.

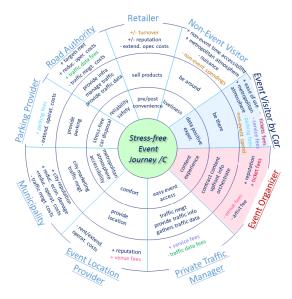


Figure B.2: Business Model 2 - Stress-free Event Journey for Car Visitors.

B.3 Business Model 3 - Free Ride Amsterdam Event

The idea for this business model is rather extreme since it proposes a "Free Ride" to an event to those who plan their arrival by car at a much earlier time than the beginning of the event. The term free refers to free parking (or even fuel consumption coupons, however in that case we should consider gas station owners as co-creation Actors). With that scenario traffic jams will be reduced and many stakeholders need to contribute. A Mobility Broker is the focal organization offering integration and being the central point of contact. They are responsible to orchestrate not only traffic-related Actors, but also the visitors who wish to book a ticket for an event. A Parking Provider will simply provide parking services for an easy car disposal while the Road Authority provides the road infrastructure and traffic management before and after the event for a reliable trip. Retailers are also involved in the business models, contributing to pre and post experience by selling products to people coming to the area. The Event Organizer will provide the content while the Event Location provide will contribute to a comfortable stay before, during and even after the event.

The main benefit for the visitor is of course the "Free Ride" (free parking) and the concert

experience as well. Their non-monetary costs are their flexibility and the sacrifices in their time schedule since they need to be there at given times to exploit the "Free Ride". The event incurs a ticket fee and any non-event spendings that visitors make especially due to the fact that they arrive much earlier.

The Mobility Broker will get variable kickback fees from the Event Organizer, the Event Location Provider and the Retailers since these stakeholders will advertise themselves in the broker. Another monetary benefit is the ticket fees since we made the assumption that they orchestrate the booking of the ticket for the visitors. On the other hand, the broker will pay the "Free Ride" as parking fees to the Parking Operator for providing parking services to its customers. They will also have to expose the data for number of visitors to Retailers to let them estimate any changes on their turnover.

Parking Providers are expecting an increase in the demand due to the fact that more people will desire to exploit the "Free Ride". However, this demand may lead to capacity constraints and to extended operational costs.

For the Road Authority, the main benefit is that the expected reduced traffic congestions will help them meet their traffic management targets (monetary and non-monetary). On the downside, they have to get and manipulate the traffic data and still have to perform the necessary traffic management.

Retailers will benefit from the "Free Ride" business model in terms of increased popularity, higher turnover since people will spend more hours before the event and have the advantage of estimating peoples attendance from data got from the Mobility Broker. However, they need to pay kickback fees to the broker and extend their operational costs.

The Event Organizer and the Event Location provider will also benefit from the proposed solution and will expect an increase in popularity and subsequently in their turnover. They also have to pay kickback fees to the Mobility Broker to advertise their services and facilities. Moreover, for the Event Location Provider, extended operational costs should be taken into account. The Business Model Radar is presented in Figure B.3.



Figure B.3: Business Model 3 - Free Ride Amsterdam Event.

Appendix C

Requirements Document

This Requirements Document is created for the development of the prototype tool. This tool is explained with a walk-through in Chapter 4.

The Requirements Document was created by using parts of the Volere Requirements Specification Template [22].

In this Requirements Document the topics of purpose, client, customer, and users of the product will be explained. Furthermore, mandated constraints, naming conventions, and scope of the work are discussed. The UML Class Diagram Meta-Model in Section C.7 shows what is needed for the BASE/X framework. After the UML Diagram, the Scope of the product is explained with Use Cases. That leads us to the Functional Requirements. In this section the requirements are explained by a diagram that shows the flow of the tool.



Department of Mathematics and Computer Science Department of Industrial Engineering & Innovation Sciences

Master of Business Information Systems

Requirements document

Tooling the BASE/X framework

Ellen de Weerd

Supervisors: Dr. Oktay Türetken Prof.Dr.Ir. Paul Grefen

C.1 Purpose of the Project

C.1.1 The User Problem or Background of the Project Effort.

"Many business domains are currently characterized by a move from an asset-orientation to a service-orientation: customers recognize that business value is not in owning assets, but in using the services offered by assets (which they do not need to own). This creates service-dominant business markets. The not-so-physical characteristics of these markets give rise to high levels of dynamism. This places high demands on the agility of service providers operating in these markets. These providers find their agility, however, heavily constrained by the business and IT platforms they use to deliver their services.

BASE/X is a framework for agility in service-dominant business, which has been developed with the Eindhoven University of Technology. This framework makes two fundamental distinctions in the setup of a service-dominant business environment. Firstly, the framework separates two concepts in business conception: business strategy and business models. Business strategy is linked to the identity of an organization and hence is relatively stable in time. Business models specify the operation in the here and now of changing markets, and hence change frequently. Secondly, the framework separates two concepts in business implementation: service capabilities and service offerings. Service capabilities are relatively stable in time as they are based on the resources of an organization (both human and non-human). Service offerings change over time - they revolve with market dynamics as operationalization of network-centric Business Models of a provider. The framework provides a basis for structural agility by on the one hand coupling the stable elements to each other and on the other hand the fluid elements.

