University of Twente & TNO

Business modeling TNO's Urban Strategy Service

Master Thesis

Maarten Zeegers

8/4/2011

Report in partial requirement for Master Program of Business Administration - Information Management, University of Twente (The Netherlands).

Table of Contents

Table of Figures

Table of Tables

Chapter 1: Introduction

Urban Strategy started as a concept in 2005 and has since then evolved into a software instrument, which has created high expectations within TNO Urban Environment & Safety and other TNO departments. In 2005 TNO was hired by the city of Tilburg to do research on the railway zone in the heart of the city. After two months a report was delivered which presented the air quality and noise calculations of the new plan. During the presentation of this report it became apparent that the plans had changed. All calculations were invalid and the project had to start from scratch.

After the project, plans were formulated to build an interactive urban environment planning instrument. There was a need for software that could calculate multiple environmental aspects at the same time and would allow real-time manipulations to find an acceptable solution for conflicts. These conflicts are usually the result of exceeding a law-based maximum value for environmental aspects (e.g. noise or air quality levels).

Figure 1, 3D visualization of noise levels in the city of Rotterdam

A modular design was chosen because of changing environmental laws and policies. This way new calculation modules (e.g. sustainability, building costs) could easily be attached. All relevant data (e.g. building sizes and population, roads, traffic intensities) is stored, geographically correct, in a database. A 3D, 2D and table/charts presentation modules are available to show exactly the level of detail that is needed for rigorous analysis and discussion. Rich movies and pictures can be exported for presentation and reporting purposes.

The 3D presentation module is an eye-catcher that receives enthusiastic reactions from participants in the workshops and presentations. This aspect transforms a common story about the urban design possibilities into an interactive movie. In a 2D geographical interface (GIS) the design can be altered and these adjustments and their implications are shown in real-time in the 3D interface. Subsequently environmental impacts of these changes can be visualized as tables and charts and also as overlays in the 3D and 2D interface.

At this point Urban Strategy can calculate traffic, air pollution, noise and external safety effects. Four additional calculation modules are being developed. Especially the speed of the various environmental effect calculations is exceptional. It takes only minutes to calculate a completely new scenario and smaller adjustments are done in real-time. This is ideal for interactive exploratory workshop sessions with various specialists. The calculation models did not have to be simplified in order to do so, so the results are as reliable as can be. These aspects make the software unique in the world.

Between 2007 and 2010 Urban Strategy has been used in approximately 20 projects in the Dutch market. TNO delivered the expertise and service necessary for the software product. Most of the interactive workshops were held at TNO in Delft and a few on a location of the customers' choice. The customers were the Dutch government (RWS), consultancy firms, cities, provinces and (consortia of) contractors that were involved in large tender procedures. There has also been some interest from Abu Dhabi, China and France and careful explorations of those opportunities have been made.

In 2011 the software will be further finalized. Steps have been made to optimize the user interface and a customer test case is being prepared. This would be the right time to develop a clear business strategy to form a business plan. Although the following sentence has often been quoted, it is still highly applicable to every kind of technology with its most famous example the VHS vs. Betamax story:

"mediocre technologies pursued within great business models may be more valuable than great technologies exploited via mediocre business models." (Chesbrough, 2009)

Chapter 2: Assignment

The assignment consists of three sections. The first section presents the goal for Urban Strategy as formulated by TNO. The second section consists of the delimitations for the assignment as formulated by TNO and the last section covers their corporate strategy.

2.1 Goal

TNO has the ambition to make Urban Strategy a “de facto” standard in the Dutch market. The following sentence is a quote from my intake interview: “In 2013 cities and provinces should have to argue why they did **not** use Urban Strategy in large urban design change projects”.

In 2011 a clear business strategy should be developed so that distinct steps can be taken towards their ambition. The scope and complexity of the software have prevented a consensus within TNO towards that goal. The following points have not yet been fully explored:

- Software license model
- IT infrastructure
- Potential customer demands
- Potential partners

The main goal is developing a business strategy that clarifies the previous points.

2.2 Delimitations

The main limitation is that the business strategy should first be developed for the Dutch market only. All models being used in the software are accredited for the Netherlands and should not necessarily be valid for other countries. Recommendations for the international market can however be made.

Organizational forms such as spin-offs and in-depth financial analysis should not be emphasized in the business strategy.

TNO (Netherlands Organization for Applied Scientific Research) is a not-for-profit organization in the Netherlands that focuses on applied science. Their corporate strategy should be reflected in the business strategy.

2.3 Corporate Strategy

TNO published a strategic plan for the years 2011-2014 [1]. The TNO act stipulates that TNO's plans have to be submitted every four years to the minister of education, culture and science and thereby to the entire Dutch cabinet and Dutch society. The corporate ambition is "innovate with impact" and the four core elements of their mission are:

- Better world through applied research
  - (Co)solution for major social problems
  - Innovation in industry
  - Valorization, generating economic activity on the basis of knowledge
- Smart solutions for complex problems
  - Combination of breadth and depth of knowledge
  - Integrating capacity across disciplines
  - Innovating, independent and reliable
  - Based on applying scientific knowledge
- Together making more of
  - Open cooperation with network of customers and knowledge institutions
  - Authoritative and directive (role/attitude)
  - Initiating, connecting and orchestrating
- Incubator and springboard for talent
  - Motivated, involved and enthusiastic
  - Open to change, creative, enterprising
  - With inspiring figureheads, based on teamwork
  - Most challenging environment

[1] The TNO strategic plan is retrieved from http://www.tno.nl/downloads/tno_strategic_plan_2011_2014.pdf

Chapter 3: Research design

The main goal, as stated in the previous chapter, is to form a business strategy for the Urban Strategy service. Business modeling is a structured way to form a business strategy. And according to Chesbrough (2002) a technology has no economic value until it is commercialized in some way via a business model. The main ambition is to make the technology a de facto standard and the main limitation is to develop this strategy initially for the Dutch market. These three elements should be combined and this results in the following main research question:

MRQ: What is the best business model for Urban Strategy with regards to TNO's ambition to make it a technological de facto standard in the Netherlands?

To be able to answer the main research question, a suitable and clear definition of the term "business model" has to be found. The term emerged in literature towards the end of the twentieth century (Pateli 2002, Pateli & Giaglis 2004) and there still is no consensus in the academic literature about the definition. Pateli & Giaglis (2004 p 308) illustrate this nicely by concluding that:

…while some researchers perceive the business model as a purely business concept that explains the logic of doing business for a firm (Timmers 1998; Linder & Cantrell 2000; Petrovic, Kittl et al. 2001; Rappa 2003), others consider it as a link between strategy, business processes, and information systems (Nilsson, Tolis et al. 1999; Osterwalder & Pigneur 2002)

This leads to the first research question:

RQ 1: What is a business model?

The second term that has to be investigated is "de facto standard". The Linux Information Project [2] defines the term as: "A de facto standard is a standard that has become a standard because it is widely used rather than because it was officially approved by some standards organization or government". De facto is a Latin phrase meaning "concerning the fact" or "in practice".

To adequately address the issue stated in the main research question one wants to know how technological de facto standards can successfully be established. The answer to that question would be very valuable to all technological companies and it is not feasible that a satisfying answer can be given within the typical time restrictions of a master research project.

What is achievable is an investigation into business strategies and influence factors that contributed to successfully establishing de facto standards in the past. This leads to the second research question:

---

[2] The definition is retrieved from http://www.linfo.org/de_facto_standard.html

RQ 2: How were technological de facto standards established in the past?

The answers to the first two research questions provide a clear understanding of the main research question. The next step would be researching how business models can be designed.

Most research on business models focuses on classification of business models and on defining the components of business models (Malone & Weill et al. 2006) and there is only one large scale empirical study that links business models to performance (i.e., Amit & Zott 2001). Ideally one would like to analyze a technology and company structure and identify the best performing business model. There are studies that have tried to do exactly that (e.g. Weil et al. 2005 and Malone et al. 2006), but have succeeded only in a few distinct business areas. Also one could argue that new (disruptive) technology often requires new business models, more elegantly said by Chesbrough (2010, p 358)

"*the root of tension [is] the conflict between the business model established for the existing technology, and that required to exploit the emerging , disruptive technology.*"

This means that designing business models for new technology always requires some innovative thinking, ideally with a business model design method. This leads to the third research question:

RQ 3: What business model design method can be used for Urban Strategy?

The answer to the third question gives the method to answer the main research question.

A literature gap exists on the subject of business model design methods experimentation and validation (Vermolen, 2009). This means that literature on applying business modeling methods is scarce. The observations of applying the chosen method for this thesis should result in recommendations for practitioners and future research on business model design, resulting in the final research question:

RQ 4: What are the observations of applying this design method to the Urban Strategy case?

Chapter 4: Theoretical Framework

The theoretical framework is divided in three sections that cover the first three research questions. The first section introduces and explores the business model concept. The goal is to clarify the rather vague term business model, not to create a new and better definition. The second section explores how de facto standards were established in the past. The last section explores ways to design and analyze business models and choose one to use in the next chapter. Together these three sections should build a concept to answer the main research question.

4.1 What is a business model?

Since 1995 there have been 1177 papers published in peer-reviewed academic journals in which the notion of a business model has been addressed (Zott, Amit & Massa, 2010). Although the sheer volume of publications would suggest a collective agreement on the definition of the popular term, this is not the case. To be able to get a clear understanding of the main research question a suitable definition of business model has to be found.

Some researchers see the business model as a business concept that describes the logic of doing business while another group considers it a link between strategy, business processes and information systems (Pateli & Giaglis 2004).

The business model is fundamental to any organization (Magretta, 2002), because it provides structured and powerful ways to understand, analyze and manage strategy choices (Pateli & Giaglis, 2004; Shafer et al., 2005) among various business stakeholders (Gordijn & Akermans, 2001). It also lays the fundament for the information system design needed for the particular business model (Eriksson & Penker, 2000). The word fundament in the previous sentence is important because there is no systematic framework or method to accurately design an information system plan from a business model as of yet. It does however give an overview of the information systems, or an information systems strategy, needed to support the business model.

4.1.1 Business model and business strategy

The terms business model, business strategy, and information systems have surfaced and they need to be linked together for a clearer picture. Business strategy in this context means the strategy developed purely for the product or technology itself. Not a firm's overall business strategy which will be called corporate strategy.

The terms business strategy and business model are widely used, in business and literature alike. When comparing the concepts used by business model experts and business strategy experts, they seem the same (Seddon & Lewis, 2003). There are a few differences however. Business strategy seems more concerned with competition between firms whereas business models are more concerned with the core logic that enables the creation of value (Linder & Cantrell, 2000). And according to Porter (1996), a firm's strategy is deeply rooted in that particular firm's environment. Seddon & Lewis (2003) argued that a business model should be more abstract than a business strategy, as depicted in Figure 2.

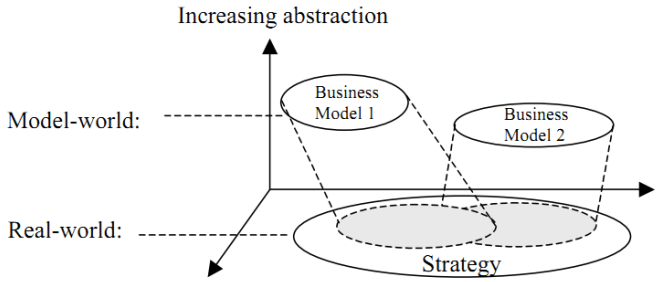

Figure 2, Relationship between "business model" and "business strategy", Seddon & Lewis (2003)

So a business model should be more abstract than business strategy and should be able to give an overview of the information systems strategy needed to support that business strategy. The business strategy for a technology or product should not conflict with the corporate strategy. Business plans and information systems plans can be seen as concrete and specific versions of the business strategy and information systems strategy. Figure 3 visualizes the relationships. These relationships are a static and simplified version of the business model in practice.

