

UNIVERSITY OF TWENTE.



# **The information driven insurance company**

*Explorative research into information driven  
business model patterns*



*Master Thesis by Michel Ophof*

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*‘Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change that is inevitable.’*

C. William Pollard  
Former CEO ServiceMasters Company

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# Colophon

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## *Synopsis*

In this explorative research, information driven business model patterns are derived from multiple case studies at information driven innovations. Afterwards, the applicability of these patterns is studied in insurance companies to innovate and do remain competitive.

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I hope that the results of this research contribute to further (business model) innovation in the insurance industry to create, deliver and capture more value for clients and organisations. It would be an honour if the derived information driven business model patterns also boost innovation in other organisations and industries. Please contact me if you have any questions or if you are interested to explore further applications of the patterns.

# Management summary

Organisations should innovate their business model to deal with technology innovations and the complex and changing business model environment. Literature and consultancy firms state that organisations need to innovate and adopt key trends to become a digital enterprise. This explorative research focuses on information as key trend in which two research goals are achieved: deriving information driven business model patterns (goal 1) and studying the applicability of these patterns in insurance companies to innovate and remain competitive (goal 2). A business model pattern expresses a relation inside a business model between a certain context, a problem, and a solution.

First, eight so-called information driven innovations from different industries are studied. Information driven innovations are fundamental technology changes by generating, acquiring, processing, aggregating, analysing, visualising, and/or distributing data and information in new ways to improve operational and/or business performance. Business models and key activities regarding data are studied. Two main dimensions are identified to classify cases: data source (behaviour or information/data) and target of value (individuals, other organisations or crowd). From there, seven information driven business model patterns are derived: (1) individual behavioural insights, (2) individual behavioural stimulation, (3) individual behavioural pricing, (4) individual behavioural input, (5) crowd behavioural insights, (6) real-time matching, and (7) big data mining.

Second, the applicability of the patterns in insurance companies is studied to innovate and do remain competitive. Five semi-structured interviews are done. Current initiatives, potential applications and restrictions are explored for every pattern. Insurers underlined that multiple patterns, except pattern 4, may drive on innovation at insurance companies. Insurers recognised, for example, potential applications for more customised products. As a result, the patterns contribute to trends that influence the insurance industry, such as customisation and the fact that the traditional solidarity crumbles. Insurers noticed several restrictions of the patterns such as the organisation of the application, ethical dilemmas, and privacy (laws). Studied insurers have different opinions about the applicability of several patterns, such as the application of individual behavioural insights for health insurances. This research provides input for (business model) innovation and possibilities to diversify and gain/improve competitive advantages for insurers. The patterns may also drive on (business model) innovation in other industries.

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# 1. Research topic

This explorative research contributes to the ‘Digital We’ open innovation project of BiZZdesign and InnoValor, Dutch consultancy organisations. This project starts in 2015 and focuses on the digital enterprise concept. This research is introduced in paragraph 1.1. The introduction ends with the research goals. As the focus is on the insurance industry, key trends in the insurance industry are discussed in paragraph 1.2. These research goals are achieved by addressing the research questions and sub-questions which are introduced in paragraph 1.3. Finally, the research approach is described in paragraph 1.4 in which is explained how these questions are addressed. This chapter ends with a reading guide for the subsequent chapters in paragraph 1.5.

## 1.1. INTRODUCTION

Blockbuster opened its first video rental store in 1985 and became very successful. In 2008, Blockbuster had 8,000 video rental stores worldwide. Blockbuster kept focusing on the traditional way of renting videos. During the years, Blockbuster added a DVD by mail service and rented videos by using vending machines. Blockbuster went bankrupt in 2011 for several reasons such as the high costs of all these stores and services. A main reason that Blockbuster failed is that they did not innovate their business model regarding video streaming services and related technology innovations. Organisations/services such as Netflix or Amazon Prime Instant Video offer video streaming services whereby, for example, customers do not have to pay late fees anymore and watch movies more easily via the Internet. As a result, many customers of Blockbuster switched to these streaming services.

Kodak is also an organisation that failed to innovate their business model. They exploited their capability regarding analog photography but did not switch correctly to digital cameras. These examples underline the importance of having two different types of business for every organisation to be(come) ambidextrous: those organisations ‘exploiting existing capabilities for profit and those focused on exploring new opportunities for growth (O’Reilly & Tushman, 2004, p. 80).’ So, to remain successful in the long run, organisations need to innovate their business model.



A business model is ‘the rationale of how an organisation creates, delivers, and captures value (Osterwalder & Pigneur, 2010, p. 14).’ Every organisation needs to deal with the complex and changing environment, which is characterised by high levels of uncertainty, competition, innovation and knowledge creation (Al-Debei et al., 2008; Bouwman et al., 2008; Al-Debei & Avison, 2010; Morabito, 2014). The examples above underline this. Thereby, organisations should adapt their business models to their environment to create or keep a competitive business model (Osterwalder & Pigneur, 2010). Teece (2010, p. 176) adds to this and states that ‘business models are often necessitated by technological innovation which creates both the need to bring discoveries to market and the opportunity to satisfy unrequited customer needs.’ Current technological innovations are linked to the digital enterprise concept. Many consultancy firms such as Deloitte, EY, Gartner, KPMG, McKinsey & Company, and PriceWaterhouseCoopers (PWC) use and propagate the digital enterprise concept to underline the impact of digital technologies on organisations.

These consultancy firms and Morabito (2014) link the digital enterprise to four key trends: Social, Mobile, Cloud and Information/Big data. These key trends underline the influences on and complexity of the current business landscape which is characterised by the intense use of Information Technology (IT), fierce global competition and rapid change (Osterwalder, 2004). The digital enterprise concept covers a wide range of key trends, too wide to give focus to this research. This research focuses on Information/Big data as key trend, because it is an overarching trend while the other key trends entail a lot data/information (sources).

Gartner (2013) defines big data as ‘high volume, velocity and/or variety information assets that demand cost-effect, innovative forms of information processing that enable enhanced insight, decision making, and process automation.’ McAfee and Brynjolfsson (2012), Hagen et al. (2013) and Morabito (2014) also refer to volume, velocity and variety. These definition and dimensions focus on improving organisations internally based on big data. This research also wants to understand how organisations use data/information externally to create, deliver and capture value. Therefore, this research refers to information as key trend. There is not scientific research done before how business models may innovate by adapting information as key trend. This research aims to study this and, thereby, contribute to science and practice.

To contribute to science, eight so-called information driven innovations from different industries are studied. Mainly business models and key activities regarding data of these cases. From there, information driven business model patterns (BM patterns) are derived for two main reasons. First, to understand how studied cases adopt information as key trend. Second, to capture the essence how these cases deal with data and information. The architect Alexander (1979, p. 247) introduced the term pattern language and describes it as ‘a three-part rule, which expresses a relation between a certain context, a problem, and a solution.’ Gamma et al. (1994) and Fowler (1997) refer also to the same elements: context, problem and a solution. BM patterns stem from these elements and are defined as: a pattern that expresses a relation inside a business model between a certain context, a problem, and a solution regarding information driven innovations. Through the BM patterns, the first research goal is achieved:

*Deriving information driven business model patterns from multiple information driven innovations.*

To contribute to practice, the applicability of the patterns is studied. The patterns help to understand the business model dynamics and serve as a source of inspiration during the composition and innovation of business models (Osterwalder & Pigneur, 2010). Therefore, it is decided to validate and study the applicability of the patterns to explore new capabilities for growth and drive on ambidexterity. A specific industry is chosen to create more valuable results regarding the applicability of the patterns. The patterns are used as a starting point, not a destination (Fowler, 1997).

The insurance industry is chosen since insurers operate in a complex (business model) environment and face multiple trends and challenges, such as (digital) technology developments, the economic crisis, customisation, and the decreasing trust of customers in financial institutions. Paragraph 1.2 explains these and other trends more in detail in. It is not guaranteed that the way insurance companies exploit their capabilities now remains the same in the future. Therefore, innovation in the insurance industry is required to offer products that fit to the changing market conditions and (business model) environment (TNO, 2013). This research aims to contribute to this by studying the applicability of the information driven business model patterns. This results in the second research goal:

*Studying the applicability of information driven business model patterns in insurance companies to innovate and do remain competitive.*

## 1.2. TRENDS IN THE INSURANCE INDUSTRY

It is not a goal to study trends in the insurance industry in detail in this research. Key trends are listed to understand the challenging and complex (business model) environment in which insurers operate. Results of the Dutch independent research organisation TNO (2013) are listed from their widely used report in the insurance industry about these trends. They identify 150 trends and developments that (may) influence the insurance industry. TNO (2013) identifies trends regarding society, technology and innovation. They conclude their report with six overarching clusters of trends that are briefly described in this paragraph.

### Six clusters of trends

#### 1. *An uncertain future*

Due to globalising, the economic crisis and technology developments, it is hard to make accurate and clear assumptions. The society becomes a more chaotic system in which complex connections create unpredictable results. A related trend that is included in this cluster is the decreasing trust of customers in financial institutes, such as banks and insurers, after several affaires. In line with distrust of customers in insurance companies, customers demand transparency and simplicity regarding processes, products and services (TNO, 2013). In addition, people's trust in other people decrease together with tolerance and solidarity (core principles for insurances). People search for new ways of solidarity, in new collectives, while the traditional solidarity crumbles (TNO, 2013).

#### 2. *The new normal*

Among insurers, the awareness grows slowly that the times of unlimited grow are gone, structural reforms are necessary, they need to let go trusted assumptions, and they are at the start of a new period. This period is characterised by new assumptions and a new reality: the new normal (TNO, 2013). Thereby, this cluster is about the impact of the economic crisis. Europe will lose its dominant position on the world market, the organisation of financial institutions will change and the dynamic of the welfare will change (TNO, 2013).

#### 3. *The changing consumer*

Multiple developments in society influence the behaviour, wishes and needs of consumers. For example, the group of elder consumers becomes bigger due to aging. Elder people have often other needs and possibilities than younger people. Economic problems lead to bigger differences between income groups, mainly due to unemployment and retrenchments (TNO, 2013).

A related trend is individualisation in which individual choices and interests become more important for people (TNO, 2013). For example, individuals have more knowledge and share their opinion more easily and often (empowerment). Empowerment results in a growing need for customisation of products and services. Trends in technology and innovation (cluster 6) such as co-creation, user-driven innovation and innovative ICT applications make more customisation and freedom of choice possible (TNO, 2013).

#### *4. The changing role of the government*

Governments need to retrench to improve their finance. Thereby, the government is necessitated to revise its role. Governments retrench on public facilities and expenses. Besides, governments transfer public tasks and facilities to inhabitants and private parties. Governments expect more independent and reliant inhabitants (TNO, 2013).

While the government incrementally pull back from several areas, the complexity and dynamic of public administration increases. For example, The European Union gets more responsibilities, but local governments need to execute the policies. Governments intervene via stricter monitoring and enforcement. At the same time, political decision making is increasingly driven by voter preferences and polls (TNO, 2013).

#### *5. New entrepreneurship*

Entrepreneurship becomes more important in these times of poor economic reality. Several trends influence how organisations serve their customers (e.g. customisation), arrange their organisation, collaborate with partners, and deal with the changing environment. In addition, demand for corporate social responsibility increases (TNO, 2013).

#### *6. The changing power of technology and innovation*

Technology and innovation form an important and new force in the society and economy. Mainly through ICT developments, information generation and processing improved a lot during the last years. The expectation is that these developments increase in the upcoming years. Thereby, digitalisation results in new products, organisation forms and business models and will arise via, for example, co-creation and customisation. Advanced computers, sensors and networks are required (TNO, 2013).

## **Related trends**

Multiple trends in the clusters entail a lot of (big) data. It is a challenge for insurers to gain accurate insights and information from all these data. Methods and systems to generate, process, aggregate, analyse, visualise and distribute these data are required (TNO, 2013). Whereas organisations generate more privacy sensitive data regarding individuals, the protection of this privacy sensitive data is important. Due to multiple laws and the growing attention of individuals regarding privacy, organisations need to deal correctly with privacy (TNO, 2013).

On top of these trends, insurance companies face competition from new entrants who deal in other ways with (some of the) trends that are introduced above. Think, for example, about organisations that apply (new) technologies to anticipate more on the changing customer with other demands.

### **1.3. RESEARCH QUESTIONS**

This research aims to achieve the research goals (see paragraph 1.1) by addressing the following research questions and four sub-questions.

#### **Research question**

*How can insurance companies innovate and do remain competitive by applying information driven business model patterns?*

#### **Sub-questions**

1. What are information driven innovations in the context of the digital enterprise?
2. What are business models and key activities regarding data of information driven innovations?
3. Which information driven business model patterns can be derived?
4. To what extent can information driven business model patterns be applied in the insurance industry?

Although this research focuses on business model innovation of insurance companies, organisations from other industries may benefit from the information driven business model patterns. These patterns may drive on innovation whereby the study of the applicability of the patterns in insurance companies may prosper the application in other organisations and sectors.

In the upcoming paragraph, the research approach will be explained in which the upcoming chapters are introduced and is stated in which chapters the sub-questions will be answered.

#### **1.4. RESEARCH APPROACH**

Focusing on relatively new topics of interest is a characteristic of explorative research (Robson, 2002; Babbie, 2010). This research focuses also on relatively new topics of interest, such as the digital enterprise, information driven innovations, information driven business model patterns, and studying the applicability of these patterns in insurance companies. The functionalistic research process of Bhattacharjee (2012) is used as a basis to describe the research approach. The functionalistic paradigm is applicable for standardised data collection (Burrell & Morgan, 1979). This research is based on the interpretivism paradigm (Burrell & Morgan, 1979), because social order is studied 'though the subjective interpretation of participants involved, such as by interviewing different participants (Bhattacharjee, 2012, p. 19).' In chapter 4, is explained in detail how this paradigm is applied. Bhattacharjee (2012) identifies five consecutive phases. This process is in line with the 'traditional image of research design' that is proposed by Babbie (2010, p. 114). According to Bhattacharjee (2012), the generalised design needs to be modified to the specific project. This is also done for this research, because a research execution and research report phase is distinguished twice (Figure 1).

##### **1. Exploration phase**

Exploration is about exploring and selecting research questions (chapter 1) and examining the published literature (chapter 2). In the second chapter, theoretical background, theories are identified that help to answer the research questions of interests that are stated in paragraph 1.3 (Bhattacharjee, 2012). Besides, the first sub-question will be addressed in chapter 2

##### **2. Research design phase**

The research design phase is about 'creating a blueprint of the activities to take in order to satisfactorily addressing the research questions (Bhattacharjee, 2012, p. 21).' One of these activities is the development of the research framework (chapter 3), which is mainly based on the theoretical background. This research builds upon this framework to analyse cases and derive BM patterns. Therefore, this research is classified as inductive, since generic principles (BM patterns) are developed from specific observations (Babbie, 2010). In chapter 4 is explained how this framework will be applied.

##### **3. Research proposal phase**

The first and brief design of the first four chapters was the main input for the research proposal. The outcome of this phase is reflected in this thesis report.

#### 4. Research execution phase

Two research execution phases are included in this research. First, eight information driven innovations are studied from which BM patterns will be derived. Second, the applicability of these patterns in four insurance companies and the Dutch Association of Insurers is studied. Therefore, there are two chapters that contain collected and analysed data: chapter 5 (second sub-question) and 7 (fourth sub-question).

#### 5. Research report phase

The research report phase is also included twice. First, intermediate conclusions about information driven business model patterns are derived from the eight information driven innovations in chapter 6 (third sub-question). Second, the final chapter contains a conclusion and discussion that focuses on the applicability of the patterns in insurance companies (chapter 8).

Figure 1 depicts the research process and contains the phases and main outputs that are introduced in this paragraph.

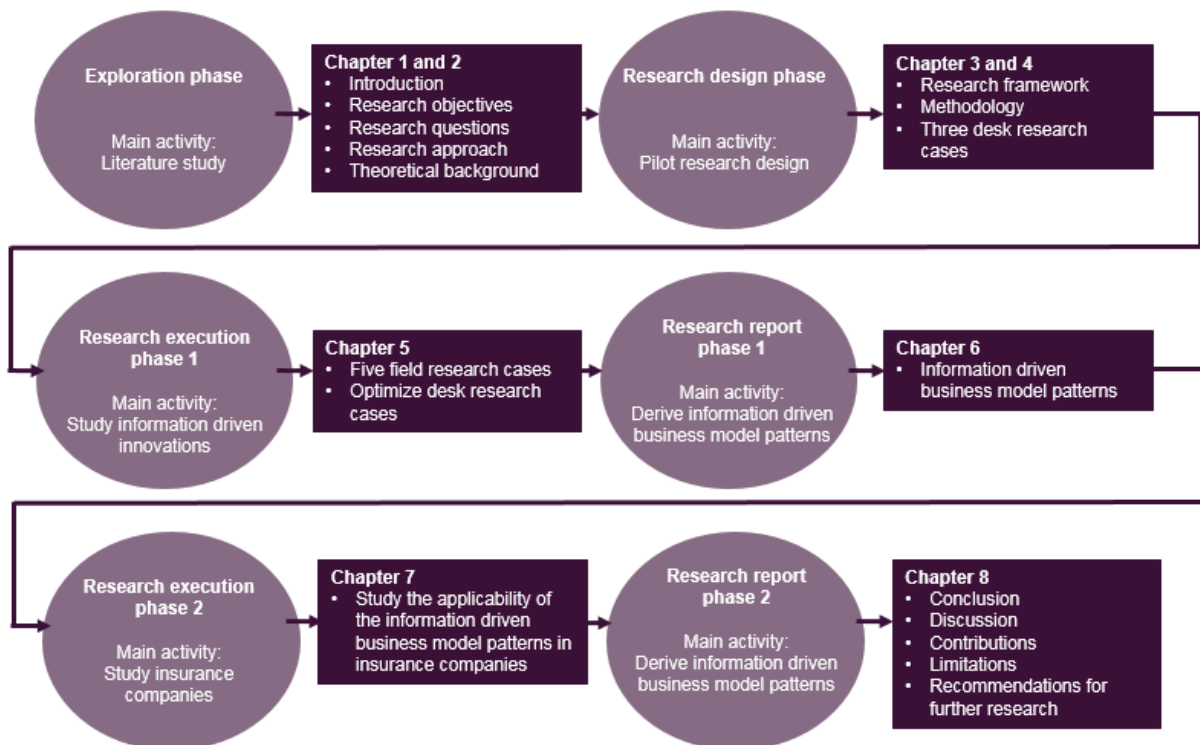


Figure 1: Research process: phases and outputs

## 1.5. READING GUIDE

Before the theoretical background of this research is discussed, readers should know the following aspects that guide the reader of this thesis:

- Chapters start by a description of the paragraphs that are included;
- Paragraphs start with a description of the topics that are included;
- A list of abbreviations is included in appendix A;
- This research builds upon definitions that are shown in italic;
- The terms ‘organisations,’ ‘enterprises,’ ‘firms,’ and ‘companies’ are used interchangeably;
- The terms ‘individual,’ ‘user,’ ‘client,’ and ‘consumer’ are used interchangeably;
- The term ‘information driven business model patterns’ are shortened by referring to the (BM) patterns;
- References of the studied information driven innovations and insurance companies are added at the end of the reference list;
- If necessary, extended reading guides are included in the upcoming chapters.



## 2. Theoretical background

This chapter contains a critical review of literature. The methodology for this theoretical background is included in paragraph 2.1. Thereafter, relevant concepts are discussed in detail. Main concepts that will be discussed are the digital enterprise (paragraph 2.2), data, information and the semiotics framework (paragraph 2.3), information driven innovations (paragraph 2.4), business models (paragraph 2.5), business model innovation (paragraph 2.6), the data driven business model framework (paragraph 2.7), and information driven business model patterns (paragraph 2.8). Related aspects are discussed in these paragraphs.

### 2.1. METHODOLOGY THEORETICAL BACKGROUND

In this chapter literature is reviewed, ‘the way we learn what’s already known and not known.’ (Babbie, 2010, p. 506) Critical review of literature is important, because it provides the foundation on which this research is build (Saunders et al., 2009). Writing the theoretical background is an ongoing process, because it ‘is usually necessary to continue searching throughout your project’s life (Saunders et al., 2009, p. 60).’ Saunders et al. (2009) visualised this as an upward spiral, starting with the research questions to the final version of the critical literature review. In between the following aspects should be defined and refined: parameters, keywords, conduct research, obtain literature and evaluate. The parameters and keywords aspect are described in this paragraph for several subject areas (concepts) that are studied. The design of the theoretical background is also added. Results of the other aspects (conduct research, obtain literature and evaluate) are integrated in the upcoming paragraphs.

#### Parameters

Bell (2005) identify the following relevant parameters that should be specified for this research: the language of publication, publication period, literature type, and subject area.

- In this research are mostly and preferably English literature sources studied.
- This research aims to study the most recent literature sources to use state of the art knowledge (the last ten years). However, some older literature sources are included of relevant and widely cited authors.
- Primary and secondary literature sources are included in this research. The main primary sources that are used are reports, theses and company reports/white papers (Saunders et al., 2009). The main secondary sources that are used are journals and books (Saunders et al., 2009). The primary sources are mainly found via Google and company

websites. The secondary, more scientific, sources are mainly found via several search engines like Scopus, Web of science, Google Scholar and the search engine of the University of Twente library. Additional sources are found in directories on the InnoValor network and in the physical library of BiZZdesign and InnoValor.

- The theoretical background is mainly build upon secondary, more scientific, sources. White papers and other primary sources are consulted when there are only a few papers found that provide clear insights in a concept. This is for example done for the theoretical background of the digital enterprise concept in paragraph 2.1. White papers of well-known global consultancy firms are included.
- According to Bell (2005), the subject area is the last parameter that should be specified. In this research, multiple subject areas (concepts) are distinguished and discussed in the upcoming paragraphs.

### **Keywords**

A deeper introduction of the subject areas/concepts and related keywords is explained. Several keywords overlap each other since concepts interrelate. In addition, backward and forward referencing is done during the evaluation of sources. Thereby, it is likely that certain sources are not reached through keywords regarding concepts that are discussed in this chapter. The keywords that are used to find literature are not summed in detail. Keywords are logically related to the concepts and aspects that are discussed in this chapter. For example, the following keywords are used and combined for the digital enterprise concept in paragraph 2.2: digital, enterprise, technology, business, definition, key trends, social (media), mobile, cloud (computing), information, and big data.

### **Design of the theoretical background**

In the context of the digital enterprise, this research focuses on information as key trend. A basic foundation of information is described in paragraph 2.3 in which data, information and the semiotics framework are discussed. In order to study the impact and possibilities of information as key trend in organisations, so-called information driven innovations are studied in this research. Therefore, the information driven innovations concept is discussed in paragraph 2.4. The business models of these information driven innovations are studied. Therefore, this concept is discussed in paragraph 2.5. Thereafter, business model innovation is discussed in paragraph 2.6 to understand the importance and techniques to innovate business models. To get a better understanding of the information driven innovations, key activities regarding data are

also studied. These activities are a part of the Data Driven Business Model (DDBM) framework which is described in paragraph 2.7. From case analyses of multiple information driven innovations, information driven business model patterns are derived. Therefore, the pattern approach and business model patterns are discussed in paragraph 2.8. Chapter 3 contains the definitions of the core concepts and model of analysis to study the information driven innovations.

## **2.2. DIGITAL ENTERPRISE**

The digital enterprise concept is used in different ways: as a synonym for virtual enterprises, networked enterprises, real-time corporations, next generation enterprises, or digital business (Umar, 2005; Slywotzky et al., 2001). These terms are widely used among managers and consultants, but there is not a widely accepted definition in literature. In this paragraph is aimed to find a definition of this concept. The following topics are discussed:

- Digital enterprise discussed in literature;
- Digital enterprise discussed in white papers;
- Digital enterprise technologies: four key trends;
- The importance to become a digital enterprise;
- Definition of a digital enterprise.

### **Digital enterprise discussed in literature**

Literature does not provide clear insights in the digital enterprise concept. In the beginning of this millennium the concept referred to business together with the usage of the Internet. For example, e-business refers to business conducted over the Internet (Amit & Zott, 2001) and a 'Business (B)-Web is a distinct system of suppliers, distributors, commerce services providers, infrastructure providers, and customers that use the Internet for their primary business communications and transactions (Tapscott et al., 2000, p. 17).'

This research shows that the digital enterprise concept is linked to digital technologies and encompasses more than the usage of Internet. Digital technologies reshape the total infrastructure of businesses regarding the organisation, structure and operations (Carr, 2001).

This reshaping process results in new kinds of businesses, so-called digital enterprises (Carr, 2001). Umar (2005) states that the next generation enterprises (synonym for digital enterprise) rely on automation, mobility, real-time business activity monitoring, agility, and self-service

over widely distributed operations to conduct business. This is in line with Carr (2001) who states that new technologies change the shape of business and rules of competition via new economic trade-offs. The changing business environment, including rules of competition, from traditional to digital is concisely formulated by Al-Debei et al. (2008, p. 1): ‘unlike the previous traditional world of business which is characterised by stability and low levels of competition, the emerging world of digital business is complex, dynamic and enjoys high levels of uncertainty and competition.’

### **Digital enterprise discussed in white papers**

Several white papers are studied since literature does not provide clear insights in the concept. Currently, different globally operating consulting firms promote the digital enterprise (or a synonym) concept. In Table 1, definitions of a digital enterprise according to several global consultancy firms are shown.

<b>Consultancy firm (year)</b>	<b>Digital enterprise description</b>
Deloitte (2014a)	‘A digital enterprise develops digital capabilities and integrates them across their organisation to transform into an intuitive enterprise within the new insight economy.’
EY (2014, p. 6)	EY links digital business to ‘a core set of digital technologies’ that transforms ‘the way companies and their customers interact. At the same time, these technologies are releasing a wave of IT-led innovation, and creating new revenue and cost-saving opportunities.’
Gartner (2014a, p. 9)	‘Digital business is the creation of new business designs by blurring the digital and physical worlds. Digital business promises to usher in an unprecedented convergence of people, business, and things that disrupts existing business models.’
KPMG (2009, p. 1)	KPMG relates the digital enterprise to ‘the second digital decade, which will humanise technology and connect consumers in new, immediate, and personal ways, companies need strategies that will transform their early pilots into lasting Digital Enterprises: businesses that target specific market segments with appropriate revenue models that generate real profits.’

PWC (2014a, p. 2)	PWC links the digital enterprise to digital IQ: ‘We think about it in terms of a company’s acumen at understanding, valuing, and weaving technology throughout the company.’
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Table 1: Digital enterprise description according to several consultancy firms

### Digital enterprise technologies: four key trends

As shown in Table 1, the digital enterprise concept is related to digital technologies. After research among the consultancy firms that are introduced in Table 1, the conclusion is that they identify the same four key trends to become a digital enterprise: Social, Mobile, Cloud and Information/Big data. Some firms use other names for the key trends and refer, for example, to forces (Deloitte, 2014b; Gartner, 2014b) or top strategic technologies (PWC, 2014b). In Table 2, the key trends are listed. Besides, Morabito (2014) is added who wrote an academic book about trends and challenges in digital business innovation.

Consultancy firm/author (year)	Social	Mobile	Cloud	Information/ Big data	Other
Deloitte (2014b)	✓	✓	✓	✓	Cyber security
EY (2014)	✓	✓	✓	✓	
Gartner (2014b)	✓	✓	✓	✓	
KPMG (2014)	✓	✓	✓	✓	Cyber security, Internet of Things, IT consumerisation
PWC (2014b)	✓	✓	✓	✓	Cyber security
Morabito (2014)	✓	✓	✓	✓	IT consumerisation, Internet of Things

Table 2: Key trends in the digital enterprise context

Results in the table look meaningless, but are included to underline the consensus that Social, Mobile, Cloud, and Information/Big data four key trends are to become a digital enterprise. Through this, the importance of the research context is also justified. Some of these key trends are identified after surveys. For example, PWC (2014b) did the Digital IQ study in which 1,400 companies are asked in which emerging technologies they are investing this year. Another example is the Technology Innovation Survey of KPMG (2014, p. 3) in which ‘nearly 800 technology leaders globally’ were surveyed.

## The importance to become a digital enterprise

The rise of the Internet combined with new digital technologies, which are related to the four key trends, will result in economic transformations and a changing business world (Morabito, 2014). Morabito (2014) refers to new potential business leaders, users and consumers regarding this changing business world. The changes and related key trends are structural and result in new strategic challenges and opportunities which cannot be ignored by companies (Deloitte, 2014b; EY, 2014; Gartner, 2014b; KPMG, 2014; PWC, 2014b; Morabito, 2014). According to Morabito (2014, p. 176) it is important for every company ‘to design and implement a business model able to deal with and exploit such characteristics of the digital economy,’ implementing the key trends. In paragraph 2.6, Osterwalder and Pigneur (2010) visualise the impact of key trends on business models. This research contributes to the development of business models in the context of the digital enterprise.

## Definition of a digital enterprise

The key trends will change over time, because technological change is going fast. Therefore, a more generic definition of a digital enterprise will be used in this research. Based on literature and working papers that are discussed above, the following, rather generic, definition of a digital enterprise is proposed: *an organisation that builds upon digital technologies within the enterprise as well as in collaboration with customers and partners in order to create a competitive position.*

### *Example: A digital enterprise in practice, the Uber case*

Uber is a ridesharing service that connects riders to drivers using their apps. A more detailed case analysis of Uber is included in chapter 5. Uber is a digital enterprise, since they build upon digital technologies (mainly the apps for riders and drivers) to deliver their service. These digital technologies support the underlying process to match riders and drivers. At the same time, the technologies enhance the collaboration between riders and drivers. Thereby, Uber aims to create a competitive position by building upon these digital technologies. More specifically, Uber builds upon information as key trend, because information (e.g. locations) of riders and drivers is combined via their technologies.

### **2.3. DATA, INFORMATION AND THE SEMIOTICS FRAMEWORK**

The digital enterprise concept covers a wide range of key trends, too wide to give focus to this research. This research focuses on information as key trend. More specifically, information driven innovations are studied (paragraph 2.4). To understand these information driven innovations, a good and generic foundation regarding data, information and the semiotics framework is required. Therefore, the following aspects are discussed in this paragraph:

- Information in the context of the digital enterprise;
- Data and information definitions;
- The semiotics framework.

The semiotics framework explains how enterprises generate and use information.

#### **Information in the context of the digital enterprise**

As explained in the previous paragraph, the digital enterprise is linked to the complex and changing business landscape. Osterwalder (2004) links this landscape to the intense use of digital technologies. Shapiro and Varian (1999, p. 8) recognise the increasing importance of information since ‘the technology infrastructure makes information more accessible and hence more valuable.’ Information is mainly chosen, because it is an overarching trend while the other key trends entail a lot information. In Figure 4 on page 21 is also shown that other trends like Social, Cloud and Mobile entail a lot big data (and information). Definition and dimensions of big data (as discussed in paragraph 2.4) focus on improving organisations internally. This research also wants to understand how organisations use data/information externally to create, deliver and capture value. Therefore, this research refers to information as key trend.

In the digital enterprise context, digital technologies generate, use and spread data and information more easily in- and outside enterprises. Think, for example, about digital technologies that relate to other key trends, e.g. social media platforms, mobile devices, mobile platforms, or cloud technologies that are provided through the Internet.

#### **Data and information definitions**

The information concept is conceived differently across disciplines and areas of professional work (Losee, 1997; Raber, 2003; Shenton & Hayter, 2006; Beynon-Davies, 2009). This research does not take part in this discussion. Concise formulated definitions, which are sufficient for this research, of data and information are used.

Data is defined as: *symbols or facts that are not interpreted and which have to be processed to become information* (Porter & Read, 1998; Raber, 2003; Bollen et al., 2006; Beynon-Davies, 2009). In line with this definition, information is data with a meaning (Bollen et al., 2006). This is in line with Beynon-Davies (2009) who defines information as: *data plus sense-making*. The difference and relation between data and information is visualised in Figure 2 (the semiotics framework) below.

### Semiotics framework

The semiotics framework of Beynon-Davies (2009), which is based on the semiotics framework of Stamper (1973), is explained below. The semiotics framework of Beynon-Davies (2009) is chosen, since it is a more structured visualisation of the semiotics framework of Stamper (1973): signs are included, three systems are distinguished and the difference between information and data is explicitly shown through four levels. The framework shows that data and information must run through a process. It is important to understand how data and information relate and how they flow from the technical to the social world. In addition, the framework explains in which organisational system data and information is generated and used.