The concepts of BASE/X are combined in a service-dominant business structure that provides an operationalization of the framework. As this is a structure with stable outer layers and flexible inner layers, we call this the business sandwich model. Applying this sandwich model to the way business is organized thoroughly changes the traditional way of thinking in terms of decision horizons where it comes to implementing agility. The business sandwich model describes the business view on agility. To enable automated support of agile business, the sandwich is mapped to an information system stack. This mapping shows how the business is connected to automated business applications at each of the layers of the sandwich. The information system stack is in its turn mapped to an infrastructure stack, which describes the basic IT platforms that form the implementation basis for the business applications. The BASE/X framework described in this document is a structure for the development of new service-dominant business: business strategy, business models, their operationalization in service compositions, business services, and their implementation in state-of-the-art automated service management platforms. To aid in the use of this structure, the framework embeds tools that are tailored to business design in a service dominant context. Application of the framework and its tools lead to well-structured management of the complexity of service-dominant business and short time-to-market of new business models. The approach is illustrated by a case study of an advanced travel industry service orchestrator." [12]

Next to "BASE/X Business Agility through Cross Organizational Service Engineering" Grefen also wrote "Service-Dominant Business Engineering with BASE/X: Business Modeling Handbook" [11]. This handbook explains how to practically perform service-dominant business modeling following the BASE/X business engineering approach.

C.1.2 Goals of the Project.

The goal of this project is to develop a prototype tool that will be helpful when working with the BASE/X framework. For the user to open the tool and be easily guided through the framework. Furthermore, the user can use the tool in a more flexible matter.

C.2 Client and Customer

C.2.1 The Client

The client is the head of the Information Systems group of Industrial Engineering and Innovation Sciences department, at the Eindhoven University of Technology. This tool can be the next step in the BASE/X framework.

C.2.2 The Customer

The customer is the head of the Information Systems group of Industrial Engineering and Innovation Sciences department, at the Eindhoven University of Technology. Furthermore, when the BASE/X framework will be used for future projects in other companies, the tool can be included. The included tool can be an aid in these future projects.

C.3 Users of the Product

C.3.1 The Hands-on Users of the Product

The users will be the future users of the BASE/X framework, when using this tool.

C.3.2 The Priorities Assigned to Users

The key users are the employees of the Information Systems group of Industrial Engineering and Innovation Sciences department, since they often use the framework.

The secondary users will be the users of the BASE/X framework in future projects, because it will be an aid in their projects

C.3.3 User Participation

The employees of the Information Systems group of Industrial Engineering and Innovation Sciences department will be questioned and surveyed throughout the project.

Other future users will be surveyed through the last part of the project.

C.3.4 Maintenance Users

After the completion of the thesis project, the Information Systems group of Industrial Engineering and Innovation Sciences department will be responsible for maintaining the code of the application. Therefore, the program should be able to be maintained and possibly improved by the Information Systems group.

C.4 Mandated Constraints

C.4.1 Solution Design Constraints

The product must help in using the BASE/X framework. The product must be reachable with a Windows or Mac computer.

C.4.2 Anticipated Workplace Environment

The tool will be used at computers, and therefore must be able to be used in most workplace environments.

C.4.3 What is the Financial Budget for the Project?

There is no budget.

C.5 Naming Conventions and Terminology

Table C.1: Naming Conventions and Terminology.

B2B	Business-to-Business
BASE/X	Business Agility through Cross-Organizational Service Engineering
BIS	Business Information Systems
BSC	Balanced Scorecard
CSS	Customer Support Services
DBPF	Dynamic Business Process Formation
FSEs	Frontline Service Employees
GD	Goods-Dominant
IE&IS	Industrial Engineering & Innovation Sciences
IS	Information Systems
IT	Information Technology
PSS	Product-Service Systems
SD	Service-Dominant
SLAs	Service-Level Agreements
SLM	Service-Level Management
SSC	'Services that Support the Customer'
TU/e	Eindhoven University of Technology
Meta-	A model C is called a metamodel, if and only if: its original is another model
Model	B (resulting from modelling an original domain A), the modeling operation B
	C implies placeholder projection [29].
Model	The term "Model" is derived from the Latin word modulus, which means meas-
	ure, rule, pattern, example to be followed [29].
UML	UML structure diagram which shows structure of the designed system at the
Class	level of classes and interfaces, shows their features, constraints and relation-
diagram	ships - associations, generalizations, dependencies, etc. [26].
Use Case	A methodology used in system analysis to identify, clarify, and organize system
	requirements [30].
Use Case	A model of how different types of users interact with the system to solve a
Diagram	problem. As such, it describes the goals of the users, the interactions between
	the users and the system, and the required behavior of the system in satisfying
	these goals [31].