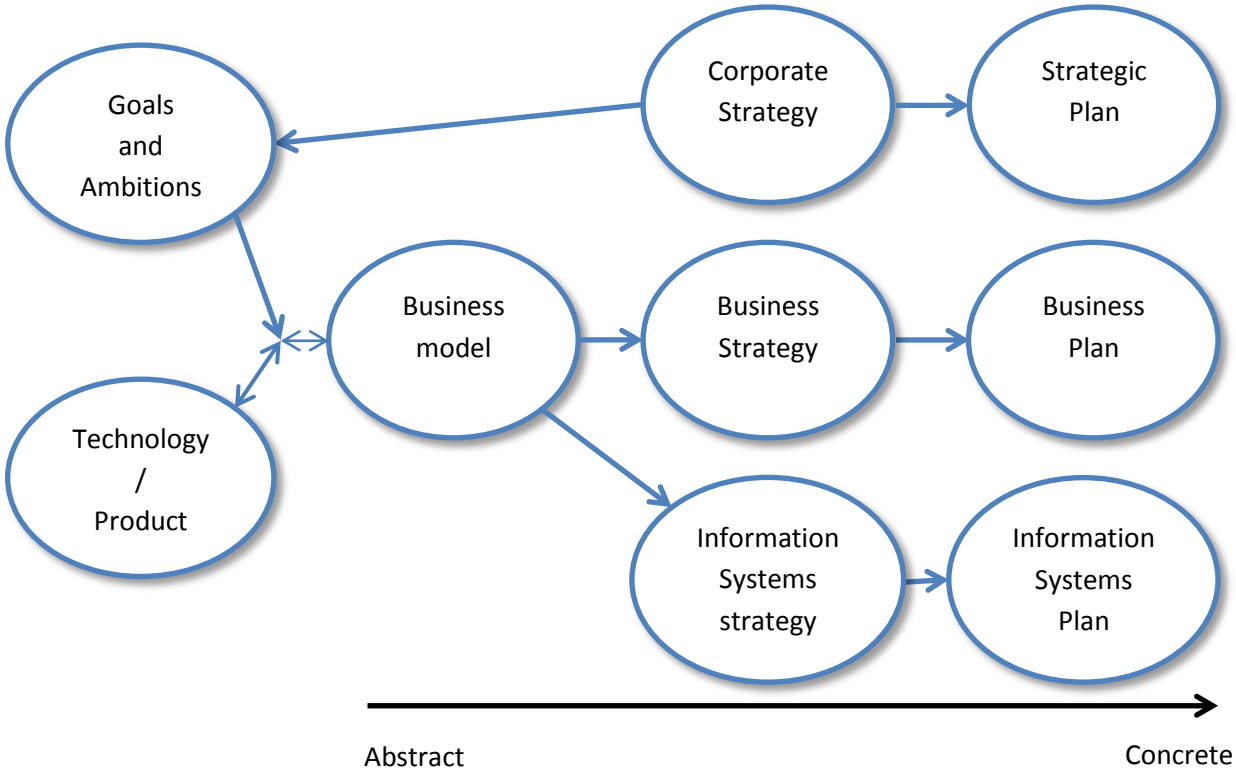

Figure 3, Simplified depiction of relationships business modeling

The following statement should be helpful in clarifying the term business model:

A business model should be more abstract than business strategy.

4.1.2 E-business model, information systems business model and business model

The term e-business model and business model have both been used in literature which creates some confusion. But as Vermolen (2009) wrote:

"When the internet was a new phenomenon, this focus was helpful to recognize the new business possibilities that were created by the internet. But, as Porter in 2001 puts it, "In our quest to see how the Internet is different, we have failed to see how the Internet is the same". The internet does not require a different business model, the internet has become an important aspect of the current business environment. Thus, now the internet is a part of the business model concept, this leads to the conclusion that the distinction between "e-business model" and "business model" no longer exists."

Another term that surfaces in literature is information systems business model. Information systems also are an important aspect of the current business environment. They are needed to support the way we do business. Information systems should be a logical consequence of the business model, not the other way around. An example is needed to clarify this statement:

Urban Strategy is an information system. The title of this thesis is "Business modeling TNO's urban strategy service", so a clear argument can be made that the main goal of the assignment is developing an information system business model.

However the information system, Urban Strategy in this case, was designed and developed with a clear goal in mind. Later on in the development stage larger ambitions for this information system were set. Urban Strategy developed into something different, and in this case, more than it was initially designed for. Information systems should be dynamic and when goals, ambitions and other applicable variables (e.g. customer wishes, partner wishes, market conditions, rival strategies etc.) shift, the information system should reflect these changes.

Business modeling an information system is about business modeling goals and ambitions associated with that information system and often changes the information system itself. Therefore the term "information system business model" holds no additional value compared to the term "business model" itself.

With all the information in mind the following statement should be helpful in selecting a suitable definition:

The definition of the term business model should be broad and applicable to every technology, product or idea. It should not focus on e-business model or information systems business model.

4.1.3 Definitions

Vermolen (2009) analyzed 30 leading journals to gather a total of 36 papers with a definition of the term "business model". The findings about the topics of business model definitions are given in the following table:

Topic	Number of papers
Generating/Capturing value	17
Revenue	4
Profit	2
Components	10

Table 1, Business model definition topics (Vermolen, 2009)

The topic of components does not fit the broad view the term business model should have. And the topics revenue and profit do not fit the main ambition of TNO with Urban Strategy. So the topic should be about generating and capturing value, which does fit the broad view. This is also emphasized by Chesbrough (2006) who states that the two main functions of a business model are value capture and value creation. An overview of 22 different business model definitions selected by Al-Debei & Avison (2010) is given in Appendix A to illustrate the differences in semantics.

A definition for business model by Osterwalder & Pigneur (2010) fits the broad view and is applicable to every technology, product or idea:

"A business model describes the rationale of how an organization creates, delivers, and captures value"

This definition is used throughout the thesis.

4.2 How were "de facto" standards established in the past?

In the technology market standards normally emerge from two different standard setting processes, de facto and de jure standards (Techatassanasoontorn & Suo, 2011).

De facto standards are the result of competition of different and often incompatible technologies with the same purpose. So it is up to the users who ultimately determine what the dominant technology is going to be. A nice example is the HD-DVD vs. Blu-ray standard for high definition content on an optical disc. Blu-ray won the competition because the playstation3 had a built-in Blu-ray player, so they developed a huge user-base compared to HD-DVD. Essentially Blu-ray had a better business model; they partnered with Sony. Sometimes the term market-based standards (Funk, 2002) or market-mediated standards (David & Greenstein, 1990) is used instead of de facto standards. De jure standards on the other hand are the result of selection and certification by a governmental agency.

4.2.1 Standard setting process

Figure 4 shows the standard setting process for de facto and de jure standardization, based on a literature review of several studies on the standardization process and outcomes (Techatassanasoontorn & Suo, 2011).

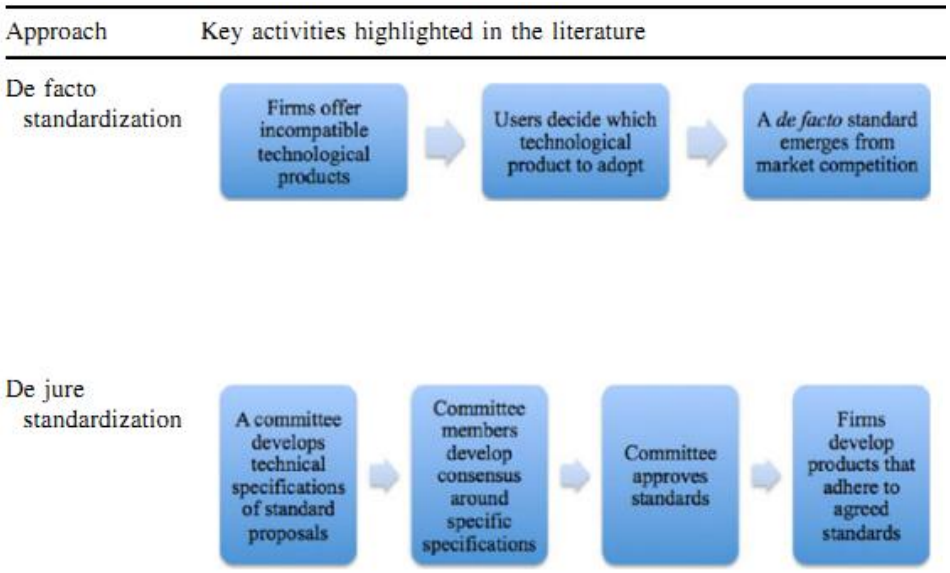

Figure 4, Standard setting process (Techatassanasoontorn & Suo, 2011)

One of the biggest indicators in the successful outcome of the standards setting process is a large user-base (Techatassanasoontorn & Suo, 2011; Shankar & Bayus, 2003). This conclusion seems trivial but as Chakravati & Xie (2006) point out, not all standards competitions lead to a winner-takes-all outcome. There are other factors that influence the de facto standardization process. An incompatible technology can still maintain a small market share if it is associated with a better functionality or better pricing strategies. High switching costs, all costs associated with adapting a new technology or product, also seem to prolong standards competition (Techatassanasoontorn & Suo, 2011).

4.2.2 Factors that influence de facto standardization process

The following table combines the conclusions of several papers (Techatassanasoontorn & Suo, 2011; Yamaha & Kurokawa, 2005; Updegrove, 2003; Shankar & Bayus, 2003) based on case studies about de facto standards in modem technology, VCR market, home video game market, IS security technology and Web services.

Factors	How
Pricing	Low and dynamic pricing can expand the user-base
Functionality	More and better functionality at the same price level can expand the user base
Switching costs	Lower switching costs can expand the user-base
Core capabilities	Selling and promoting a firm's core capabilities to rivals, partners and competitors is of strategic importance when diffusing a standard
Strategic alliances	Strategic alliances with (would-be) competitors are important when diffusing a standard
Modularity	A modular and open interface technology can be important when diffusing a standard
Proprietary purpose	A standard has more success in the absence of a perceived proprietary advantage to any individual company

Table 2, Factors that influence de facto standardization process

Although the factors mentioned above are not exhaustive, they did influence the standardization process in the past in somewhat similar markets. So the business strategy for Urban Strategy should incorporate as many of the factors named above as possible.

Furthermore Yamaha & Kurokawa (2005) stated that, based on literature review, de facto standards have both merits and demerits depending upon specific situations. The following figure gives an overview of their findings:

	Merits	*Demerits*
For manufacturers (standard proposers)	Higher profit from: • Higher market share • Lower cost • Loyalty income	Higher cost and risk from: • Initial technology development • Initial market development • Technological and market free-riders
For consumers	Higher utility from: • Lower price • More available software • More informed decision • Market for used products	Lower utility from: • Less competition • Less innovations

Figure 5, Merits and demerits of de facto standards (Yamaha & Kurokawa, 2005)

Especially the demerits for standard proposers are things to consider for the business strategy.

4.3 What business model design method can be used for Urban Strategy?

As mentioned in the research design most studies on business models focus on classification of business models and on defining the components of business models (Malone & Weill et al. 2006). These classifications along components are called typologies (or sometimes, arguably wrong, taxonomies) and their goal is developing a structured way of analyzing business models (Lambert, 2006). They are also a first step towards developing a business model design method, an application of the research. Business models can be classified in many ways, but the classifications usually differ in usefulness.

4.3.1 Business model components

Of all sets of business model components, Osterwalder's set is considered the most comprehensive (Pateli, 2002). Osterwalder (2003) created a business model ontology consisting of nine components, called building blocks to describe and classify business models, see Figure 6. This ontology was based on a synthesis of existing business model literature. Gruber (1993) defines ontology as an explicit specification of a conceptualization. The main goal of applying ontologies is the development and implementation of an explicit account of a shared understanding in a given subject area in order to solve a problem (Ushold and Gruninger 1996).

Pillar	Building Block of Business Model	Description
Product	Value Proposition	A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer.
Customer Interface	Target Customer	The Target Customer is a segment of customers a company wants to offer value to.
	Distribution Channel	A Distribution Channel is a means of getting in touch with the customer.
	Relationship	The Relationship describes the kind of link a company establishes between itself and the customer.
Infrastructure Management	Value Configuration	The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer.
	Capability	A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.
	Partnership	A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer.
Financial Aspects	Cost Structure	The Cost Structure is the representation in money of all the means employed in the business model.
	Revenue Model	The Revenue Model describes the way a company makes money through a variety of revenue flows.