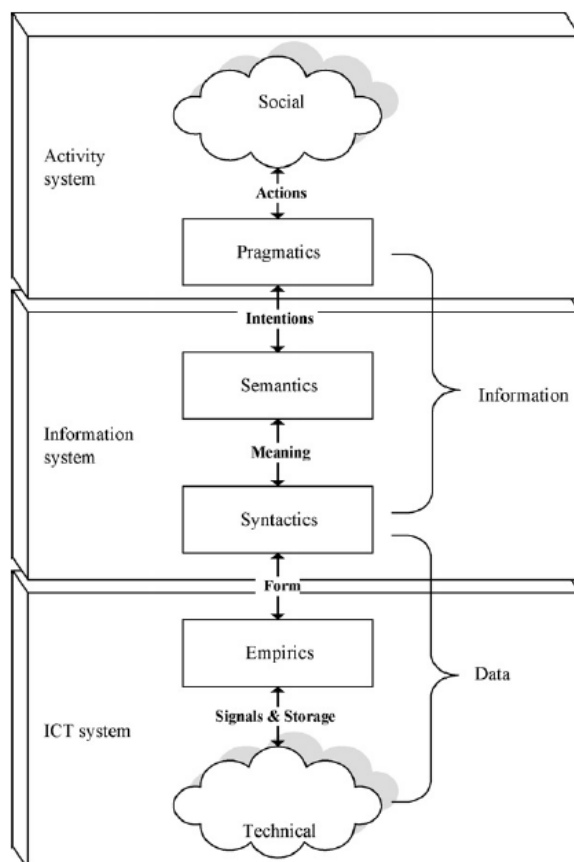


Figure 2: The semiotics framework (Beynon-Davies, 2009, p. 5)

### Signs

Semiotics is the study of signs, which are seen as ‘the core-element of concern serving to link issues of human intentions, meaning, the structure of language, forms of communications transmission, data storage and collaborative action (Beynon-Davies, 2009, p. 5).’ These signs are visualised with arrows in Figure 2. Stamper (1973) states that signs exist in most forms of human activity, because they are critical in the process of human communication and understanding. A sign-system is an organised collection of signs, e.g. every-day spoken language (Beynon-Davies, 2009).



### *Three systems*

The semiotic framework represents the concept of information ‘as necessarily a sociotechnical phenomenon interposing between three different levels of system of interest to organisational informatics: activity systems, information systems (IS) and Information Communication Technology (ICT) systems (Beynon-Davies, 2009, p. 5).’ Data is stored in ICT systems and gets a meaning via IS. Information is used with an intention for action and flows from the IS to the activity system.

### *Four levels*

Before choosing the right focus for this research, the four levels are briefly discussed.

- Activity systems are about targeted communication. ‘*Pragmatics* is concerned with such purpose of communication’ and ‘links the issue of signs with that of intention (Beynon-Davies, 2009, p. 5).’ Intentions are about linking language to action.
- *Semantics* is ‘the study of the meaning of signs, the association between signs and the world (Beynon-Davies, 2009, p. 5).’ It is about linking symbols and their concepts.
- ‘*Syntactics* is concerned with the formalism used to represent a sign (Beynon-Davies, 2009, p. 6).’ Syntactics focuses on the form of communication in terms of the logic and grammar of sign-systems instead of the content.
- *Empirics* is about studying ‘the signals used to carry or code the signs of a message (Beynon-Davies, 2009, p. 6).’ Communication channels and their characteristics are studied on this level, e.g. electronic transmission.

#### *Example: The semiotics framework in practice, the Sense Health case*

Sense Health develops applications that empower individuals to control their health and wellbeing. A more detailed case analysis of Sense Health is included in chapter 5. This example aims to explain the four levels of the semiotics framework. Applications on smartphones activate sensors that generate raw data/signs (empirics). Syntactics is about processing this data to Sense Health and focus on the form of communication of the data. Thereafter, semantics is about the analysis of this (raw) data to provide a meaning to the signs. Via these levels, data transforms to information (data plus sense-making). Sense Health provides insights in behaviour and consequences on wellbeing (pragmatics). Thereby, Sense Health intends to change behaviour of individuals to improve the health and wellbeing of these individuals.

## 2.4. INFORMATION DRIVEN INNOVATIONS

As stated before, information driven innovations will be studied in this research to derive BM patterns. Therefore, the following related concepts are discussed:

- The role and importance Information Technology (IT);
- Big data;
- Definition of information driven innovations.

### The role and importance of IT in organisations

As explained in the previous paragraph, information as key trend implies digital technologies to handle data and information. Beynon-Davies (2009) refers often to IT as a synonym of digital technologies. A definition of IT is provided, since the information driven innovations are mainly based on (innovative) IT. Beynon-Davies (2009, p. 11) defines IT as: *'any such collection of artefacts used to extend human information processing and communication capabilities or compensate for inherent cognitive and social limitations in this area.'* Therefore, IT is linked and interrelated with both the IS and ICT system in the semiotics framework.

Significant investments in IT are done to shape business strategies, customer relationships and extended enterprise networks (Sambamurthy et al., 2003). IT can be seen as a mediator between organisational characteristics and outcomes (Dewett & Jones, 2001; Sambamurthy et al., 2003). Research also shows that IT can improve organisational outcomes (Brynjolfsson & Hitt, 1996; Kohli & Devaraj, 2003). Figure 3 visualises this intermediating role of IT between organisational characteristics and organisational outcomes. Information as key trend entails IT/digital technologies and may improve organisational outcomes. It became clear that IT becomes more important for organisations.

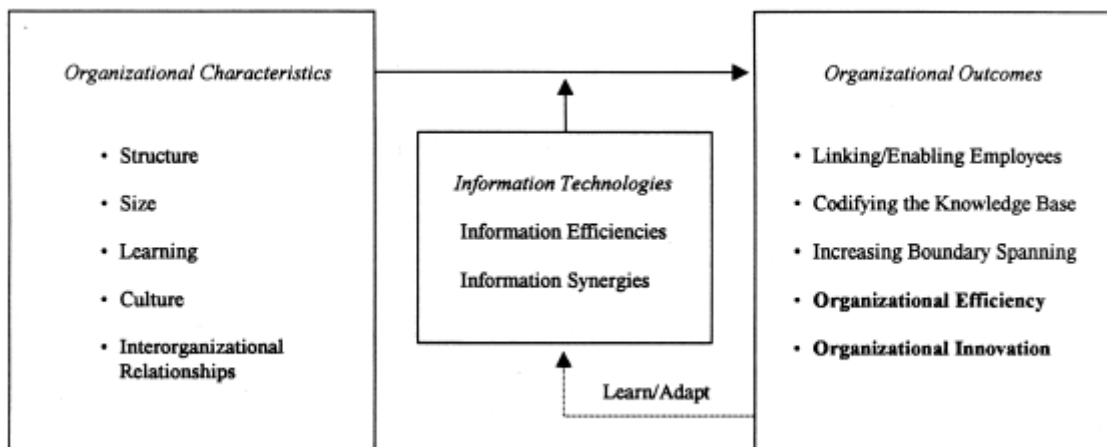


Figure 3: The role of IT in organisations (Dewett and Jones, 2001, p. 314)

Because of the importance of IT in organisations, business strategy and IT should be aligned (e.g. Henderson & Venkatraman, 1993; Luftman, 2003; El Mekawy et al., 2009). This research does not focus specifically on this aspect, but organisations need to take it into account. Besides, strategic alignment should be translated correctly in the business model of an organisation (Venkatraman & Henderson, 1998). Paragraph 2.5 explains the business model concept.

### **Big data**

As shown in Table 2 on page 14, information as key trend is related to big data. Therefore, the big data concept is discussed. The focus on the increasing importance of data, a definition of big data and the value of big data for organisations are discussed.

#### *The increasing importance of data*

Data plays an important role in the semiotics framework (Figure 2 on page 17), the formation of information. Currently data will play a more important role in the way organisations are doing business. Hartmann et al. (2014) mention the exponential growth of available and potentially valuable data. This data is generated by, for example, the Internet, social media, cloud computing, and mobile devices: ‘often referred to as big data (Hartmann et al., 2014, p. 1).’ Gantz and Reinsel (2012) estimate that the digital universe increases from 130 exabytes to 40,000 exabytes in the period between 2005 and 2020. This means more than 5,2000 gigabytes for every individual on this world in 2020. Morabito (2014, p. 6) recognises that data is not structured anymore, since semi structured and even unstructured data is available, e.g. ‘text, log files, audio, video, and images posted, e.g. on social networks to sensor data, click streams, e.g., from internet of things.’

#### *Definition of big data*

There is not a clear definition of big data in literature. Morabito (2014, p. 5) relates big data to improvement of ‘strategic resources to define strategies for products and services that meet customers’ needs, increasingly informed and demanding.’ This research looks wider than strategy (internal) improvements. Therefore, a widely used definition of big data (Hartmann et al., 2014) is used that is given by Gartner (2013). Gartner (2013) defines big data as ‘*high volume, velocity and/or variety information assets that demand cost-effect, innovative forms of information processing that enable enhanced insight, decision making, and process automation.*’

For example, McAfee and Brynjolfsson (2012), Hagen et al. (2013) from A. T. Kearney and Morabito (2014) also refer to volume, velocity and variety. These dimensions and two other dimensions (accessibility and veracity) are discussed.

- *Volume* refers to tremendous amount of data of data that can only be processed with (new) big data technologies (Hagen et al., 2013). Morabito (2014, p. 5) states that volume ‘concerns the unmatched quantity of data actually available and storable by businesses;’
- *Velocity* refers to the speed at which big data yield useful results (Hagen et al., 2013), the dynamics of the volume of data (Morabito, 2014);
- *Variety* refers to the range of data types and sources (Hagen et al., 2013), the data that actually is available (Morabito, 2014);
- Morabito (2014, p. 6) adds *accessibility* as fourth dimension, ‘the unmatched availability of channels a business may increase and extend its own data and information asset;’
- In a white paper of IBM, Schroeck et al. (2012, p. 5) add *veracity* as another dimension, which refers to ‘the level of reliability associated with certain types of data.’ This dimension is about striving for high quality of the data (Morabito, 2014).

These dimensions are visualised by Morabito (2014) in Figure 4. In addition, drivers for big data (Social Networks, Mobile, Cloud Computing, and the Internet of things) are shown in this figure. This justifies the choice for the focus on information, because the other identified key trends that are identified in paragraph 2.1 (Social, Mobile and Cloud) entail a lot information.

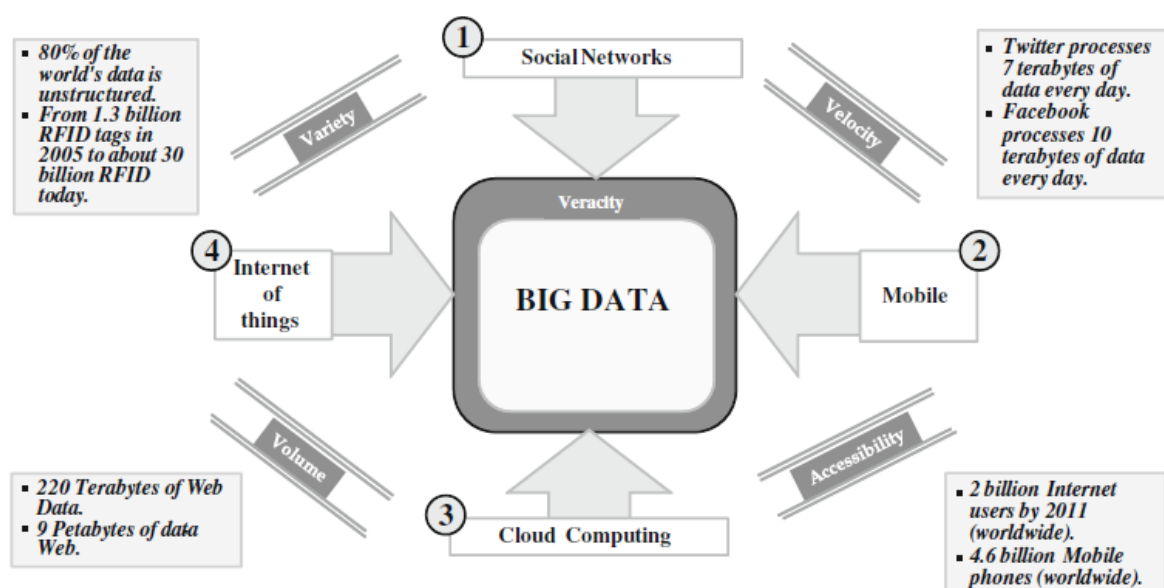


Figure 4: Big data drivers and characteristics (Morabito, 2014, p. 5)

### *The value of big data*

Digital data can be found in every industry, economy, organisation and user of digital technology (Manyika et al., 2011). It becomes clear that big data requires IT. ‘Big data will be a source of new economic value and innovation (Mayer-Schönberger & Cukier, 2013, p. 12).’ This message is underlined by almost every consultancy firm that identify information or big data as a key trend (Deloitte, 2014b; EY, 2014; Gartner, 2014b; KPMG, 2014; PWC, 2014b). They suggest that big data technologies also have a mediating role between organisational characteristics and (improvement of) outcomes as represented in Figure 3 on page 19. McAfee and Brynjolfsson (2012, p. 64) confirm this after they conducted structured interviews with executives of 330 public North American companies. Their results show that ‘the more companies characterised themselves as data-driven, the better they performed on objective measures of financial and operational results.’ This may seem logical because decisions are based on data instead of intuition. Although the implementation of big data requires some effort it can result in a basis for a competitive advantage and growth of individual firms (Manyika et al., 2011; Schroeck et al., 2012; McAfee & Brynjolfsson, 2012; Hagen et al., 2013). Information, big data and current technological (IT) changes result in new ways to create, deliver and capture value. ‘Big data call for a radical change to business models (Morabito, 2014, p. 5).’ In literature more papers arise that argue that big data can be a key resource for new business models (Chen et al., 2011; Hagen et al., 2013; Otto & Aier, 2013; Hartmann et al., 2014).

### **Definition of information driven innovations**

As stated before, this research does not focus specifically on big data to understand how high volume, velocity and/or variety information assets are used to enhance insight, decision making, and process automation. Definition and dimensions of big data focus on improving organisations internally. This research also wants to understand how organisations use data/information externally to create, deliver and capture value. Therefore, multiple so-called information driven innovations will be studied.

Gartner (2014b, p. 9) relates information as key trend to information innovation. Gartner states that ‘information innovation responds to fundamental technology changes by gathering, managing, analyzing, and using information in new ways to leap ahead in operational or business performance.’ By extending this definition of Gartner (2014b) with key activities regarding data of Hartmann et al. (2014) (explained in paragraph 2.7), the following

definition of information driven innovations is composed: *fundamental technology changes by generating, acquiring, processing, aggregating, analysing, visualising, and/or distributing data and information in new ways to improve operational and/or business performance*. This definition underlines the importance of IT/digital technologies and is in line with the context of a digital enterprise. Hereby, the first sub-question is addressed: what are information driven innovations in the context of the digital enterprise?

*Example: Information driven innovations in practice, the TomTom Traffic case*

TomTom Traffic is the real-time traffic information service of TomTom. A more detailed case analysis of TomTom Traffic is included in chapter 5. TomTom Traffic generates floating car data of the driver community via apps, GPS and PND's (technologies). Certain traffic information is also acquired such as information regarding accidents or road closures. All this data and information is analysed by TomTom to deliver optimal real-time traffic information and to offer new and innovative services. Therefore, TomTom Traffic is identified as information driven innovation.

## **2.5. BUSINESS MODEL CONCEPT**

In this research, business models of the information driven innovations will be composed. Therefore, the following topics regarding the business model concept are explained:

- Position with respect to business strategy and business processes;
- Business model definition;
- Business model frameworks;
- Business model framework of Osterwalder (2004).

### **Introduction**

The business model concept was introduced in 1975 and became popular during the last twenty years (Bouwman et al., 2012). The concept yielded 600 hits in Google in 2000 and increased to 102 million hits in 2010 (Bouwman et al., 2012). Ghaziani and Ventresca (2005) also underline the increased popularity of the concept. They study the use of the term Business Model in management articles in the period between 1975-2000. Ghaziani and Ventresca (2005) compare the use of business model as a key-word with other management key-words such as business plan, revenue model and business strategy. Their results show that the use of business model as a key-word increased a lot after 1990 in both absolute shares and compared to other investigated key-words (Ghaziani & Ventresca, 2005). Specifically, their results show that this increase

accelerated from the mid-90s. Zott et al. (2011) did similar research and extended the period to 2009. They analysed the number of publications for every year regarding business models in the business/management field. Zott et al. (2011) also found a tremendous increased interest in business models between 1995 and 2009, which is similar to the findings of Ghaziani and Ventresca (2005) and Bouwman et al. (2012). Despite this increased interest and the fact that there are multiple studies and papers found regarding the business model concept, there is no consensus about the positioning, definition and framework of business models. These aspects are discussed below.

### **Positioning with respect to business strategy and business processes**

The positioning of business models with respect to business strategy and business processes is discussed a lot in literature. The distinction between business models and business processes is clear (e.g. Morris et al., 2005; Osterwalder et al., 2005; Burkhart et al., 2011). Bouwman et al. (2008, p. 35) clarifies the meaning of processes: ‘the clear translation of the mission and the structure of the business model into more operational terms.’ Generally, business models focus on ‘what’ a company does and business processes focus on ‘how’ companies work on operational level (Gordijn et al., 2000; Osterwalder et al., 2005; Burkhart et al., 2011).

There is no consensus regarding the distinction between business models and business strategy, because some researchers see them as the same and use the terms interchangeably (Margretta, 2002; Morris et al., 2005; Al-Debei et al., 2008; Burkhart et al., 2011). Morris et al. (2005, p. 733) state that ‘the business model has elements of both strategy and operational effectiveness.’ Osterwalder (2004, p. 14) looks ‘at a business model as the translation of a company’s strategy into a blueprint of the company’s logic of earning money.’ Business strategy, business models and business processes are interrelated while they all focus on earning money in a sustainable way (Osterwalder, 2004). Business models are visualised as a mediator, ‘acting as a sort of glue,’ between business strategy and business processes in Figure 5 (Osterwalder, 2004, p. 15). The process layer represents the actual implementation of the business model, ‘how’ companies work on an operational level.



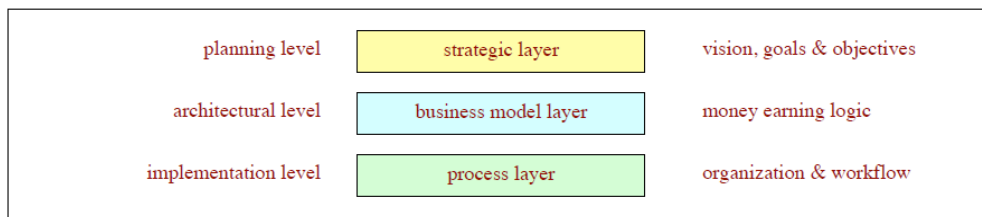


Figure 5: Business layers (Osterwalder, 2004, p. 14)

Al-Debei and Avison (2010) underline this mediating positioning of business models in the digital business organisation context (Figure 6). Al-Debei and Avison (2010) identify business models as a conceptual tool of alignment in the more complex digital world. This world is characterised by a dynamic environment, high level of competition, uncertainty and knowledge creation and innovation (Al-Debei et al., 2008; Al-Debei & Avison, 2010). As noted earlier, this environment fits to the environment in which digital enterprise operate (paragraph 2.1). This matches also with the view of Teece (2010): a business model reflects management's hypothesis about customer needs (strategy), and how an enterprise can organise to best meet customer needs, and get paid well for doing so (business model).

In the scope of this master thesis project, the focus is primarily on business models. Strategy and business processes are not taken into account explicitly. The positioning of the business model of Osterwalder (2004), Al-Debei and Avison (2010) and Teece (2010) is used. This is visualised in Figure 5 and Figure 6.

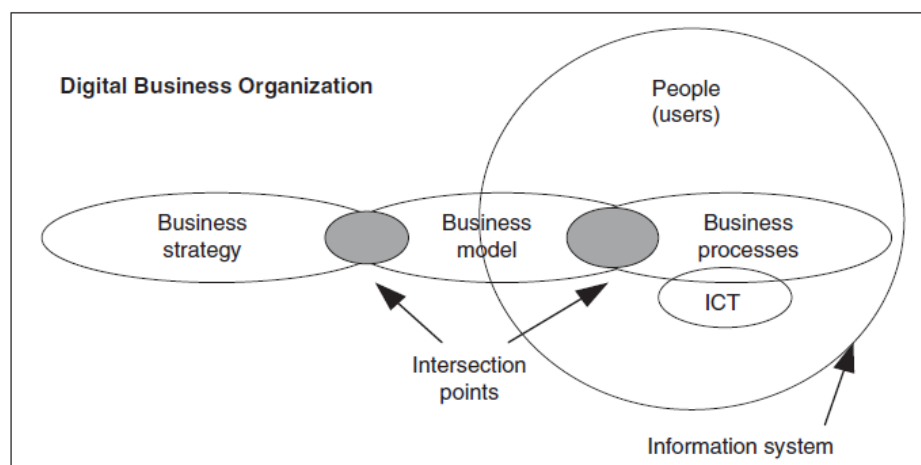


Figure 6: Business model intersection points (Al-Debei and Avison, 2010, p. 370)

### **Business model definitions**

There is not a widely accepted definition of a business model (Burkhart et al., 2011; Zott et al., 2011; Bouwman et al., 2012). Margretta (2002) argue that a good business model is essential to every organisation which encompasses new ventures and established organisations, but how can they be applied when their meaning is not clear? Therefore, Table 3 contains some of



the most prevalent and widely cited definitions. These definitions show the complexity of the concept and it is likely that the units of analysis (information driven innovations) in this research also may have different views on business models.

Author(s) (year)	Business model definition
Osterwalder (2004);	‘A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing a company's logic of earning money.’
Osterwalder and Pigneur (2010)	‘A business model describes the rationale of how an organization creates, delivers, and captures value.’
Al-Debei and Avison (2010)	A business model is ‘an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization presently and in the future, as well all core products and/or services the organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives.’
Teece (2010)	‘A business model articulates the logic, the data, and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value.’

Table 3: Selection of business model definitions

This broad range of definitions also support the fact that there is no academic consensus about the definition (Burkhart et al., 2011; Zott et al., 2011; Bouwman et al., 2012). In this research, the concise and widely used business model definition of Osterwalder and Pigneur (2010, p. 14) is used: *‘a business model describes the rationale of how an organization creates, delivers, and captures value.’* This choice is justified together with the selection of a business model framework below.

### Business model frameworks

Research and literature review by Bouwman et al. (2012) and Hartmann et al. (2014) show several business model frameworks and underline that there is no consensus about the elements of business models. Therefore, several business model frameworks are (re)analysed in Table 4 to provide an overview of the different compositions of elements. The table is mainly based on work of Hartmann et al. (2014). Hartmann et al. (2014) identify six key elements and classify,

if possible, the elements of the frameworks among these elements. The authors of the frameworks describe the elements in their way, but some are (almost) identical to one of the key elements. For example, Chesbrough and Rosenbloom (2002) propose the profit potential element which is classified as revenue stream. The findings of Hartmann et al. (2014) are reanalysed by analysing the original papers of the frameworks. The STOF business model of Bouwman et al. (2008) and business model framework of Teece (2010) are added. The analysis deviates one time from the analysis of Hartmann et al. (2014). Hartmann et al. (2014) classify the 'target customer' element among the customer segment element in the analysis of the business model framework of Osterwalder (2004). Johnson et al. (2008) also include the target customer element by stating that the customer value proposition should be composed by specifying the target customer, job to be done and the offering. Therefore the customer segment element is also marked.









Almost all frameworks include the six key elements. Several frameworks add other elements to complete the business model elements. The framework of Osterwalder contains nine elements, so-called building blocks, and encompasses more than the other frameworks. Osterwalder (2004) distinguishes value proposition, target customer, distribution channel, relationship, value configuration, capability, partnership, cost structure and revenue model. The business model framework of Osterwalder (2004) will be used for three reasons. First, the business model framework is in line with Osterwalders' (2004) definition of a business model that also will be used. Second, the business model framework of Osterwalder (2004) is a comprehensive framework that includes three additional dimensions (customer relationship, distribution channels and key partners) next to the six key dimensions in the table. This research aims to create a broader view on the business model by studying, for example, the network aspects (key partners) and social aspects (customer relationship). Third, because it is a popular tool that allows practitioners to design business models in a creative session (Osterwalder & Pigneur, 2010; Bouwman et al., 2012). The framework is widely used since it simplifies the way of visualising organisations and, therefore, it is helpful during the process of deriving and studying the applicability of the BM patterns to exploit (business model) innovation.

Element Author(s) (year)	Value proposition/ offering	Key resource	Key activity	Market/ customer segment	Revenue stream	Cost structure	Other elements	Citations Google Scholar, 11.1.2015
Chesbrough and Rosenbloom (2002)	✓			✓	✓	✓	Value chain, value network and competitive strategy	2136
Osterwalder (2004)	✓	✓	✓	✓	✓	✓	Customer relationship, distribution channels and key partners	1156
Morris et al. (2005)	✓	✓		✓	✓	✓	Competitive strategy factors and personal/investor factors	1080
Johnson et al. (2008)	✓	✓	✓	✓	✓	✓	-	954
Al-Debei and Avison (2010)	✓	✓	✓	✓	✓	✓	Value network	172
Bouwman et al. (2008)	✓	✓	✓	✓	✓	✓	Technology	209
Teece (2010)	✓	✓	✓	✓	✓		-	1340

Table 4: (Re)analysis business model frameworks

### The business model framework of Osterwalder (2004)

Osterwalder (2004) creates the business model framework through two steps. First, four main areas/pillars are identified: product, customer interface, infrastructure management and financial aspects. Second, these areas are broken down into nine interrelated building blocks. Table 5 gives an overview of these four pillars and nine building blocks.

Pillar	Building block	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.
	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.
Customer interface	Relationship 	The Relationship describes the kind of link a company establishes between itself and the customer.
	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.
Infrastructure management	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.
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Table 5: The nine building blocks of a business model (Osterwalder, 2004, p. 43)

Osterwalder and Pigneur (2010, p. 44) develop the Business Model Canvas (BMC) tool ‘which allows you to paint pictures of new or existing business models.’ This model is displayed in Figure 7. The icons in Table 5 and Figure 7 show the link.



Figure 7: Business Model Canvas (Osterwalder & Pigneur, 2010)

Although the canvas does not represent a theory, it can be used to create understanding, discussion, creativity, and analysis (Osterwalder & Pigneur, 2010). Therefore, this tool is valuable for studying information driven innovations and business model innovations by studying the applicability of BM patterns.

## 2.6. BUSINESS MODEL INNOVATION

‘The practical and economic importance of business models becomes particularly evident, when companies change their business model through innovations (Burkhart, 2011, p. 4).’ The following aspects regarding business model innovations:

- Definition of business model innovation;
- Main reasons to innovate business models;
- Techniques to innovate business models.

### **Definition of business model innovation**

The underlying reason for business model innovation is about improving and innovating current business models. In line with the business model definition and framework of Osterwalder and Pigneur (2010), the following definition of business model innovation is composed: *the transformation of the current business model rational in order to improve the way how value is created, delivered and captured by an organisation.*

### **Main reasons to innovate business models**

Based on literature review, the following main reasons to innovate business models are distinguished.

#### *Entrepreneurial initiatives*

Business models are always changing through the open-ended interactions between elements and managers' initiatives (Demil and Lecocq, 2010). These entrepreneurial initiatives aim to innovate the business model and, thereby, increasing the created value by a company.

#### *Gaining a competitive advantage*

Morris et al. (2005) state that it is the goal of a business model to create a sustainable competitive advantage. Afuah and Tucci (2001) state that well-formulated and innovative business models gain a competitive advantage and that would result in better results compared to competitors. Pohle and Chapman (2006) confirm the statement of Afuah and Tucci (2001). Results of a questionnaire among 765 CEOs who operate worldwide show that companies that innovate their business model had significant operating margin growth compared to companies that focus on products/services/markets innovation and operational innovation (Pohle & Chapman, 2006).

#### *Dealing with the complex and changing business model environment*

Paragraph 2.1 introduced the complex and changing business model environment is introduced which is characterised by high levels of uncertainty, competition, innovation, and knowledge creation (Al-Debei et al., 2008; Bouwman et al., 2008; Al-Debei & Avison, 2010; Morabito, 2014). Organisations need to deal correctly with the environment to create or keep a competitive business model (Osterwalder & Pigneur, 2010).

Osterwalder and Pigneur (2010) visualise the complex and changing business model environment (Figure 8) and identify four main areas: market forces, industry forces, key trends, and macroeconomic forces. ‘Understanding changes in the environment helps you adapt your model more effectively to shifting external forces (Osterwalder & Pigneur, 2010, p. 200).’

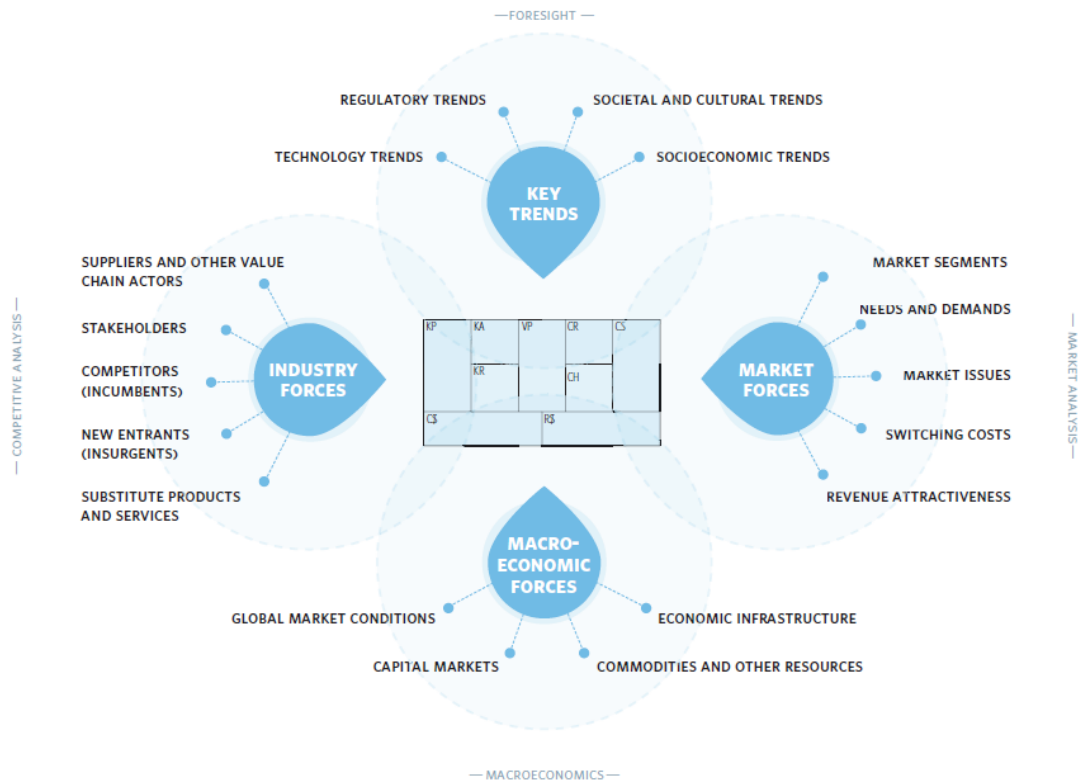


Figure 8: Business model environment (Osterwalder & Pigneur, 2010, p. 201)

*Example: Business model innovation in practice, the insurance industry*

The identified trends in the insurance industry in chapter 1 relate to the complex and changing business model environment. For example, ‘the changing customer’ and ‘changing power of technology and innovation’ as a cluster of trends relate to, respectively, societal and cultural (key) trends and technology (key) trends. Besides, ‘the new normal’ relates to macro-economic forces and ‘new entrants’ relate to industry forces. These trends drive on business model innovation.

The influence of technology innovation on business model innovation is described more in detail, because the information driven innovations that will be studied entail technology innovation.

### *The influence of technology innovation on business model innovation*

As shown in paragraph 2.1, literature and several global consultancy companies explain and underline that information as key trend can improve the competitive advantage of a company (Malhotra, 2000; McAfee & Brynjolfsson, 2012). Osterwalder (2004) states that business model innovation is most often based on technological change. Teece (2010, p. 176) agrees on this and states that ‘business models are often necessitated by technological innovation which creates both the need to bring discoveries to market and the opportunity to satisfy unrequited customer needs.’ For example, Amit and Zott (2001) identify that the Internet and rapid decline in computing and communication costs resulted in new ways to create and deliver value. Current technological changes also result in new ways to create and deliver value. Gartner (2014c) states, for example, that the revolution of digital technologies continues the rise and establishment of new and innovative business models. Therefore, information driven innovations provide interesting insights to innovate business models.

#### *Example: The influence of technology innovation in practice, the Chipin/Fairzekering case*

Chipin/Fairzekering applies (new) technologies that measure driving behaviour of individuals. Thereupon, Chipin/Fairzekering created their business model by rewarding ‘good’ driving behaviour. Herewith, digital technologies entail an (innovative) business model. A more detailed case analysis of Chipin/Fairzekering is included in chapter 5.

### **Techniques to innovate business models**

To investigate business model innovation in a more structural way, the business model framework can help (Chesbrough, 2007; Osterwalder & Pigneur, 2010). Many organisations do not have the right competences to innovate their business model (Johnson et al., 2008; Chesbrough, 2010). Innovation is not only offering and delivering new products or services. Osterwalder and Pigneur (2010) propose several techniques to innovate business models. These techniques are briefly discussed below. How these techniques contribute to main reasons to innovate business models is also explained.

#### *Take one of the four epicentres as starting point*

Take one of the four epicentres as starting point (resource-driven, offer-driven, customer-driven or finance-driven) and see how other building blocks are influenced by it (Osterwalder & Pigneur, 2010). Business models change through changes within their core components (Demil & Lecocq, 2010), e.g. changes in the key resources can change other building blocks. Osterwalder and Pigneur (2010, p. 138) state that ‘change often originates in areas



identified through a SWOT analysis: an investigation of business model's strengths, weaknesses, opportunities, and threats.' A SWOT analysis will reveal reasons to innovate business models. This technique is not used in this research, because this research does not aim to do a SWOT analysis for the insurance industry.