C.6 The Scope of the Work

C.6.1 The Current Situation

Currently, there is no specific tool for using the BASE/X framework. The previously used tools include but are not limited to Microsoft Word and PowerPoint, but these are not specifically intended for the usage of the BASE/X framework.

C.6.2 The Context of the Work

The goal is to create a prototype tool for the BASE/X framework, focusing on the Business Model Radar. Furthermore, the Business Strategy Canvas will be added to show potential of the prototype tool. Service Compositions and Business Services will not be added to the prototype tool, due to an earlier defined definition of the project. In consideration of these last two parts of the BASE/X framework, the prototype tool should be able to add these parts in the future.

C.7 UML Class Diagram Meta-Model

To be able to have a better understanding of the BASE/X framework, a UML Class Diagram Meta-Model was created (shown in Figure C.1). In this diagram one can see what is needed for the BASE/X framework in the tool. The extra information on the outside indicates what needs to be in the verification of a project inside the tool.

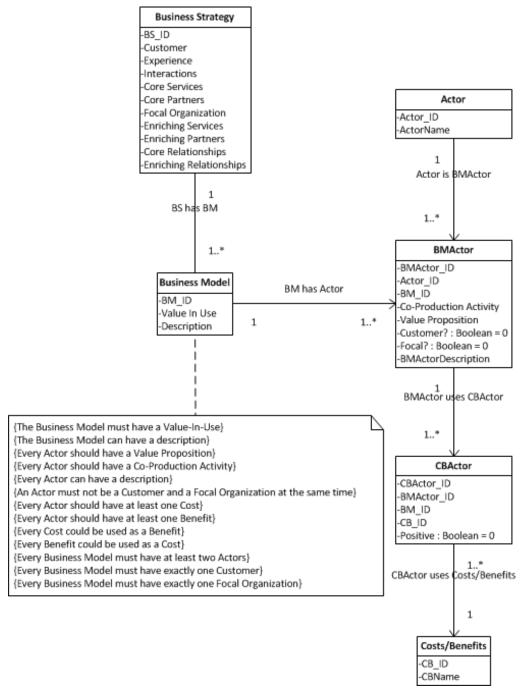


Figure C.1: UML Class Diagram.

C.8 The Scope of the Product

This section the Use Case Diagram, Figure C.2, will be explained. This diagram shows the five Use Cases; Manage Project, Manage Business Strategy Canvas, Manage Business Models, Manage Business Model, and Manage Actor. These Use Cases will be explained in Tables C.2, C.3, C.4, C.5, and C.6. Screenshots (Figure C.3, C.4, C.5, C.6, C.7, C.8, C.9, and C.10) are shown after each Use Case.

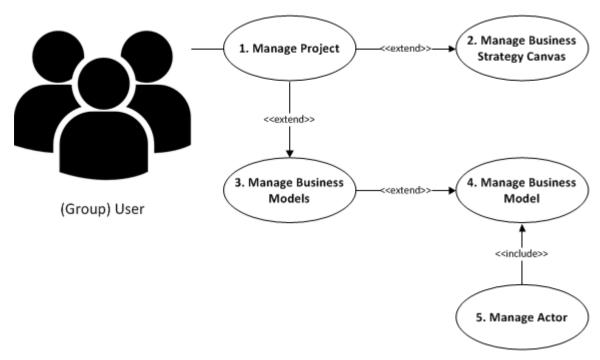


Figure C.2: Use Case: Manage Project.

C.8.1 Product Use Case List

Table C.2: Use Case 1 - Manage Project.

Actors	Users
Description	The use case describes how users manage project, starting with
	the Service Dominant Business Strategy Canvas.
Trigger	The user opens the application.
Preconditions	1. The user has the application installed on the computer.
Post-conditions	1. Project is managed, database is updated.
	2. Figure C.3 opens.
Normal Flow	1a. The user clicks "New" in the main screen to create a new
	project.
	or
	1b. The user clicks "Open" in the main screen to open a previ-
	ously saved project
Includes	Use Case "Manage existing project"
Priority	On a priority scale of 1(low priority) to 10(high priority), the
	priority for this use case is 10.
Frequency of Use	Every project at least once.
Notes and Issues	An example screen-shot is shown in Figure C.3

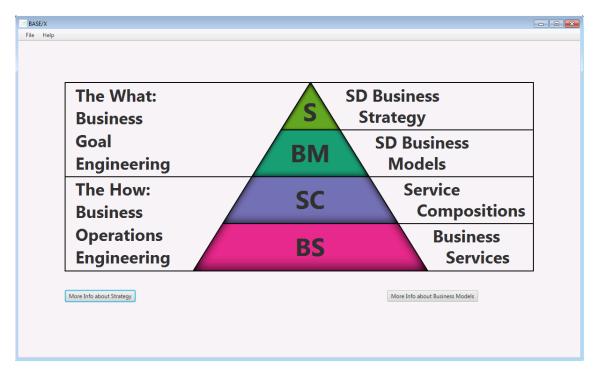


Figure C.3: Start.