Figure 6, Osterwalder's 9 building blocks (components)

These components, by Osterwalder called building blocks, are compared to 14 other papers, the results of an extensive literature search, that define business model components (see Appendix B). This was done to demonstrate the overlaps and differences in business model component literature. As can be seen there are no clear semantics in business model literature. Even if a consensus could be reached

about business model components this would not automatically result in business model design methods.

4.3.2 Business model design methods

Research on design methods and tools for business models is scarce (Pateli & Giaglis, 2004). The available tools in literature are based on process modeling methods. Lagha et al. (2001) came up with the e-business modeling language (eBML) and Osterwalder (2004) proposed the business model modeling language (BM^2L). But these are still software tools to capture business models. As of yet most academic literature seems to be missing the important element of a true business model design method.

To be able to successfully answer the main research question a hands-on approach to business model design is needed. A method that converts a technology or product and associated ambition and goals into a business model.

The only hands-on method for business model design that could be found was a book called “Business Model Generation” by Alex Osterwalder and Yves Pigneur. Essentially it is a qualitative method for business model design that uses nine building blocks to describe the essential parts of a business model.

“Business Model Generation” advises to use workshops and discussions among various stakeholders to design and analyze business models. The workshop methodology used to arrive at the final business model for Urban Strategy is presented in the next chapter.

Chapter 5: Workshop Methodology

This chapter is divided in six sections. The first section presents details of the chosen business modeling method and tool. In the second section the workshop design based on the modeling method is explained. The third explains the partial business models approach. The fourth section presents the workshop results. These results form the foundation for the final business model. In the fifth section an analysis is performed on the workshops. The analysis is the foundation for the workshop observations in research analysis in the next chapter. The last section presents the evaluation of the workshop results.

5.1 Workshop method

Alex Osterwalder and Yves Pigneur have written a popular book called “Business Model Generation”. It uses a 9 building block canvas as a business model design tool, see Figure 7. The nine building blocks themselves are explained in detail along with useful tips, tricks and numerous helpful examples. Although no scientific explanation has been published describing the rationale of evolving from the BM ontology (Osterwalder, 2003) to this design tool, it has been co-created with 470 practitioners from 45 different countries.

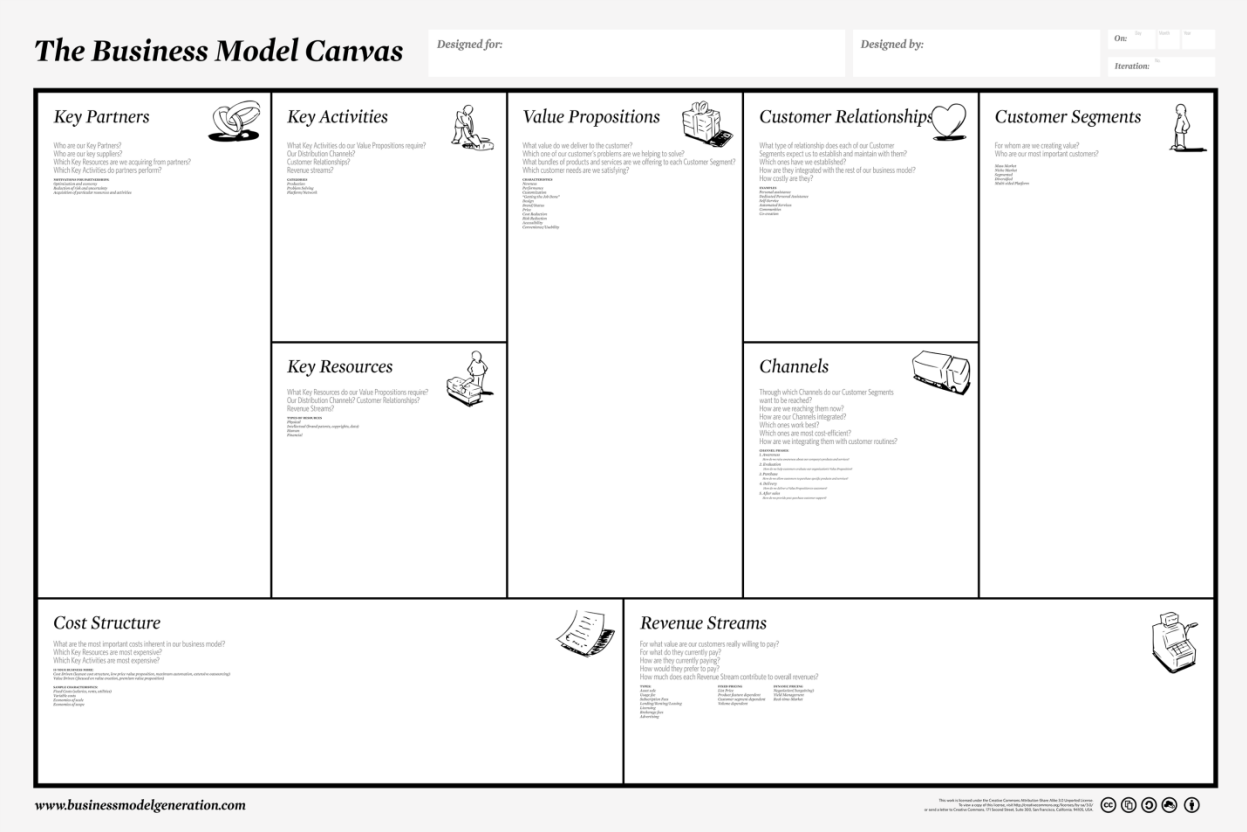

Figure 7, The Business model canvas

The book advises to plan business model generation workshops. The brainstorming during these workshops is invaluable for creating different perspectives on the business model. The people present should be a diverse team; with various areas of expertise, different ages and from different levels of seniority. This should help in generating, discussing and selecting new ideas.

There are four brainstorming rules:

- Stay focused, don't let the discussion stray too far from the problem at hand.
- Enforce the rules, this is the task of the facilitator.
- Think visually and write the ideas down.
- Prepare, immerse the team in issues related to your problem.

Other useful tips from the book are:

- Ask "what if" questions.
- Use a warm up exercise.

5.2 Workshop design

5.2.1 Workshop planning

One overall rule for the workshops was developed:

The business model design sessions should have an open structure; Everybody is allowed to comment or criticize without the fear of reprisal as long as commenting is done decently and with the use of arguments.

A total of nine people were selected by the department manager of TNO and asked via e-mail to attend the workshops. The team consisted of the project manager, the department manager, a senior proposition manager, a computer programmer, an innovation specialist, a business analyst, a market analyst, a manager from a different department and a master business administration student fulfilling the role of facilitator. Two people had never used or seen Urban Strategy and one person did not work at TNO. Attendance was voluntary but everybody wanted to attend the workshops.

Due to busy schedules the workshops were planned as two two-hour sessions, six weeks apart. The activities of the first workshop:

- Demonstration of the software for the people unfamiliar with the technology.
- Explanation of the goals and rules.
- Short creative session lasting fifteen minutes gathering business case ideas.
- Exploration of a few of those ideas by using the canvas in the remaining time of the first workshop.

In the creative session all stakeholders were asked what ideas they would want to explore. Not just the ideas they thought would work.

The activities of the second workshop:

- Recapitulation of the first workshop.
- Exploration of the remaining ideas by using the canvas.

5.2.2 Workshop setup

The workshops were being held in a conference room in Delft.

5.2.2.1 First workshop

The business model canvas was printed on 4 A3-size paper sheets (see Figure 9).

Since there was not enough time to do a warm-up exercise, the canvas was printed on paper with an explanation of each of the nine building blocks and the sequence in which to treat each building block (see Figure 8).

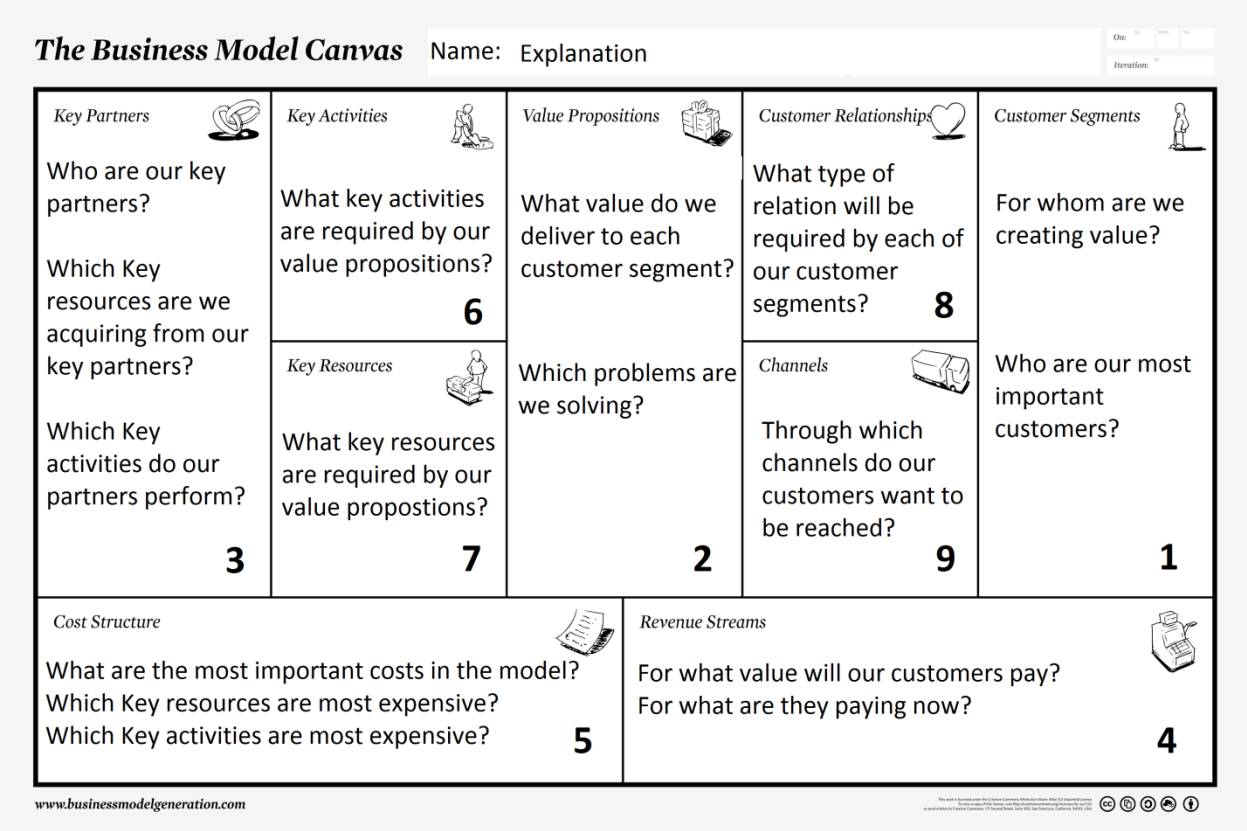

Figure 8, Explanation of the business model canvas

The person with the role of facilitator wrote down the information in the nine building blocks as soon as an agreement among the participants on its content was reached. Post-its were available to all participants, so that thoughts and questions could be written down and placed on the canvas. (see Figure 9).