#### *'What if' questions*

'What if' questions help organisations to get out of the status quo: 'what we think of as impossible might be just doable (Osterwalder & Pigneur, 2010, p. 140).' For example: what if an organisation removes a costly resource? Osterwalder and Pigneur (2010) notice that these questions are merely a starting point. Therefore, what if questions can be used to drive on the discussion to do more with main reasons to innovate business models. This technique is not used in this research, since this research aims to contribute to science and drive on business model innovation in a structured way.

#### *Business model patterns*

Business model patterns are useful during the design and innovation of business models (Osterwalder & Pigneur, 2010). Paragraph 2.8 explains and defines an information driven business model pattern as a pattern that expresses a relation inside a business model between a certain context, a problem, and a solution regarding information driven innovations. Thereby, the patterns can include main reasons to innovate business models. The patterns can serve as inspiration when innovations of business models are considered. This technique will be used in this research, since they may drive on business model innovation in a more structured way. 'If they could be adopted elsewhere, why not apply them to one's own company (Gassmann & Schweitzer, 2013, p. 93)?'

### **2.7. DATA DRIVEN BUSINESS MODEL FRAMEWORK**

The importance of the application of information as key trend in organisations is discussed before. Only a few papers were found that address business models in which data/information plays an important role: Chen et al. (2011), Otto and Aier (2013) and Hartmann et al. (2014). Hartmann et al. (2014) developed a Data-Driven Business Model framework (DDBM) that helps to analyse data and information in combination with business models in a structured way which is described in this paragraph:

- Introduction of the DDBM;
- Key activities regarding data.

## Introduction of the DDBM

Hartmann et al. (2014, p. 6) define a DDBM as ‘*a business model that relies on data as a key resource.*’ Hartmann et al. (2014) use the DDBM framework (Figure 9) during their analysis of business models of 100 start-up companies that capture value of big data. At least one feature needs to be selected for every dimension, but it is possible that more than one feature for any dimension is selected (Hartmann et al., 2014). For example, a company may have multiple data sources. Furthermore, during the analysis of companies, the features were limited to the second level of the DDBM framework. For example, Hartmann et al. (2014) do not differentiate between types of internal data during their research to reduce the number of variables.

The six dimensions of the DDBM are directly related to several business model building blocks (Table 5 on page 30). For example, data sources are related to key resources, offering is related to the value proposition, target customer is related to customer segments, and revenue model is related to revenue streams. Nevertheless, the complete DDBM is not applicable for this research. Analysing and classifying the eight information driven innovations, that will be studied in this research, via the complete DDBM will result in meaningless results. As will be explained in chapter 4, information driven innovations from different industries will be studied. Therefore, features of the DDBM are too broad or do not fit with the cases as shown in the example below. Every information driven innovation uses internal and external data sources and the target customers are often B2B and B2C. The offering dimension of the DDBM is also too parsimonious. Studied cases offer more than data, information/knowledge or a non-data product/service. A more specific analysis of these dimensions will benefit this research to really understand information driven innovations.

### *Example: Applying the complete DDBM is not valuable, the TomTom Traffic case*

TomTom Traffic is the real-time traffic information service of TomTom. A more detailed case analysis of TomTom Traffic is included in chapter 5. This example shows that the complete DDBM is not suitable for this research. TomTom uses both internal (data archive) and external (road authorities) data sources. Target customers of TomTom Traffic are B2C (drivers) and B2B (e.g. automotive manufacturers or media partners). In addition, the offering dimension of TomTom Traffic is more than only data and/or information/knowledge (two features in the DDBM). For example, alternative routes are suggested to save time, fuel consumption and CO2 emission.

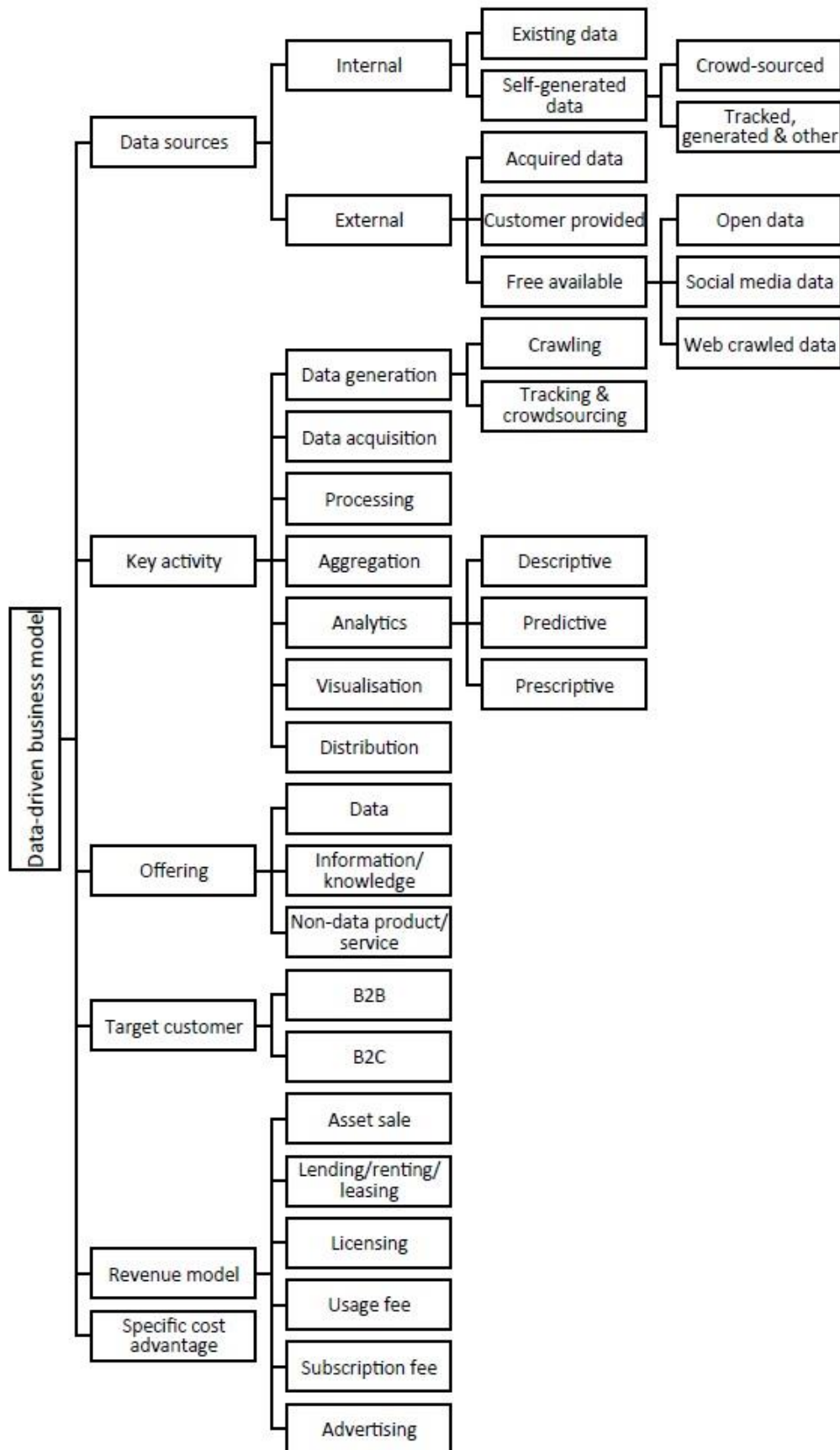


Figure 9: Data-Driven Business Model framework (Hartmann et al., 2014, p. 11)

Regarding the DDBM, it is partly valuable and important for this research to create a structured foundation about how data and information are used by the information driven innovations. Therefore, this research focuses on the key activities regarding data of the DDBM.

### **Key activities regarding data**

Hartmann et al. (2014, p. 8) state that ‘once again, no comprehensive collection of key activities of DDBMs is available.’ The key activities regarding data are briefly discussed below.

- *Data generation:* A company can generate data themselves (internal data sources). Data generation can be done manually (crawling) or automatically through sensors, tracking tools or crowdsourcing tools (Hartmann et al., 2014). Often, organisations use apps and/or devices to generate data;
- *Data acquisition:* Organisations may acquire data from external data sources such as key partners;
- *Data processing:* For further activities with the generated and/or acquired data, organisations may process data to data centres to transform, reduce or clean data;
- *Data aggregation:* For further activities with the generated, acquired and/or processed data, organisations may aggregate certain data;
- *Data analytics:* Analytics as key activity has the strongest link with big data (paragraph 2.4). Analytics is used for descriptive analytics (explain the past), predictive analytics (predict future outcomes) and prescriptive analytics (predict future outcome and suggest decisions). Through analytics, organisations gain accurate insights. Thereupon, organisations improve their decisions, increasingly informed;
- *Data visualisation and distribution:* Organisations may visualise and distribute the (analysed) data or insights.

### **2.8. INFORMATION DRIVEN BUSINESS MODEL PATTERNS**

Paragraph 2.6 argues that BM patterns are useful during the design and innovation of business models. This research aims to derive information driven business model patterns. Therefore, the following topics are explained in this paragraph:

- Pattern approach;
- Information driven business model patterns.

## Pattern approach

The architect Alexander (1979, p. 247) introduced the term pattern language and describes it as *‘a three-part rule, which expresses a relation between a certain context, a problem, and a solution.’* A pattern proves its existence over and over. Based on the definition of Alexander (1979), Gamma et al. (1994, p. 3) define design patterns as ‘descriptions of communicating objects and classes that are customised to solve a general design problem in a particular context.’ Patterns are abstractions and stand above the implementation level (Gamma et al., 1994; Hruby, 2006). Fowler (1997, p. 6) links patterns also to ‘a solution to a problem in context.’ The definitions contain the same elements: context, problem and solution (Alexander, 1979; Gamma et al., 1994; Fowler, 1997).

The context, problem and solution element form the core of the description of patterns. In addition, Gamma et al. (1994) state that patterns need a name, because with a vocabulary people can talk more easily about patterns. Consequences of applying the pattern (results and trade-offs) are another main element of the description of patterns (Gamma et al., 1994). Finally, other elements such as ‘known uses’ complete the description of elements, because ‘known uses’ show where a pattern is also applied (Gamma et al., 1994). The description of the patterns is elaborated in chapter 6.

## Information driven business model patterns

Osterwalder and Pigneur (2010, p. 54) cite architect Alexander: ‘pattern in architecture is the idea of capturing architectural design ideas as archetypal and reusable descriptions.’ The fact that patterns can be re-used is valuable in this research as we study the applicability. Osterwalder and Pigneur (2010, p. 55) define BM patterns as ‘Business models with similar characteristics, similar arrangements of business model Building Blocks, or similar behaviors. We call these similarities BM patterns.’ This definition is not applied in this research, because it focuses on a static composition of business model building blocks. Therefore, we apply the definition of Alexander (1979) to define an information driven business model pattern: *a pattern that expresses a relation inside a business model between a certain context, a problem, and a solution regarding information driven innovations.*

The BMC tool is helpful during the composition and visualisation of the patterns (Osterwalder & Pigneur, 2010). This tool is displayed in Figure 7 on page 30. This tool can help during the identification and innovation of business models (Osterwalder & Pigneur, 2010).

*Example: Business model patterns in practice, the Facebook and Waze case*

Osterwalder and Pigneur (2010) distinguish five business model patterns. These are generic BM patterns instead of information driven business model patterns. For example, organisations with a so-called Freemium pattern offer a product/service free-of-charge to a substantial customer segment (Osterwalder & Pigneur, 2010). These organisations with ‘non-paying customers are financed by another part of the business model or by another customer segment (Osterwalder & Pigneur, 2010, p. 89).’ For example, the business models of Skype, Metro (newspaper) and Google (Osterwalder & Pigneur, 2010) contain this pattern. Among the cases that are included in chapter 5, Facebook and Waze contain this pattern. Facebook is free for internet users. Facebook generates revenue streams by selling targeted reach to marketers (advertising fees). Waze is free for drivers. Waze generates revenue streams via advertising fees of advertisers (roadside organisations).

## 3. Research framework

This chapter contains the start of the research design phase by explaining the framework that will be used. In the upcoming chapter, the methodology is explained and includes how this framework will be applied. In paragraph 3.1, definitions of core concepts of this research are listed. In paragraph 3.2, the components whereupon this research builds are described. Finally, the model of analysis states how information driven innovations will be studied.

### 3.1. DEFINITIONS OF CORE CONCEPTS

Table 6 provides an overview of definitions of the core concepts in this research. These definitions are composed or identified in chapter 2.

Concept	Definition
Digital enterprise	An organisation that builds upon digital technologies within the enterprise as well as in collaboration with customers and partners in order to create a competitive position.
Data	Symbols or facts that are not interpreted and which have to be processed to become information.
Information	Data plus sense-making.
Information Technology	Any such collection of artefacts used to extend human information processing and communication capabilities or compensate for inherent cognitive and social limitations in this area.
Big data	High volume, velocity and/or variety information assets that demand cost-effect, innovative forms of information processing that enable enhanced insight, decision making, and process automation.
Information driven innovations	Fundamental technology changes by generating, acquiring, processing, aggregating, analysing, visualising, and/or distributing data and information in new ways to improve operational and/or business performance.

Business model	A business model describes the rationale of how an organisation creates, delivers, and captures value.
Business model innovation	The transformation of the current business model rational in order to improve the way how value is created, delivered and captured by an organisation.
Data Driven Business Model	A business model that relies on data as a key resource.
Pattern approach/language	A three-part rule, which expresses a relation between a certain context, a problem, and a solution.
Information driven business model pattern	A pattern that expresses a relation inside a business model between a certain context, a problem, and a solution regarding information driven innovations.

Table 6: Definitions of core concepts

### 3.2. BUILDING UPON FOUR COMPONENTS OF THE THEORETICAL BACKGROUND

This research does not aim to discuss and investigate all definitions in Table 6 in detail. The framework builds primarily upon these definitions and the following four components.

#### 1. Business Model Canvas

The BMC tool is relatively easily to use and creates understanding, discussion, creativity, and analysis of business models (Osterwalder & Pigneur, 2010). Therefore, BMC's of the information driven innovations will be composed (chapter 5).

#### 2. Semiotics framework

The semiotics framework of Beynon-Davies (2009) is used as a fundamental information framework, since it is important to understand the data an information concept as a sociotechnical phenomenon. The semiotics framework gives an overview of, for example:

- The difference between information and data;
- The way how data transforms in information between the technical and social world of an organisation;
- How information is composed in organisations via several levels of semiotics and through systems.

This framework will be kept in mind during this research to understand the key activities regarding data of the information driven innovations.



### **3. Key activities regarding data**

The DDBM of Hartmann et al. (2014) provides insights how data is used in business models. In order to understand how the information driven innovations use data, this research focuses on the key activities regarding data of the DDBM: data generation, data acquisition, data processing, data aggregation, data analytics, and data visualisation and distribution. Thereby, it is likely to create more reliable results: ‘the extent to which your data collection techniques or analysis procedures will yield consistent findings (Saunders et al., 2009, p. 156).’ The key activities regarding data of the information driven innovations are described in the case analysis in chapter 5.

The key activities of the DDBM can be linked to the semiotics framework. An example is already given in chapter 2: the semiotics framework in practice, the Sense Health case. Data generation and acquisition are linked to empirics. Data processing and aggregation are linked to syntactics. Data analytics is linked to semantics. Finally, data visualisation and distribution is about pragmatics to link language to action (internally or externally).

### **4. Pattern approach**

The pattern approach (Alexander, 1979; Gamma et al., 1994; Fowler, 1997) will be used to derive BM patterns. The elaboration of the patterns focuses on six key elements of a pattern: pattern name, context, problem, solution, consequences, and known uses (Gamma et al., 1994). In the upcoming chapter, is explained in detail how patterns are derived from multiple cases.

### **3.3. MODEL OF ANALYSIS**

BMC and key activities regarding data will be composed of the information driven innovations. As a result, multiple case analyses form the context from which BM patterns will be derived. The patterns will be derived by applying a pattern approach and optimised through an iterative process. As a result, the patterns entails BMC’s and processes of the key activities regarding data. The methodology is explained more in detail in the upcoming chapter and includes also the methodology to study the applicability of the patterns. The study of the applicability does not build upon current components from the theoretical background.

## 4. Methodology

In this chapter, the research design phase is described, ‘how’ the research framework was applied. Paragraph 4.1 describes the generic research design. Two rounds of case studies were done and, therefore, the methodology is described in the following order:

- Paragraph 4.2: Case selection and sampling of information driven innovations;
- Paragraph 4.3: Data collection and analysis information driven innovations;
- Paragraph 4.4: Deriving information driven business model patterns;
- Paragraph 4.5: Case selection and sampling in the insurance industry;
- Paragraph 4.6: Data collection and analysis insurance companies;
- Paragraph 4.7: Studying the applicability of patterns in insurance companies.

### 4.1. RESEARCH DESIGN: QUALITATIVE MULTIPLE CASE STUDIES

This is an explorative research: ‘what is happening; to seek new insights; to ask questions and to assess phenomena in a new light (Robson, 2002, p. 59).’ This research focuses on relatively new topics of interest such as the digital enterprise, information driven innovations, information driven business model patterns, and the study of the applicability of these patterns in insurance companies. Studying new topics of interest is a characteristic of explorative research (Robson, 2002; Babbie, 2010).

In order to derive and study the applicability of the patterns two rounds of case studies were done. Case studies are valuable in exploratory research characterised by ‘how’ and ‘why’ questions (Yin, 2003; Saunders et al., 2009). A case study examines a contemporary phenomenon in its real-life context (Yin, 1981). In this research, multiple organisations (cases) were studied as phenomenon. Robson (2002, p. 178) continued on Yin (1981) and described a case study as: ‘a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence.’ Paragraph 4.3 and 4.6 describes the multiple sources of evidence.

Single and multiple case studies are distinguished in literature (Yin, 2003; Saunders et al., 2009). Saunders et al. (2009, p. 146) stated that a single case ‘is often used where it represents a critical case or, alternatively, an extreme or unique case.’ Multiple cases are often studied

to confirm the findings of the first case and the need to generalise from these findings (Yin, 2003; Saunders et al., 2009). Therefore, multiple case studies were done to generalise findings to derive and study the applicability of the patterns. Patterns cannot be found via a single case study, because they are too context specific and a single case study does not provide enough information about re-usable aspects in patterns.

In the subsequent paragraphs, this research refers to multiple interviews and a focus group that were done. Additional (case) information is, together with interview recordings and notes, available on request.

#### **4.2. CASE SELECTION AND SAMPLING OF INFORMATION DRIVEN INNOVATIONS**

The unit of analysis is defined as ‘the what or whom being studied (Babbie, 2010, p. 98).’ In this research, multiple organisations were studied. Cases were selected through purposive sampling in which cases selection is based on judgment of the researchers about which cases will be the most useful or representative (Babbie, 2010). Not every organisation is suitable for this research and, therefore, probability sampling was excluded. First, information driven innovations were studied to derive the patterns.

As introduced in chapter 2, information driven innovations were related to the digital enterprise concept. In order to select the cases, a list with cases was composed through a brainstorm session. Cases should be in line with the definition of an information driven innovation. During this session, cases were selected that applied technology changes to deal with data and information in new ways. It became clear that the focus was more on improvements of operational performances instead of business performances. Business performances could not be studied during the case selection, since these detailed insights were not publicly available. As shown in Table 7 and Table 8, the selected cases were relatively young. Through this, it was hard to state if business performances are well. Cases were also briefly analysed by focusing on the key activities regarding data and how these key activities contribute to create, deliver and capture value. From the initial list of cases, five cases were approached to study through field research (exploration phase). All cases that were approached were willing to contribute to this research.

Before research was done in the field, three cases were studied through desk research (pilot phase). These were also selected via a brainstorm session and brief analyses. It depended also on the availability of public sources which cases were studied through desk research. Well-known, foreign and (in the scope of this research) unattainable cases were selected for desk research.

In line with the explorative nature of this research, information driven innovations were studied from different industries to generate a broad overview of information driven innovations. Case analyses of the selected cases are included in chapter 5 which also justifies why cases are identified as information driven innovations.

### **Desk research – Pilot phase**

Three case studies were investigated through desk research. The main reason was to test and optimise the research framework to study the other cases through field research. This resulted in the definitive research design to study the cases. As a result, field research was improved. Desk research was also done, because it was impossible in the scope of this research to study several (foreign) cases through field research. These cases were studied through other (public available) sources. Paragraph 4.3 explains which sources were used. In addition, case studies via desk research were done to reach the saturation level efficiently, ‘until additional data collected provides few, if any, new insights (Saunders et al., 2009, p. 235).’

Table 7 contains a concise introduction of the desk research cases that were studied. The Full Time Equivalent (FTE) is the ratio of the number of employees that work full-time at a certain organisation. Company profiles are briefly introduced, since chapter 5 contains detailed explanations of the cases.

<b>Case</b>	<b>fte</b>	<b>Profile</b>
Facebook	8,350	Facebook, founded in 2004, is a social media platform. Their mission is to give people the power to share and make the world more open and connected (Facebook, 2014a). Facebook earns money through advertisements. Based on input from the people, marketers create targeted ads. Facebook has 890 million daily active users on average for December 2014 (Facebook, 2014a).

Uber	>1,000	Uber, founded in 2009, is a ridesharing service that connects, real-time, riders to drivers through their apps. Uber is currently available in 250 cities in 54 countries worldwide. They are rapidly expanding their global presence (Uber, 2014a). Uber identifies themselves as an order service instead of a transport company.
Waze	200	Waze, founded in 2008, is an application that provides real-time traffic updates by combining traffic information that is shared by the community of people who use Waze. The more people who use Waze, the better the real-traffic updates get (Waze, 2014a).

Table 7: Desk research cases information driven innovations

### Field research – Exploration phase

Five cases were studied through field research in which the research framework was applied. Table 8 contains a concise introduction of the field research cases, since chapter 5 contains detailed explanations of the cases.

Case	fte	Profile
Chipin/ Fairzekering	4	Chipin, founded in 2013, provides technology that measures individual driving behaviour. Fairzekering is the showcase of Chipin to show that the technology works. They give online feedback about, for example, driving behaviour and technical conditions of a vehicle. Fairzekering rewards ‘good’ driving behaviour through premium discounts. Insurance companies, drivers and the society may benefit via, for example, lower premium costs, less accidents, less damage, and improved fuel efficiency.
Coosto	70	Coosto, founded in 2010, delivers a tool for social media monitoring and webcare for other organisations. Coosto dives into social web data and provides in-depth insights into conversations on social media. They acquire data from more than 400,000 social (dynamic) sites, sites where interaction takes place. Users can engage in these conversations with the engagement module.

Quby Smart Thermostat	30	Quby, founded in 2004, is the developer of the Smart Thermostat, better known as the 'Toon' thermostat that is provided by Eneco. The Quby Smart Thermostat provides insights in energy use. Through a smart meter or own measurement devices, the Smart Thermostat collects data about energy consumption and presents it in an understandable way (information). Thereby, they change the way how people experience energy.
Sense Health	25	Sense-Health is founded in 2013. The mission of Sense Health (2015a) is 'to empower people to take control over their health and wellbeing.' Sense Health focuses mainly on mental healthcare, chronic deceases and employee wellbeing. They create solutions (applications) to provide insight in behaviour and the consequences on people's wellbeing. Through sensors and applications is individual data and information measured and analysed.
TomTom Traffic	4,000	TomTom, founded in 1991, gained market share by selling Personal Navigation Devices (PND's) since 2004. TomTom wants to innovate continuously. An example is TomTom Traffic which is introduced in 2010. This is a real-time traffic information service that 'gets you there faster.' In order to suggest faster routes, TomTom Traffic uses crowd-sourced data from more than 400 million data sources around the world.

Table 8: Field research cases information driven innovations

### 4.3. DATA COLLECTION AND ANALYSIS INFORMATION DRIVEN INNOVATIONS

This research used a qualitative approach that can be studied using qualitative data. It is impossible to measure the research framework through quantitative methods. The research framework was applied (chapter 3), when the information driven innovations were studied. The goal was to create a good understanding of the BMC and key activities regarding data. This paragraph explains how data was collected and analysed for the desk and field research cases. In addition, reliability and validity is discussed.

## **Desk research**

Cases were studied with a lot of public available information, such as company websites, annual reports, privacy policies, news articles, and/or company presentations. In addition, privacy policies were an important source to understand the key activities regarding data. Data was also collected by using the products/services of the desk research cases to gain more accurate insights. Several screenshots were included in chapter 5. Multiple sources were used to reach the saturation level and for triangulation, ‘to ensure that the data are telling you what you think they are telling you (Saunders et al., 2009, p. 146).’

Data collection was reliable, since it is likely that the same data will be collected when observations are repeated by applying the research framework (Babbie, 2010). Studied desk research cases have a lot public available sources. Therefore, a lot sources were consulted for a thoughtful understanding of the cases. The aspects of the research framework were the main focus during the data collection: nine building blocks of the BMC and key activities regarding data. Data was collected in a structured way and, mainly thereby, reliable. Validity is another quality measurement of research (Babbie, 2010). Validity is ‘a term describing a measure that accurately reflects the concept it is intended to measure (Babbie, 2010, p. 153).’ This research aimed to study how information driven innovations work. To study this, the BMC and key activities regarding data were sufficient and valid. Data analysis was also reliable and valid, since collected data was linked to elements of the research framework. During internal meetings and presentations with/for supervisors and (business model) consultants of InnoValor with academic backgrounds, the analyses were discussed in order to improve the validity of the cases analyses.

## **Field research**

Before starting the interviews, initial BMC’s and key activities regarding data of the cases were studied to create a better understanding of the cases. Data was collected by studying the same sources as the desk research cases. There was not much public data available of the selected cases that were studied through field research. The interviews contributed to triangulate the data and to reach the saturation level. In addition, data was collected by using the products/services of the following cases: Coosto, Sense Health and TomTom Traffic.

Five semi-structured interviews were completed in which a list of themes and questions were covered. The list of themes and questions are listed in appendix B. These questions were mainly open-ended and focused on the BMC and key activities. The questions to design the BMC were mainly developed by Osterwalder and Pigneur (2010). The questions about the key activities regarding data focused on the key activities in the DDBM. During the interviews, the BMC was composed together with the interviewees. Afterwards, to reduce interviewer bias, the initial BMC was discussed regarding differences and, thereby, strengthen the BMC.

Interviewees were representatives at management level of the information driven innovations (the unit of observation) who were capable to provide relevant input for this research. For example, a business development manager, managing director(s) and privacy and security manager were interviewed. Five interviews were completed with an average duration of 75 minutes. It is impossible in the scope of and irrelevant in the context of this research to explain every aspect of the BMC and key activities regarding data in detail in this report.

The role and performance of the interviewer and interviewee were critical to collect valuable information, develop relationships and prevent data from interviewer and interviewee bias (Saunders et al., 2009). This affected the reliability, since it depended on the interviews if other researchers collect the same data in repeated observations. Familiarity with the questionnaire and subject, following questions wording exactly, recording responses exactly and probing for responses were important guidelines that were applied during the interviews (Babbie, 2010). As a result, this benefitted the reliability and validity of the data collection.

Data analysis was also reliable and valid, since answers of interviewees was linked to elements of the research framework. This was possible, since questions were asked that were directly linked to the BMC and key activities regarding data (appendix B). This enhances the validity. Besides, the memoing technique was used: ‘writing memos that become part of the data for analysis in qualitative research (Babbie, 2010, p. 404).’ Therefore, it was not needed to use an extensive analysis methodology of qualitative data. In order to triangulate and optimise the data of the semi-structured interviews, extra public available data sources were consulted after the interviews. Privacy policies were an important source to understand the key activities regarding data.



During internal meetings and presentations with/for supervisors and (business model) consultants of InnoValor with academic backgrounds, analyses were discussed in order to improve the validity of the cases analyses. Finally, the results of the case analyses were sent to the interviewees to confirm the analysis. Thereby, the quality of the case analyses were guaranteed.

#### **4.4. DERIVING INFORMATION DRIVEN BUSINESS MODEL PATTERNS**

Inductive reasoning was applied: ‘general principles are developed from specific observations (Babbie, 2010, p. 22).’ Deriving patterns can be seen as the general principles. Babbie (2010) underlined that case studies can form the basis for the development of more generic theories. This is in line with inductive reasoning. In addition, Saunders et al. (2009) linked induction to, among others, the collection of qualitative data and a realisation that the researcher is part of the research process. This was also the case for this research.

There was not an analytical technique to derive BM patterns found in literature. None of the authors of business model frameworks that were introduced in chapter 2 focused in their methodology on BM patterns. For example, Osterwalder and Pigneur (2010), who spend a main part of their book on BM patterns, did not explain their methodology to derive these patterns. Therefore, a methodology to derive the patterns was composed. Multiple steps were taken to gain a scientific foundation of the patterns. This was an iterative process with multiple sessions to explore, derive and optimise the patterns. The steps are explained below. Several major steps are explained more in detail. In addition, several pictures are included in appendix D to support this method. At the end of this paragraph, reliability and validity of the patterns is analysed.

- **Derive dimensions and classification of cases;**

Dimensions were identified that comprise all cases. Five generic steps were taken to determine these dimensions. This was an iterative process. First, literature regarding classifications was reviewed. Second, multiple dimensions were derived from the case analyses and discussed in multiple sessions. Main dimensions that were identified are: data source, target of value, real-time versus batch, focus on the key activity regarding data, and the main information flow: backward or forward. Selected and omitted dimensions are explained in chapter 6. Third, cases were divided among these dimensions. For example, cases were classified among the ‘real-time versus batch’ and the ‘main information flow: backward or forward’ dimensions. Fourth, dimensions were mapped on each other. For example, the ‘real-time versus batch’ and the

‘main information flow: backward or forward’ dimension were mapped on each other. Through an iterative process and multiple sessions, an optimisation of the dimensions and classification of cases was achieved. Thereby, the main criteria was to use and create understandable dimensions and classification. It was important to keep in mind that the classification should be understandable for outsiders and useful during the study of the applicability of the patterns. Therefore, vague and useless dimensions were omitted. Fifth, the two most useful dimensions were used in the classification and added in chapter 6.

- **Session to explore patterns;**

The classification scheme of the previous step was the basis to derive the patterns. In order to gain a better understanding of the classification of patterns, the following aspects are described:

- Specific versus generic patterns;
- Level of deriving patterns;
- Main questions to derive patterns.

#### *Specific versus generic patterns*

Miles (1979, p. 599) mentioned ‘the steady tension between the unique, contextually specific nature of single sites, and the need to make sense across a number of sites’ as a challenge during the analysis of qualitative data from multiple case studies. This is exactly the challenge that was faced to derive BM patterns by making sense of the data of a number of sites (eight information driven innovations).

In the discussion how to derive BM patterns, the tension between specific and generic patterns needed to be solved. Patterns (abstractions) were derived from information driven innovations from different industries. Therefore, generic patterns were derived since it was not suitable for this research to derive specific patterns from eight cases. Specific patterns would have led to meaningless results during the study of the applicability of these patterns in insurance companies. In addition, this research aimed to achieve the same goal with BM patterns as Osterwalder and Pigneur (2010, p. 55): ‘recast well-known business concepts in a standardised format – the Business Model Canvas – so that they are immediately useful in your own work around business model design or invention.’ In this research, patterns are used to drive on business model innovation.

### *Level of deriving patterns*

Generic patterns were derived in the four boxes in which cases are classified in the classification scheme in Figure 40 on page 88. To reduce complexity, cases in these boxes were compared on the level on which cases were studied. Chipin/Fairzekering, Coosto, Facebook, Uber, and Waze were studied at the organisational level since these cases offer one product/service that can be seen as information driven innovations. For example, Coosto's main focus is the Coosto tool and Uber's main focus is the ridesharing service at the organisational level.

Quby Smart Thermostat, Sense Health and TomTom Traffic are studied at the product/service level, since these organisations offer also other products/services besides the studied 'information driven innovations.' Quby develops also other IT products, TomTom offers also GPS smart watches and Sense offers also Internet of Things or Greenhouse solutions.

### *Main questions to derive patterns*

The following questions were asked to derive patterns:

- What is the role of information to create, deliver and capture value in the business models of the cases?;
- Information from whom creates value for whom (stakeholder view)?;
- How is information used and which value does it create (the key activities regarding data)?

By asking these questions, other related questions arose. The answers were compared to derive patterns. In addition, the relation inside a business model of the cases between a certain context, a problem, and a solution were discussed. This was in line with the BM patterns definition in chapter 2. Thereby, initial designs of the patterns were created (see impression in appendix D).

- **Session to improve patterns;**

The initial design of the patterns was critically reviewed and optimised. The main focus of this session was to identify the added value that is created through information in the business model. As explained before, several information driven innovations have multiple goals and create, for example, value for multiple parties with information. As a result, it became clear that studied cases justify multiple patterns. This is in line with Osterwalder and Pigneur (2010, p. 55) who state that 'a single business model can incorporate several patterns.' An initial composition was created how patterns are linked and interrelated.