Table C.3:	Use	Case	2 -	Manage	Business	Strategy	Canvas.

Actors	Users
Description	The use cases describe how users will edit the Business Strategy
	Canvas.
Trigger	The user opens the application.
Preconditions	1. The user has the application installed on the computer, and
	is working in a project (Managed in Use Case 1, table C.2).
Post-conditions	1. Business Strategy Canvas is edited, saved, and database is
	updated.
Normal Flow	1. The user clicks on a specific field in the Business Strategy
	Canvas. (Figure C.4)
	2. The user can edit the selected field.
	3. The user selects "Save" in the screen and all the information
	shown in this screen is saved in the database.
Priority	On a priority scale of 1(low priority) to 10(high priority), the
	priority for this use case is 6.
Frequency of Use	At least once in every project.
Assumptions	Project members already discussed the above topics.
Notes and Issues	An example screen-shot is shown in Figure C.4

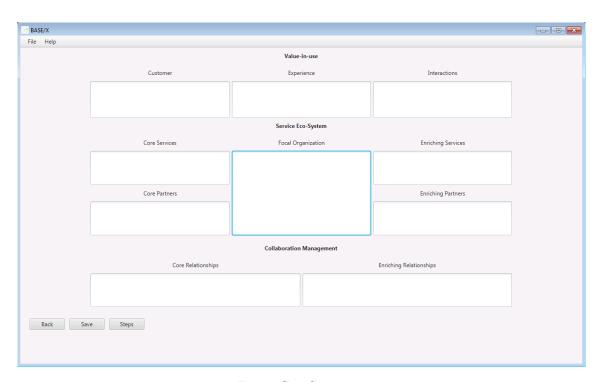


Figure C.4: Strategy.

Table C.4:	Use	Case 3	3 - Manage	Business	Models.
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Actors	Users
Description	The use case describes how users the Business Models within
	the project.
Trigger	The user opens the application.
Preconditions	1. The user has the application installed on the computer, and
	is working in a project (managed in Use Case 1, table C.2).
Post-conditions	1. After managing the Business Models, database is updated.
Normal Flow	1. The user opens the Business Models screen (Figure C.5).
	2. The user selects "Add Business Model" in the Business Mod-
	els screen to create a new Business Model.
	3. A pop-up screen opens to enter the Value-In-Use and a small
	description of the new Business Model (Figure C.6).
Priority	On a priority scale of 1(low priority) to 10(high priority), the
	priority for this use case is 10.
Frequency of Use	At least once in every project.
Assumptions	Project members already discussed the above topics.
Notes and Issues	Example screen-shots are shown in Figures C.5, C.6, and C.7

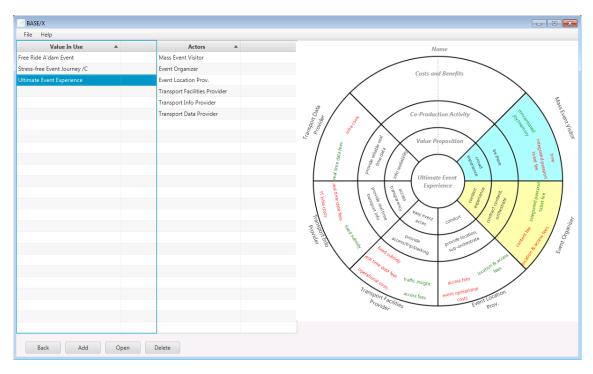


Figure C.5: All Business Models.

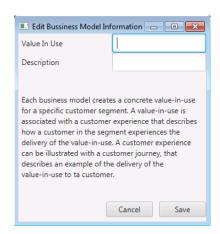


Figure C.6: Add Business Model.

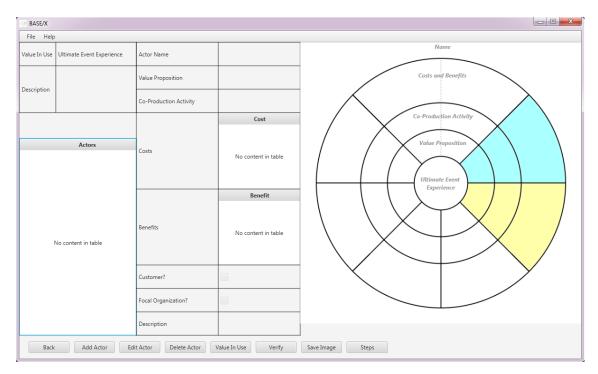


Figure C.7: Empty Business Model.

Table C.5: Use Case 4 - Manage Business Model.