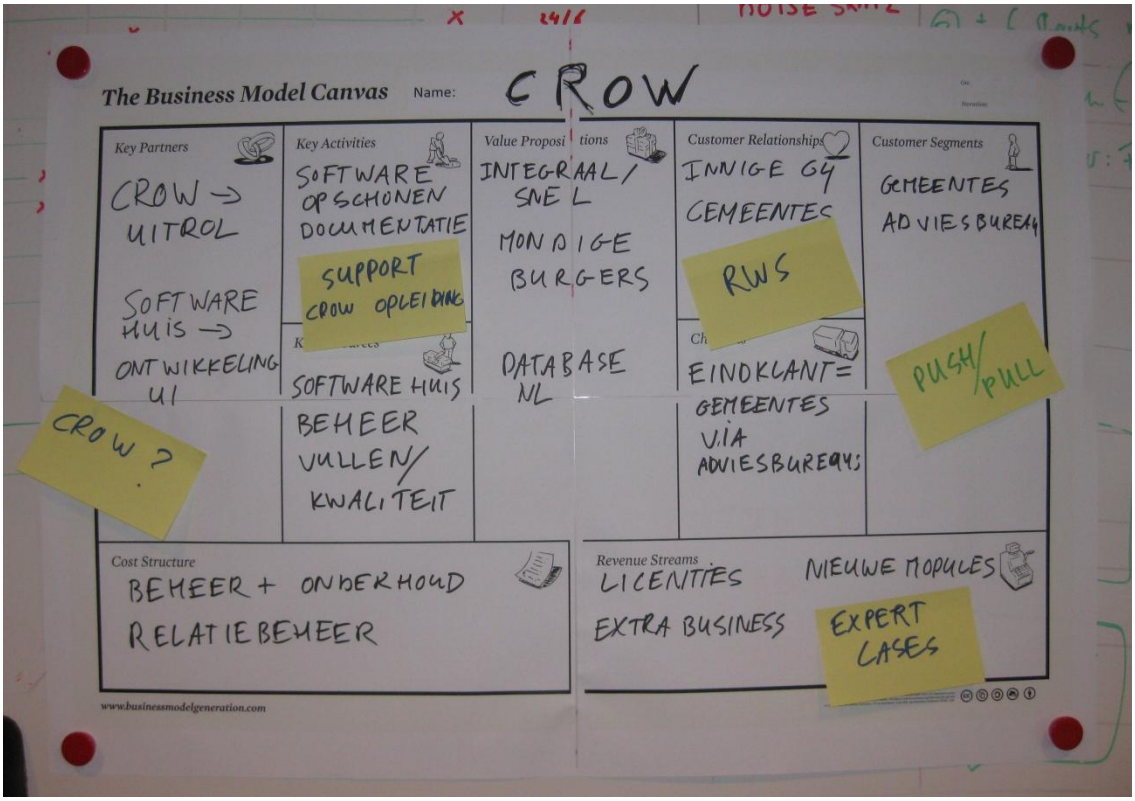

Figure 9, Example paper canvas (in Dutch)

After the first workshop the paper canvasses have manually been digitized.

5.2.2.2 Second workshop

For the second workshop a digital canvas was made (see Figure 10). This was done for three reasons:

- Digital text is easier to read and faster to write.
- It is hard to enforce the rules as a facilitator with your back to the group constantly writing on the canvas.
- There is no need to manually digitize the canvasses afterwards.

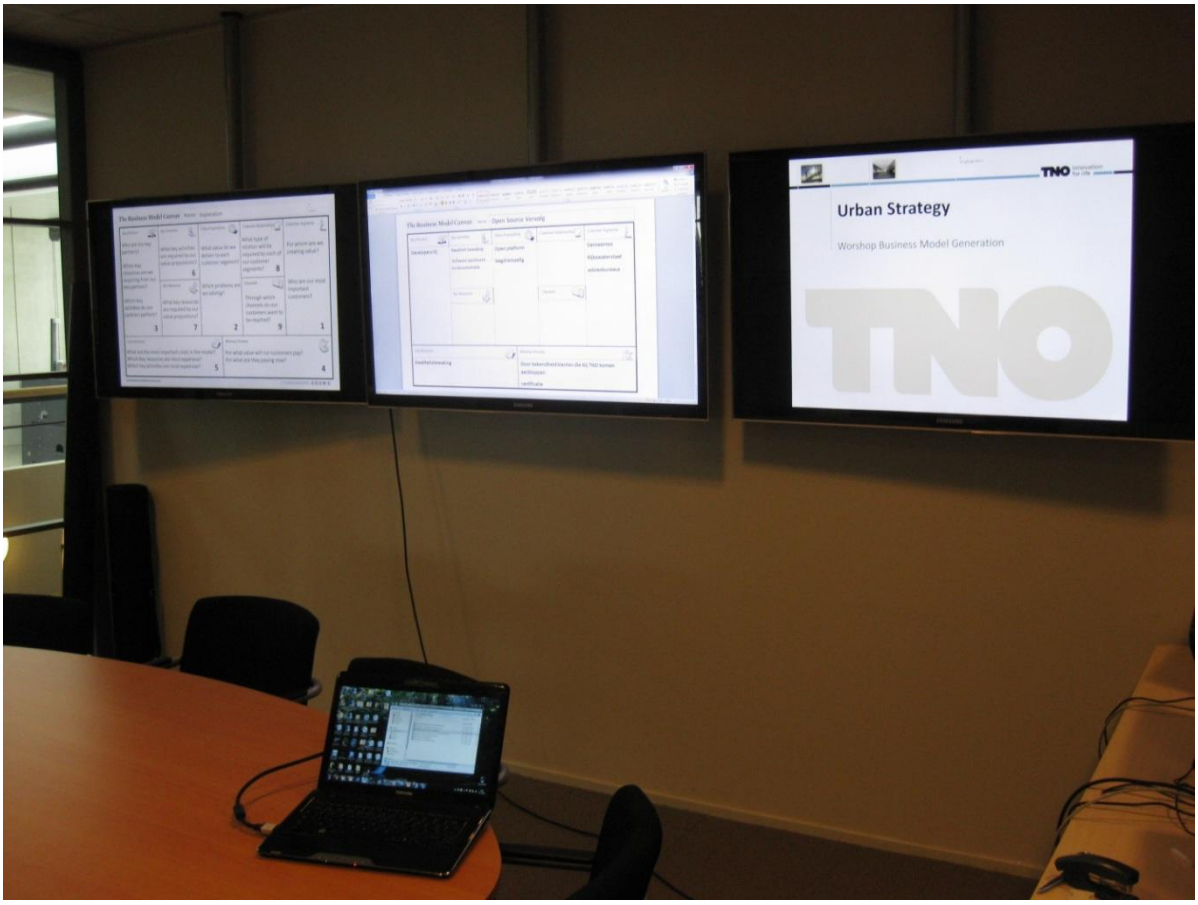

Figure 10, Digital canvas setup

Three 55 inch screens were available in the conference room. One was used for displaying the digital canvas. Another one displayed the explanation of the nine building blocks. The facilitator wrote down the comments on the digital canvas and was better able to participate in the workshop session.

5.3 Partial business models approach

Due to the time limitations of the workshops and the number of ideas that had to be explored a partial business model approach was agreed upon. All ideas and resulting partial business models should be from the TNO point of view. For each idea the unique consequences would be explored with the business model canvas. The resulting canvasses therefore do not depict a complete business model. So if one of the ideas would be “software supplier” only the unique consequences of that idea would be explored:

- Value propositions: Customer-specific software configuration
- Key activities: installing software on location, delivering support on location
- Etc.

The advantage is that ideas that did not match the ambitions, goals or core competences of TNO could be eliminated without losing much time. Afterwards combinations of the surviving ideas would be made and evaluated, which would result in a final and complete business model.

5.4 Workshop results

During the creative session in the first workshop a total of 8 business ideas were collected. The first few ideas mentioned were basically what was already happening, or what the actors wanted to happen. But at the end a few surprising suggestions made the list.

- Software supplier
- Service supplier (consultancy)
- Consortium with partners
- Consortiums on a project basis
- Focus on consultancy firms as customers
- CROW partnership [3]
- Software as a Service
- Open Source

Three ideas were chosen to explore during the first workshop. A discussion erupted about the term partner and about Urban Strategy itself. An agreement was reached on both accounts:

- A partner is an organization that invests something in the technology, not an organization that gets paid by-the-hour.
- Urban Strategy is software, but it is too complex to view it as just that. To be able to successfully use it, expertise from different areas is needed. A better fit would be to view it as a technology and service oriented product.

The second workshop started with a recapitulation. The canvasses of the ideas previously discussed were shown again and some discussion about topics that were already handled started again. After about twenty minutes the remaining ideas were explored.

After the two workshops only four of the ideas survived:

- Open Source
- Focus on consultancy firms as customers
- CROW partnership
- Software as a Service

[3] CROW is the Dutch knowledge platform for infrastructure, traffic, transport and public space

The four ideas that did not survive, while using the canvas, were not able to convince in being successful in reaching the ambition of a de facto standard in the Netherlands.

- “Software supplier” did not fit because of the complexity of and expertise needed for Urban Strategy. It also did not fit with the core competences of TNO; knowledge and expertise.
- “Consortium with partners” would be too time consuming to set up. There was also some serious doubt if suitable partners could be found who would together be willing to pay for development.
- “Consortiums on a project basis” would prevent TNO, as an independent research institute, to do further surveys and research after the project was finished. This would effectively block a considerable amount of core activities within TNO.
- “Service supplier (consultancy)” was the business strategy at the moment and it could never achieve the ambition of a de facto standard. This would only be possible if the consultancy firms operating in The Netherlands would start using Urban Strategy.

The four ideas that did survive, all seemed to contribute to the de facto standardization ambitions of TNO. These four canvasses are presented separately in the following four sections. The advantages for TNO of each idea are also listed.

5.4.1 Open Source

This idea was mentioned during the creative session because of its potential for “de facto” standard setting ambitions. A perceived vendor lock-in is a negative factor in de facto standard setting processes. The unique consequences of this idea are listed in the following figure:

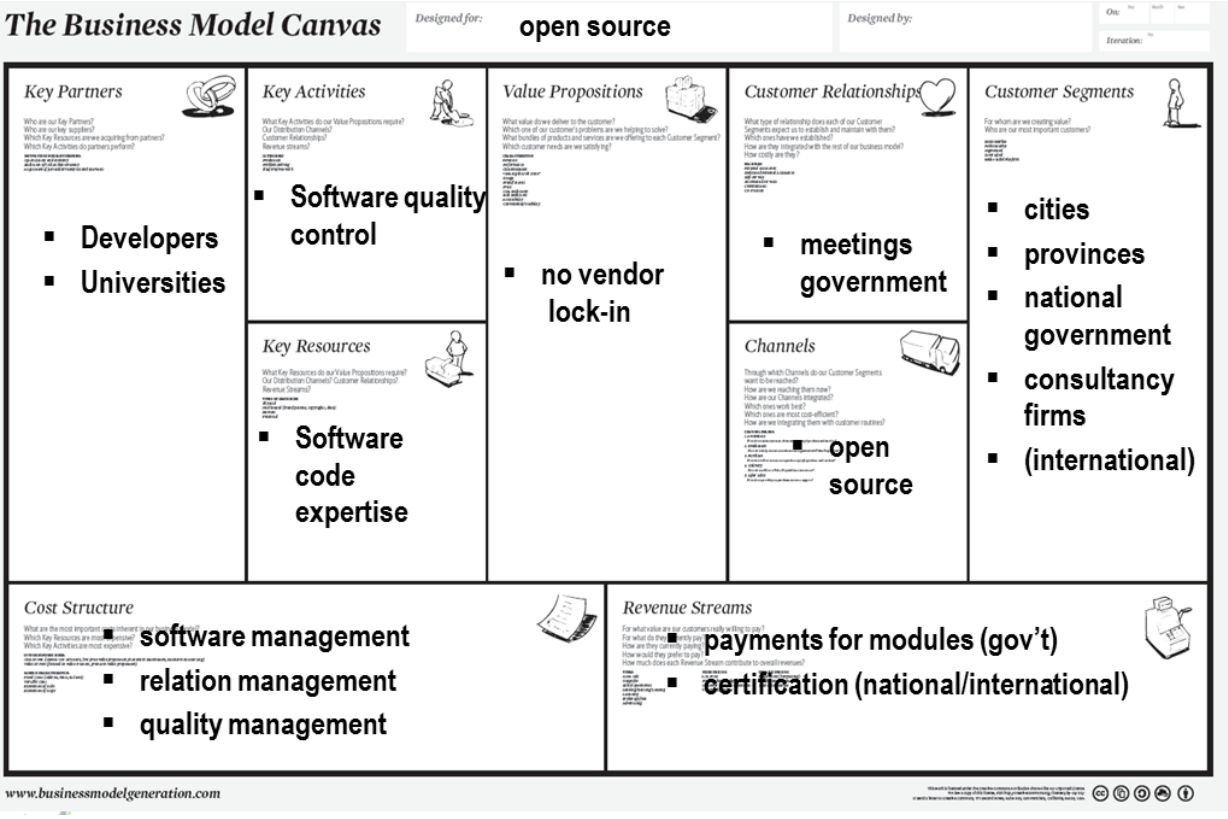

Figure 11, Business model canvas "Open Source"

“Open Source”
Lowered perceived proprietary purpose (vendor lock-in); It would effectively lower the threshold to use and develop for the software.
Potential international brand recognition.
Fits with corporate strategy of spreading knowledge and cooperating with universities.