- **Focus group;**

A focus group was organised to develop a more scientific foundation of the patterns. The patterns were discussed and suggestions for optimisations were given. According to Babbie (2010, p. 322), a focus group is ‘a group of subjects interviewed together, prompting a discussion.’ Saunders et al. (2009, p. 344) stated that ‘participants are normally chosen using non-probability sampling, often with a specific purpose in mind.’ This was also done in this research, since experts were invited that were capable to contribute to the discussion and optimisation regarding the patterns. A focus group was mainly chosen because of its flexibility, the fact that it entails speedy results and the fact that ‘the technique is a socially oriented research method capturing real-life data in a social environment (Babbie, 2010, p. 323).’ This was important, since the patterns should be understandable during the study of the applicability of the patterns in insurance companies. As a result, all feedback of participants was valuable.

The focus group took two hours in which three young professional consultants and six senior consultants of InnoValor participated (appendix D). According to Saunders et al. (2009) and Babbie (2010), nine participants is good number of participants. Consultants who participated have academic backgrounds in Business Administration, Information Technology, Marketing and Business models. In addition, five consultants completed a PhD thesis and four consultants completed a MSc thesis. Since InnoValor focuses on four subjects, including business models and agility, contributions of the participants were valuable for the development and optimisation of the patterns.

After a presentation of the research design and framework, results were discussed regarding: the eight information driven innovations, classification of cases and patterns, and the seven patterns that were derived (chapter 6). The participants provided critical and constructive feedback on everything that was presented.

- **Individual session to process feedback of the focus group;**

Interview recordings and notes of the focus group were analysed and processed afterwards.

- **Iterative process: discussions and improvements of the patterns;**

It was an iterative process to improve the patterns. Additional information, notes and initial versions of the patterns are available on request.

- **Validating patterns during the study of the applicability of the patterns;**

During the study of the applicability of the patterns in insurance companies, the patterns were validated (see chapter 7). The classification of the studied information driven innovations, patterns, linkages and interrelations were explained.

- **Complete the information driven business model patterns.**

All contributions were processed and resulted in the final composition of the seven information driven business model patterns (see chapter 6). All these steps were done to reduce the subjectivity and enhance the scientific value of these patterns. Thereby, through these steps, this research aimed to reach the saturation level and triangulate and optimise the patterns.

### **Reliability and validity of the patterns**

The method to derive the patterns was reliable. It is hard to compare this method with other methodologies, since there was not an analytical technique to derive BM patterns found in literature. Multiple steps were taken to derive and optimise the patterns in a scientific way. Despite of the fact that the method was complex and iterative, it is likely the (almost the) same classification and patterns will occur in repeated observations. For example, during the focus group with nine experts, the classification was and patterns were extensively discussed. Slightly different patterns may occur through the important role of the researchers in this process. This is in line with the explorative nature of this research. Further research should enhance the reliability of the (method to derive) patterns.

The validity of the patterns was enhanced through the methodology to derive the patterns: the patterns accurately reflects the concept it is intended to measure, information driven business model patterns (Babbie, 2010). Based on Babbie (2010), six types of validity are briefly discussed: face, criterion-related, construct, content, internal, and external validity.

- The patterns have face validity since it seems a reasonable measure to show how organisations create, deliver and capture value with information.
- Criterion-related validity is ‘the degree to which a measure relates to some external criterion (Babbie, 2010, p. 154).’ The validity of the patterns is shown in their ability to drive on (business model) innovation. Results of the study of the applicability of the patterns underline that the patterns have criterion-related validity (see chapter 7).

- It is hard to discuss construct validity. This is ‘the degree to which a measure relates to other variables within a system of theoretical relationships (Babbie, 2010, p. 154).’ As explained earlier, the (methodology to derive) information driven business model patterns was not studied before. In addition, there was not literature found that discuss theoretical relationships regarding the patterns. As a result, the methodology and patterns cannot be directly related to other variables.
- The patterns have content validity whereas the patterns ‘covers the range of meanings included within a concept (Babbie, 2010, p. 155).’ The patterns describe how information is used to create, deliver and capture value in the BMC of studied information driven innovations.
- Based on the brief discussions of the previous validity types, the (methodology to derive) patterns have internal validity since the patterns accurately reflect what went on in this study (Babbie, 2010).
- The patterns have also external validity. The patterns are generalizable to the ‘real’ world since the (methodology to derive) patterns was developed to derive patterns that were close to reality (Babbie, 2010). This was mainly done to enhance the study of the applicability of the patterns in the insurance industry.

#### **4.5. CASE SELECTION AND SAMPLING IN THE INSURANCE INDUSTRY**

This research aimed to validate the patterns and contribute to practice by studying the applicability of BM patterns. A specific industry is studied to understand how these patterns may strengthen organisations in this industry. The applicability of the patterns was studied in a specific industry (the Dutch insurance industry), since the patterns were derived from information driven innovations from different industries. Studying the applicability of these patterns in organisations from multiple industries would have resulted in meaningless results.

The Dutch insurance industry is investigated in this research. As explained in chapter 1, based on TNO (2013), the insurance industry face different trends in that influence the complex and changing business model environment of insurers. These trends underline the importance of and drive on (business model) innovation in the insurance industry.

Just as in paragraph 4.2, the unit of analysis were multiple organisations: four insurance companies and the Dutch Association of Insurers (‘Verbond van Verzekeraars’). This research refers to insurance companies and insurers to address these five organisations.

Multiple insurance companies were studied to acquire more input regarding the applicability of the patterns. Insurance companies were selected through purposive sampling. On purpose, selected insurance companies were different insurers who offer different compositions of insurances, such as health, damage and/or life insurances. In addition, the Dutch Association of Insurers is interviewed, since they represent the interests of 95% of the insurance companies on the Dutch market. Table 9 contains a concise introduction of the insurers that were studied through field research.

Case	fte	Profile
Achmea	15,000	Achmea, founded in 1811, is the largest insurance company in the Netherlands that offers multiple insurances such as indemnity, health and income insurances to 8,000,000 clients (Achmea, 2015a). Achmea has eleven brands such as FBTO, Interpolis, InShared, and Zilveren Kruis Achmea.
a.s.r.	4,000	A.s.r., founded in 1720, is a Dutch organisation that offers multiple insurances such as indemnity, health, and income insurances to 2,000,000 clients. They have five brands: a.s.r., Ardanta, De Amersfoortse, Europeesche Verzekering, and Ditzo. Besides insurances, a.s.r. offers pensions, savings and investment products (a.s.r., 2015a).
Generali	480	Generali, founded in 1831, is part of the international Generali group. This group belongs to the top three of largest insurance companies in Europe. Generali offers multiple insurances such as indemnity and income insurances to 400,000 clients in the Netherlands (Generali, 2015a). Generali does not offer health insurances. Mostly, Generali offers their insurances via professional intermediaries. Their brand 'De Nederlanden van Nu' is an exception and offers insurances directly to consumers (Generali, 2015b).

Cooperation VGZ	2,700	The Dutch cooperation VGZ, founded in 1948, offers health insurances to 4,200,000 clients through six insurance companies that are linked to the cooperation: VGZ, Univé, IZA, IZZ, UMC, and Cares. These companies offer basic and additional health insurances. In addition, these companies focus on business (health) care, absenteeism reduction and prevention (Coöperatie VGZ, 2013).
Dutch Association of Insurers	120	The Dutch Association of Insurers (Verbond van Verzekeraars), founded in 1978, is an independent organisation that represent the interests of Dutch private insurance companies. ‘The Association’s members represent more than 95 percent of the insurance market expressed in terms of gross premium income (Verbond van Verzekeraars, 2015).’

Table 9: Field research insurance industry

#### 4.6. DATA COLLECTION AND ANALYSIS INSURANCE COMPANIES

Before starting the interviews, generic information about the insurance companies and trends that influence the industry were studied. Public available data such as research reports, company websites, annual reports, news articles, and/or company presentations were consulted.

Thereafter, five semi-structured interviews were done in which a list of themes and questions were discussed. This list of themes and questions is added in appendix C. The questions were mainly open-ended. First, the interview focused on main trends that influence the insurer and insurance industry. Second, the applicability of the patterns was studied.

Interviewees were representatives at management level and were capable to provide relevant input for this research. For example, a (senior) advisor, department manager, director, and lead architect were interviewed. On purpose, these representatives were interviewed as they are (partially) responsible for innovation in the organisations that they work for. Five interviews were completed with an average duration of 60 minutes.

The role and performance of the interviewer and interviewee were critical to gain valuable information, develop relationships and prevent results from interviewer and interviewee bias (Saunders et al., 2009). This role was especially important during the study of the applicability,



since correct and accurate explanations of the information driven innovations, classification and derived BM patterns were required. The interviewee needed to understand this information and provided his/her insights. Reliability was affected, since it depended strongly on the interviewer and interviewee if other researchers collect the same data in repeated observations. In the scope of this research, this was the most reliable method to study the applicability. Input of interviewees was anonymised in this research, because it was an explorative study of the applicability. Input of interviewees consisted mainly out of initial ideas and discussions regarding current initiatives, potential applications and restrictions. This way of collecting data was valid, since interviewers accurately explained the patterns to interviewees. In addition, the applicability of the patterns was accurately studied to measure how insurance companies can innovate and do remain competitive.

Aspects of the coding method of the Grounded Theory of Strauss and Corbin (1998) were applied during the analysis of the qualitative data. As paragraph 4.3 explained, specific questions were asked during the study of the information driven innovations that supported the coding procedure. This was not possible when insurers were studied. First, data was analysed by grouping trends that multiple insurers face through open coding: ‘the initial classification and labelling of concepts in qualitative data analysis (Babbie, 2010, p. 400).’ Axial or selective coding were not applied, since the most common trends were identified through open coding.

The data of the applicability of the patterns was analysed more in detail. First, the collected (interview) data was linked to the seven patterns (open coding). Thereupon, axial coding was done: ‘a reanalysis of the results of open coding in the Grounded Theory Method, aimed at identifying the important, generic concepts (Babbie, 2010, p. 402).’ For example, all data regarding health insurances for a specific pattern were analysed. The important and generic current initiatives, potential applications and restrictions were adopted in appendix E. In addition, a memoing technique (Babbie, 2010) was also applied. Finally, a cross case analysis is applied through selective coding: ‘In Grounded Method Theory, this analysis builds on the results of open coding and axial coding to identify the central concept that organises the other concepts that have been identified in a body of textual materials (Babbie, 2010, p. 402).’ Main inputs regarding current initiatives, potential applications and restrictions were added in this research.

#### **4.7. STUDYING THE APPLICABILITY OF PATTERNS IN INSURANCE COMPANIES**

As stated in chapter 2, BM patterns may drive on business model innovation in a more structured way. This research focused on (business model) innovation by studying the applicability of the BM patterns in insurance companies. The previous paragraph explained how and which data were collected and analysed. A case-oriented analysis is applied to understand several insurers by looking closely to the details of these insurers (Babbie, 2010).

A modelling principle of Fowler (1997, p. 13) was applied: ‘patterns are a starting point, not a destination.’ This was in line with the Osterwalder and Pigneur (2010). Fowler (1997, p. 13) suggested that ‘once you have identified a potentially useful pattern, then try it out.’ This is exactly done in this research. This research did not aimed to make the patterns fit in the insurance companies or to develop complete business cases for the patterns. In advance, researchers knew that it was likely that patterns are not applicable in certain insurance companies. This was also a valuable finding. As stated in the previous paragraph, input of interviewees consisted mainly of initial ideas and discussions regarding current initiatives, potential applications and restrictions.

## 5. Case analysis

This chapter contains the results of the research execution phase. In the previous chapter, the cases that have been studied through desk and field research are briefly introduced. This chapter builds upon this introduction and describes the results of the case analysis. Paragraph 5.1 contains a reading guide. Thereafter, cases are described in alphabetical order in paragraph 5.2 up to and including 5.9.

### 5.1. READING GUIDE

Concise and complete insights in the aspects of the research model are provided. Several important elements of the case analysis are described. Thereby, the second sub-question of this research will be addressed in this chapter: what are business models and key activities regarding data of information driven innovations? As stated before, more extensive case information is available on request.

Before the case analysis is discussed, it is important to make some notes.

- Certain elements in the BMC's of cases are generalised such as the key activities. Product management, data management, Research & Development (R&D), and operations are recognised in every case. This is done to create more consistency among the BMC's;
- In certain cases, aspects and terminology of the participants are added. For example, at Coosto recognised employees as key resource and TomTom recognised specific functions, such as software engineers and data scientists, as key resource;
- The BMC and key activities regarding data are added at the end of every case analysis;
- The coloured boxes in the BMC's show the relation between aspects among certain building blocks. For example, Fairzekering identifies young adult drivers (<24 years) and environmentally conscious/green drivers as customer segments. The customer relationship with these customer segments is based on self-service;
- White coloured boxes do not relate to a specific colour or relate to several coloured boxes;
- Quotes are shown in italic.

## 5.2. CHIPIN/FAIRZEKERING

Chipin is a Dutch organisation that provides technology that measures and analyses driving behaviour. This clarifies their slogan: driven by data. The customer segments of Chipin are car fleet owners and insurance companies. Insurance companies can build their propositions upon the technology/concept of Chipin. Fairzekering is the showcase of Chipin

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*'Safety is the core of our value proposition.'*

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*'Track and trace is not new. Creating behavioural insights via technologies and algorithms makes us interesting and innovative.'*

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to prove that the technology works. Fairzekering was introduced in 2014 and won three innovation awards in 2014. Fairzekering focuses on young adult drivers (<24 years) and environmentally conscious/green drivers. People who know that they do not drive safely, do not want that their driving behaviour is generated, analysed and linked to the price of the car insurance (premium).

Many (insurance) companies focus on retrenchments of expenses that they can influence directly, e.g. wages and rent of offices. Chipin/Fairzekering focuses on the highest expenses of (insurance) companies: claims. When drivers install a so-called OBD/Chipin, this device connects with the systems of Chipin. Generally, the device generates data which is analysed afterwards (Figure 10).

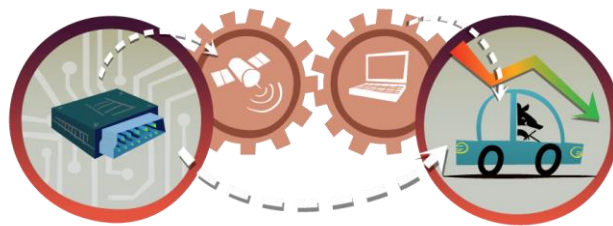


Figure 10: Chipin/Fairzekering in an overview

The Chipin device generates data with regard to driving behaviour, accidents, technical conditions, and car identification. The device measures the time of the day, location, speed, acceleration, and braking of drivers. Data is then analysed via algorithms to generate a driving score. Via the dashboard (Figure 11) and apps, users get insights in their driving behaviour. At the end of every month, Fairzekering computes a monthly score.

Users save money when they drive safely because a green driving score entails 35% premium discount, an orange score entails 10% discount and a red score entails no premium discount.

*‘We do not use the traditional premium model of insurances. We change the game with dynamic pricing: adapt prices directly to individual driving behaviour.’*

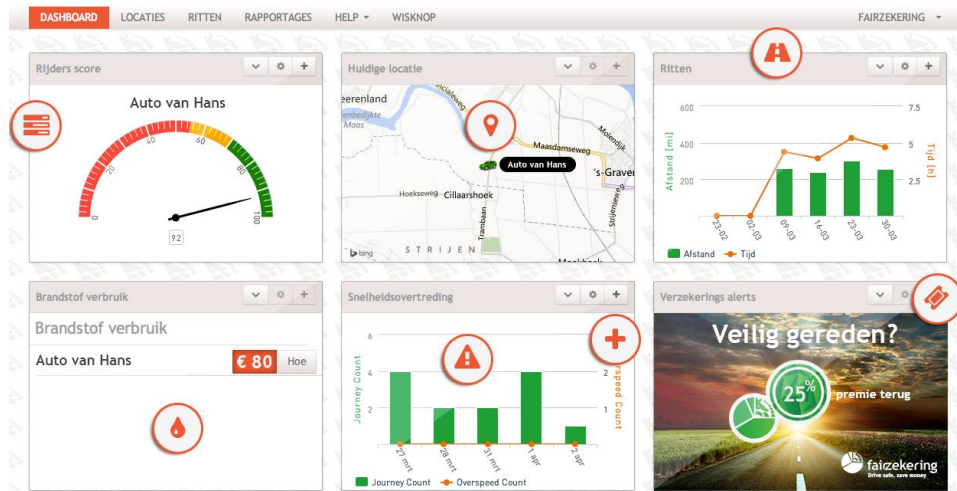


Figure 11: Screenshot Fairzekering dashboard

Regarding the accidents, the Chipin device generates First Notification Of Loss (FNOL) data. Within a minute after an accident, information/data such as speed, accelerometer samples and g-forces are summarised in a pdf document. This is helpful during the judgment of claims for both insurance companies and drivers. In addition, the device measures several technical conditions of a car such as battery voltage, driven kilometres and diagnostic trouble codes that a car generates.

Besides benefits for the conscious drivers and insurance companies (Figure 12), Chipin/Fairzekering states that they create safety for and improve the society by generating insights in driving behaviour via telematics: reducing accidents, care costs, traffic jams, fuel consumption, and CO2 usage. In the future, Chipin/Fairzekering wants to build upon their current business model. Chipin/Fairzekering wants to create added value for multiple parties. For example, predictions regarding maintenance of cars or automatic linkage with emergency

*‘It is not our only goal to sell devices. We want to add, adjust and change current situations and ways of working.’*

services when an accident occurs. In the long run, it is possible that the database becomes the most valuable asset of Chipin/Fairzekering when data of a large set of riders is available.

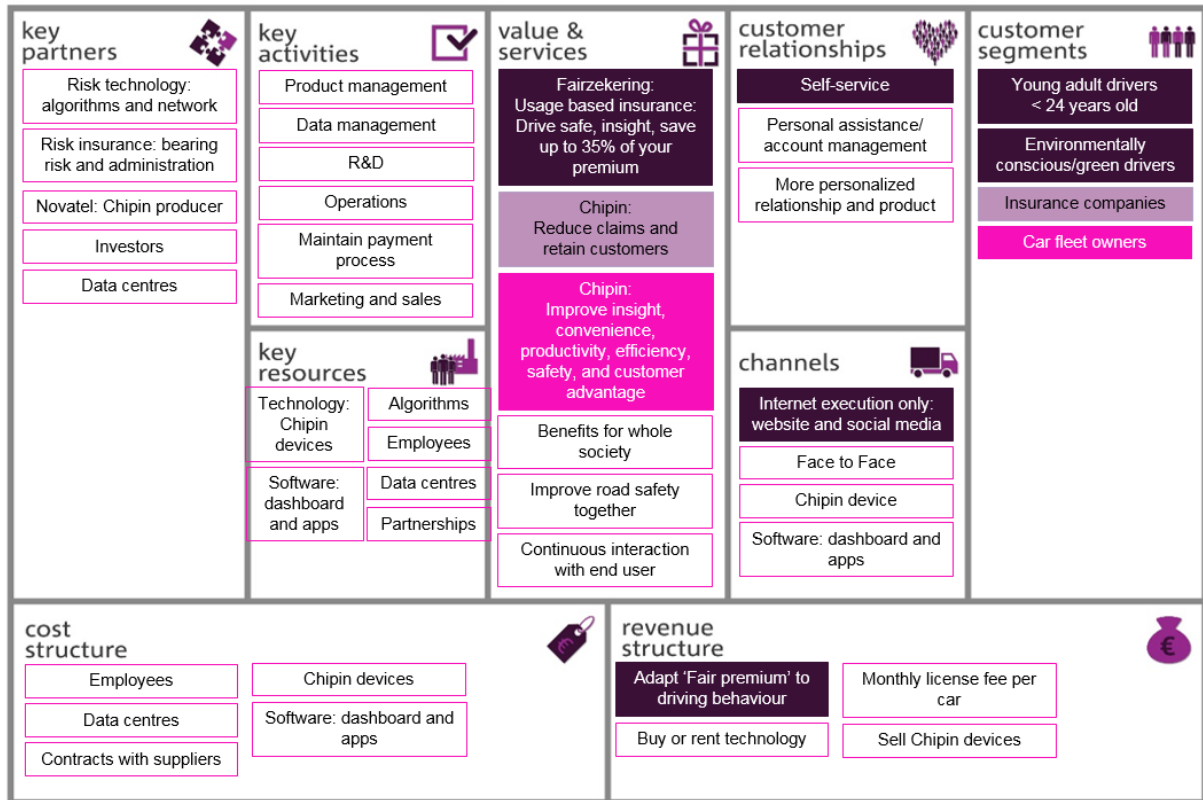


Figure 12: Business Model Canvas of Chipin/Fairzekering

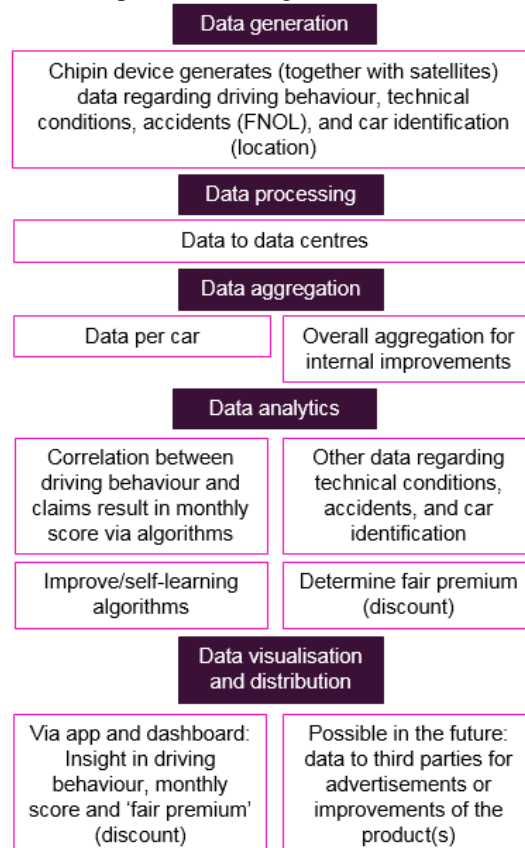


Figure 13: Key activities regarding data at Chipin/Fairzekering (2014)

### 5.3. COOSTO

Coosto is a Dutch organisation that offers the Coosto tool for social media monitoring and webcare. Coosto's name is a derivative from the French deep-sea explorer Jacques Cousteau. Coosto dives into social web data and provides in-depth insight into conversations on social media. Coosto focuses mainly on the Coosto tool. Training and consultancy is also provided to support the tool. Whereas Coosto is a real B2B organisation, they specify several organisational departments as customer segments. They create, deliver and capture also value for scientific researchers, because the Coosto tool helps to gather data and insights in an accurate and convenient way.

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*'Complete organisations may benefit when multiple departments use the Coosto tool, because insights can be shared.'*

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Currently, Coosto is active in three countries: Belgium, the Netherlands and the United Kingdom. Coosto acquires data from more than 400,000 social (dynamic) sites. Coosto (2015) defines social sites as sites 'where interaction takes place.' So, these are not only known social media platforms such as Facebook, Instagram and Twitter, but also less known platforms such as forums, blogs and news sites. Coosto does not generate data. Only the acquired data is processed to data centres. This is done since 2009 for every country where Coosto is active. In fact, Coosto creates a copy of the social domain on the internet.

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*'Often it is an eye-opener for organisations when they see that people speak about their organisation on, for them, unknown sites.'*

---

Coosto aggregates data such as posts and reactions on news articles. Before Coosto saves data, several analyses and classifications are done, such as gender and sentiment analysis (see Figure 16). All these steps are done automatically. Users of the Coosto tool get the results of these analyses together with raw social data via keyword search. Afterwards, users can analyse data provided by the Coosto tool to gain more insights. Coosto also offers an engagement module to support work in webcare teams.

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*'We process, for example, a tweet in the Coosto data archive within a minute after someone posts a tweet. The fact that we create real-time and automatically insights in all this data makes us innovative.'*

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Via the Coosto tool, users get real-time answers (insights) on questions regarding who, what, where, when, why, and how. Figure 14 depicts a screenshot of Coosto Open regarding 'Utwente' as key word search term. These results may support brand monitoring in organisations. Coosto Open is a free version of the Coosto tool with limited features. For example, Coosto opens provides insights in the statistics of the last thirty days. The left side of Figure 14 shows other paid features of the Coosto tool. Coosto Open is a channel in the BMC to reach (new) customers segments.

For this example, the Dutch version of Coosto open is used, because in the Dutch social domain Utwente is more commonly used. Results show that the activity and sentiment increased after the Christmas holidays. Plausibly, the fact that there was a (free) new year's breakfast on the fifth of January supports these (positive) results.

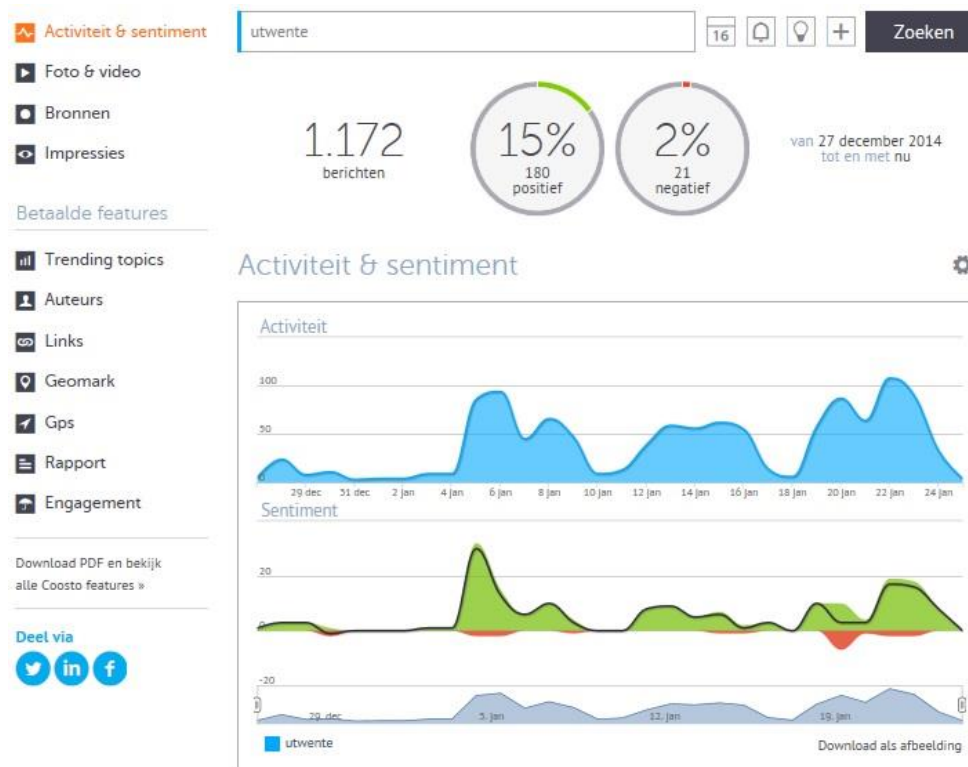


Figure 14: Coosto Open screenshot with 'Utwente' activity and sentiment analysis (25-1-2015)

Currently, Coosto offers three versions in three countries. In the near future, Coosto aims to link and bundle these versions, and related data archives, in order to create a proposition in which Coosto creates, delivers and captures value for multinationals.



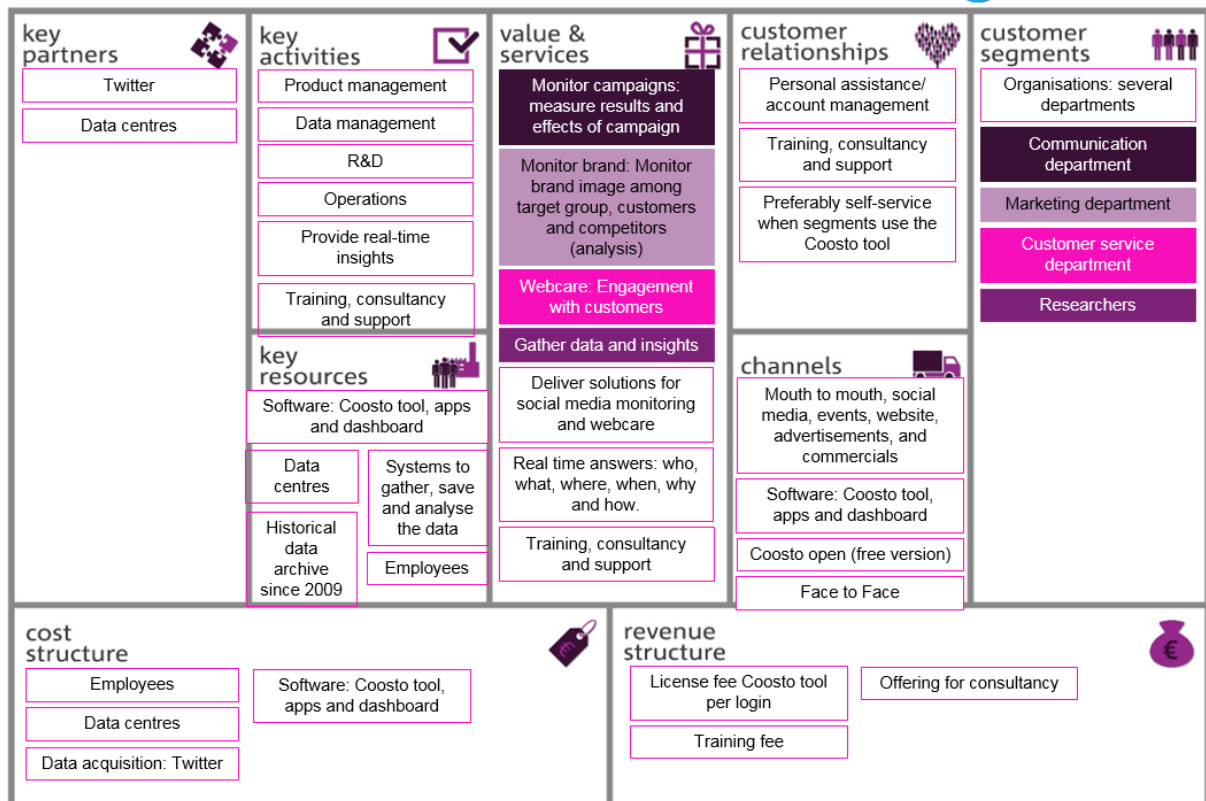


Figure 15: Business model canvas of Coosto

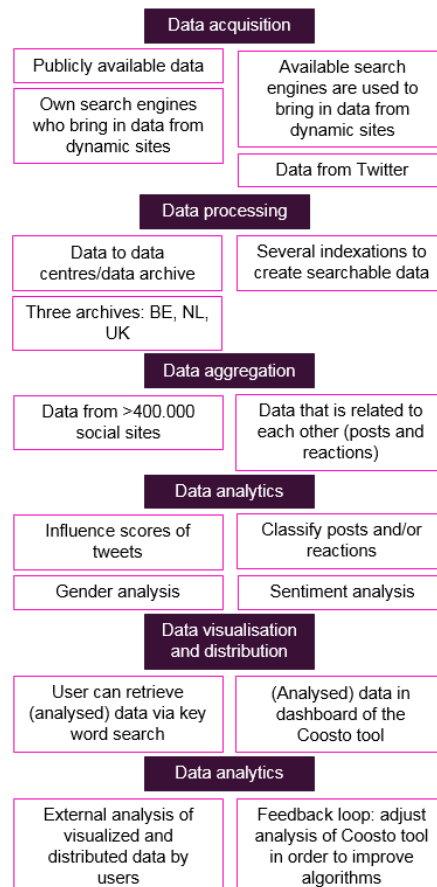


Figure 16: Key activities regarding data at Coosto (2015)

#### 5.4. FACEBOOK

Facebook offers different products such as Facebook, Messenger, Instagram and WhatsApp. In this research and paragraph, Facebook (the website and app) is studied and described as information driven innovation.

Facebook, the well-known social media platform, was founded in 2004 when college students, including founder and current CEO Mark Zuckerberg, joined Facebook. Since 2006, Facebook is open for everyone. This resulted in 1.39 billion monthly active users as of December 31, 2014 and this contributes to the networking effects in the BMC. During the last years,

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*The mission of Facebook (2014a) is to 'give people the power to share and make the world more open and connected. People use Facebook to stay connected with friends and family, to discover what's going on in the world, and to share and express what matters to them.'*

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Facebook improved and added several products on the Facebook platform such as the profile, news feed, graph search, pages, groups, photos, and videos (Facebook, 2014a). Figure 17 depicts a screenshot of the timeline of the University of Twente page.

In their annual report 2013, Facebook explicitly states which value they aim to create, deliver and capture for different customer segments: (internet) users, marketers and developers (see Figure 18). The mission of Facebook, cited above, focuses on value for Facebook users. This underlines the importance of Facebook users in their business model, where insights, based on these users, are processed into targeted reach and ads for marketers. This is important for the revenue streams of Facebook, since internet users do not have to pay for a Facebook account. Facebook earns money through (advertising) fees of marketers and developers. Developers use 'a set of development tools and Application Programming Interfaces (APIs) that enable developers to easily integrate with Facebook to create mobile and web applications (Facebook, 2013, p. 6).' So when there are a lot of (active) users, it is interesting for marketers and developers to collaborate with/buy at Facebook. Therefore, it is important that (more) users remain active on the Facebook platform.