Actors	Users
Description	The use cases describe how users view and/or edit existing pro-
	jects and finally export a Business Model Radar to an image.
Trigger	The user opens the application.
Preconditions	1. The user has the application installed on the computer.
	2. The user has opened a project
	3. The user has already made some Business Models in the
	current project.
Post-conditions	1. Existing project is modified, database is updated.
	2. Business Model Radar is converted to image for use in other
	files.
Normal Flow	1. The user opens the All Business Models-screen.
	2. The user selects the Business Models, in the current project,
	he/she wants to review.
	3. The user selects "Open" to open the selected Business Model
	(Figure C.8 is displayed)
	4. The user selects "Edit Business Model" and he/she can
	change information in any of the fields of the Business Model
	information.
	4b. The user selects "Edit Actor" and he/she can change in-
	formation in any of the fields of the Actor information.
	5. The user selects "Save" and all the information is depicted
	on the canvas on the half-right side of the screen.
	6. The user selects "Verify" and a list of important/not important errors is shown.
	7. The user selects "Convert to IMG" and a picture file is generated.
Priority	On a priority scale of 1(low priority) to 10(high priority), the
1 HOIRty	priority for this use case is 10.
Frequency of Use	Multiple times per project.
Special Requirements	1. The supported image files are PNG, JPEG.
Notes and Issues	An example screen-shot is shown in Figure C.8
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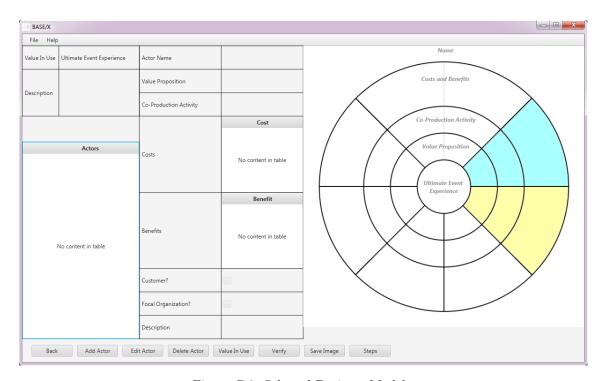


Figure C.8: Selected Business Model.

Table C.6: Use Case 5 - Manage Actor.

Actors	Users
Description	The use case describes how users view and/or modify lists of
Description	business Actors.
Trigger	The user opens the application.
Preconditions	1. The user has the application installed on the computer.
T 1000Hartions	2. The user has opened a project
	3. The user is currently in a Business Model in the current
	project.
Post-conditions	1. Actor is edited, database is updated.
Normal Flow	1. The user selects "Edit Actor".
	2. A pop-up window appears with the information of the selec-
	ted Actor (Figure C.9).
	3. The user edits the information about the Actor.
	4. The user saves the information about the Actor and closes
	the screen.
	5. The Figure C.8 is renewed, with the edited information.
Alternative Flows	3a. User wants to edit Costs or Benefits of the Actor and selects
	a Cost or Benefit and clicks "Edit" to change the Cost or Benefit
	name, and to possibly change if it is a Cost or Benefit.
	3b. User wants to add a Cost or Benefit, clicks "Add" to add
	respectively Cost or Benefit. Figure C.10 opens and user can
	select any of the Costs and Benefits already used in this Business
	Model.
	3b1. User can create a new Cost or Benefit for this Business
	Model by selecting "New".
Exceptions	1. No Actor is selected. The user gets a message to select one
	Actor.
Priority	On a priority scale of 1(low priority) to 10(high priority), the
	priority for this use case is 10.
Frequency of Use	Multiple times per project.
Notes and Issues	An example screen-shot is shown in Figure C.9 and Figure C.10



Figure C.9: Edit Selected Actor.

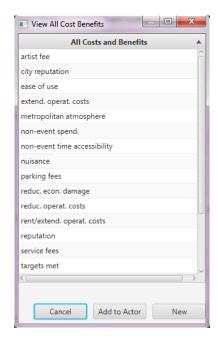


Figure C.10: View Cost Benefits.

C.9 Functional Requirements

In this section the Functional Requirements will be explained. The flow of the tool is shown in a diagram in Figure C.11. This figure shows the flow the user can take within the tool. The numbers in the Figure correspond with the Requirement ID. All the Requirements have sub-requirements, these sub-requirements are needed to satisfy the Requirement. The tables following the Figure C.11, show the requirements with description, rationale, dependencies, and sub-requirements.