Table 3, Advantages TNO "Open Source"

5.4.2 Focus on consultancy firms

This idea was mentioned because all large urban change projects are executed by consultancy firms. The customer segment focus here is consultancy firms, but their customers are still cities, provinces and the national government. The consultancy firms are better able to manage projects for their customers because of the integrated solution they can present with Urban Strategy. The nationally accredited models in Urban Strategy make sure that change plans are accepted by the government. The unique consequences of this idea are listed in the following figure:

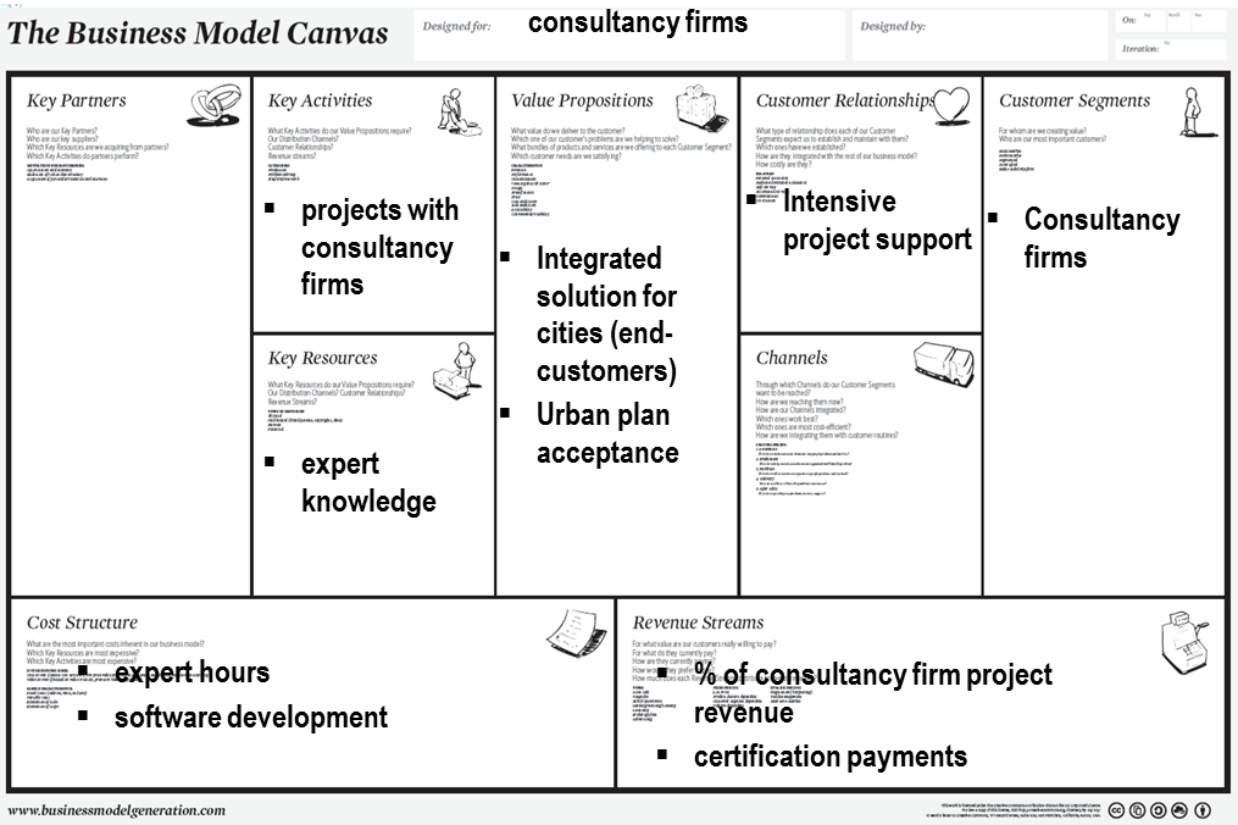

Figure 12, Business model canvas "Focus on consultancy firms"

"Focus on consultancy firms"
Time consuming but potential high revenue streams.
If "de facto" standard is to be established consultancy firms have to use the software.
All large urban change projects are handled by consultancy firms.

Table 4, Advantages TNO "Focus on consultancy firms"

5.4.3 CROW Partnership

This idea was mentioned because it initializes a huge user-base. With CROW as a partner that handles the training for the Urban Strategy software, all cities and provinces are advised by the government to use Urban Strategy. Even the largest city in The Netherlands does not have the expertise required to use Urban Strategy for large urban change projects. The cities should be informed that large projects should still be handled by consultancy firms to prevent an expectancy mismatch. Small adjustments (e.g. shutting down a road, or traffic congestion) and their consequences can be explored by the cities and this should result in better city planning. Functionality in the software makes citizen involvement possible which is required for smooth acceptance of large urban change projects. A partner should optimize the user interface for the software to make it as easy to use as possible for cities. The unique consequences of this idea are listed in the following figure:

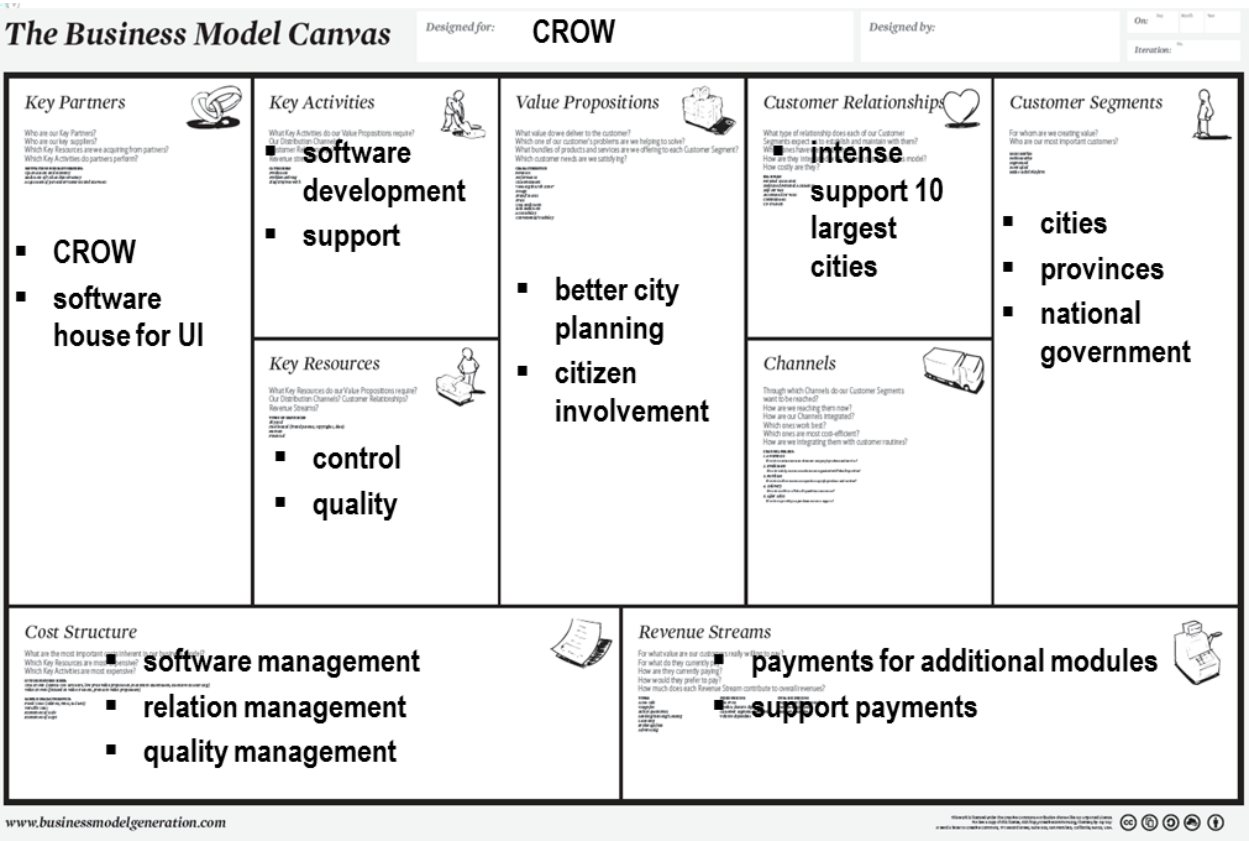

Figure 13, Business model canvas "CROW Partnership"

"CROW Partnership":
Initializes huge user-base. All cities and provinces are advised to use software.
Cities will ask for Urban Strategy when dealing with consultancy firms.

Table 5, Advantages TNO "CROW Partnership"

5.4.4 Software as a Service:

This idea was mentioned because of the low switching costs for all customers. Using the software online would eliminate expensive hardware requirements and database licenses for the customers. The portal that would have to be developed could service cities (less functionality) and consultancy firms (more functionality) alike. The unique consequences of this idea are listed in the following figure:

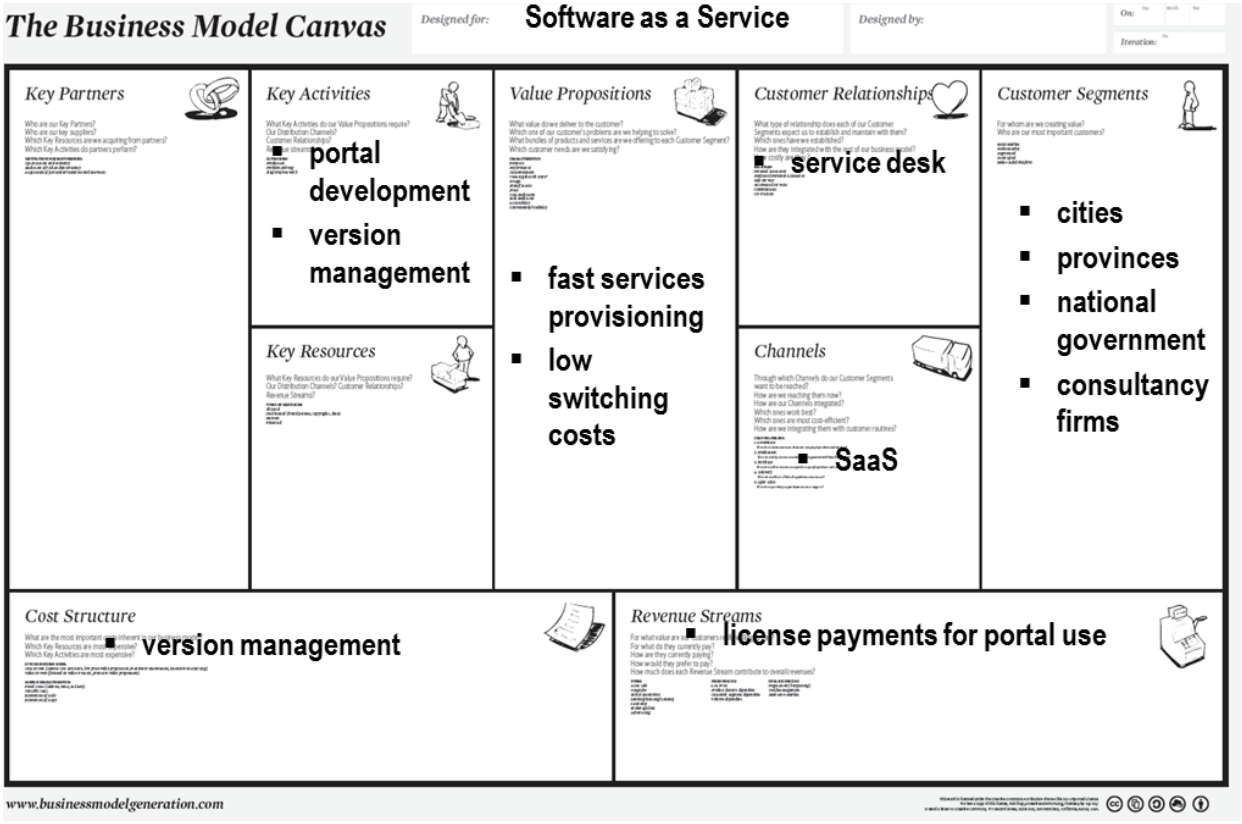

Figure 14, Business model canvas "Software as a Service"

"Software as a service"
The only way to keep switching costs for customers low (no expensive hardware and huge database license costs).
Dynamic pricing strategies are an option to create larger user-base.
Obtaining large database with detailed information nation-wide.
Lower costs for updating the software.