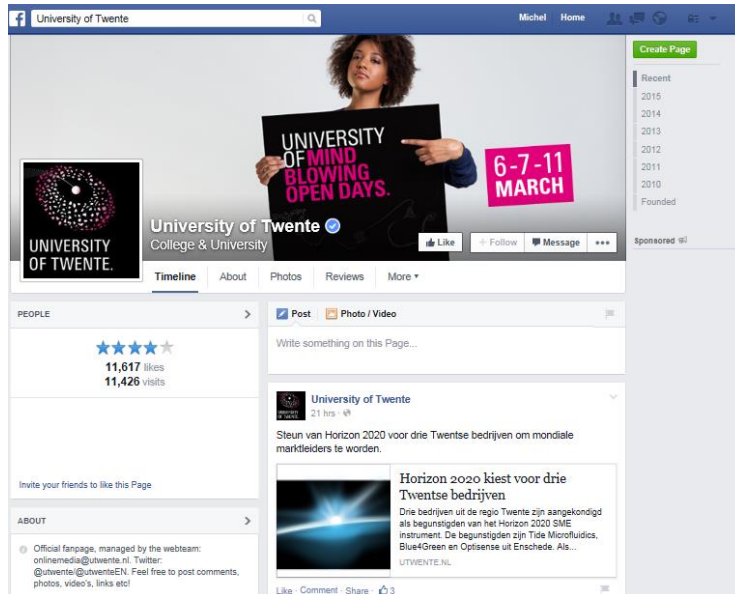


Figure 17: Anonymised screenshot Facebook page University of Twente (30-1-2015)

Certain elements are omitted in the screenshot for privacy reasons. For example, advertisements (revenue stream) are omitted on the right of this screenshot. Advertisements are targeted on the Facebook user based on insights that Facebook generates by analysing how, when, wherefore, and where users use Facebook.

Facebook (2014b) updated their privacy policy on the 30<sup>th</sup> of January 2015 in which they explain what information they acquire from multiple sources (Figure 19). For example, information what users do and provide by adding content. Facebook processes and distributes this information within seconds to and from the platform. Facebook acquires also information how people use Instagram and Facebook and shares this information between these two platforms. In addition, Facebook acquires also data when users visit or use other third-party websites and apps that use Facebook services. In the media is a lot of criticism on this policy, because it is sometimes unclear which information Facebook acquires and how far they may follow users (e.g. NOS, 2014; Globalnews, 2015). Facebook generates and acquires all this information to create a more complete profile of a Facebook user. Facebook classifies the information of users, e.g. locations, interests and/or gender. When marketers want to advertise, they can target their ads to a specific audience. Thereupon, Facebook aims to create more value for marketers by improving the targeted reach.

Facebook aims to improve their products and services in the near future. The updated data policy, briefly introduced before, is an example to improve the products. Facebook intends 'to increase the size of our network by continuing our marketing and user acquisition efforts, enhancing our products including mobile applications, and making Facebook more easily accessible to people throughout the world (Facebook, 2013, p. 7).' This is important, because the user community is the core of the BMC of Facebook.

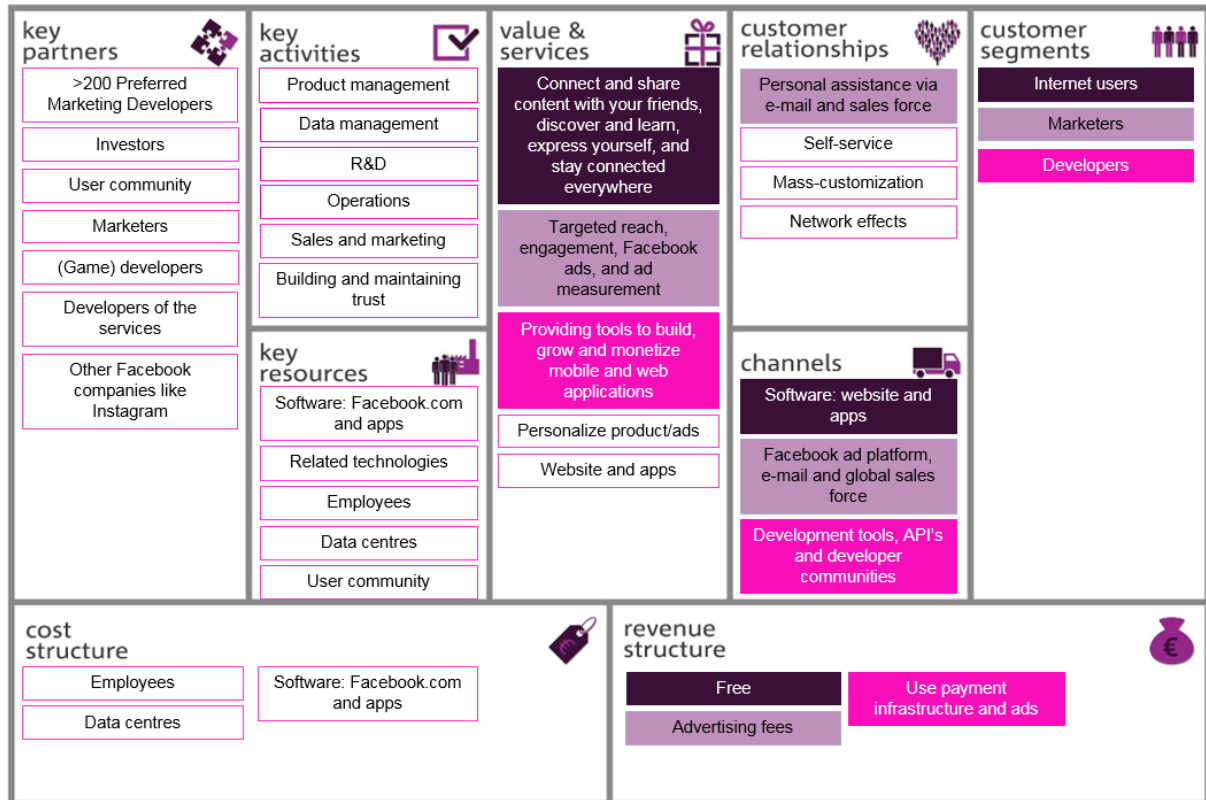


Figure 18: Business Model Canvas of Facebook

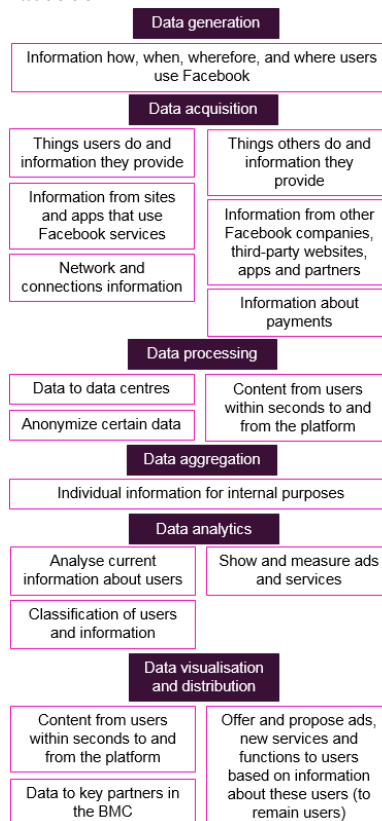


Figure 19: Key activities regarding data at Facebook (2014b)

### 5.5. QUBY SMART THERMOSTAT

Quby is a Dutch organisation and developer of the Smart Thermostat. The Quby Smart Thermostat provides insights in and control over energy use and costs. Households want insights and control for several reasons such as increasing energy costs

and attention for sustainability. Energy providers and/or grid operators who offer the Smart Thermostat have a tool for interaction with customers and, thereby, stand out from competitors (attract new customers) and increase customer retention.

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*'Based on insights, households can optimally manage energy use and costs. To gather these insights, we generate and analyse a lot of information/data.'*

---

In the Netherlands, Eneco (energy provider) exclusively distributes the so-called 'Toon' thermostat (Figure 20). Eneco distributed about 100,000 Toon thermostats already. Currently, Quby wants to sell the Smart Thermostat to other energy providers and/or grid operators in other countries (see customer segments in the BMC). These segments have contact with households, the end user of the thermostat. Thereby, energy providers and/or grid operators can be identified as customer segment, channel, key resource, and key partner in the BMC of Quby. Besides that, Quby identifies households also as customer segment, since Quby aims to satisfy their needs. Quby does not receive revenue streams directly from these households. Households pay to energy providers and/or grid operators. Quby gathers revenue streams through energy providers and/or grid operators.



Figure 20: Toon Thermostat of Eneco produced by Quby

The Smart Thermostat focuses on energy use and costs. Therefore, a meter adapter needs to be installed in the meter cupboard of households. This adapter generates data regarding gas and electricity usage (Figure 23). Together with energy tariffs, all data is processed to the Smart Thermostat via WiFi. The Smart Thermostat aggregates data on different time levels such as

seconds, hours, and years. For example, households may want to know their current (second level) and past energy usage (year level). After several analyses, the Smart Thermostat visualises usage information in kWh, m3 and costs on the display (Figure 21). Users can control their energy usage through the display and apps. Apps provide remote access to the Smart Thermostat. Via so-called Toon Smart Plug-ins, users also have remote access to control energy usage of devices such as home lighting. Quby's philosophy is to keep data as much as possible on the Smart Thermostat. Quby processes data to other households and data centres only when

*'It is our philosophy to keep data as much as possible on the Smart Thermostat.'*

users provide consent to benchmark energy usage with others and for product management/development.



Figure 21: Dashboard Toon Thermostat of Eneco

As shown in the value proposition in Figure 22, the Quby Smart Thermostat is a platform for new (data) services. Many new data services are relevant when there are a lot of users. For example, a service to predict maintenance on boilers. Technically this is already possible. Currently, Quby develops a business model for this. Other examples are creating insights in solar energy or insights for boiler producers to know where their boilers are installed. In order to develop the Smart Thermostat and new data services, smart people are required. Therefore, employees entail the largest expenses for Quby.

*'We develop new business models based on the Smart Thermostat to create value for multiple parties.'*



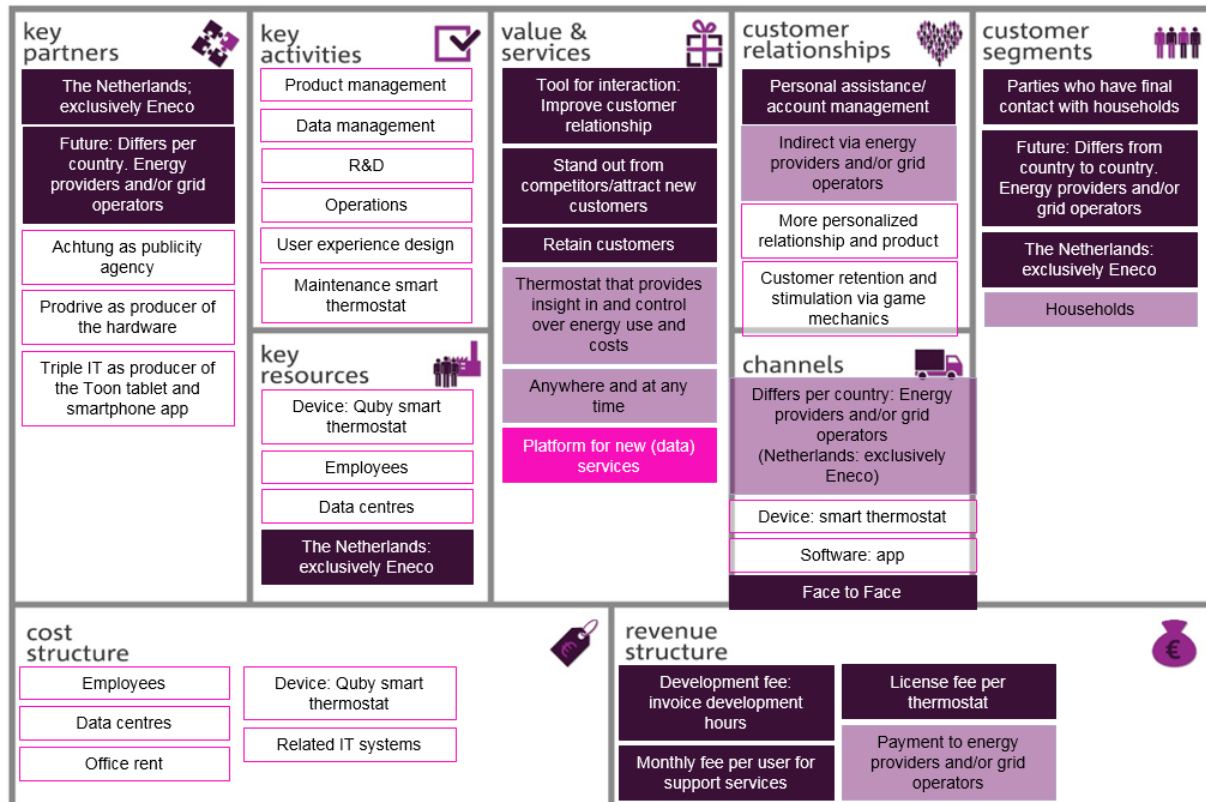


Figure 22: Business Model Canvas of Quby Smart Thermostat

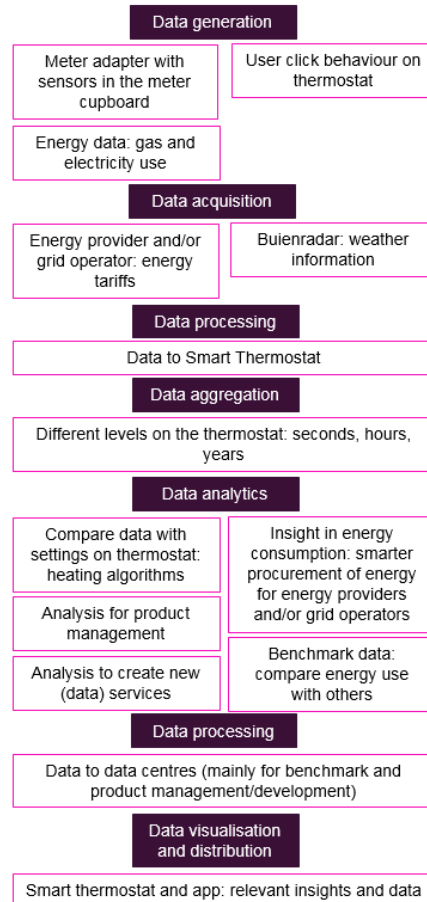


Figure 23: Key activities regarding data regarding the Quby Smart Thermostat (Eneco, 2014)

## 5.6. SENSE HEALTH

Sense Labs (previously Sense Observation Systems) is a Dutch organisation that has developed a platform to facilitate real time processing of sensor data. Their main focus is healthcare, while they also offer their platform for use in the Internet of Things domain. Developers can add and connect sensor devices and applications. In this research, the focus is on the Sense Health domain, where Sense develops context aware applications, using sensor data in their applications and building cognitive behavioural coaching applications.

Sense Health develops applications that empower individuals to control their health and wellbeing. Sense Health focuses on vital signs, emotions and behaviour. The applications provide insights in behaviour and consequences on wellbeing. Sense Health works closely together with domain expert. Sonneveld education for vitality and Parnassia for mental health. They set the norms regarding vital signs, emotions and behaviour. These norms are

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*'We are able to gather a lot of data via sensors concerning an individual. Thereupon, we monitor and coach individuals real-time.'*

---

*'Coaches are available 24/7 via our applications. They provide personalised feedback at moments when individuals (mainly patients) need it.'*

---

compared with individuals through applications. Based on these insights, individuals are coached. Thereby, the applications of Sense Health are personalised which entails customer satisfaction and retention. Thereupon, Sense Health aims to trigger behavioural change by coaching individuals (interaction). Sense Health aims to do this real-time.

The customer segments of Sense Health are healthcare institutions and organisations/employers. Currently, Sense Health develops applications together with these segments. Therefore, customer segments are also key partners in the BMC. Examples of applications are Goalie (focus on mental healthcare), iVitality (chronic diseases) and Brighter (focus on employee well-being). The Brighter app is explained to get a better understanding of this application. Brighter is developed together with ASML (customer segment and key partner). Figure 24 depicts a screenshot of the Brighter app. The (Brighter) application activates certain (available) sensors in smartphones. Thereby, this app gathers information through smartphones as sensor-rich device.



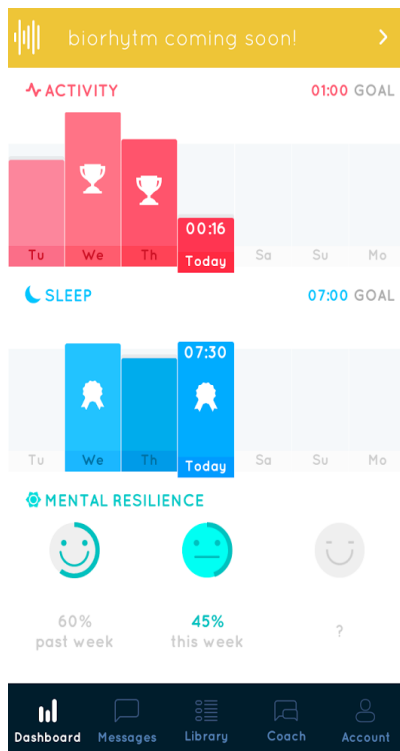


Figure 24: Screenshot Brighter app

The sensors generate data regarding activity, sleep and mental resilience. The app analyses and visualises personalised data (insights). Besides the dashboard (Figure 24), the Brighter app has multiple other tabs. Based on goals that are set by individuals, the app coaches individuals with messages such as ‘you are at 80% of your target at 60 minutes. Just 5 minutes to go.’ Besides own goals, other goals and information (of Sonneveld education) are added. Stories to enhance vitality are shared under the library tab. Under the coach tab, it is possible to get in touch with a personal coach. So, the Brighter app stimulates individuals to improve their behaviour and reduce medical expenses which benefits individuals and organisations. Finally, individuals may improve the accuracy of the app manually by correcting measurements done through smartphone sensors.

In the near future, Sense Health keeps on developing and investing in their current applications and algorithms. In addition, Sense Health wants to respond to demand on the relatively new market on which they operate. Sense Health identifies multiple opportunities that create benefits for multiple parties by focusing on diseases such as diabetes, rheumatism or cardiovascular diseases. Sense Health states that it is plausible that technology will change health care.

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*‘Sensors are developing. In the near future it is likely that smart watches become an information sensor in our applications.’*

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*‘Currently, technology supports treatments. In the future, it is possible that treatments support technology.’*

---

In the future, Sense Health aims to transfer from project work, such as developing the Brighter app for ASML, to offering products to a larger market.

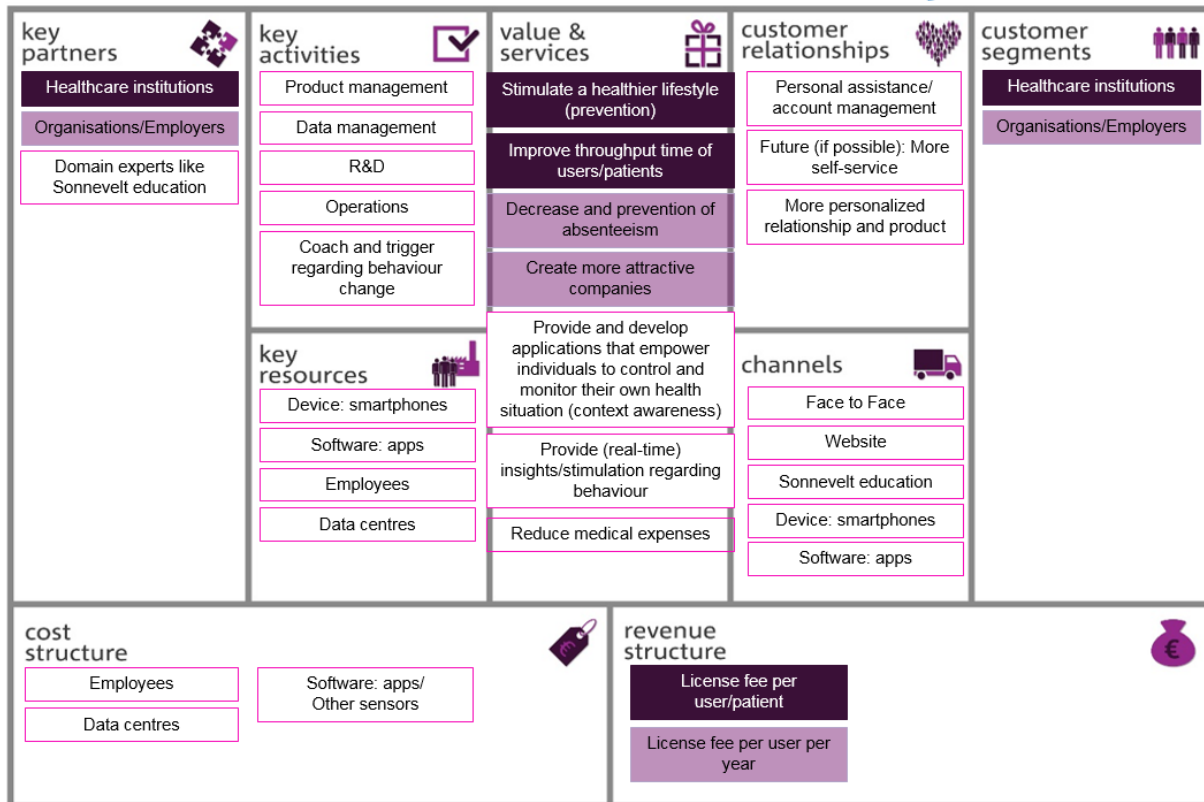


Figure 25: Business Model Canvas of Sense Health

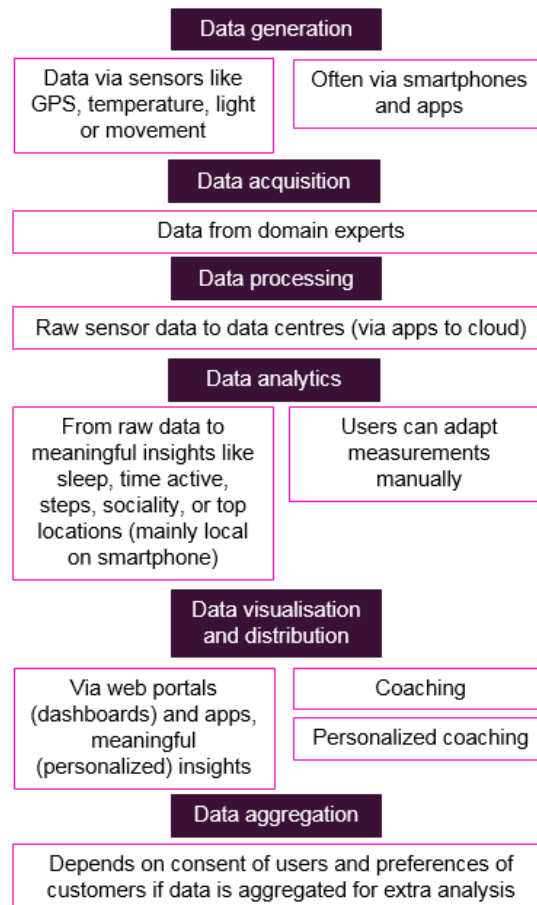


Figure 26: Key activities regarding data at Sense Health (2015b)

## 5.7. TOMTOM TRAFFIC

In this research and paragraph, TomTom Traffic is analysed as information driven innovation. The terminology of the process of TomTom Traffic and Waze are adapted to each other whereas they deliver (almost) the same service.

TomTom is a Dutch organisation that is well known for the production of Personal Navigation Devices (PND's). They sell PND's since 2004 to empower movement. Besides

PND's, TomTom designs and develops other location based solutions such as Global Positioning System (GPS) sport watches, fleet management services and TomTom Traffic.

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*'Since 2006, we develop information driven innovations by focusing on real-time traffic information.'*

---

TomTom started with the development of TomTom Traffic in 2006 to guide drivers in a better way. The service is offered via the PND's (Figure 27), apps and dashboards (channel). The service is available in Europe since 2010. Currently, TomTom Traffic is available in 46 countries all over the world. The goal of TomTom (2015a) is 'to build a more precise view of

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*'TomTom Traffic is a real-time big data solution. Without good data scientists we create rubbish. Smart employees are necessary.'*

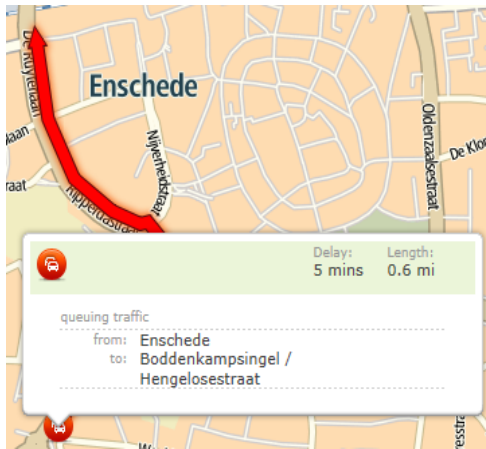
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traffic flow over the entire road network to enable us to give drivers more exact route information and arrival times.' With TomTom Traffic, they aim to reduce traffic congestions for everyone. TomTom wants to create value for multiple parties such as drivers and different organisations (see customer segments). For example, in Figure 27, an alternative route is suggested to save time, fuel consumption and CO2 emission. A more specific example of real-time traffic information (in the online dashboard) is shown in Figure 28. Here below is explained how TomTom creates this real-time traffic information.



Figure 27: Real-time traffic information on a PND

TomTom Traffic generates floating car data of the driver community through apps, GPS and PND's. Information is also generated through detector loops/cameras. In addition, TomTom



Traffic acquires data from multiple public organisations/road authorities such as information about road closures and accidents. TomTom also has a historical archive with real travel times. Drivers contribute to this historical archive. All this data flows to the so-called traffic fusion engine where all data is combined and analysed. TomTom Traffic distributes real-time traffic information (value), such as real-time transfer times and delays.

Figure 28: Real-time traffic information in the online dashboard

The so-called community of drivers is important for TomTom Traffic since they are customer segment, key resource and key partner in the business model. Value is mainly created by and for the community, the end user installed base. Currently, the community consists out of 400,000 vehicles worldwide. TomTom aims to attract more vehicles via partnerships with automotive manufacturers.

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*‘Real-time traffic information improves when there are more drivers who use and contribute to TomTom Traffic.’*

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*‘The biggest challenge regarding privacy: not knowing where drivers are unless we need to know their location to generate valuable real-time traffic information.’*

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Privacy is about freedom and self-determination, two important aspects for drivers. Privacy of information and data is important. TomTom (2015b) aims to ‘respect and safeguard the contribution made by every single driver. We create profiles of the roads, not of people.’ TomTom focuses on privacy by design: generate and acquire not more data than necessary.

Besides expanding and developing TomTom Traffic, TomTom focus on technologies and services regarding highly automated driving.

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*‘Currently, we offer navigation to a lot of drivers. In the future, drivers prefer more information instead of navigation.’*

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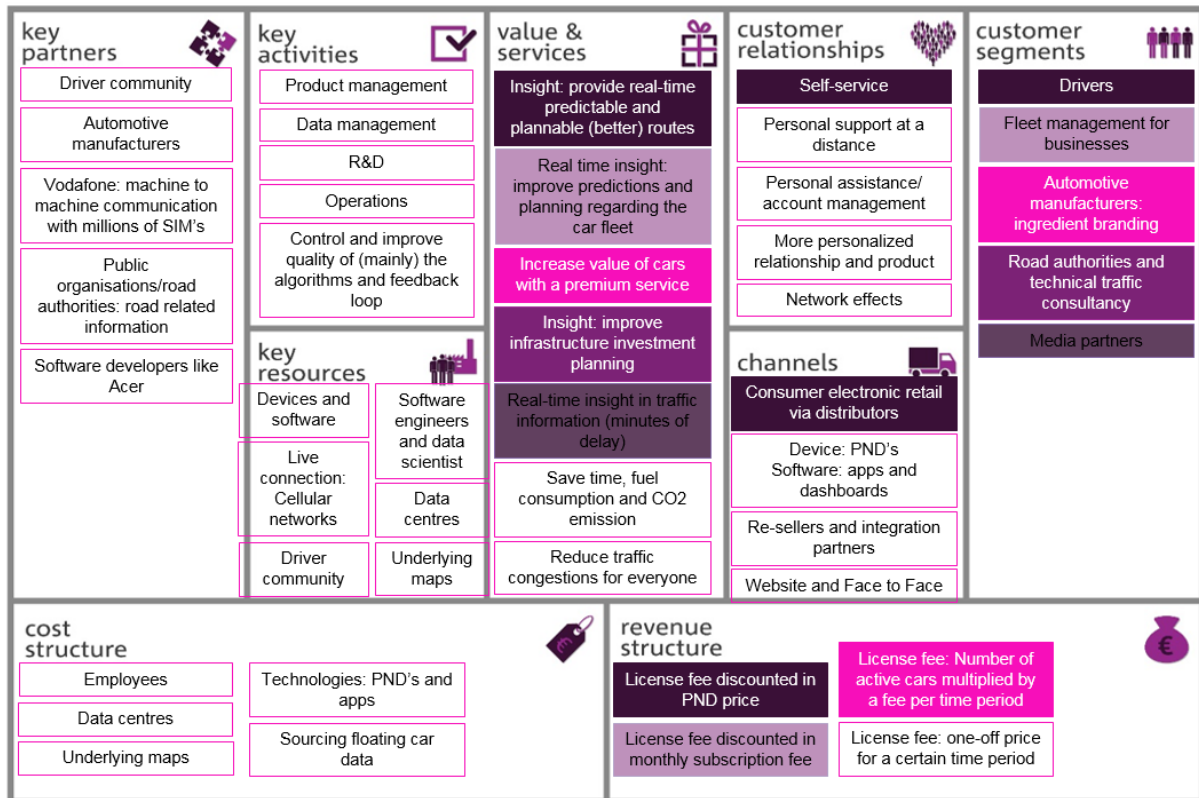


Figure 29: Business Model Canvas of TomTom Traffic

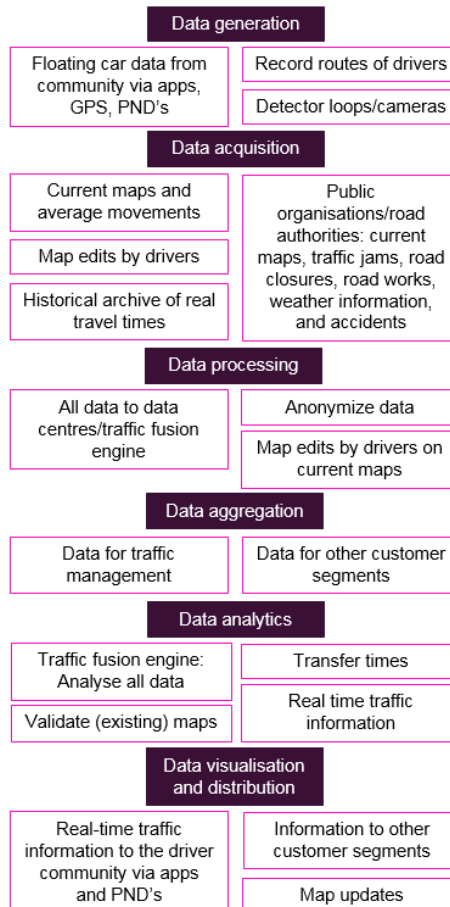
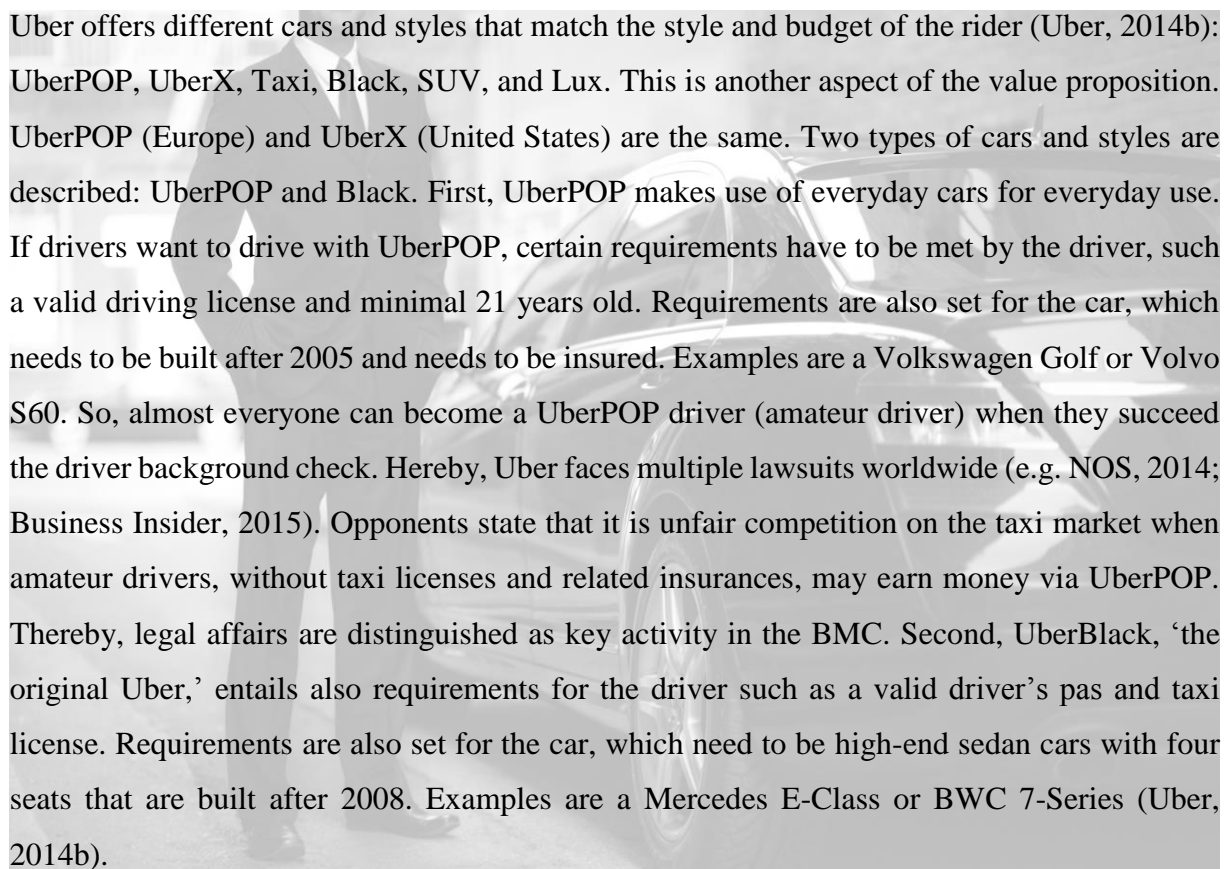


Figure 30: Key activities regarding data at TomTom Traffic (2015)

## 5.8. UBER

Uber, headquartered in the United States, is a privately held company and does not provide annual reports including the exact number of the increasing number of fte's. Uber is a ridesharing service that connects riders to drivers, the customer segments, through their apps. They identify themselves as an order service instead of a transport company. Uber (2014a) states that they evolve the way the world moves, make cities more accessible, open up more possibilities for riders and more business for drivers. This is processed in the BMC of Uber.