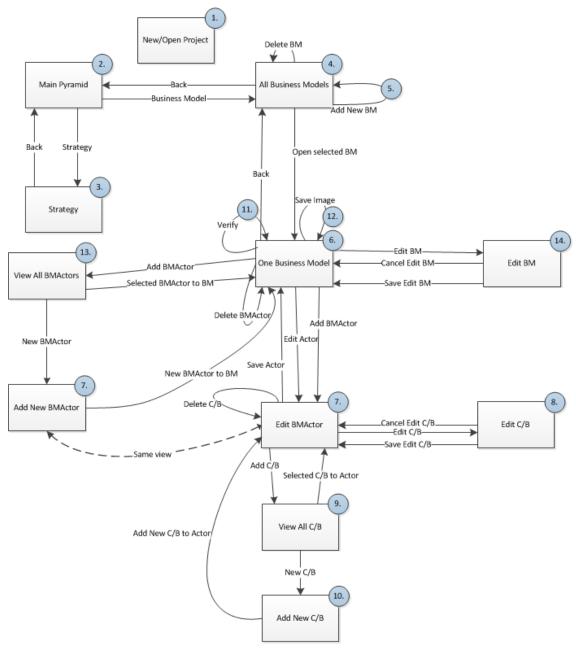


Figure C.11: Flow of the Tool.

Table C.7: Functional Requirement 1 - Manage Project.

Requirement 1	Requirement type: Event/Use case: Create New Project
Description	The user shall be able to create a new project.
	The user shall be able to open an existing project.
Rationale	The user wants create a new project.
	The user wants to reopen a project
Dependencies	Use Case 1 (Table C.2)
1-1	Save project with all its contents into a file, with extension .bsx.
1-2	Open projects from file.
1-3	Create new black project.

Table C.8: Functional Requirement 2 - Main BASE/X Pyramid.

Requirement 2	Requirement type: Event/Use case: Main BASE/X Pyramid page
Description	The user should be able to go to the Strategy and All Business Models.
Rationale	The user is managing a project.
Dependencies	Use Case 1 (Table C.2)
	Functional Requirement 1 (Table C.7)
2-1	Open Business Strategy.
2-2	Open Business Models.

Table C.9: Functional Requirement 3 - Strategy.

Requirement 3	Requirement type: Event/Use case: Strategy
Description	The user shall be able to manage the Strategy.
Rationale	The user wants to maintain the Strategy of the current project.
Dependencies	Use Cases 1, 2 (Tables C.2, C.3)
	Functional Requirements 1, 2 (Tables C.7, C.8)
3-1	Maintain business strategy information.
3-2	Save business strategy.

Table C.10: Functional Requirement 4 - Overview of Business Models.

Requirement 4	Requirement type: Event/Use case: Overview of Business Models
Description	The user shall be able to view all the Business Models that are present in
	the current project.
Rationale	The user wants to see the Business Models in the current project. To be
	able to select one Business Model to view more specifically.
Dependencies	Use Cases 1, 3 (Tables C.2, C.4)
	Functional Requirements 1, 2 (Tables C.7, C.8)
4-1	View all Business Models.
4-2	View Actors in selected Business Model.
4-3	View preview of the Business Model Radar.
4-4	Open the selected Business Model.
4-5	Delete the selected Business Model.

Table C.11: Functional Requirement 5 - Add Business Model.

Requirement 5	Requirement type: Event/Use case: Add Business Model
Description	The user shall be able to add a new Business Model to the project.
Rationale	The user wants to add a new Business Models in the current project.
Dependencies	Use Cases 1, 3 (Tables C.2, C.4)
	Functional Requirements 1, 2, 4 (Tables C.7, C.8, C.10)
5-1	Maintain business model information.
5-2	Discard changes and return to view all business models.
5-3	Save changes and return to view all business models.

Table C.12: Functional Requirement 6 - Maintain Existing Business Model.

Requirement 6	Requirement type: Event/Use case: Maintain Existing Business Model
Description	The user shall be able to view the existing information of one Business
	Model.
Rationale	The user wants to see all information of the Business Model.
Dependencies	Use Cases 1, 3, 4 (Tables C.2, C.4, C.5)
	Functional Requirements 1, 2, 4 (Tables C.7, C.8, C.10)
6-1	Maintain business model information.
6-2	Maintain information on selected actor.
6-3	Export the Business Model Radar image with the information of the Busi-
	ness Model.
6-4	Return to view all business models.
6-5	Delete the selected Actor.
6-6	Verify and display information about the current Business Model.
6-7	Save the Business Model Radar as a PNG-file.

Table C.13: Functional Requirement 7 - Maintain Actor.

Requirement 7	Requirement type: Event/Use case: Maintain Actor
Description	The user shall be able to maintain an Actor.
Rationale	To be able to manage the information about the selected Actor.
Dependencies	Use Cases 1, 3, 4, 5 (Tables C.2, C.4, C.5, C.6)
	Functional Requirements 1, 2, 4, 6, 13 (Tables C.7, C.8, C.10, C.12, C.19)
7-1	Maintain actor information.
7-2	Discard changes and return to view Business Model.
7-3	Save changes and return to view Business Model.

Table C.14: Functional Requirement 8 - Maintain Costs and Benefits.