Table 6, Advantages TNO "Software as a Service"

5.5 Workshop analysis

Overall reactions of the participants on the business model canvas were positive. Some participants had already used it in another project and it was accepted as a guide for business modeling and business strategy. All participants left the workshops with a positive feeling and better understanding of the technology and the possible business strategies that could be applied.

The use of arguments and "what if" questions during the workshops was extensive. A few times the facilitator and department manager had to cut off a lively discussion to get back on track. All the discussion did lead to a clearer picture about possible business models and strategies. A nice example was the idea "open source". Initially people were very negative about this idea. The idea was explored in both workshops due to time limits in the first workshop. After the second workshop the negative opinions were almost all gone in favor of a slightly positive mind-set about the idea. The negative mind-set was basically due to a lack of information on the subject. Taking the time to shed light on subjects that were initially not clear to everyone did contribute to useful discussions.

The explorations of the four remaining ideas, the canvasses, themselves are not complete business models. They are however all from the TNO point of view. Because of the time constraints of the workshops the focus was on mapping the direct consequences of the ideas. Osterwalder (2003, p 14) explains that confusion sometimes arises when people use the term business model for a part of the business model. It was explained to the actors in the workshops that combinations of the surviving ideas would be made to arrive at a complete business model. This approach was useful because it made the brainstorming sessions less complex. The focus could be on one idea and its implications at a time.

5.6 Workshop evaluation

After the workshops, decisions were made during a meeting that two ideas were invaluable for the ambition to make Urban Strategy a "de facto" standard in the Netherlands. "Software as a Service" and "Open Source" should be present in the final business case. Due to agreements already made by TNO with CROW (Partner) and a large consultancy firm the other two ideas also had to be in the final business model. This resulted in a complex multi-sided business model. The canvas is presented and analyzed in Chapter 6: Research results and analysis.

Appendix C gives an example of an evaluation method when multiple business models still exist after the workshops. This method however is not finished and does require some additional interpretation by the facilitator.

Chapter 6: Research results and analysis

This chapter is divided in two sections. Research results presents the final business model, business strategy summary and business model validation. Research analysis presents the observations of the workshop method (answering research question 4), observations on the business case validation method, de facto standardization alignment and corporate alignment.

6.1 Research results

6.1.1 Final business model

The following canvas sums up the final business model, combining all applicable elements of the four partial business models, for TNO's Urban Strategy service from TNO's viewpoint:

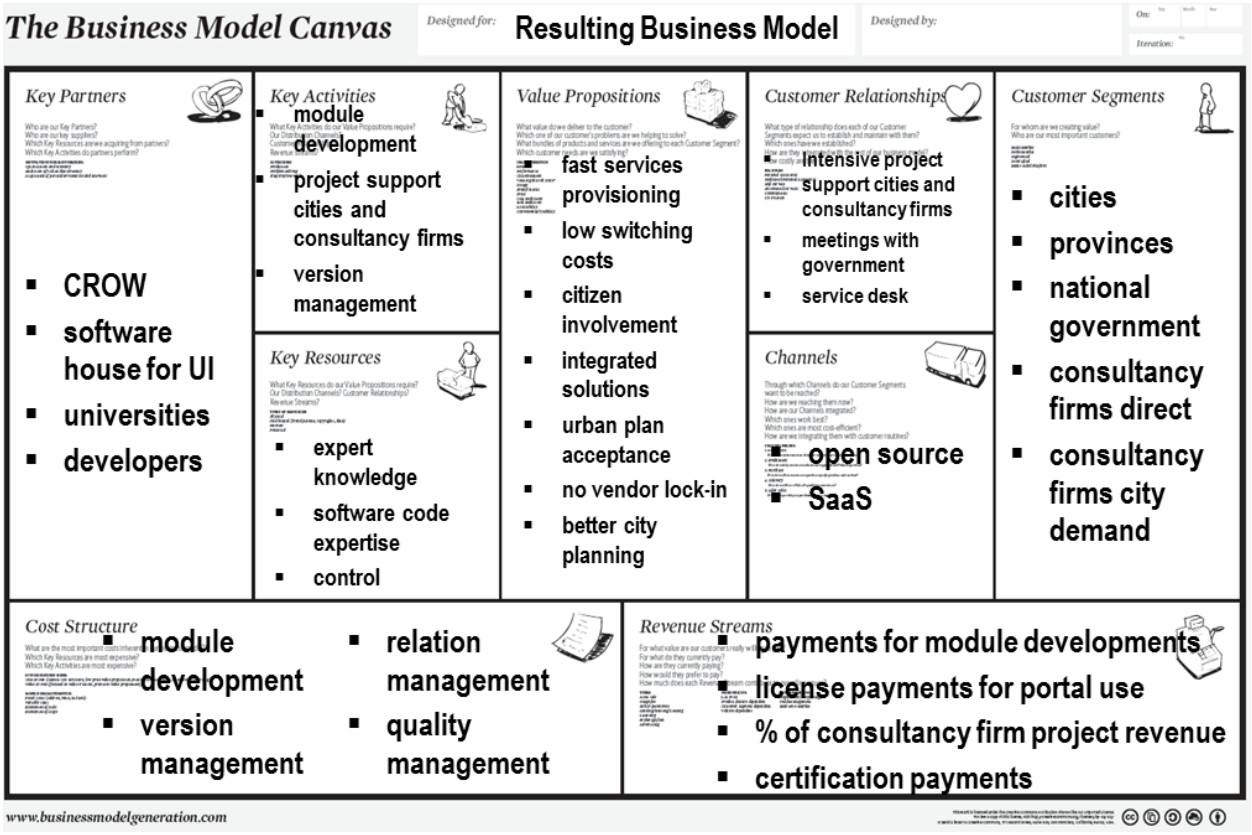

Figure 15, Business model canvas "Final business model"

6.1.2 Business strategy summary

The resulting business strategy is a two sided platform targeting government and cities as well as consultancy firms.

Primary focus is on top 10 cities and provinces. The government will advise to use Urban Strategy (and has already agreed to do so). The software as a service (portal) approach keeps the switching costs low by eliminating the need for expensive hardware and database licensing costs for the customer. The openness about limited functionality for cities themselves should prevent a mismatch in customer

expectations and the license payments for portal use should initially cover version management and quality management.

Secondary focus is on consultancy firms. Direct contact with firms about the unique value propositions of the technology and the open source approach should result in expanding the user-base beyond cities and provinces. Software as a service makes dynamic pricing strategies and payment on project basis possible and this can be used to further expand the user-base. Demand from cities for Urban Strategy in large urban change projects should convince the remaining consultancy firms to use the software.

In this way module development is covered by payments from the government and, if required for a specific project, consultancy firms. Certification payments and consultancy firm percentage project revenue should at least cover relation management and project based support.

6.1.3 Validation

Validation of the business model and resulting strategy is important because it checks whether the value propositions match with the needs of the customer segments. A mismatch would result in a flawed and ultimately failing business model and strategy.

The final business model was validated by the city of Rotterdam. Rotterdam has the largest city planning department in the Netherlands and has strong connections with the other top 10 cities in the Netherlands. Validation was done by showing the business model canvas and explaining the complex business model. Due to time limits and lack of ties with other cities, no other cities could be checked this way. Rotterdam was asked how other cities would respond to the business case. Meetings that had already taken place with consultancy firms prevented business case validation from the consultancy firm as customer.

The results of the validation were:

- Value proposition matches the needs of Rotterdam, specifically:
    - Citizen involvement
    - Low switching costs
    - No vendor lock-in
- Value proposition should also match the needs of other cities
- Positive and detailed feedback on:
    - Pricing strategies
    - Support services
    - Open source approach

6.2 Research analysis

6.2.1 Workshop observations

The partial business models (ideas) have the potential to create confusion as Osterwalder (2003, p 14) notified. When it is clear that they are only part of a business model, and should be combined afterward to create a full business model, they have a few advantages:

- Focused discussion on one problem at a time.
- Complex business case generation in limited time.

It is doubtful that a complex business model as presented in the research results could be generated in the limited time that was available, 2 times 2-hour workshop, without the partial business cases approach.

The business model canvas had four other strong points:

- Immediate acceptance as a guide for business strategy
- Strong information sharing method
- Satisfied workshop participants
- Unexpected results due to open discussions among different stakeholders

Especially the negative attitude towards open source that gradually changed into a positive attitude during the two workshops is a nice example of the strong potential of the business modeling canvas.

The terms that were written on the canvas during the workshops were not abstract enough to properly fit in a business model. The terms had to be converted by the facilitator afterwards to result in abstract business model canvasses.

6.2.2 Business case validation observations

The business model validation method as applied in this thesis is very open. It basically consists of showing the business model to possible customers and partners. It is doubtful that companies would be enthusiastic about this method. They still think their business model should be a secret. Current financial accounting practices combined with other company information readily available reveals a business model not long after the launch of a product or technology. Only if the business model would reveal too much information (e.g. disruptive technology in combination with a new (innovative) business model) the validation method is more difficult to implement. Non-disclosure agreements and assuring the business model canvas is abstract should help in implementation.

The business model canvas was effective in the validation process. Detailed feedback was received about the value propositions, channels, customer relationships and revenue streams.

6.2.3 De facto standardization alignment

The business strategy reflects 5 of the 7 standardization factors:

factor	
Pricing	Dynamic pricing strategies can be employed to expand the user-base
Switching costs	Switching costs have been minimalized
Core capabilities	Key activities reflect core capabilities of TNO
Modularity	Open and modular interface
Proprietary purpose	Open source strategy lowers perceived proprietary purpose

Table 7, De facto standardization alignment

The demerits for standard proposers found in literature do only partially apply to the business model:

- Initial technology development was not an issue; return on investment did not have to be a part of the business model.
- Technological and market free-riders issue is not present due to the open source approach and expertise required.
- Initial market development costs are indeed higher than the current business model.

6.2.4 Corporate alignment

Urban Strategy itself reflected two of the core elements and the new business model added a third core element and enhanced the fit with two other elements:

Corporate strategies	
Better world through applied research	Urban Strategy is the solution for fast and reliable urban design problems. The business model ultimately focusses on consultancy firms and should generate revenue to keep innovating.
Smart solutions for complex problems	Urban Strategy is a smart solution that integrates knowledge across disciplines. The open platform is extremely suitable for innovation.
Together making more of	Open platform for cooperation with universities, institutes, firms and enthusiasts.

Table 8, Corporate alignment

Chapter 7: Summary

Urban Strategy is a service that is developed by TNO. The heart of the service is a complex modular software suite that enables visualization of real-time environmental calculations on an urban change project. Multiple plan variants can be compared, manipulated and discussed with various experts in a workshop setting. In 2010, the ambition for Urban Strategy to become a de facto standard in The Netherlands for urban change projects was set by TNO. A clear business strategy for Urban Strategy that reflects the ambition was needed. An advice for a business strategy has been developed by "business modeling TNO's Urban Strategy service".