Uber offers different cars and styles that match the style and budget of the rider (Uber, 2014b): UberPOP, UberX, Taxi, Black, SUV, and Lux. This is another aspect of the value proposition. UberPOP (Europe) and UberX (United States) are the same. Two types of cars and styles are described: UberPOP and Black. First, UberPOP makes use of everyday cars for everyday use. If drivers want to drive with UberPOP, certain requirements have to be met by the driver, such as a valid driving license and minimal 21 years old. Requirements are also set for the car, which needs to be built after 2005 and needs to be insured. Examples are a Volkswagen Golf or Volvo S60. So, almost everyone can become a UberPOP driver (amateur driver) when they succeed the driver background check. Hereby, Uber faces multiple lawsuits worldwide (e.g. NOS, 2014; Business Insider, 2015). Opponents state that it is unfair competition on the taxi market when amateur drivers, without taxi licenses and related insurances, may earn money via UberPOP. Thereby, legal affairs are distinguished as key activity in the BMC. Second, UberBlack, 'the original Uber,' entails also requirements for the driver such as a valid driver's pas and taxi license. Requirements are also set for the car, which need to be high-end sedan cars with four seats that are built after 2008. Examples are a Mercedes E-Class or BWC 7-Series (Uber, 2014b).

The amount and availability of different cars and styles differs per city. For example, in the Netherlands, UberPOP, Black and Lux are available in Amsterdam and UberPOP and Black are available in The Hague and Rotterdam (Uber, 2014c). To get a better understanding of Uber and their services for this research, an UberPOP ride is ordered in Amsterdam. Figure 31 depicts a screenshot of driving with UberPOP through the Uber app. The name of the driver, picture and license plate information are excluded.



# U B E R

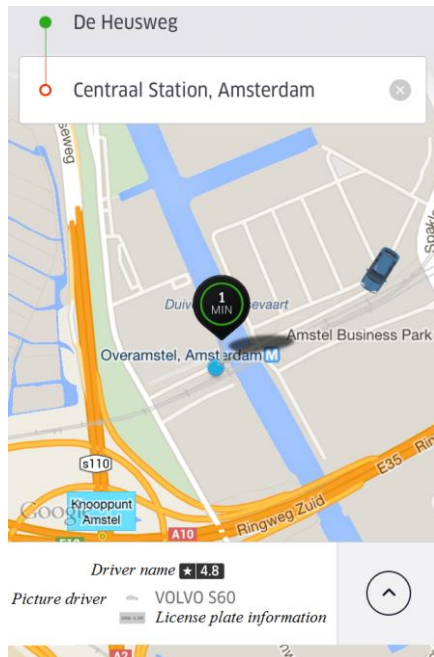


Figure 31: Anonymised screenshot driving with UberPOP

Uber generates real-time geo location information of riders and drivers through the GPS of smartphones. The app for drivers is installed on phones that Uber provides to drivers. When riders determine a pickup location and order a driver, The Uber app offers, after analysis, riders real-time the nearest available driver with the highest rating. When riders accept an offer, they can follow real-time where their driver is (the car on the map in Figure 31). In addition, an estimated time of arrival is shown to the rider. To create reliable pickups, other information of drivers is displayed such as the rating, name, picture, and license plate information of a driver.

Based on the Uber style, kilometres and minutes of the ride, the Uber smartphone and app of the drivers determine the prices. If the demand for rides increases in a city, the price for Uber rides increases as well (price surging). This is an incentive for drivers to get on the road, but ‘when enough cars are on the road, prices go back down to normal levels (Uber, 2014d).’ Riders and drivers do not need cash, because money is transferred via the account of a rider. Afterwards, riders get specific insights in their trips via the online dashboard (Figure 33). In addition, riders and drivers can rate each other to enhance the performances of both segments.

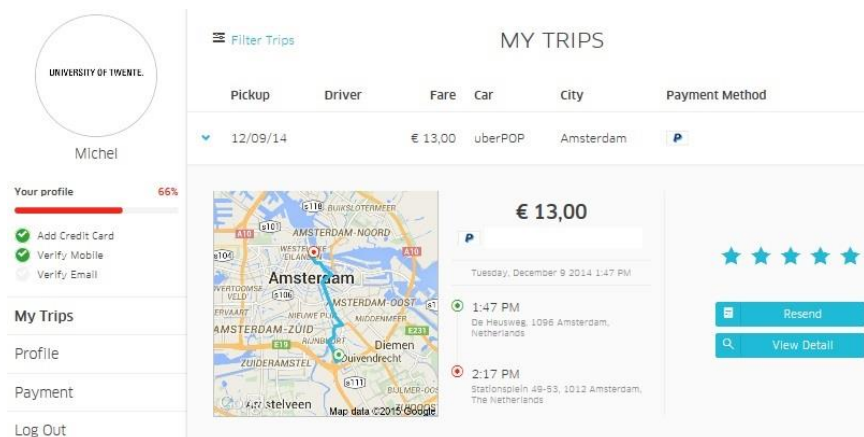


Figure 32: Screenshot online dashboard Uber

Uber is founded in 2009 and currently available in 250 cities in 54 countries worldwide (Uber, 2014a). The future plans of Uber (2014a) are clear: ‘Uber is rapidly expanding global presence continues to bring people and their cities closer.’

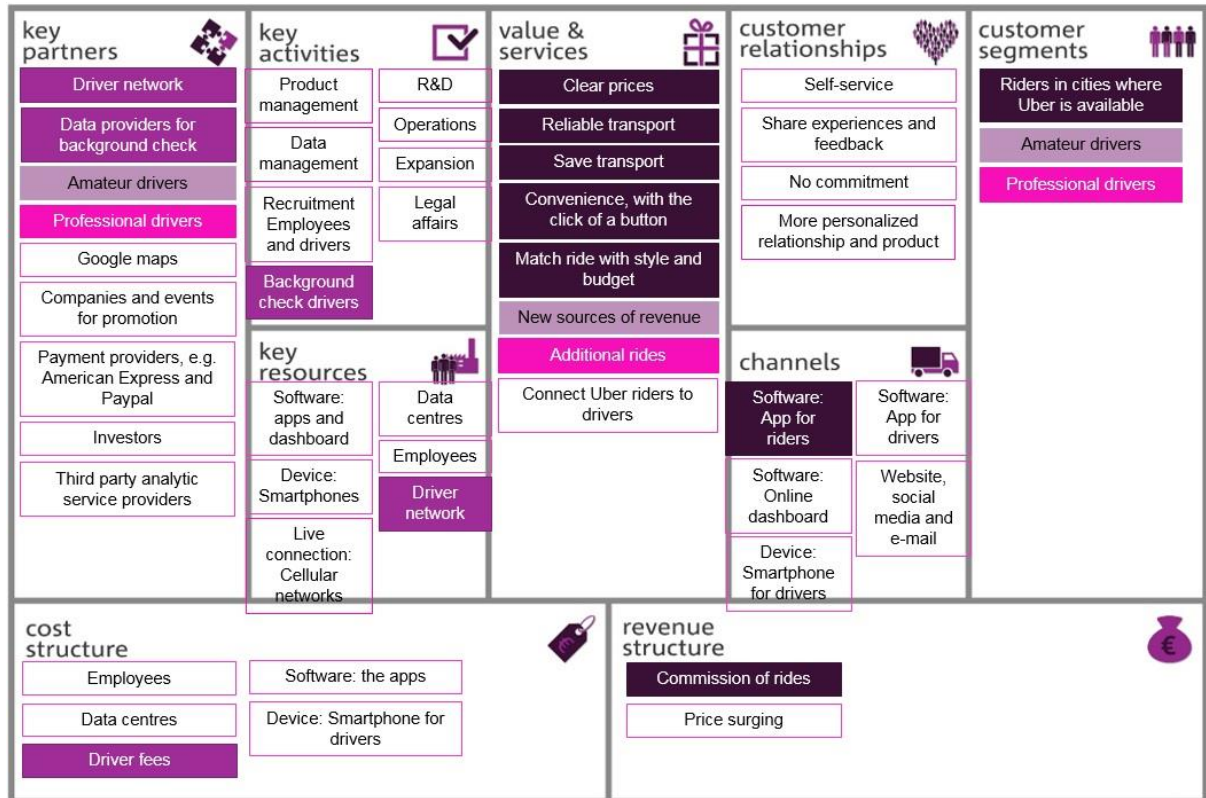


Figure 33: Business Model Canvas of Uber

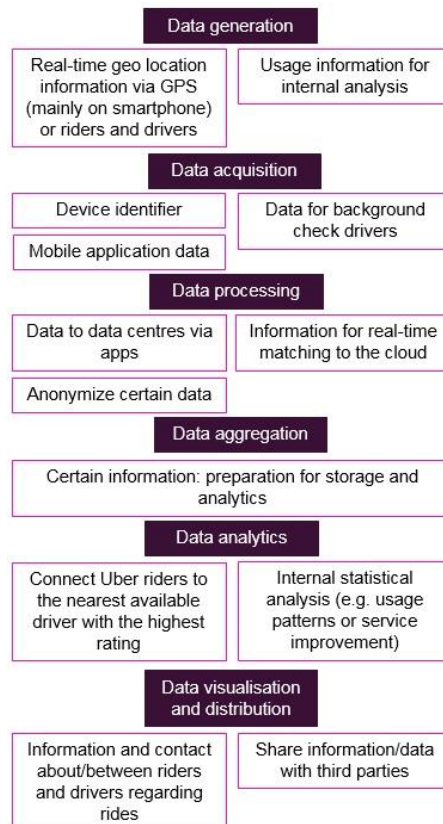


Figure 34: Key activities regarding data at Uber (2014e)



## 5.9. WAZE

Waze offers (almost) the same service as TomTom Traffic. Therefore, the terminology of Waze and TomTom Traffic are adapted to each other. Several main differences between Waze and TomTom Traffic are described in this paragraph.

Waze is headquartered in the United States and was acquired by Google for more than 1 billion dollars in 2013 (Economist, 2013). Waze (2014a) is a navigation app that creates real-time traffic and road information worldwide and thereby ‘saving everyone time and gas money on their daily commute.’ Waze generates real-time traffic information by connecting and analysing information of individual drivers. A screenshot of real-time traffic information from Enschede



Figure 35: Screenshot real-time traffic information of Waze

to Schiphol airport is shown in Figure 35. By combining the real-time traffic information of individuals, Waze aims to ‘outsmart traffic, together (Waze, 2014a).’ This is the core of the BMC and, thereby, the drivers are important to create, deliver and capture value.

The Waze app is free for drivers, a key difference with TomTom Traffic. Waze main revenue stream is location based advertising for organisations (customer segment). Advertisers pin their business on the map and, thereafter, drivers near the location see the pin of an organisation (Figure 36). When drivers search on the map, the organisations and ads are shown. Organisations can track how many drivers they reach and navigate to their organisation (Waze, 2014c). A second revenue stream are the license fees that Waze generates by aggregating data for governmental departments and other interested parties.

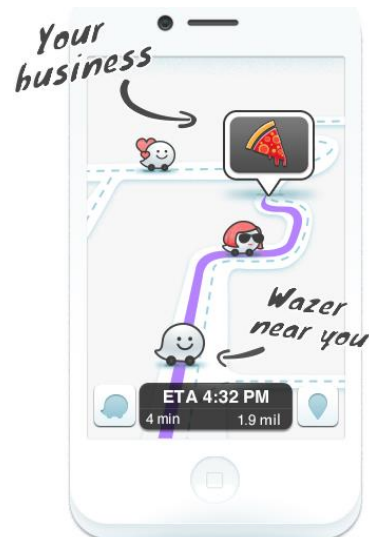


Figure 36: Waze (2014c) advertisements

Waze generates traffic data through the app and GPS from drivers. They do not generate data through PND's (Waze, 2014d). This is a main difference in the key activities regarding data of Waze compared to TomTom Traffic. After typing in the destination, drivers need to drive with the app open on their phone. The data network (key resource) and telecom providers (key partners) are important in the BMC (Waze, 2014b). Waze depicts mainly the smarter routes, other drivers (icons) and other road information (icons) on the app (Figure 35).

As stated before, the community of drivers is important in the BMC. Waze uses a gamification element to improve the customer relationship and retain drivers. Drivers earn points by driving with Waze (e.g. 3.2 points per KM). Drivers also earn points via different activities besides providing automatically real-time traffic information. Waze (2014e) asks drivers, for example, to provide road information regarding accidents, police traps or other hazards along the way. Drivers earn points for these road reports. Waze (2014e) stimulates drivers to edit and improve the maps to 'ensure that the data in their areas is as up-to-date as possible.' Drivers can edit maps automatically and this entails extra points (Waze, 2014f). Figure 37 depicts a screenshot of this web editing tool and shows which adaptations drivers can do. Waze ranks all drivers to stimulate their contribution and improve the real-time traffic information and, thereby, the BMC.

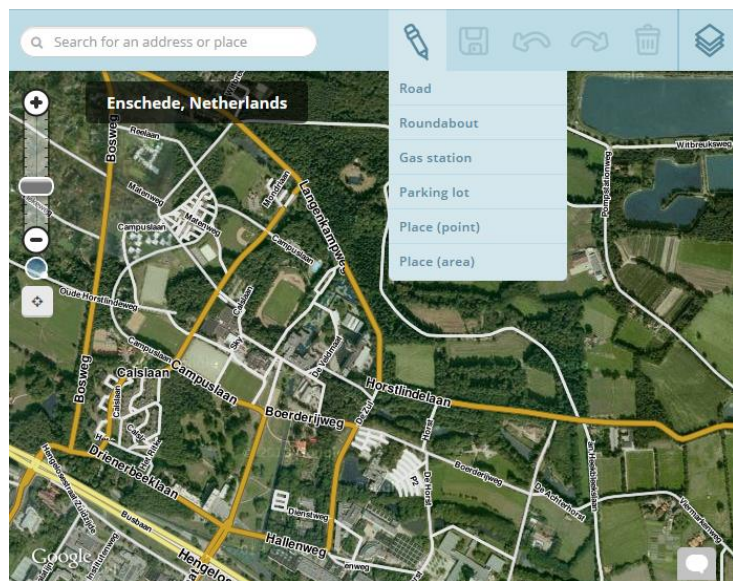


Figure 37: Screenshot map editing tool of Waze

Waze does not state clear goals that they want to reach in the (near) future. Currently, Waze (2014g) develops there apps and related technologies. 'Waze is aware of your concerns and is working to make things better (Waze, 2014g).' For example, Waze (2014g) focuses on improvement of the worldwide infrastructure, integrating features to generate extra revenues and 'implementing a web interface to allow editors to immediately close streets for a specified period.'

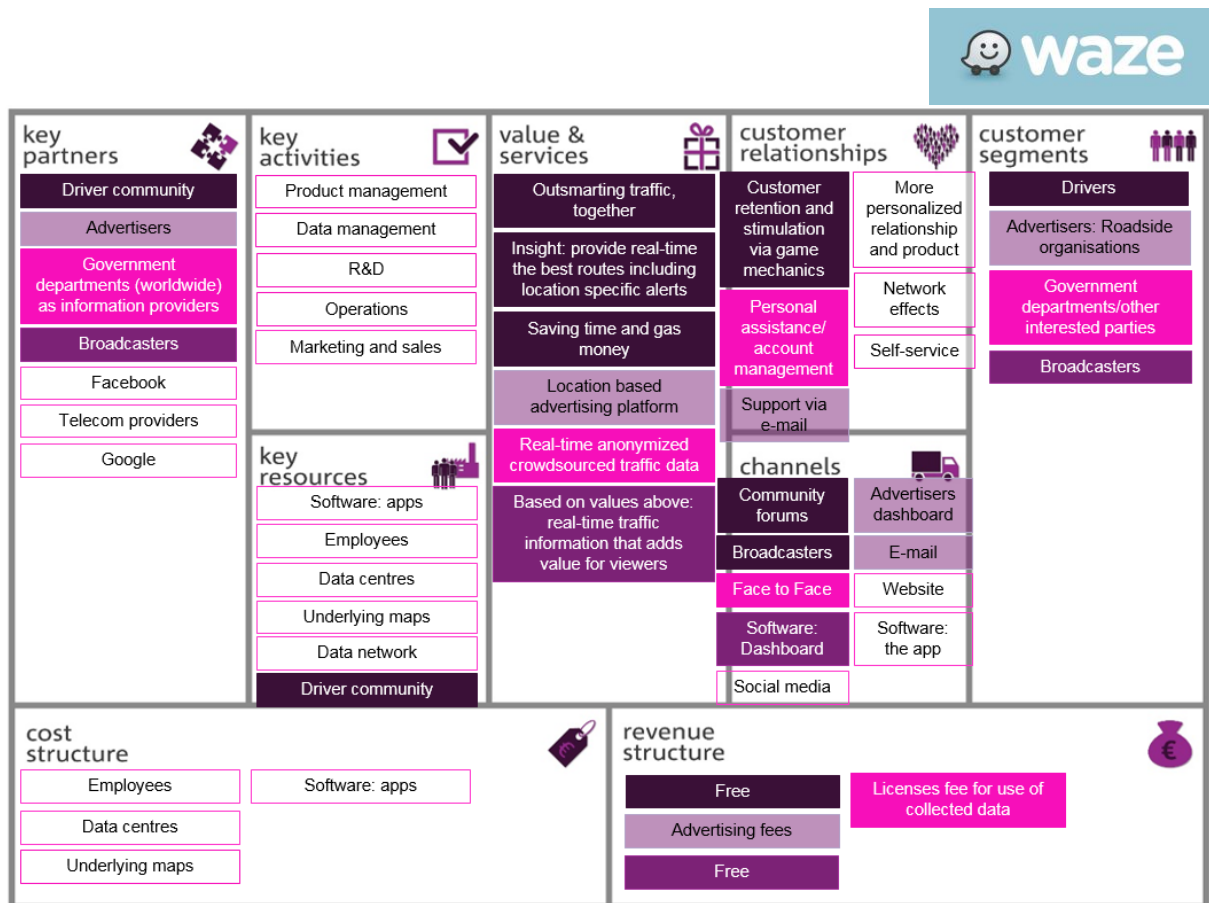


Figure 38: Business Model Canvas of Waze

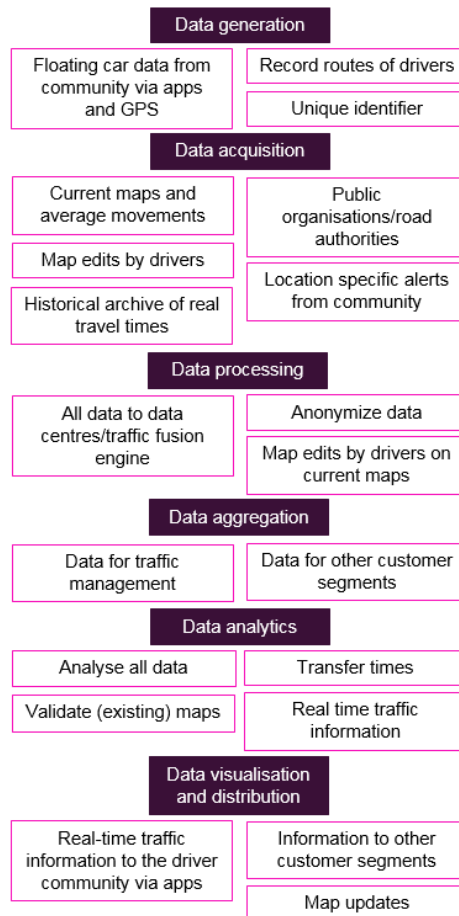


Figure 39: Key activities regarding data at Waze (2014d)

## 6. Information driven business model patterns

In this chapter, the first part of the ‘research report’ phase is described. The BM patterns, derived from the case description in the previous chapter, address the third sub-question: which information driven business model patterns can be derived? To address this sub-question, this chapter starts with a classification of the cases and patterns in, respectively, paragraph 6.1 and 6.2. in order to create an understanding of the common ground. Generic descriptions of the patterns that are derived in this study are added in paragraph 6.3. Before the patterns are explained in detail, the format of the patterns is explained in paragraph 6.4. Paragraph 6.5 up to and including 6.11 contain detailed explanations of the seven most information driven business model patterns that are derived in this research. Finally, paragraph 6.12 describes how patterns are linked and interrelated.

### 6.1. CLASSIFICATION OF STUDIED CASES

Two topics are discussed in this paragraph:

- Classification in literature;
- Classification of cases.

#### Classification in literature

Classification is about comparing and ordering objects into groups, based on the comparisons between these objects (Bailey, 1994). Therefore, a classification scheme forms the foundation for the development of the patterns. It shows the main differences between cases and supports the derivation of the patterns. In addition, a classification enhances the understanding of the cases and patterns (Lambert, 2006).

Classifying cases and patterns is a complex process (Bailey, 1994; Lambert, 2006). Lambert (2006) investigates multiple business model frameworks and shows that every author classifies business models in different ways. This is in line with the findings in chapter 2, where dimensions of multiple business model frameworks were analysed. The complexity of classifications increases with the number of variables (dimensions) that are taken into account (Bailey, 1994; Lambert, 2006). For example, two dichotomous dimensions result in 4 cells ( $=2^2$ ) and five dimensions result in 32 cells ( $=2^5$ ).

It is not possible in the scope of this master thesis to investigate and compare multiple or even all dimensions in a classification scheme. Therefore, this research aims to classify the cases and patterns via the two most important dimensions that distinguish the cases and patterns. As explained in chapter 4, the classification will be developed through an iterative process with multiple sessions.

Abdollahi and Leimstoll (2011) investigate a classification for business model types in e-commerce. Their results show the benefits of a two-dimensional classification compared to a three-dimensional classification. In fact, a two-dimensional classification ‘leads to a more appropriate understanding and selection of business models (Abdollahi & Leimstoll, 2011, p. 13).’ Their three-dimensional classification provides useless result. Taking three dimensions into account at the same time entail single results since classifying cases among three dimensions differ for every case. Thereby, cases cannot be compared accurately. Whereas this research aims to structure cases in a classification and, thereafter, derive patterns (abstractions) of the classification, a two-dimensional classification is composed.

### **Classification of cases**

The classification focuses on the information driven dimensions of the cases. In chapter 4, the steps to develop these dimensions are explained. These dimensions comprises all cases (Figure 40):

- Data source: (Behaviour; Information/Data);
- Target of value: (Individual(s); Other organisation(s); Crowd).

Cases can be classified among different dimensions for different business activities in their BMC. The dimensions are explained more in detail below.

*Example: Classifying cases among different dimensions for different business activities, the TomTom Traffic case*

TomTom Traffic relies on behaviour as data source to generate real-time traffic information whereby the crowd the target of value is. TomTom Traffic relies also on information/data as data source to give, for example, traffic related insights. Individual behaviour is aggregated to generate these insights. Other organisations are then the target of value, such as road authorities, technical traffic consultancy or media partners.



- *Data source: (Behaviour; Information/Data)*

Two main types of data sources are distinguished that comprise the cases: behaviour and information/data.

*Behaviour as data source: data that is directly related to individual behaviour without aggregating individual contributions directly.*

Multiple information driven innovations rely on behaviour as data source: Chipin/Fairzekering, Facebook, Quby Smart Thermostat, Sense Health, TomTom Traffic, and Waze. Behaviour of individuals is generated through smart technologies (mainly apps and/or devices). Sense Health generates, for example, (health) behaviour of individuals through apps and smartphone sensors.

*Information/data as data source: other (existing) information/data sources and information/data that is derived from behaviour as data source by aggregating this data.*

There are also cases that rely on information/data such as Coosto that acquires all social media data. Coosto builds their business model on this information/data by offering a social media monitoring and engagement tool to other organisations. The main data source for Uber is also information/data, because Uber does not generate behavioural data and focus on combining information/data, such as location information, from two data sources: riders and drivers.

Other cases rely also on information/data for other business activities in their business model. Based on that, cases can also be classified as business models that rely on information/data. Often this information/data is generated by aggregating behaviour. This is already shown in the example of the TomTom Traffic case above.

- *Target of value: (Individual(s); Other organisation(s); Crowd)*

Among the cases, three parties are identified as the target of value. At Quby Smart Thermostat, Sense-Health and Chipin/Fairzekering, the main target are individual(s). For example, an individual gains insight in his/her energy use and costs (behaviour) through the Quby Smart Thermostat. Uber creates also value for individuals: riders and drivers.

Facebook, TomTom Traffic and Waze create value for a crowd. The target of value of these products/services are a crowd. For example, TomTom Traffic creates value for the crowd (of drivers) by generating, aggregating and analysing driving behaviour of all drivers.

The information driven innovations gather valuable information/data when they create value for individuals and/or a crowd. It became clear that all cases have (also) information/data as data source to create value for other organisations. Information driven innovations that rely also on behaviour do, for example, other aggregations and analyses on individual behavioural data to create other information/data. This other information/data may entail value in the BMC of these cases. For example, Facebook offers targeted reach to marketers (other organisations), because they generate valuable information/data by measuring behaviour of a crowd. Quby thinks about generating and selling data to predict maintenance on boilers. This entails value for boiler producers.

Note: other organisation(s) do not refer to the studied case. Of course, all information driven innovations aim to create (financial) value/benefits for their organisation. During the explanation of the patterns is referred to service providers as the organisations that applied a pattern.

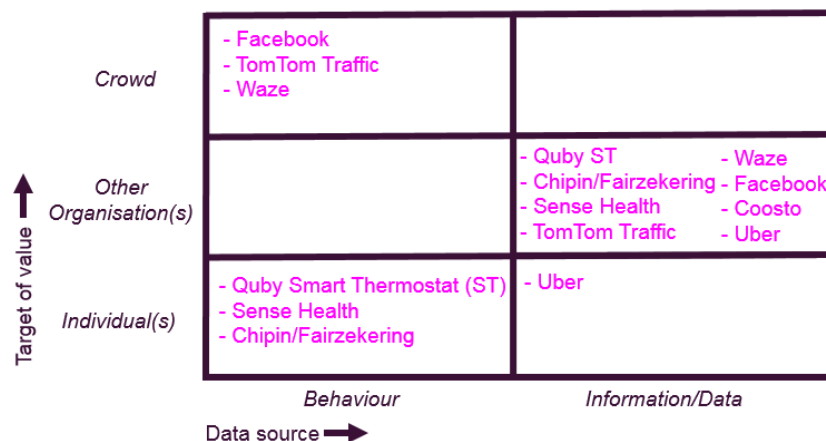


Figure 40: Classification of the information driven innovations cases

### Omitted dimensions

Multiple dimensions were identified and discussed during this research, such as real-time or batch, main information flow: backward or forward, or the focus on the key activity regarding data. The following dimensions are omitted since they are less distinctive for the studied cases:

- *Real-time or batch*

This dimension is not used, since several cases have characteristics of both in a specific business activity which makes this a less distinctive dimension. For example, Coosto provides real-time insights in social sites, but also the opportunity, to have insights in their data archive (batch).

In addition, Facebook can be classified among real-time and batch since updates are shared real-time, but users may also look in the archive (e.g. timelines and photos) of users.

- *Focus on the key activity regarding data*

As shown in the previous chapter, there is a lot overlap between data generation, acquisition, processing, aggregation, analysis, visualisation, and distribution among the cases. Cases cannot be linked to a specific key activity regarding data. What is, for example, the key activity regarding data of Sense Health or Waze? Activities such as generation, aggregation and analysis of data are key activities regarding data in all cases. It became clear that, this dimension is confusing and excluded.

- *Main information flow: backward or forward*

In several cases, information/data flows (from an event) to the organisation. For example, information/data regarding driving behaviour flows back to Chipin/Fairzekering. This could be classified as backward. After analyses, Chipin/Fairzekering visualises and distributes data to individuals to create an event: drive safely. This is classified as forward. It became clear that, cases cannot be classified among this dimension, because all studied cases are a mediator to generate, acquire, analyse, visualise, and distribute information/data from and to events. It became clear that this dimensions is not sufficiently distinctive.

## 6.2. CLASSIFICATION OF THE PATTERNS

Figure 41 introduces the most information driven business model patterns. Chapter 4 explains the methodology to derive the patterns in which this study focused on the information driven aspects of the cases. The patterns are derived from the cases. They are briefly introduced in this paragraph and explained more in detail in paragraph 6.5 up to and including 6.11.

- *Behaviour as data source and individual(s) as the target of value*

The Quby Smart Thermostat provides insights and control over energy use and costs of individuals (pattern 1: individual behavioural insights). On top of these individual behavioural insights, information driven innovations show two possibilities to do ‘something’ with these behavioural insights. Sense-Health stimulates individuals to improve their behaviour (pattern 2: individual behavioural stimulation). Chipin/Fairzekering adapts prices to the behaviour of individuals (pattern 3: individual behavioural pricing).

- *Behaviour as data source and crowd as the target of value*

Individuals connect and share content with friends, discover and learn, express themselves, and stay connected everywhere via the Facebook platform. When individuals share content (behaviour), they automatically create value for Facebook users (crowd).



Data is not aggregated and individual contributions are traceable (pattern 4: individual behavioural input). There is also a related pattern. In the TomTom Traffic and Waze case, individual behaviour data is required to generate real-time traffic service. Behaviour data of one individual is not enough to generate accurate real-time traffic information. Therefore, individual behaviour is the main data source, but is aggregated indirectly. Thereby, individual contributions are not traceable. The crowd creates value because it provides behavioural insights, input for the aggregated data that is used to generate real-time traffic information (pattern 5: crowd behavioural insights).

- *Information/data as data source and individual(s) as the target of value*

The sixth pattern is derived from the Uber case. In the classification scheme, this case and pattern deviates from the other cases and patterns. Generally, Uber matches riders and drivers through their apps (pattern 6: real-time matching).

- *Information/data as data source and other organisation(s) as the target of value*

Coosto deviates from most cases as behaviour is not a data source. Coosto acquires public available social media data from more than 400.000 social sites and does not generate behavioural data. Coosto focuses on and create value for other organisations (B2B) by aggregating and providing insights in a lot of (social media) data: big data mining.

Examples in the previous paragraph of TomTom Traffic, Facebook and Quby underline that most cases also have business activities with information/data as data source. Facebook offers targeted reach to other organisations and TomTom Traffic sells real-time traffic information to media partners and broadcasters. As noticed earlier, these cases gather this real-time traffic information via pattern 5 (crowd behavioural insights). It became clear that patterns are related linked. Paragraph 6.12 explains how patterns are linked and interrelated.

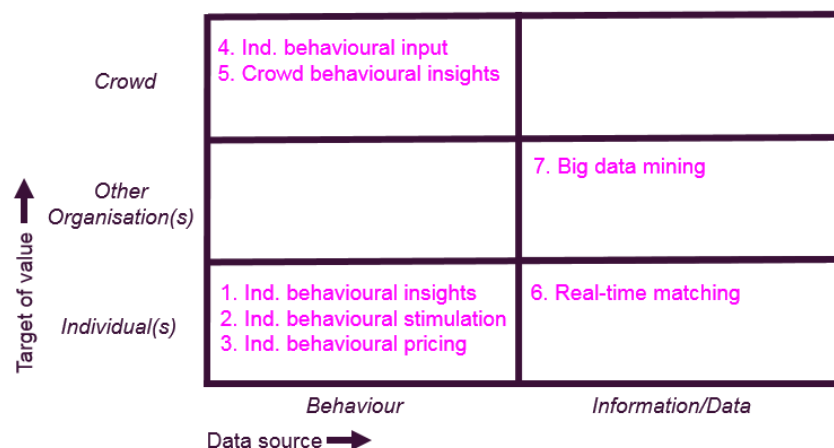


Figure 41: Classification of the information driven business model patterns

## Other patterns

Based on the classification and an iterative process to derive and optimise the patterns, these seven patterns are the most information driven. The patterns comprise all cases that are studied. It is likely that other patterns can be positioned in the (empty) boxes in Figure 41. Think about crowd behavioural stimulation or pricing. The cases that were studied in this research do not justify these kind of patterns and are, therefore, excluded.