Requirement 8	Requirement type: Event/Use case: Maintain Costs and Benefits
Description	The user shall be able to maintain the Cost and Benefits.
Rationale	To be able to edit the selected Cost or Benefit.
Dependencies	Use Cases 1, 3, 4, 5 (Tables C.2, C.4, C.5, C.6)
	Functional Requirements 1, 2, 4, 6, 7 (Tables C.7, C.8, C.10, C.12, C.13)
8-1	Maintain Cost/Benefit information
8-2	Discard changes and return to view Edit Actor.
8-3	Save changes and return to view Edit Actor.

Table C.15: Functional Requirement 9 - Add Costs and Benefits.

Requirement 9	Requirement type: Event/Use case: Add Costs and Benefits
Description	The user shall be able to add a certain Cost or Benefit to the current Actor.
Rationale	To be able to add a Cost or Benefit to this Actor.
Dependencies	Use Cases 1, 3, 4, 5 (Tables C.2, C.4, C.5, C.6)
	Functional Requirements 1, 2, 4, 6, 7 (Tables C.7, C.8, C.10, C.12, C.13)
9-1	View all the Costs and Benefits in the Business Model
9-2	Discard changes and return to edit actor.
9-3	Add selected Cost/Benefit and go back to Edit Actor.
9-4	Add new Cost/Benefit to the current actor and current business model.

Table C.16: Functional Requirement 10 - Add New Cost/Benefit.

Requirement 10	Requirement type: Event/Use case: Add New Cost/Benefit
Description	The user shall be able to add a new Cost or Benefit to this Actor.
Rationale	To be able to add a new Cost or Benefit to the Actor and Business Model.
Dependencies	Use Cases 1, 3, 4, 5 (Tables C.2, C.4, C.5, C.6)
	Functional Requirements 1, 2, 4, 6, 7, 9 (Tables C.7, C.8, C.10, C.12, C.13,
	C.15)
10-1	Maintain Cost/Benefit information
10-2	Discard changes and return to view all Cost/Benefit.
10-3	Save changes and return to view all Cost/Benefit.

Table C.17: Functional Requirement 11 - Verify Business Model.

Requirement 11	Requirement type: Event/Use case: Verify Business Model
Description	The user shall be able to Verify the current Business Model.
Rationale	To be able to view the verification results of the Business Model.
Dependencies	Use Cases 1, 3, 4 (Tables C.2, C.4, C.5)
	Functional Requirements 1, 2, 4, 6 (Tables C.7, C.8, C.10, C.12)
11-1	Check the rule "Value-In-Use has a valid name"
11-2	Check the rule "Business Model has a valid description"
11-3	Check the rule "Actors have valid Value Propositions"
11-4	Check the rule "Actors have valid Co-Production Activities"
11-5	Check the rule "Actors have valid Descriptions"
11-6	Check the rule "Actors are not Customer and Focal Organization at the
	same time"
11-7	Check the rule "Actors have at least one Cost"
11-8	Check the rule "Actors have at least one Benefit"
11-9	Check the rule "Costs in this Business Model are also a Benefit in this
	Business Model"
11-10	Check the rule "Benefits in this Business Model are also a Cost in this
	Business Model"
11-11	Check the rule "There are at least 2 Actors"
11-12	Check the rule "There are multiple Actors being Customer"
11-13	Check the rule "There is one Actor Customer"
11-14	Check the rule "There is one Actor Focal Organization"

Table C.18: Functional Requirement 12 - Save Image.

Requirement 12	Requirement type: Event/Use case: Save Image
Description	The user shall be able to save the Business Model Radar image.
Rationale	To be able to save the Radar.
Dependencies	Use Cases 1, 3, 4 (Tables C.2, C.4, C.5)
	Functional Requirements 1, 2, 4, 6 (Table C.7, C.8, C.10, C.12)
12-1	Save the image with, user specified, name and location.

Table C.19: Functional Requirement 13 - View All Actors.

Requirement 13	Requirement type: Event/Use case: View All Actors
Description	The user shall be able to add an extra Actor to the current Business Model,
	out of a list of Actors in the project
Rationale	Choose one of the Actors to add to the current Business Model.
Dependencies	Use Cases 1, 3, 4 (Tables C.2, C.4, C.5)
	Functional Requirements 1, 2, 4, 6 (Tables C.7, C.8, C.10, C.12)
13-1	View all the Actors in the Project
13-2	Discard changes and return to view the Business Model
13-3	Add selected Actor to Business Model and return to view the Business
	Model

Table C.20: Functional Requirement 14 - Maintain Business Model Information.

Requirement 14	Requirement type: Event/Use case: Maintain Business Model Information
Description	The user shall be able to add a new Business Model to the project.
Rationale	The user wants to add a new Business Models in the current project.
Dependencies	Use Cases 1, 3, 4 (Tables C.2, C.4, C.5)
	Functional Requirements 1, 2, 4, 6 (Tables C.7, C.8, C.10, C.12)
14-1	Maintain business model information.
14-2	Discard changes and return to view the Business Models.
14-3	Save changes and return to view the Business Models.

Table C.21: Functional Requirement 15 - Exporting and Importing Model Components.