The following sections summarize the answers to the research questions and main research question.

7.1 Research Question 1

The first research question was "what is a business model?" Review of academic literature revealed that it is a vague term. Misconceptions exist on more than one level.

In literature and in business the terms "business strategy" and "business model" are widely used but poorly defined, often stretched to mean almost everything. Business models were invented out of a need to systematically compare business strategies. To make comparison of business strategies possible a level of abstraction was needed. This leads to the following statement:

A business model should be more abstract than business strategy.

The terms e-business model, information system business model and business model are used throughout literature. E-business model is often used in conjunction with business strategies that rely heavily on the internet. But the internet is an important aspect of the current business environment. So the term e-business model holds no additional value over the term business model. Roughly the same logic can be applied to the term information system business model. Information systems are an important aspect of the current business environment and are needed to support the way a technology or product creates value. Even when the product or technology itself is an information system, the term information system business model holds no additional value. This leads to the following statement:

The definition of the term business model should be broad and applicable to every technology, product or idea. It should not focus on e-business model or information systems business model.

A definition for business model by Osterwalder & Pigneur (2010) fits the broad view and is applicable to every technology, product or idea:

"A business model describes the rationale of how an organization creates, delivers, and captures value"

The following picture gives a simplified overview of the main aspects and relationships of business modeling:

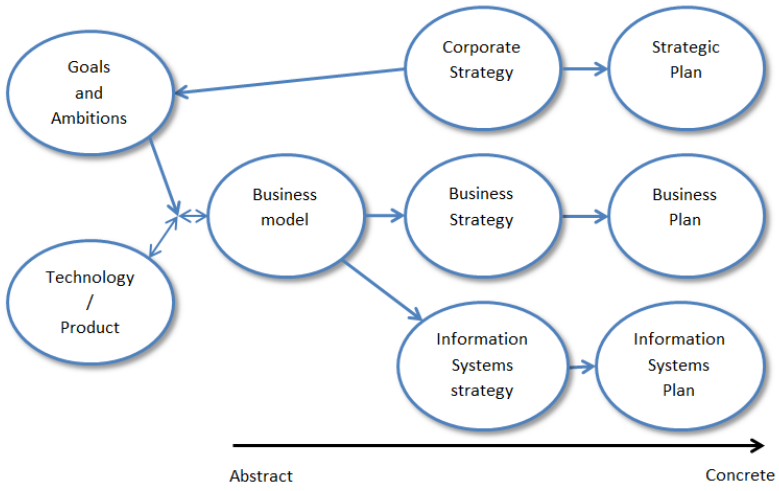

Figure 16, Simplified depiction of relationships business modeling

7.2 Research Question 2

The second research question was "How were "de facto" standards established in the past?" Review of academic literature revealed that the largest indicator of a successful de facto standard setting process was a large user-base. But a large user-base does not always guarantee a winner takes-all outcome. Other factors do have a significant effect on the standardization process outcome. The following table combines the conclusions of several papers based on multiple case studies in technology markets.

Factors	How
Pricing	Low and dynamic pricing can expand the user-base
Functionality	More and better functionality at the same price level can expand the user base
Switching costs	Lower switching costs can expand the user-base
Core capabilities	Selling and promoting a firm's core capabilities to rivals, partners and competitors is of strategic importance when diffusing a standard
Strategic alliances	Strategic alliances with (would-be) competitors are important when diffusing a standard
Modularity	A modular and open interface technology can be important when diffusing a standard
Proprietary purpose	A standard has more success in the absence of a perceived proprietary advantage to any individual company

Table 9, Factors that influence de facto standardization process

Although the factors mentioned above are not exhaustive, they did influence the standardization process in the past.

7.3 Research Question 3

The third research question was "What business model design method can be used for Urban Strategy?". Review of academic literature revealed that research on design methods and tools for business models is scarce. Most studies on business models focus on classification of business models and on defining the components of business models. There is no consensus in literature on these classifications and components, but even if there was, this would not automatically result in business model design methods. As of yet most academic literature seems to be missing the important element of a business model design method. The only hands-on method for business model design that could be found was a book called "Business Model Generation" by Alex Osterwalder and Yves Pigneur. The workshop methodology needed to answer the main research question was based on guidelines from this book and a tool called the business model canvas.

7.4 Main Research Question

The main research question was: "What is the best business model for Urban Strategy with regards to TNO's ambition to make it a technological de facto standard in the Netherlands?". Application of the workshop methodology ultimately lead to the final business model and resulting business strategy.

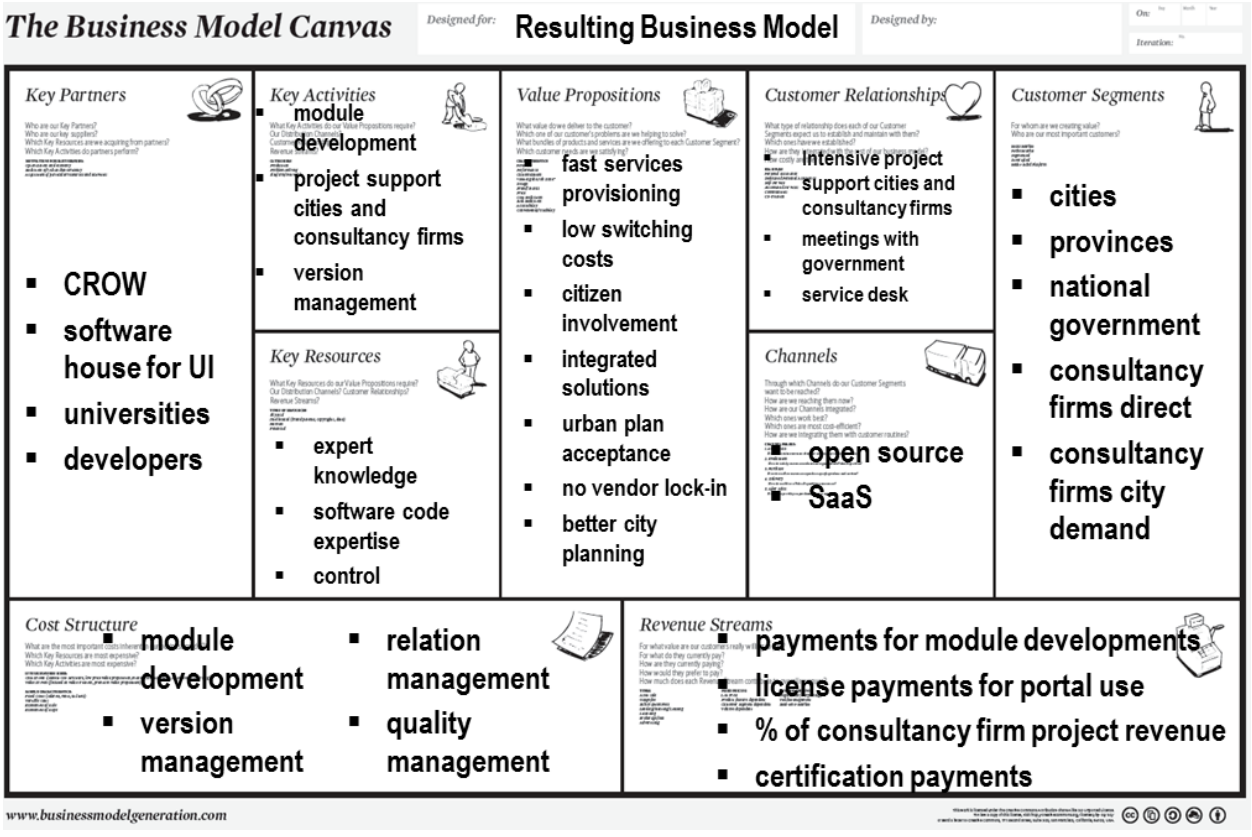

Figure 17, Business model canvas "Final business model"

The resulting business strategy reflects 5 of the 7 standardization factors, and 3 of the 4 corporate core elements.

7.5 Research Question 4

The last research question was: "What are the observations of applying this design method to the Urban Strategy case?".

The business model canvas had four strong points:

- Immediate acceptation as a guide for business strategy
- Strong information sharing method
- Satisfied workshop participants
- Unexpected results due to open discussions among different stakeholders

The partial business models approach had two advantages:

- Focused discussion on one problem at a time.
- Complex business case generation in limited time.

The business model canvas was effective in the business model validation process. Detailed feedback was received about the value propositions, channels, customer relationships and revenue streams.

The workshop methodology based on Osterwalder and Pigneur's "Business model generation" for designing business models should not be seen as a holy grail. Applying it does not guarantee business success, it does not even guarantee a valid business model. It should be seen as a structured way of thinking about different types of business models applied to a product, idea or technology. Especially the brainstorming with different types of actors all with their own view and expertise can generate helpful insight and ultimately develop a clear business model and resulting business strategy.

Chapter 8: Research Limitations and Future Research

8.1 Limitations

The research done via case studies about the factors influencing the de facto standardization process, have been done in somewhat similar markets. Although a case can be made arguing that they could also apply to the Urban Strategy market, one always has to be careful to generalize these conclusions to other markets.

The limitations of the workshop methodology and business model validation method are related to the number of case studies performed. From research methodological point of view, the research counts only one investigator. The investigator might be biased in one way or another, which affects the reliability of the study. The bias might however be mitigated by standardizing research procedures and the sharing of documents and thoughts with the research community and superiors. The number of case studies performed can greatly affect the generalizability of theories. The thesis only performed one case study and is therefore externally not valid. The thesis only performed business model validation against one potential customer. It is not possible to conclude that the workshop methodology and business model validation methodology can be applied in every scenario. It depends on the actors involved and the company itself. The thesis did identify and describe a possible solution for business model design and validation. Future research can investigate if the proposed solution can be applied to different scenarios.

8.2 Future Research

The workshop methodology is only tested with one case. Multiple case studies makes cross case analysis possible. Results of earlier cases can be replicated and hypotheses of earlier cases can be tested (Van Aken et al., 2007). The appropriate number of cases depends on how much is known and how much new information is likely to be learned from incremental cases (Eisenhardt, 1991). Future research should use the proposed workshop methodology and or business model validation and apply it to other technologies, other not-for-profit companies, smaller companies and companies in other countries in order to learn from the diversity of companies around the world and to be able to generalize the findings.

Bibliography

Al-Debei M.M. and Avison D. (2010), "Developing a Unified Framework of the Business Model Concept". *European Journal of Information Systems,* 19(3): pp. 359-376

Amit R. and Zott C. (2001), "Value creation in e-Business". *Strategic Management Journal,* 6–7(22): pp. 493–520.

Chakravarti A. and Xie J. (2006), "The impact of standards competition on consumers: effectiveness of product information and advertising formats". *Journal of Marketing Research*, 43(2): pp. 224–236

Chesbrough H.W. and Rosenbloom R.S. (2002), "The role of The Business Model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies". *Industrial and Corporate Change*, 11(3): pp. 529–555.

Chesbrough H.W. (2006), "Open Business Models: How to Thrive in the New Innovation Landscape". *Harvard Business School Press,* Boston

Chesbrough H.W. (2009), "Business Model Innovation: Opportunities and Barriers". *Long Range Planning*, 43(2-3): pp. 354-363

David P.A. and Greenstein S. (1990), "The economics of compatibility standards: an introduction to recent research". *Economics of Innovation and New Technology*, 1(1–2): pp. 3–41

Eisenhardt K.M. (1991), "Better Stories and Better Constructs: The Case of Rigor and Comparative Logic". *The Academy of Management Review*, 16(3), pp. 620-627

Erikkson H. and Penker M. (2000), "Business Modeling with UML – Business Patterns at Work" , *John-Wiley & Sons*, New York.