### 6.3. GENERIC DESCRIPTIONS OF THE PATTERNS

A brief overview of the patterns that are identified in this study are provided in Table 10.

Pattern	Description
1. Individual behavioural insights	This pattern creates, delivers and captures value for individual(s) by providing insights in individual behaviour by using advanced technologies that support the data process regarding behavioural user data.
2. Individual behavioural stimulation	This pattern builds upon the individual behavioural insights pattern by stimulating 'good' individual behavioural by using advanced technologies that support the data process regarding behavioural user data.
3. Individual behavioural pricing	This pattern builds upon the individual behavioural insights pattern by adapting prices to individual behaviour by using advanced technologies that support the data process regarding behavioural user data.
4. Individual behavioural input	This pattern creates, delivers and captures value for a crowd. Individual (behavioural) input improves products/services or situations automatically for the whole crowd. Advanced technologies that support the data process regarding these improvements are used.
5. Crowd behavioural insights	This pattern creates, delivers and captures value for a crowd that is created by behavioural insights of the same crowd by using advanced technologies that support the data process regarding this crowd data.
6. Real-time matching	This pattern creates, delivers and captures value for individuals by matching supply and demand of products/services in real-time by using advanced technologies that support the data process for real-time matching.

7. Big data mining	This pattern creates, delivers, and captures value for other organisation(s) by providing accurate and convenient insights in complex, unattainable and unstructured information/data from multiple sources by using advanced technologies that support the data process and that make big data mining possible.
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Table 10: Descriptions of the information driven business model patterns

#### 6.4. PATTERNS FORMAT

The pattern approach and (information driven) business model patterns concept are described in chapter 2. The description of the patterns starts with a generic description, case studies that justify the pattern and the dimensions of the classification (see the previous paragraph). Then, based on Gamma et al. (1994), the following elements are described of the patterns:

1. *Pattern name*: Gamma et al. (1994) state that it is important to give patterns a name, because with a vocabulary people can talk more easily about patterns. The pattern names, introduced in paragraph 6.1, are the titles of the subsequent paragraphs.
2. *Context*: The context of the patterns is described to capture the relevant elements in the context.
3. *Problem*: The problem describes when to apply the pattern. The description of the problem contains some conditions that must be met before a service provider can apply a pattern (Gamma et al., 1994). The problem description includes challenges to improve operational and/or business performance and, thereby, drive on business model innovation.
4. *Solution*: ‘The solution describes the elements that make up the design, their relationships, responsibilities, and collaborations (Gamma et al., 1994, p. 3).’ The distinctive elements of the BM patterns are described and explained more in detail below.
5. *Consequences*: Consequences are the results and trade-offs of applying the pattern (Gamma et al., 1994). Major consequences are described for every pattern. The value proposition in the visualisation of the patterns shows only main results. Generic consequences are mentioned, since this research does not aim to study results of applying patterns in detail.
6. *Known uses*: Other (strongly related) known uses are identified that justify the BM patterns by showing the repeatable successful application of the solution. Known uses are identified among different industries. During multiple sessions, several known uses

are discussed and identified. Desk research is done to identify and validate the known uses. As noted earlier this research does not aim to provide a complete list of known uses.

7. *Variants*: This is an optional element if important variants of patterns are recognised.

## **Solution**

Mainly the generic data process and visualisation of the patterns with the BMC form the solution of the patterns. The focus is on how patterns support to create, deliver and capture value in the BMC. A stakeholder view gives insight in the value that the patterns generate. Examples support the solution description of a pattern.

### *The data process*

The data process provides a global understanding how data should be used in the solution. The elements of the process are mainly processed in the key activities building block using acronyms: Generation (G), Acquisition (Ac), Aggregation (Ag), Analysis (An), Visualisation and Distribution (VD). The result of this process are briefly stated, e.g. insights (pattern 1: individual behavioural insights). Therefore, technologies, devices and/or apps are required and related to the channels and key resource in the BMC.

### *Visualisation of the patterns in the BMC*

- Purple coloured boxes contain the main elements of a pattern;
- Light coloured boxes show the (possible) value for service providers that a pattern entails. These boxes do not appear in every pattern case;
- White coloured boxes relate to both purple and light coloured boxes;
- Several revenue streams are suggested in the visualisation of the patterns. For example, individuals pay a license fee to use TomTom Traffic. Individuals can use Waze for free since advertisers pay advertising fees. Cases do not apply uniform revenue streams for a pattern. Therefore, identified revenue streams of the cases that support a pattern are added;
- Since the key partners do not have uniform types of key partners, only technology providers and data source providers are recognised as key partners. In practice, it is likely that other key partners are required to implement a pattern.

## 6.5. PATTERN 1: INDIVIDUAL BEHAVIOURAL INSIGHTS

### Description

This pattern creates, delivers and captures value for individual(s) by providing insights in individual behaviour by using advanced technologies that support the data process regarding behavioural user data.

### Case studies

- Chipin/Fairzekering;
- Quby Smart Thermostat;
- Sense Health.

### Classification

- Data source: Behaviour;
- Target of value: Individual(s).

### Context

- Requires relevant behaviour that can be assessed.

### Problem

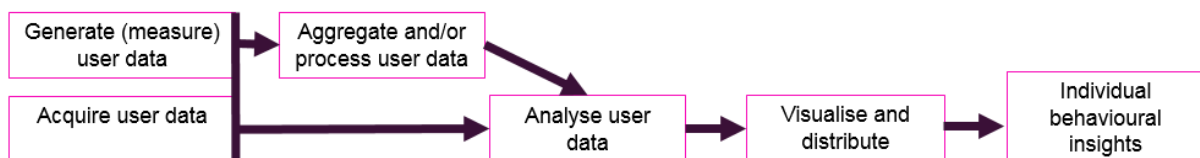
- The problem is that individuals do not have insight in their behaviour. For example, insights in driving behaviour, the consumption of products or daily activity.

### Example

Individuals use a lot of energy when they are not at home. It became clear that individuals pay too much for products that they do not need/use, since they do not have accurate insights. This leads also to problems for service providers, because when customers are not satisfied about their current provider(s) of products it is difficult to retain these customers. When individuals are confronted with behavioural insights, certain problems, such as unexpected high energy consumption (and bills), can be mitigated or reduced.

### Solution

- In order to create individual behavioural insights, service providers need advanced technologies (mainly apps and/or devices) that generate and acquire user data. Besides, related technologies are needed to analyse this data;
- Afterwards, service providers visualise and distribute the insights using apps and/or devices;



- This solution does not aim to stimulate behaviour, but it is possible that individuals can adjust their behaviour based on the insights.

### Example

The business model of the Quby Smart Thermostat contains this pattern. The Smart Thermostat generates, analyses, visualises and distributes data regarding energy usage and costs. Thereby, the Smart Thermostat can be seen as channel and key resource. Users gain insights in their behaviour using the Smart Thermostat and apps. Users can adjust their energy use using the Smart Thermostat and app, but this is not an element of this pattern. Fairzekering provides insights in the driving behaviour of users, but does not provide the opportunity to adjust their driving behaviour using their Chipin technology or apps.

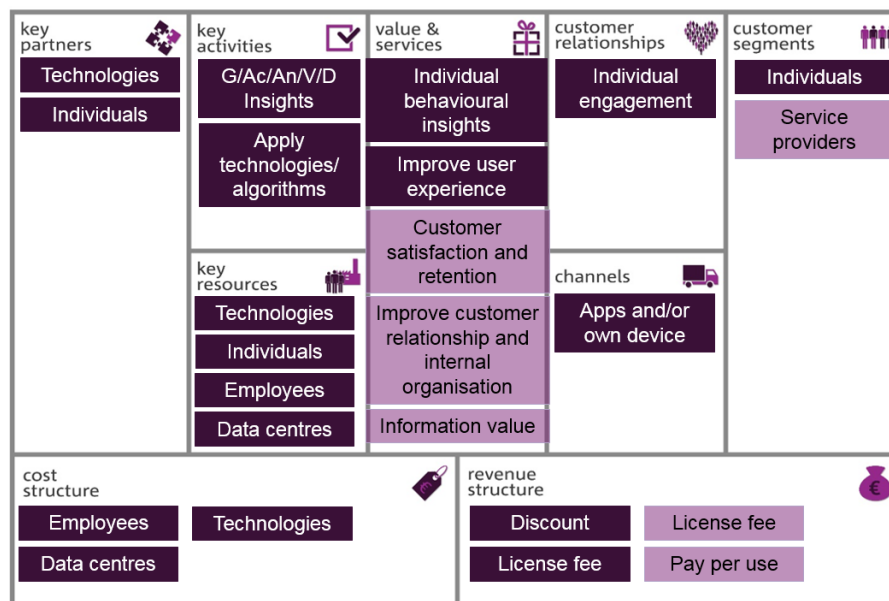


Figure 42: Individual behavioural insights

### Consequences

#### Results

Main results (value) are shown in the value proposition of Figure 42.

- Individuals can adapt their procurement of products/services, when they have more accurate insights;
- A better user experience via more customised products/services is created, because individual data is generated and analysed (individual engagement);
- Service providers have continuous interaction with customers. This can result in more satisfied customers when insights are shared continuously (improve customer relationship);
- Service providers may improve their internal organisation. For example, when energy providers know how much energy is consumed in areas during certain time periods, they can adjust their procurement to these predictions.

### *Trade-offs*

- Investment costs can be high, because expensive technologies and smart people are required to support the user data process;
- Do service providers develop and implement the technologies on their own or do they need/use partners?;
- Service providers need to think about the maintenance and further development of the technologies;
- The privacy of individuals and data is another trade-off for service providers. Service providers need a privacy policy and users should provide consent to provide data regarding their behaviour;
- Service providers should investigate the benefits and possibilities to generate and provide individual behavioural insights. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

### **Known uses**

- There are multiple thermostats available that provide insight in energy use such as the Nest thermostat;
- Sense Health provides also individual behavioural insights in activity and sleep of users. It is not always the case that users are stimulated to be(come), for example, more active or sleep more (pattern 2);
- In the telecom industry, consumers get individual behavioural insights regarding, for example, data usage. Consumers are not directly stimulated to change their behaviour.

## **6.6. PATTERN 2: INDIVIDUAL BEHAVIOURAL STIMULATION**

### **Description**

This pattern builds upon the individual behavioural insights pattern by stimulating ‘good’ individual behavioural by using advanced technologies that support the data process regarding behavioural user data.

### **Case studies**

- Chipin/Fairzekering;
- TomTom Traffic;
- Sense Health;
- Waze.

### **Classification**

- Data source: Behaviour;
- Target of value: Individual(s).

## Context

- Builds upon the context of pattern 1 (individual behavioural insights);
- Service providers do not have direct influence on behaviour;
- Create individual behavioural insights and stimulate ‘good’ behaviour.

## Problem

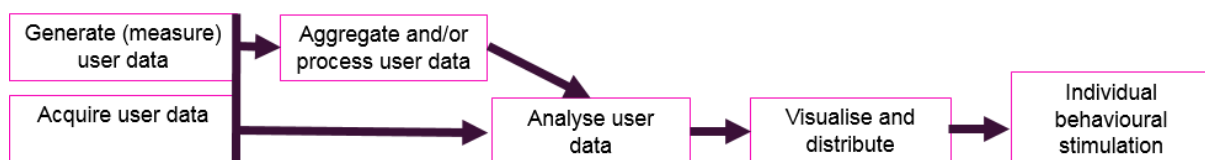
- Builds upon the problem of pattern 1 (individual behavioural insights);
- ‘Good’ behaviour leads to value for customers and service providers. This requires individual behavioural insights (pattern 1), which is often not available;
- ‘Wrong’ behaviour may harm customer satisfaction, and thereby, customer retention.

## Example

People want to live healthier, but do not have insights and stimuli to improve their way of living. This may harm individuals, but also service providers when employees live unhealthy.

## Solution

- Service providers need individual behavioural insights in order to stimulate behaviour. In order to create individual behavioural insights, service providers need advanced technologies (mainly apps and/or devices) that generate and acquire user data. Besides, related technologies are needed to analyse this data;
- Afterwards, service providers visualise and distribute the insights using apps and/or devices;



- Individual behaviour is generated and stimulated continuously.

## Example

Sense Health provides individual behavioural insights in activity and sleep of users. When users do not exercise enough, Sense Health applications may stimulate users to do some extra exercises. The Brighttr app provides messages such as ‘walk another round with your dog.’



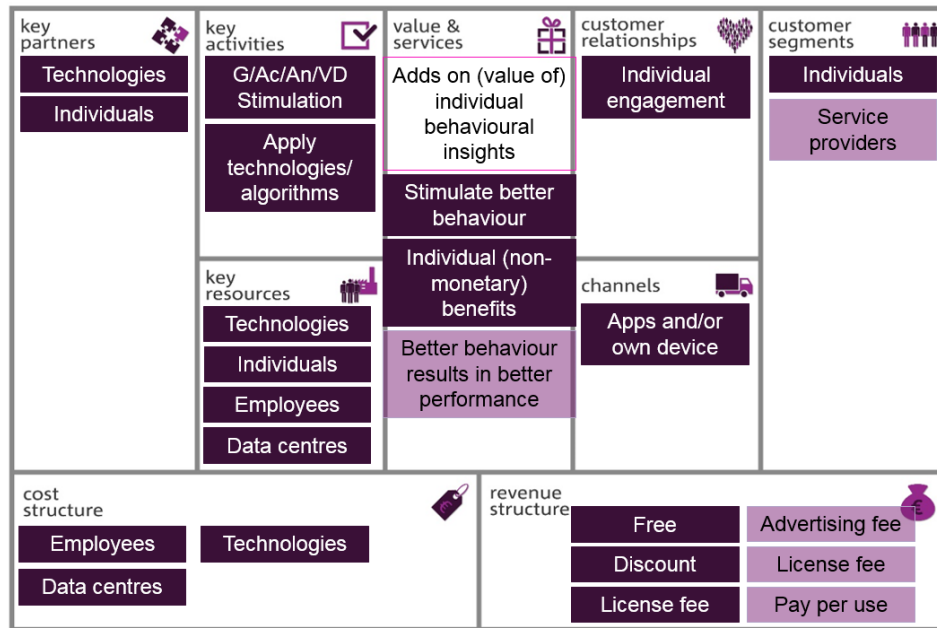


Figure 43: Individual behavioural stimulation

## Consequences

### Results

Main results (value) are shown in the value proposition of Figure 43.

- Results of this pattern built upon the value that is created by pattern 1 (individual behavioural insights);
- Individual behavioural stimulation results in ‘better’ behaviour and individual (non-monetary) benefits such as a healthier life or less traffic congestions;
- Service providers may improve internal performances. For example, Chipin fleet management solutions result in improved planning of the fleet. They can reduce costs and increase profits.

### Trade-offs

- This business model pattern entails the same trade-offs as the pattern 1 (individual behavioural insights regarding investment costs, development, implementation, maintenance and further development of the technologies. The privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to stimulate individual behaviour. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

### *Example*

Who can see where certain cars of the fleet are driving? What if they deviate from the original planning? Service providers need a certain policy how they deal with the privacy of individuals in order to make things clear for people who are involved.

### **Known uses**

- The gamification element of the Smart Thermostat of Quby justifies this pattern, because users can benchmark their behaviour with other users which entails stimulation (community based);
- The ‘Rationalizer’ of Philips is an emotion sensing system for home investors who trade online. Although this system cannot be bought anymore, it justifies this pattern. The rationalizer is a bracelet that acts as an ‘emotion mirror’ by measuring the user’s feeling and alert them when it may be wise to re-consider their actions;
- Electronic ankle tags that are provided by the Dutch department of justice measures and analyses individual behaviour. Behaviour is stimulated in the right direction when users deviate from the agreed appointments;
- Decos Cartracker is a system that scores driving behaviour of employees based on several aspects such as accelerating, speeding and braking. Decos Cartracker aims that organisations stimulate behaviour based on insights in driving behaviour;
- Google Search measures your search behaviour and stimulates you to visit certain sites via their advertisements;
- A related known use is the Dutch internet site Buienradar.nl that provides real-time rain predictions (‘weather behaviour’). Based on these individual behavioural insights, behaviour of people is stimulated in a certain direction. This known use entails other trade-offs, because the investment costs and privacy sensitivity are not that high compared to the other case studies and known uses that justify this pattern.

### **Variants**

This pattern contains two variants, since individual behavioural stimulation can be based on individual behaviour (Chipin/Fairzekering and Sense Health) or on behaviour of a crowd (TomTom Traffic and Waze). It became clear that it depends on the specific case if the crowd of individuals can be seen as key resource and key partner. This is the case in the TomTom Traffic and Waze case study. In the Sense Health case this is not the case, because individual behaviour is generated and stimulated without input from the community of users.

## 6.7. PATTERN 3: INDIVIDUAL BEHAVIOURAL PRICING

### Description

This pattern builds upon the individual behavioural insights pattern by adapting prices to individual behaviour by using advanced technologies that support the data process regarding behavioural user data.

### Case studies

- Fairzekering (showcase label of Chipin).

### Classification

- Data source: Behaviour;
- Target of value: Individual(s).

### Context

- Builds upon the context of pattern 1 (individual behavioural insights);
- Service providers do not have direct influence on behaviour;
- Create individual behavioural insights and adapt prices to behaviour.

### Problem

- Builds upon the problem of pattern 1 (individual behavioural insights);
- Individuals often pay for costs that they do not make, but they do not have the opportunity to do something about it;
- Service providers face costs that cannot be influenced easily such as costs that are made by customers.

### Example

Car insurance companies reimburse the damage that customers make. These companies do not have direct influence on damage costs that arise through customer behaviour. Consumers who do not make damage, pay indirectly also a share of the damage costs that others make through (higher) premiums. When companies adapt prices to the behaviour of consumers, certain problems regarding customer satisfaction and retention can be mitigated or solved.

### Solution

- Service providers need individual behavioural insights in order to adapt prices to the behaviour of individuals. In order to create individual behavioural insights, service providers need advanced technologies (mainly apps and/or devices) that acquire and generate user data. Besides, related technologies are needed to analyse this data to adapt prices;
- Service providers adapt prices to the behaviour of individuals. Thereafter, these prices (and related content) are visualised and distributed to individuals.

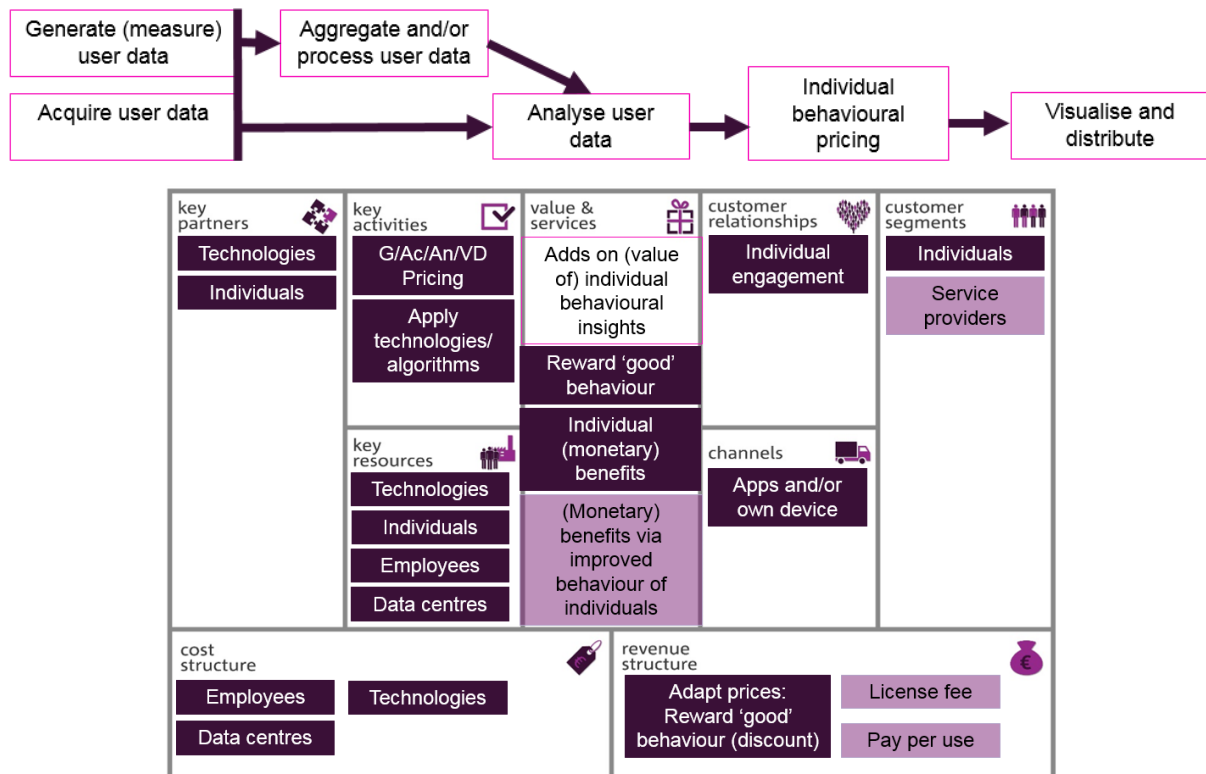


Figure 44: Individual behavioural pricing

### Example

Fairzekering provides usage based car insurances and is active in the damage insurance industry. Driving behaviour of users is measured and analysed on several aspects such as accelerating, speeding and braking. Users gain individual behavioural insights. At the end of the month, the behaviour is translated in a driving score which is directly related to discount percentages: individual behavioural pricing.

### Consequences

#### Results

Main results (value) are shown in the value proposition of Figure 44.

- There is overlap with the results of the previous pattern, since this solution contains elements of individual behavioural stimulation and insights;
- Individuals gain individual behavioural insights which is already an incentive to perform better;
- Individual behavioural pricing may result in individual behavioural stimulation, because 'good' behaviour is rewarded. Behaviour may improve when users get, for example, discount when they behave well. Subsequently, this improves customer satisfaction;

- In the case of Fairzekering, individuals are rewarded when they drive well. Thereby, Fairzekering does not have to pay damages. As a result, Fairzekering gains also (monetary) benefits: customer retention improve, costs decrease and profits may increase for service providers . As noted earlier, costs also will decrease for users when they drive well.

#### *Trade-offs*

- This business model pattern entails the same trade-offs as the previous patterns regarding investment costs, development, implementation, maintenance and further development of the technologies. Besides, the privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to relate individual behaviour to the pricing mechanism. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

#### *Example*

Good behaviour will result, in the case of Fairzekering, to premium discount for the consumers and less damage costs that Fairzekering needs to pay, a win-win situation. While consumers have insight and incentives to behave better, customer retention will improve.

#### **Known uses**

- The No Claim Bonus contains elements of this pattern. For every year that a driver does not claim, he/she gets more discount on his/her premium. This system is in line with the current economic principles and is not based on individual behaviour. Thereby, the ‘individual behavioural pricing’ pattern is a sophistication of the No Claim Bonus, because behaviour is actively measured and prices are adapted every month (in the case of Fairzekering);



- There are several (foreign) insurance companies who applied this pattern, such as Autosaint (UK), Coverbox (UK), Progressive (US), Motaquote (UK), and Polisvoormij (NL);
- An ironic known use: a restaurant in Canada gave a discount to guests, since their children behaved well. This known use does not rely on technologies;
- Rijkswaterstaat, a Dutch government organisation that is responsible for the Dutch highways, introduced peak avoidance projects. Drivers are stimulated to avoid certain routes during peak moments. Drivers are rewarded when they avoid these routes.

## 6.8. PATTERN 4: INDIVIDUAL BEHAVIOURAL INPUT

### Description

This pattern creates, delivers and captures value for a crowd. Individual (behavioural) input improves products/services or situations automatically for the whole crowd. Advanced technologies that support the data process regarding these improvements are used.

### Case studies

- Facebook;
- TomTom Traffic;
- Waze.

### Classification

- Data source: Behaviour;
- Target of value: Crowd.

### Context

- Every individual has and creates own insights. Individuals can drive the value creation process for the crowd when they share individual behavioural input with the crowd of users (automatically);
- Thereupon, the crowd gets better products/services or insights in situations. This has also positive effects for service providers;

### Problem

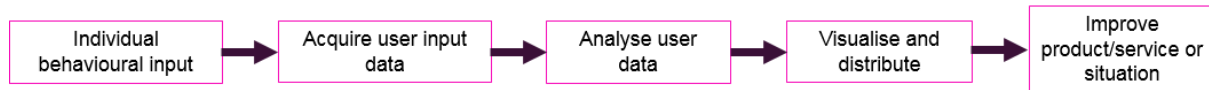
- Contributions of individuals may create value for a crowd when products/services or situations are improved;
- Service providers want to improve the value that they create for the crowd of customers but they do not have the insights or do not know how this is possible.

### Example

The crowd of consumers of TomTom Traffic and Waze drive everywhere. These consumers get insights in (traffic) situations via maps. Maps need to be changed when (new) roads are build or rebuild. It is hard for TomTom or Waze to update their maps on their own. Consumers can improve the value of TomTom Traffic and Waze, when new insights regarding maps are automatically added and processed.

### Solution

- It should be possible for individuals to share their insights by using several advanced technologies. Thereby, technologies that acquire, aggregate, analyse, visualise, and distribute consumer input data are required;
- This data process differs from the previous patterns, because technologies does not specifically generate individual behavioural insights. Therefore, the term input is chosen, since individuals decide to provide input;



- The input and current product/service are necessary. Thereby, these are recognised as, respectively, key partners and key resources;
- This solution aims to translate consumer input in improvements of the current product/service or situations.

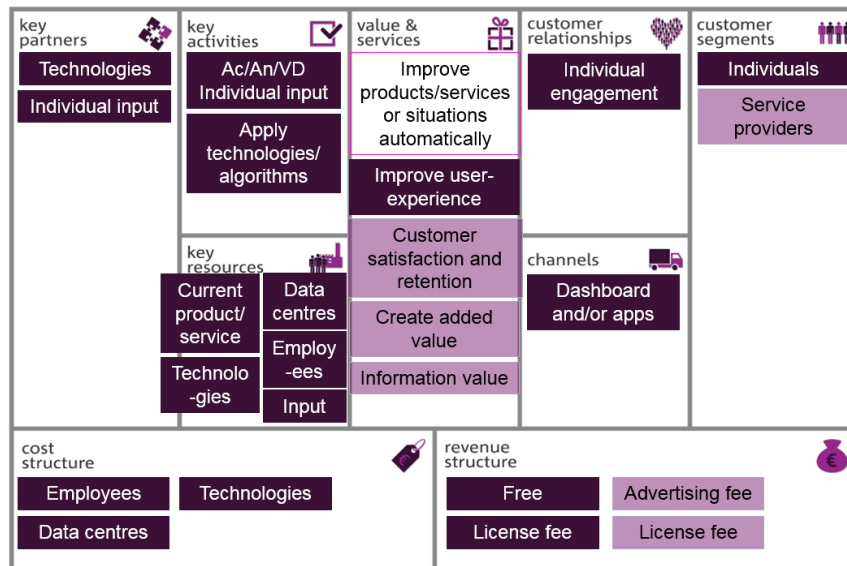


Figure 45: Individual behavioural input

### Example

Consumers of TomTom Traffic and Waze may provide input to improve the current maps using several technologies. Consumers may adjust maps manually using technologies. The provided input is acquired, analysed, visualised, and distributed to improve the products (maps). It became clear that this solution and pattern can be seen as an enriched and automatic version of co-creation: improve value creation through interactions between consumers and service providers.

As noted earlier, TomTom Traffic measures automatically where people drive. When people drive circles at traffic intersections, maps are updated with traffic circles. This solution does not focus on this process.

### Consequences

#### Results

Main results (value) are shown in the value proposition of Figure 45.

- Individual behavioural input leads to value for the crowd (of users) and service providers;

- Based on input from consumers, products and/or services are improved to create (more) value. This has positive influence on the user-experience. As a result, customer satisfaction and customer retention improve;
- Thereby, service providers may outperform competitors and earn higher profits.

#### *Trade-offs*

- This business model pattern entails the same trade-offs as the previous patterns regarding investment costs, development, implementation, maintenance and further development of the technologies. Besides, the privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to acquire individual behavioural input. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

#### **Known uses**

- Facebook is a real-time content sharing platform. The crowd of users want individual behavioural insights (content) from other users. Content can be automatically shared with friends of users. It became clear that data is not aggregated and individual contributions can be recognised;
- Thereupon, other social media platforms such as Foursquare, Instagram and Twitter are also known uses;
- Adam is a free app that analyses and provide real-time traffic information for commuter traffic around Amsterdam. Users have the possibility to provide input regarding traffic situations which will be processed in traffic information for the crowd who use Adam;
- Forums or other feedback programs of organisations are a related known use, but take into account that these programs do not rely that much on technology;
- Online news sites invite visitors to share pictures that are related to news articles. Often, these pictures are uploaded automatically on news sites such as Nu.nl.

## **6.9. PATTERN 5: CROWD BEHAVIOURAL INSIGHTS**

### **Description**

This pattern creates, delivers and captures value for a crowd that is created by behavioural insights of the same crowd by using advanced technologies that support the data process regarding this crowd data.



## Case studies

- Facebook;
- TomTom Traffic;
- Waze.

## Classification

- Data source: Behaviour;
- Target of value: Crowd.

## Context

- Every individual has and create own insights. The crowd can drive the value creation process for the crowd when these insights are combined and shared (automatically);
- Thereupon, the crowd gets better products/services or insights in situations.

## Problem

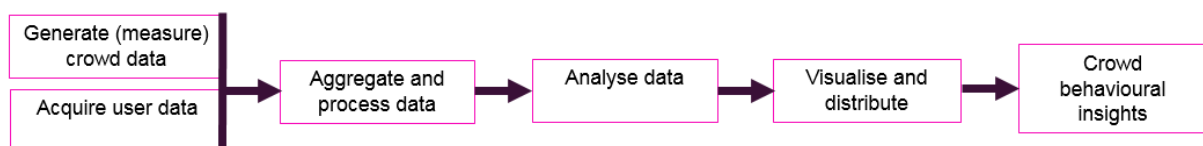
- Service providers want to improve the value that they create for the crowd of customers but they do not know how this is possible;
- Thereby, undesirable products/services or situations may arise which harms customer satisfaction and customer retention.

## Example

Traffic congestions arise mainly when there are too many people who want to drive on the same road at the same time. Traffic congestions are seen as a problem and have impact on the value that is created for individuals, who want to spend their spare time in different ways, and business, who lose money when cars are stuck in traffic. The problem is that individuals do not have insights in the behaviour of others. TomTom Traffic and Waze show that crowd behavioural insights create value when the same crowd have real-time insight in these complex (and perishable) situations (traffic congestions) that are caused by the crowd.

## Solution

- (Behavioural) insights need to be shared. Therefore, (advanced technologies that generate) (behavioural) insights are required. Technologies (mainly apps and/or devices) should generate and analyse user data (just as the previous patterns);
- Aggregation and processing data is important in this data process, because aggregated data of the crowd will be analysed to gather useful insights. Therefore, aggregation is depicted in line with the other activities;



- Service providers share real-time insights with the crowd. Thereby, value is real-time delivered to the crowd that provides the behavioural insights and drives the value (closed loop);
- The network effects stimulate the crowd to provide data and increase the real-time created value.

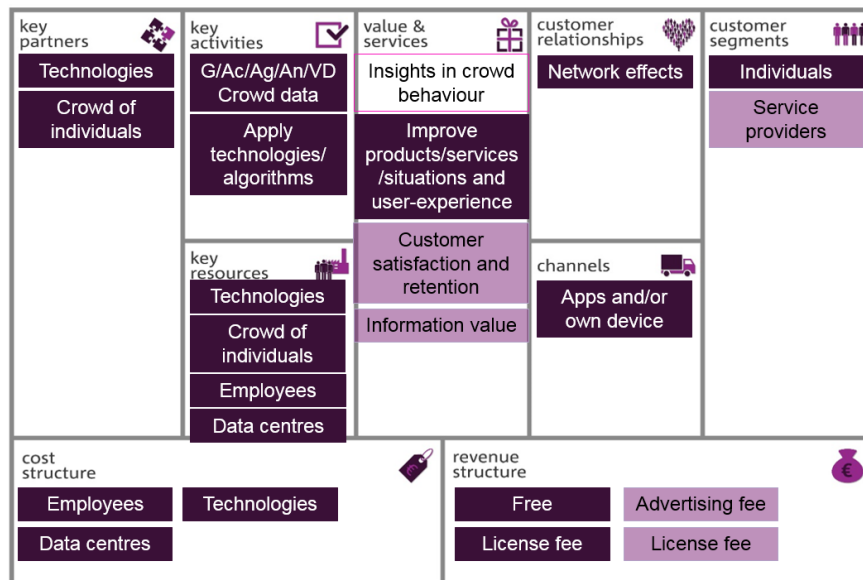


Figure 46: Crowd behavioural insights

### Example

Users of Waze provide real-time insights regarding traffic conditions using technologies (the Waze app). The Waze app and related technologies generate and analyse real-time insights (traffic information) from the crowd. By analysing input from these crowd behavioural insights, Waze know traffic conditions regarding congestions or accidents. Thereafter, these real-time insights are shared through the Waze app.