Requirement 15	Requirement type: Event/Use case: Exporting and Importing Model Com-
	ponents
Description	The user shall be able to export parts of the project.
	The user shall be able to import parts of other projects to the project
Rationale	The user wants to exports parts of the project, for later use in another
	project
	The user wants to imports a parts of other projects into the current project.
Dependencies	Use Case 1 (Table C.2)
	Functional Requirements 1, 2 (Tables C.7, C.8)
15-1	Export a business model into a file.
15-2	Import a business model in a file into an existing project.

C.10 Conclusions

To conclude this Requirements Document, this Chapter contains Table C.22 with all the earlier mentioned Requirements.

The main focus of this Requirements Document is the creation of a prototype tool for the BASE/X framework, the main part being about the Business Model Radar, and a side part towards the Business Strategy. This prototype tool will to be developed as part of a thesis project. More information about the BASE/X framework can be found at [11], [12], and [13] by Grefen et. al., [14] by Lüftenegger et. al., and [25] by Traganos et. al.

Table C.22: List of Requirements.

Req 1	Requirement type: Event/Use case: Create New Project
1-1	Save project with all its contents into a file, with extension .bsx.
1-2	Open projects from file.
1-3	Create new black project.
Req 2	Requirement type: Event/Use case: Main BASE/X Pyramid page
2-1	Open Business Strategy.
2-2	Open Business Models.
Req 3	Requirement type: Event/Use case: Strategy
3-1	Maintain business strategy information.
3-2	Save business strategy.
Req 4	Requirement type: Event/Use case: Overview of Business Models
4-1	View all Business Models.
4-2	View Actors in selected Business Model.
4-3	View preview of Business Model Radar.
4-4	Open the selected Business Model.
4-5	Delete the selected Business Model.
Req 5	Requirement type: Event/Use case: Add Business Model
5-1	Maintain business model information.
5-2	Discard changes and return to view all business models.
5-3	Save changes and return to view all business models.
Req 6	Requirement type: Event/Use case: Maintain Existing Business Model
6-1	Maintain business model information.
6-2	Maintain information on selected actor.
6-3	Export the Business Model Radar image with the information of the Business
	Model.
6-4	Return to view all business models.
6-5	Delete the selected Actor.
6-6	Verify and display information about the current Business Model.
6-7	Save the Business Model Radar as a PNG-file.
Req 7	Requirement type: Event/Use case: Maintain Actor
7-1	Maintain actor information.
7-2	Discard changes and return to view Business Model.
7-3	Save changes and return to view Business Model.
Req 8	Requirement type: Event/Use case: Maintain Costs and Benefits
8-1	Maintain Cost/Benefit information
8-2	Discard changes and return to view Edit Actor.
8-3	Save changes and return to view Edit Actor.

Req 9	Requirement type: Event/Use case: Add Costs and Benefits
9-1	View all the Costs and Benefits in the Business Model
9-2	Discard changes and return to edit actor.
9-3	Add selected Cost/Benefit and return to edit actor
9-4	Add new Cost/Benefit to the current actor and current business model
Req 10	Requirement type: Event/Use case: Add New Cost/Benefit
10-1	Maintain Cost/Benefit information
10-2	Discard changes and return to view all Cost/Benefit.
10-3	Save changes and return to view All Cost/Benefit.
Req 11	Requirement type: Event/Use case: Verify Business Model
11-1	Check the rule "Value-In-Use has a valid name"
11-2	Check the rule "Business Model has a valid description"
11-3	Check the rule "Actors have valid Value Propositions"
11-4	Check the rule "Actors have valid Co-Production Activities"
11-5	Check the rule "Actors have valid Descriptions"
11-6	Check the rule "Actors are not Customer and Focal Organization at the same time"
11-7	Check the rule "Actors have at least one Cost"
11-8	Check the rule "Actors have at least one Benefit"
11-9	Check the rule "Costs in this Business Model are also a Benefit in this Business
	Model"
11-10	Check the rule "Benefits in this Business Model are also a Cost in this Business
	Model"
11-11	Check the rule "There are at least 2 Actors"
11-12	Check the rule "There are multiple Actors being Customer"
11-13	Check the rule "There is one Actor Customer"
11-14	Check the rule "There is one Actor Focal Organization"
Req 12	Requirement type: Event/Use case: Save Image
12-1	Save the image with, user specified, name and location.
Req 13	Requirement type: Event/Use case: View All Actors
13-1	View all the Actors in the Project
13-2	Discard changes and return to view the Business Model
13-3	Add selected Actor to Business Model and return to view the Business Model
Req 14	Requirement type: Event/Use case: Maintain Business Model Informa-
14.1	tion
14-1	Maintain business model information.
14-2	Discard changes and return to view the Business Models
14-3	Save changes and return to view the Business Models
Req 15	Requirement type: Event/Use case: Exporting and Importing Model
15 1	Components
15-1	Export a business model into a file
15-2	Import a business model in a file into an existing project