Funk J.L. (2002), "Global competition between and within standards: the case of mobile phones". *Palgrave*, New York

Gordijn J. and Akkermans J.M. (2001), "Designing and evaluating eBusiness Models". *IEEE Intelligent Systems*, 16(4): pp. 11–17

Gruber T. (1993), "A translation approach to portable ontologies". *Knowledge Acquisition,* 5(2): pp. 199-220

Lagha S.B., Osterwalder A., Pigneur Y. (2001), "Modeling e-Business with eBML". *Proceedings of 5th International Conference on Management of Networked Enterprises (CIMRE)*, Mahdia, October 25-26

Lambert S. (2006), "A Business Model Research Schema". *Proceedings of the 19th Bled eConference,* Bled, Slovenia, June 5 - 7

Linder, J. C. and S. Cantrell (2000), “Changing business models: surveying the landscape”. *Accenture Institute for Strategic Change*

Magretta J. (2002), “Why business models matter”. *Harvard Business Review,* 80(5): pp. 86– 92.

Malone T.W., Weill P.,Lai R.K., D’Urso V.T., Herman G., Apel T.G., Woerner S.L. (2006), “Do Some Business Models Perform Better than Others?”. *MIT Sloan*, Working Paper 4615-06, pp. 1-3

Nilsson, A. G., C. Tolis and C. Nellborn (1999), “Perspectives on Business Modelling - Understanding and Changing Organisations”. *Springer,* Berlin

Osterwalder A. and Pigneur Y. (2002), “An e-Business Ontology for Modeling eBusiness”. *15th Bled Electronic Commerce Conference*, Bled, Slovenia

Osterwalder A. (2003), “The Business Model Ontology: A Proposition in a Design Science Approach”. Switzerland, University of Lausanne: 173.

Osterwalder A. and Pigneur Y. (2010), “Business Model Generation”, *Wiley*

Pateli A. (2002), “A Domain Area Report on Business Models”. Athens University of Economics and Business, Athens

Pateli A. and Giaglis G. (2004), "A Research Framework for Analysing e-Business models". *European Journal of Information Systems*,13: pp. 302-314.

Petrovic O., Kittl C. and Teksten R.D. (2001), “Developing Business Models for e-Business”. *Conference on Electronic Commerce*, Vienna.

Porter M.E. (1996), “What is Strategy?”. *Harvard Business Review*, 74(6): pp. 61-78.

Porter M.E. (2001), "Strategy and the Internet". *Harvard Business Review* ,79(2): pp. 63-78.

Rappa M. (2003), “Managing the digital enterprise - Business models on the Web”. *[online]*, accessed 06/27/2011, available: http://ecommerce.ncsu.edu/business_models.html.

Seddon P.B. and Lewis G.P. (2003), “Strategy and business models: what’s the difference?” *7th Pacific Asia Conference on Information Systems*, Adelaide, South Australia

Shafer S.M., Smith H.J. and Linder J. (2005), “The power of business models”. *Business Horizons*, 48(3): pp. 199-207.

Shankar V. and Bayus B.L. (2003), “Network effects and competition: an empirical analysis of the home video game industry”. *Strategic Management Journal*, 24(4):pp. 375-384

Techatassanasoontorn A.A. and Suo S. (2011), “Influences on standards adoption in de facto standardization”. *Information Technology and Management* , pp. 1-29

Timmers P. (1998), "Business Models for Electronic Markets", *Electronic Markets* ,8(2): pp. 3-8.

Ushold M. and Gruninger M. (1996). "Ontologies: Principles, Methods and Applications". *Knowledge Engineering Review,* 11(2): pp. 93-155

Van Aken J.E., Berends H., Van der Bij H. (2007), "Problem Solving in Organizations: A Methodological Handbook for Business Students". *Cambridge University Press*

Yamada H. and Kurokawa S. (2005), "How to profit from de facto standard-based competition: Learning from Japanese firms' experiences". *International Journal of Technology Management,* 30(3-4): pp. 299-326

Zott C., Amit R. and Massa L. (2010), "The business model: Theoretical roots, recent developments and future research". *Journal of Management Studies*, forthcoming

Appendix A

Authors	BM descriptions	Thematic indicators
Timmers (1998, p. 4)	An architecture for products, services and information flows, including a description of various business actors and their roles; a description of the potential benefits for the various business actors; and a description of sources of revenues.	Architecture, Value Proposition, Business actors and roles, Revenue sources.
Venkatraman & Henderson (1998, pp. 33–34)	A strategy that reflects the architecture of a virtual organization along three main vectors: customer interaction, asset configuration, and knowledge leverage.	Architecture, Organization strategy, Customers, Asset configuration, Knowledge leverage.
Linder & Cantrell (2000, pp. 1–2)	The organization's core logic for creating value. The business model for a profit-oriented enterprise explains how it makes money.	Business logic, Value Capture, Revenue sources.
Gordijn *et al.* (2000, p. 41)	A BM answers the question: 'who is offering what to whom and expects what in return?' A BM explains the creation and addition of value in a multi-party stakeholder network, as well as the exchange of value between stakeholders.	Value proposition /exchange, Stakeholder network.
Petrovic *et al.* (2001, p. 2)	A business model describes the logic of a 'business system' for creating value that lies beneath the actual processes.	Business logic, Value proposition, Intermediate theoretical layer.
Amit & Zott (2001, p. 4)	A business model depicts the design of transaction content, structure, and governance so as to create value through the exploitation of new business opportunities.	Value proposition, Structure, Governance.
Torbay *et al.* (2001, p. 3)	The organization's architecture and its network of partners for creating, marketing, and delivering value and relationship capital to one or several segments of customers in order to generate profitable and sustainable revenue streams.	Value proposition, Architecture, Network of partners, Relationship capital, Customer segments, Revenue.
Stähler (2002, Online, p. 6)	A model of an existing business or a planned future business. A model is always a simplification of the complex reality. It helps to understand the fundamentals of a business or to plan how a future business should look.	Abstract, Simplification of current and future business reality.
Chesbrough & Rosenbloom (2002, p. 532)	The business model provides a coherent framework that takes technological characteristics and potentials as inputs, and converts them through customers and markets into economic inputs. The business model is thus conceived as a focusing device that mediates between technology development and economic value creation.	Coherent framework, Mediating construct, Technology, Economic Value.
Magretta (2002, p. 4)	The business model tells a logical story explaining who your customers are, what they value, and how you will make money in providing them that value.	Value proposition, Customers, Revenue sources.
Bouwman (2002, p. 3)	A description of roles and relationships of a company, its customers, partners and suppliers, as well as the flows of goods, information and money between these parties and the main benefits for those involved, in particular, but not exclusively the customer.	Roles and relationships: company, customer, partners, Value proposition, Revenue.
Hedman & Kalling (2003, pp. 49, 52–53)	Business model is a term often used to describe the key components of a given business. That is customers, competitors, offering, activities and organization, resources, supply of factors and production inputs as well as longitudinal process components to cover the dynamics of the business model over time.	Key business components, Resources, Customers, Value proposition, Network, Architecture, Structure, Dynamic.

Figure 18, Academic business model definitions overview (Al-Debei & Avison, 2010)

Campanovo & Pigneur (2003, p. 4)	A detailed conceptualization of an enterprise's strategy at an abstract level, which serves as a base for the implementation of business processes.	Conceptual, Intermediate theoretical layer.
Leem *et al.* (2004, p. 78)	A set of strategies for corporate establishment and management including a revenue model, high-level business processes, and alliances.	Strategy, Revenue, Alliances.
Shafer *et al.* (2005, p. 202)	A representation of a firm's underlying logic and strategic choices for creating and capturing value within a value network.	Business logic, Strategy, Value proposition, Value network.
Osterwalder *et al.* (2005, pp. 17–18)	A conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value relationship capital, to generate profitable and sustainable revenue streams.	Conceptual tool, Business logic, Value proposition, Customer segments, Architecture, Network of partners, Revenue.
Haaker *et al.* (2006, p. 646)	A blueprint collaborative effort of multiple companies to offer a joint proposition to their consumers.	Blueprint, Network of firms, Customers, Value proposition.
Andersson *et al.* (2006, pp. 1–2)	Business models are created in order to make clear who the business actors are in a business case and how to make their relations explicit. Relations in a business model are formulated in terms of values exchanged between the actors.	Business actors and relations, Value exchange.
Kallio *et al.* (2006, pp. 282–283)	The means by which a firm is able to create value by coordinating the flow of information, goods and services among the various industry participants it comes in contact with including customers, partners within the value chain, competitors and the government.	Value proposition: information/goods/services, Industry participants: customers/partners/ competitors/government.
Rajala & Westerlund (2007, p. 118)	The ways of creating value for customers and the way in which a business turns market opportunities into profit through sets of actors, activities, and collaborations.	Value proposition, Set of actors, Revenue.
Janssen *et al.* (2008, p. 204)	A business model reflects the core business of an organization and is useful to describe (and even prescribe) the organization from the perspective of its main mission, and the products and services that it provides to its customers.	Business logic, Value proposition, Customers; Current or future business.
Rappa (2008, Online)	A method of doing business by which a company can sustain itself, that is, generate revenue. The business model spells out how a company makes money by specifying where it is positioned in the value chain.	Revenue sources, Position in the value chain.

Figure 19, Academic business model definitions overview (Al-Debei & Avison, 2010)

Appendix B

Business model ontology	Hamel 2000	Mahadevan 2000	Chesbrough and Rosenbloom 2000	Magretta 2002	Amit and Zott 2001	Applegate and Collura 2001	Maitland and Van de Kar 2002
Value Proposition	Product/market scope	Value stream	Value proposition	What does the customer value?	Transaction component	Product and Services offered	Value proposition, assumed value
Target Customer	Market scope		Market segment	Who is the customer?		Market opportunity	Market segment
Distribution Channel	Fulfillment & support, info & insight			How can we deliver value at an appropriate cost?		Marketing/sales model	
Customer Interface	Relationship dynamics					Brand and reputation	
Value Configuration	Core processes	Logistical stream	Structure of the value chain		Architectural configuration	Operating model	
Capability	core competencies, strategic assets					(Organization and culture, management model)	
Partnership	suppliers, partners, coalitions		Position in the value chain		Transaction component	Partners	Companies involved in creating value
Cost Structure			Cost structure	What is the underlying economic vale?			
Revenue Model	pricing structure	Revenue stream		How do we make money in this business		Benefits to firm and stakeholders	Revenue Model

Figure 20,Business model components comparison (Osterwalder, 2003)

Business model ontology	Stähler 2001	Weill and Vitale 2001	Petrovic, Kittl et al.	Gordijn 2002	Afuah and Tucci 2003	Tapscott, Ticoll et al. 2000	Linder and Cantrell 2000
Value Proposition	Value Proposition	Value Proposition, strategic objective	Value Model	Value offering	Customer Value		value proposition
Target Customer		Customer Segments		Market Segment	Scope		
Distribution Channel		Channels	Customer relations model				channel model
Customer Interface			Customer relations model				commerce relationship
Value Configuration	Architecture		Production Model	e3-value configuration	connected activities, value configuration	b-webs	commerce process model
Capability		Core competencies, CSF	Resource Model		capabilities		
Partnership	Architecture	e-business schematics		Actors		b-webs	
Cost Structure				Value exchange	cost structure		
Revenue Model	Revenue Model	Source of revenue	Revenue Model	value exchange	pricing, revenue source		pricing model, revenue model

Figure 21,Business model components comparison (Osterwalder, 2003)

Appendix C

When dealing with multiple business models after the workshops, a quantitative method can be applied that results in the best fitting business model. All valid combinations of the partial business models can be scored against multiple critical success factors. The critical success factors can be interpreted by the facilitator during the workshops and should be weighed by the stakeholders. The critical success factors should reflect the ambition, secondary goals and customer and partner alignment. An example (in Dutch) is given in the following table:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2		CROW				Consortium				Adviesbureaus opleiden				Stakeholders
3	Open Source	j	j	n	n	j	j	n	n	j	j	n	n	
4	extern beheer	j	n	j	n	j	n	j	n	j	n	j	n	
5	marktpenetratie	8	8	6	6									9
6	omzet TNO	6	7	7	8									7
7	klant alignment	4	4	3	3									8
8	flexibiliteit	1	2	3	4									3
9	TNO doelen	7	6	6	5									5
10	totaal	184	189	166	171									

Table 10, Example for multiple business model evaluation (in Dutch)

This method is not finished at all but could be used as an inspiration to multiple business model evaluation.