### Consequences

#### Results

Main results (value) are shown in the value proposition of Figure 46.

- Individuals and service providers gain insights (and value) regarding certain products and situations that is based on crowd input;
- Products/services/situations may be improved. This increases the user-experience. As a result, customer satisfaction and customer retention improves.

### *Trade-offs*

- This business model pattern entails the same trade-offs as the previous patterns regarding investment costs, development, implementation, maintenance and further development of the technologies. Besides, the privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to generate and analyse crowd behavioural insights. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

### **Known uses**

- Facebook deviates from the TomTom Traffic and Waze case, since their technologies focus more on real-time acquisition, distribution and visualisation of content (insights) that is shared by the Facebook community;
- Facebook aggregates data to analyse crowd insights. Based on these insights, marketers can do targeted reach. Therefore, other social media platforms such as Twitter and Foursquare are known uses;
- PatientsLikeMe is a patient research network. Individuals connect with and support others who have the same disease or condition and track and share their experiences. Thereby, crowd insights will result in value for individuals. In addition, the organisation sells these insights to other organisations, such as pharmaceutical companies. Thereupon, these organisations may improve their products/services. As noted earlier, the real-time element is not that important in this example;
- Quirky is a place for 'social product development.' An individual submits an idea. Other individuals (the crowd) vote on all of the submitted ideas and can contribute to the development of the product (product name, design and concepts);
- Adam is a free app that analyses and provide real-time traffic information for commuter traffic around Amsterdam. Information and behaviour is analysed continuously. For example, when too many follow a certain advice, the advice is adjusted to this new situation;
- The gamification element of the Quby Smart Thermostat: crowd behavioural insights may drive the value creation process, because individuals can compare their behaviour regarding energy usage with other users. The crowd is not a key resource for Quby, since the gamification elements is an extra feature and not the core of the product (provide insights in and control over energy use);

- E-commerce organisations such as Bol.com. These organisations generate and analyse crowd behavioural insights to adjust offerings to individuals to improve value for individuals and their organisation. As noted earlier, there are a lot of online shops who do this.

### **Variants**

This pattern contains two variants, because, based on the crowd behavioural insights, behaviour of the crowd of TomTom Traffic and Waze users is stimulated to drive better routes. Therefore, crowd behavioural stimulation could be a variant, but this is not applicable in the Facebook case where aggregated crowd behavioural insights are used in the value proposition to offer targeted reach.

## **6.10. PATTERN 6: REAL-TIME MATCHING**

### **Description**

This pattern creates, delivers and captures value for individuals by matching supply and demand of products/services in real-time by using advanced technologies that support the data process for real-time matching.

### **Case studies**

- Uber.

### **Classification**

- Data source: Information/Data;
- Target of value: Individual(s).

### **Context**

- Every organisation want to optimise matching supply and demand regarding products/services;
- Real-time matching contributes to the sharing economy.

### **Problem**

- Matching demand and supply is not optimal in certain cases. For example, the process is too complex or it takes too much time before demand and supply is matched. Customer satisfaction can decrease;
- IT can bring new possibilities for (new) organisations. Organisations who adopt these technologies disrupt current markets;
- It is difficult for traditional organisations to match in real-time. It became clear that well established companies face several problems: costs, prices, organisational performance and/or customer retention may be harmed.

### Example

Often, taxi companies match riders (demand) and drivers (supply) via their telecom network: riders need to call and wait for a driver. This traditional process results in relatively high costs (e.g. offices and employees) to match parties and, thereby, offering a taxi service. In addition, the customer satisfaction may be harmed, due to higher prices and the fact that riders do not have insights in prices and arrival times. When service providers match demand and supply real-time, certain problems can be mitigated or solved.

### Solution

- Service providers turn the matching process into real-time matching;



- IT should be capable to support the process that is visualised above in a short period of time in order to guarantee the real-time element of the solution. Thereby, accurate and quick generation, analysis, visualisation, and distribution of user data is required;
- Customer relationship is excluded in this solution, since this pattern is based on self-service where a mediating service provider, that applies this pattern, matches demand and supply.

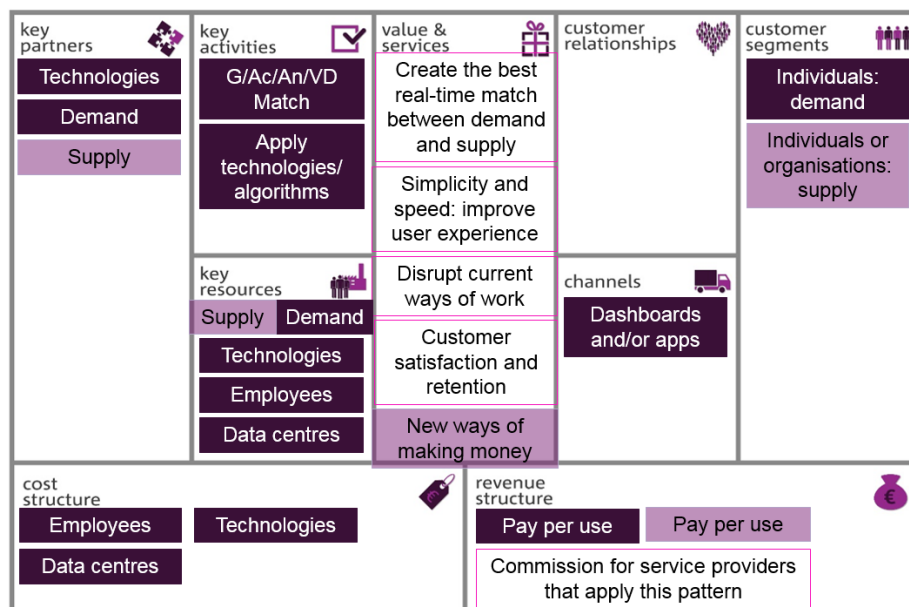


Figure 47: Real-time matching

### *Example*

Uber is a ridesharing service that connects riders (demand) to drivers (supply) using their apps (and related technologies). This process is done real-time. When riders demand for a ride, information about both riders and drivers is real-time measured, collected and analysed. Thereafter, data is distributed and visualised: an available driver and estimated arrival time is offered to riders. When riders accept the offer, riders and drivers are matched in real-time.

### **Consequences**

#### *Results*

Main results (value) are shown in the value proposition of Figure 47.

- Real-time matching is about simplicity and speed. These are two core elements that entail the user-experience of demand and supply;
- When both segments accept the technology and the technology functions well, customer satisfaction and retention will increase when this solution is applied;
- After investments costs are made, costs of matching decrease by using technologies. It is likely that service providers who apply this pattern will stand out from competitors. Thereby, this prospers organisational performance and profits of service providers.

#### *Trade-offs*

- This business model pattern entails the same trade-offs as the previous patterns regarding investment costs, development, implementation, maintenance and further development of the technologies. Besides, the privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to apply real-time matching. It is also important to think about the technological possibilities and the willingness of individuals to support the solution.

### **Known uses**

- Lyft is a company that operates in the United States that does the same as Uber;
- Brokerage firms use also real-time trade matching technologies to buy and sell financial products;
- There are also known uses where the way of matching justifies our pattern. These are other sharing platforms such as Airbnb, Snappcar, Peerby, or Blablacar. For example, Airbnb is an online platform whereupon letters (local hosts) and renters (travellers) are matched with each other. The real-time component is not that important in this example;

- E-commerce sites such as ebay.com or marktplaats.nl where buyers and suppliers find each other;
- A related example is buuv.nu. This is an online neighbourhood marketplace where residents offer and ask services without asking anything in return;
- Finally, there are also apps that match individuals with each other such as Tinder.

## 6.11. PATTERN 7: BIG DATA MINING

### Description

This pattern creates, delivers, and captures value for other organisation(s) by providing accurate and convenient insights in complex, unattainable and unstructured information/data from multiple sources by using advanced technologies that support the data process and that make big data mining possible.

### Case studies

- Chipin/Fairzekering;
- Coosto;
- Facebook;
- Quby Smart Thermostat;
- Sense Health;
- TomTom Traffic;
- Uber;
- Waze.

### Classification

- Data source: Information/Data;
- Target of value: Other organisation(s).

### Context

- As shown in the previous patterns, individuals and crowds create a lot of valuable information/data;
- In chapter 2, the big data concept were discussed and Morabito (2014, p. 6) cited who recognised that data is not structured anymore, because semi structured and even unstructured data is available, e.g. ‘text, log files, audio, video, and images posted, e.g. on social networks to sensor data, click streams, e.g., from internet of things;’
- It is valuable for organisations to have clear and relevant insights in this information/data for internal and external purposes.



## Problem

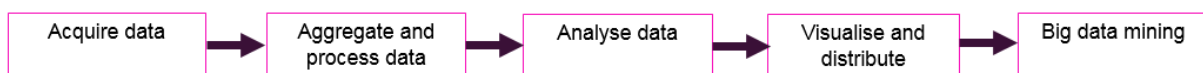
- Organisations do not have clear and relevant real-time insights in the different kinds of data (sources);
- Lack of insights may entail negative effects for organisations internally and externally;
- Thereby, a related problem is that organisations do not have the capabilities to deal with this data and prevent the organisation of negative effects.

## Example

Individuals share a lot of data about all kinds of topics on social media. Opinions and questions regarding news, products/services or brands are shared on several known social media platforms such as Facebook, Instagram and Twitter, but also on less known platforms such as forums, blogs and new sites. When several individuals (with influence) share negative opinions about a certain brand, the brand image may be harmed. When organisations have (real-time) insights in these opinions (data) and the capabilities to engage in online conversations, organisations can protect themselves from these potential negative effects.

## Solution

- Organisations need clear and relevant insights in the different kinds of information/data (sources). Advanced technologies are required to deal accurately with the data. Then, big data mining is possible;
- 'Acquire data' can be the result of insights that are gathered with the previous patterns;



- This solution deviates from the previous solutions, because the data that is used comes in via key partners and key resources instead of the customer segments. That is why organisations are not classified as main element in this solution.

## Example

Coosto acquires and analyses social media data from more than 400,000 sites. When the data is acquired, a certain tool supports during the analysis, visualisation and distribution of this data. The tool provides real-time insights in the relevant data and supports during further analysis of this data. In addition, the tool has the possibility to engage in online dialogs.

The crowd behavioural insights have value for other organisations. TomTom Traffic provides real-time traffic information to media partners and Waze offers real-time traffic information to broadcasters. It became clear that these cases underline this solution.

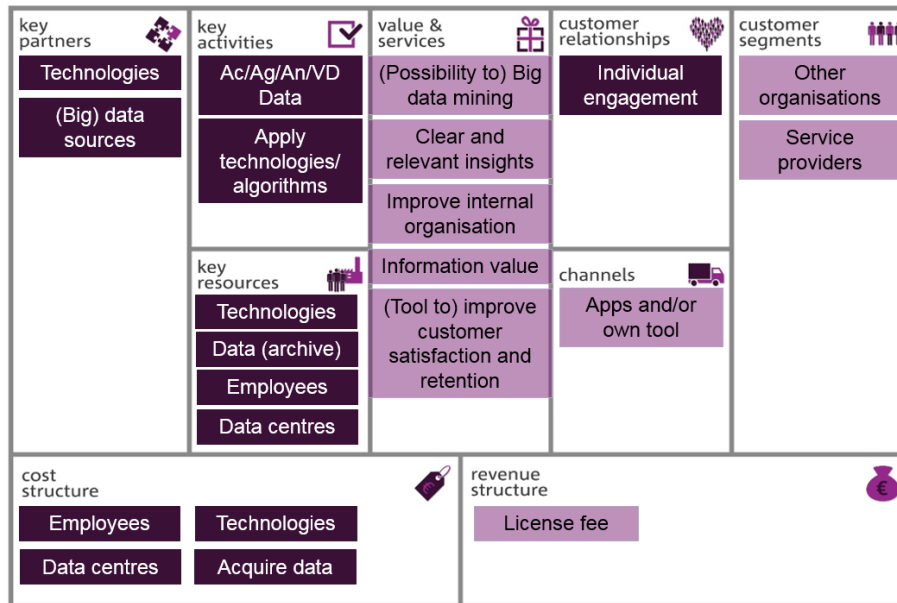


Figure 48: Big data mining

## Consequences

### Results

Main results (value) are shown in the value proposition of Figure 48.

- The main results of this solution are derived from the already introduced business model of Coosto (chapter 5). Value is created for users of these big data mining technologies (organisations);
- The increased value, mainly insights, may prosper results of scientific researchers, departments and organisations in total by improving internal and/or external performances;
- The degree of influence on individuals can also be managed. It goes without saying that (customer) relationships and finally organisational performance will improve;
- Applying this pattern should or will not result in a complete new business model, but it will improve the current business model.

### Trade-offs

- This business model pattern entails the same trade-offs as the previous patterns regarding investment costs, development, implementation, maintenance and further development of the technologies. Besides, the privacy of individuals and data entails another trade-off;
- Service providers should investigate the benefits and possibilities to create more and better insights via big data mining.

## Known uses

- There are several organisations who offer more or less the same tool as Coosto. Hootsuite, OBI4wan, Socialmention, Trackur, and Vocus are examples that also focus on monitoring real-time online social media;
- Media Distillery, a start-up organisation, developed a technology that automatically extract information from live radio (audio) and television (video) data;
- Amelia is an artificially intelligent computer system that can supports customer services. The system can read and understand text, follow processes, solve problems and learn from experiences. For example, when customers call with a question or problem, Amelia is able to deal with this on her own by mining a lot of data;
- Every information driven innovation that is studied in this research entails a lot of valuable data which may be used for big data mining and internal and external improvements.

### 6.12. LINKED AND INTERRELATED PATTERNS

Different patterns interrelate or have a link with each other, mainly since the eight information driven innovations contribute to multiple patterns. Figure 49 provides a generic overview of linked and interrelated patterns. To improve the readability of the figure, pattern names are excluded. In the explanation below, pattern names are included.

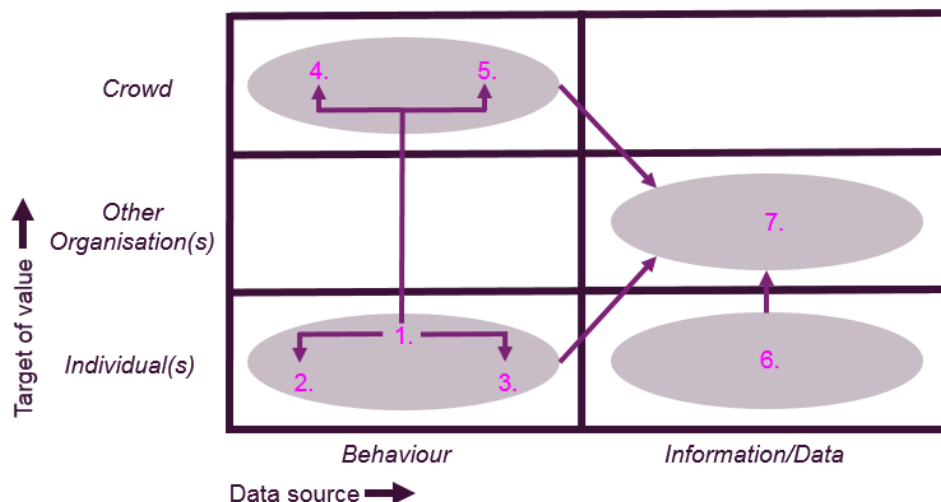


Figure 49: Linked and interrelated patterns

As explained in the previous paragraphs, multiple cases and patterns are based on individual behavioural insights (pattern 1). Based on these insights, for example, service providers stimulate individual behaviour (pattern 2) or adapt prices to this individual behaviour (pattern 3). Behavioural insights can also create value for a crowd when individuals share their

insights (pattern 4). For example, TomTom drivers may for example adapt maps automatically. Consequently, aggregation of individual behavioural insights may result in crowd behavioural insights (pattern 5), such as the real-time traffic information. Pattern 6 deviates from the other patterns, but entails a lot valuable information/data. For example, Uber knows where and when there are peaks in the amount of drivers that are ordered. Examples and known uses that are discussed in the previous paragraphs underline also that the information driven innovations and known uses entail valuable information/data. Thereby, all patterns may entail valuable information/data which may have value for other organisations and service providers (pattern 7).

More patterns can be identified in the future using other cases. For example, individual behavioural pricing may be done to stimulate individual behaviour and big data mining may result in (behavioural) insights or stimulation. Multiple other links and interrelations may arise in practice. Figure 49 provides a generic overview.

## 7. Applicability of the patterns in the insurance industry

This chapter contains the second part of the research execution phase: studying the applicability of the patterns in the insurance industry. The methodology is explained in chapter 4. Four insurance companies (Achmea, a.s.r., Generali, and VGZ) and the Dutch Association of Insurers were studied through semi-structured interviews. This chapter addresses the fourth sub-question of this research: to what extent can information driven business model patterns be applied in the insurance industry? The study and analysis of the applicability is introduced in paragraph 7.1. Thereafter, the detailed applicability of the patterns is discussed in paragraph 7.2 up to and including 7.8. Results of this chapter form the main input to answer the research question in chapter 8.

### 7.1. ANALYSIS OF THE APPLICABILITY

In chapter 1, based on TNO (2013), multiple trends were identified that influence the insurance industry. Insurers recognised mainly the following trends that influence the insurance industry: trust crisis, economic crisis, technological developments and innovations (digitalisation), the traditional solidarity crumbles, demand for customised products, and the challenge to create accurate insights out of the increasing amount of data (sources). These trends are in line with reasons to innovate business models that were explained in chapter 2, such as dealing with the complex and changing business model environment. As noted earlier, applying the BM patterns will not result in an insurer that deals with all these trends. Results of studying the applicability underline that multiple patterns may help to deal with these trends.

Insurers can innovate by applying the BM patterns and, thereby, remain competitive. Patterns do not have to become the core of business models but can be added to enhance current business models by offering other/extra products/services to clients (e.g. pattern 1: individual behavioural insights) or enhancing the internal organisation of an insurance company (e.g. pattern 7: big data mining). Insurers may need (key) partners in their business model to apply (a) pattern(s).

During the interviews, the following elements were discussed per pattern:

- Current initiatives;
- Recognise potential applications;
- Restrictions to the applicability of a pattern.

A concise analysis of the applicability of the patterns is included in Table 11.

Pattern	Validate patterns	Current initiatives in line with pattern	Recognise potential applications	Controversial pattern	Promising pattern
1. Individual behavioural insights	✓✓	✓	✓✓	✓	✓
2. Individual behavioural stimulation	✓✓	–	✓	✓✓	✓
3. Individual behavioural pricing	✓✓	✓	✓✓	✓	✓
4. Individual behavioural input	✓✓	–	–	–	–
5. Crowd behavioural insights	✓✓	–	✓✓	–	✓✓
6. Real-time matching	✓✓	–	✓✓	✓✓	✓
7. Big data mining	✓✓	✓✓	✓✓	–	✓✓

Table 11: Concise analysis application of the patterns in the insurance industry

– = not (recognised/applicable)

✓ = to a limited extent

✓✓ = to a wide extent

Insurers validated the seven BM patterns and recognised their successful application in the information driven innovations. Insurers implemented already initiatives that are (to a limited extent) in line with the pattern description of pattern 1 (individual behavioural insights), 3 (individual behavioural pricing) and 7 (big data mining). Several insurers provided individual behavioural insights (pattern 1) of practitioners regarding the prescription of medicines. Currently, initiatives of individual behavioural pricing (pattern 3) focuses mainly on car insurances. Big data mining (pattern 7) is the essence of an insurer to predict, for example, if losses occur and determine prices of insurances.

*‘Creating awareness regarding the patterns results in added value for insurers.’*

*‘It is important to start dialogues regarding the possibilities, added value, ethical and legal limits to apply these patterns.’*

Except for pattern 4 (individual behavioural input), all patterns were found to be applicable. Insurance companies recognised potential applications of the patterns. These are introduced in the subsequent paragraphs. Potential applications may drive on business model innovations.

Controversial patterns were also identified: pattern 1 (individual behavioural insights), 2 (individual behavioural stimulation), 3 (individual behavioural pricing), and 6 (real-time matching). There were, for example, different opinions among insurers to generate and apply individual behavioural insights, stimulation or pricing for health insurances. Insurers doubted about restrictions, such as ethical dilemmas and privacy (laws). Insurers doubted also about the role of insurance companies to apply individual behavioural stimulation (pattern 2) or real-time matching (pattern 6). These doubts were not identified during the study of the applicability of the other controversial patterns (pattern 1 and 3). It became clear that pattern 2 and 6 are identified as more controversial. Insurers recognised pattern 5 (crowd behavioural insights) and 7 (big data mining) as promising patterns to a wide extent for further applications in insurance companies.

More details are given for every pattern in insolation in the upcoming paragraphs. A detailed and anonymised analysis of the applicability is included in appendix E. The answers of the insurance companies focused on health and damage insurances. Other (more specific) insurances were not consistently mentioned, such as life or B2B insurances. Just as in chapter 6, answers regarding the applicability of patterns are linked and interrelated.

## **7.2. APPLICABILITY PATTERN 1: INDIVIDUAL BEHAVIOURAL INSIGHTS**

Current initiatives are to a limited extent in line with the pattern description. Insurers recognised potential applications for health and damage insurances. This is a controversial pattern since opinions about the applicability differ among insurers. Therefore, this pattern is classified as promising to a limited extent.

Individual driving behavioural insights are only noticed as current initiatives. Related initiatives focus mostly on individual behaviour of third parties, such as practitioners or damage repair companies. For example, several insurers provide behavioural insights regarding prescription of medicines and referral behavioural to practitioners. These related initiatives do not fit exactly to the description of this pattern, since insights are not generated continuously and automatically. The initiatives also do not focus on the end user, clients of insurers.



In the case analysis of Sense Health, multiple health apps were introduced that can generate individual behavioural insights. Nowadays, individual behavioural insights are generated easily using health apps and wearables such as (smart) watches, bracelets or (Google) glasses. Insurers noticed that they can and should do much more with these potential applications. Based on individual behavioural insights, prevention and recovery may improve. Insurers predicted that care costs and premiums may decrease and, thereby, the competitive position of insurers may increase. As a result, the whole society may benefit when individuals live healthier. There are already insurers who started pilots, such as developing personal health dossiers with health data that individuals generate by using Fitbits (wearable).

Multiple potential applications are also recognised for damage insurances such as travel, liability, building or burglary insurances. When sensors are installed in buildings, individual behavioural insights can be generated regarding the prevention for fires or burglaries. Multiple insurers predicted that insurances will be based more on usage (behaviour) instead of ownership in the future. Therefore, individual behavioural insights are required. This is explained more in detail in the description of the applicability of pattern 3 (individual behavioural pricing) in paragraph 7.4.

Insurers need to take the restrictions of this pattern into account. Ethical dilemmas may arise as insights can be misused, such as refusing new clients since insurers can predict more accurately future behaviour and needs. This is prohibited by law for basic health insurances. Insurers need to respect privacy (laws) to understand to what extent an insurer may generate and use individual behavioural insights. Due to the trust crisis, insurers recognised the perception and personas of clients as another restriction: why should individuals share behavioural (health) insights with an insurer that they distrust? Insurers mentioned multiple times that it is important to create benefits for individuals when they allow to generate and use insights. Based on these restrictions, insurers doubted mainly for health insurances about the applicability of this pattern. They noticed that these restrictions do not weigh heavily for damage insurances as the privacy issue is less important and sensors become cheaper. Whereas times and views on privacy are changing, insurers predicted that this becomes a more promising pattern.

### **7.3. APPLICABILITY PATTERN 2: INDIVIDUAL BEHAVIOURAL STIMULATION**

Among the insurance companies, there are no current initiatives mentioned that are in line with the pattern description. Notwithstanding, insurers recognised potential applications. This is a controversial pattern since opinions about the applicability differ among insurers. Therefore, this pattern is recognised as promising to a limited extent.

Insurance companies noticed that individual behavioural insights initiatives result often in stimulation. For example, based on insights, practitioners/damage repair companies/drivers will adapt their behaviour. When a practitioner has insights that his/her average of prescribed medicines is much higher than other practitioners, it is likely that individual behaviour is stimulated and will change. Other current initiatives focused on stimulation on aggregated levels which is not in line with the description of this pattern. Insurers mentioned that behavioural stimulation is often done for whole groups, such as employees, via prevention programs.

Based on the (technical) possibilities of pattern 1, insurers recognised potential applications for individual behavioural stimulation. An insurer mentioned that it is possible to link behavioural insights to expected care costs. Based on these insights, individuals become conscious and individual behaviour can be stimulated. This may benefit individuals, insurers and the society as a whole. Potential applications for damage insurances are also identified. Insurers think about doing more with smart thermostats to support insurances. For example, to stimulate (invalid) individuals to stay longer at home. In addition, an insurer is working on a pilot to train (stimulate) individuals to drive safer via stimulations through dashboards.

The applicability of this pattern is controversial, since insurers have different opinions about the applicability and importance of certain restrictions. In addition to restrictions of pattern 1, the main restriction of this pattern is that insurers doubt how they could adopt this pattern in their activities. Is it a role of insurers to stimulate individual behaviour via applications, such as the pilot to train (stimulate) individuals to drive safer? Insurers noticed cases in which individual behavioural stimulation does not work, such as water damage that is caused by neighbours or all kinds of damages that is caused by younger children. Based on these doubts and restrictions of pattern 1, this pattern is promising to a limited extent.

#### **7.4. APPLICABILITY PATTERN 3: INDIVIDUAL BEHAVIOURAL PRICING**

Current initiatives are recognised to a limited extent since individual behavioural pricing is only recognised for car insurances. Insurers mentioned potential applications for health and other damage insurances if they know how to deal with certain restrictions. This is a controversial pattern since opinions about the applicability differ among insurers. Therefore, this pattern is promising to a limited extent.

Insurance companies referred to SamenGezond (free interpreted as ‘Together Healthy’), an initiative of Menzis. Menzis is a Dutch insurer. With SamenGezond, individuals earn points if they, for example, do not smoke, fill in questionnaires regarding their life style, use Runkeeper, and/or share pictures of healthy moments. With earned points, individuals can buy products and services with discounts in the webshop of Menzis. Individual behavioural insights are generated (pattern 1) and healthy individual behaviour is rewarded and, thereby, stimulated (pattern 2). This is a strongly related current initiative, because individual behaviour is not measured continuously and is not directly linked to the price of (health) insurances. In the Chipin/Fairzekering case, individual behaviour is directly related to the prices of the car insurance. There are no other current initiatives recognised for other damage insurances.

Based on the (technical) possibilities of pattern 1, insurers recognised potential applications for individual behavioural pricing. Opinions of insurers regarding the applicability differ for health insurances. Insurers need to accept every one for basic health insurances. Only for certain additional health insurances, insurers ask questions to accept/refuse individuals. Insurance companies noticed potential applications to link individual behaviour to the pricing mechanism, just as the Chipin/Fairzekering case, when they know how to deal with the restrictions.

As paragraph 7.2 states, multiple insurers predicted that insurances will be based more on usage instead of ownership in the future. This is in line with the customisation trend. Individuals do not want to pay for damages that others make anymore. This is in line with the trend that the traditional solidarity crumbles. Interesting examples were discussed such as individual behavioural pricing for travel, liability, burglary, or building insurance. Why should individuals pay much when they are most of the time at home and do not visit locations where it is more likely to be hold responsible for damage to others? Thereby, insurers assume that individuals do not harm others (e.g. through internet) when they are at home. It is also possible that insurers

measure individual behaviour and know when individuals are on holiday. Thereupon, individual behaviour could be priced for travel insurances. Technologies can generate insights when individuals are abroad and relate this to the pricing mechanism.

This pattern entails a lot restrictions, because it is a relatively new way of insuring. Insurers do not know how far they can and may go regarding individual behavioural pricing. Current perceptions of individuals and insurers regarding privacy or ethical dilemmas can be a main restriction. It is likely that these perceptions need to change to accept this pattern. This restriction is directly related to the trust crisis. In addition, insurers need to investigate the legal limits of this pattern.

This pattern adjusts the pricing mechanism. Insurers mentioned that it becomes an actuarial challenge to relate prices to individual behaviour (preferably without much time slack). Insurers mentioned that they need to keep in mind that solidarity and sharing risks of/with individuals the essence of an insurer is. Nevertheless, insurers recognised that it is important to think about how individual behavioural pricing can be adopted in the business activities of insurers. Finally, when insurers know how to deal with these main restrictions, it is likely to do more with the potential applications and, thereby, improve the business model. Further research is required.

#### **7.5. APPLICABILITY PATTERN 4: INDIVIDUAL BEHAVIOURAL INPUT**

Insurances are not subject of movements to improve and enhance products continuously, such as adding content (input) to Facebook or map edits (input) to TomTom Traffic or Waze. Insurers stated that it is hard to realise automatically improvements via individual behavioural input that create value for a crowd (the other clients). Policy conditions of insurances are fixed. Due to actuarial calculations and statistics to share (financial) risks, it is impossible that individuals adapt insurances automatically and manually. Related initiatives of this pattern that were recognised refer to online platforms or communities where individuals provide (automatically) feedback (input). There are no current initiatives that are in line with this pattern. In addition, no potential applications were recognised. Therefore, this is not a promising pattern.

## **7.6. APPLICABILITY PATTERN 5: CROWD BEHAVIOURAL INSIGHTS**

There are not current initiatives of this pattern recognised, but every insurance company that was interviewed noticed potential applications. This is not a controversial pattern and, therefore, promising to a wide extent.

Insurers did not recognise current initiatives, but underlined the importance and (potential) value for individuals and insurers of this pattern. For example, individuals want to benchmark their behaviour with others. This is possible via technologies and showed by the rise of websites on which insurances can be compared, such as Independer or HoyHoy. The websites focus on static data, such as prices and policy conditions. Insurers did not link this pattern to static data. Insurers recognised potential applications to gain crowd behavioural insights regarding dynamic data and questions like: which car insurance do others have with car X from brand Y that is built in 2010? Another question could be: which health insurance do individuals with certain (health) characteristics have? These crowd behavioural insights are also valuable for insurers to improve their data analyses and understanding of the demands of individuals. Note that these potential applications do not focus specifically on creating real-time crowd behavioural insights. Insurance companies recognised that, regarding these insights, the real-time component is not even important compared to real-time traffic information of TomTom Traffic and Waze.

Generating crowd behavioural insights does not entail difficult ethical dilemmas, because data is anonymised and aggregated. However, the privacy of individuals and data remains an important restriction. The privacy restriction is more important for health instead of damage insurances. Individual contributions may not be traceable. In addition, multiple insurers recognised that the organisation of the application should not be underestimated whereas it is a challenge to generate crowd behavioural insights. That is why technologies, money and smart employees form another main restriction. When insurers can deal correctly with these main restrictions, insurers should and can apply this promising pattern and create added value in their BMC.

### **7.7. APPLICABILITY PATTERN 6: REAL-TIME MATCHING**

Insurance companies did not notice current initiatives regarding this pattern. They recognised potential applications. Insurers have several doubts and different opinions regarding the applicability of this pattern (controversial pattern). It became clear that this pattern is classified as promising to a limited extent.

Insurers think about influences of the sharing economy on their organisations and insurances. This is a relatively new trend that influences the insurance industry. Several insurers developed already insurances that fit to the sharing economy, but this is not the focus of this pattern. Insurance companies recognised this pattern and mentioned that they think about this pattern in the customer journey of the future. Due to the newness, insurers did not implement initiatives but recognised potential applications. For example, waiting list mediation can be improved by focusing more on the real-time element by matching individuals who demand home care or physiotherapy. Insurers agreed that real-time matching (using other technologies) is not applicable for acute care like heart attacks. In the future it is likely that initiatives for acute care occur, but this is not the main responsibility for insurers.

Insurance companies mentioned related initiatives, such as showing real-time if a certain treatment or accident will be reimbursed by an insurer. This pattern is also in line with the prediction that insurances will be based more on usage instead of ownership (discussed in paragraph 7.4). Many things that an individual possesses/demands regarding damage insurances has potential for real-time matching, such as reducing the time slack between accidents and recovery. Thereby, real-time matching enhances the transparency of insurances and may benefit individuals and insurers.

Insurers doubted about the role of insurers to apply real-time matching. An insurer mentioned that insurance companies can be seen as an extra link in the professional supplier chain to repair damages when they apply this pattern and doubted if this will be efficient. Insurers noticed also benefits: increase transparency of insurances and efficient ways to match. For example, real-time matching for assistance after accidents in real-time. Other restrictions that were related to the organisation of the application, ethical dilemmas and privacy (laws). When insurers do have their role clear in mind to apply this pattern correctly, insurers should apply this pattern in the future.

## 7.8. APPLICABILITY PATTERN 7: BIG DATA MINING

Current initiatives are identified, since big data mining the essence of an insurer is. Insurers recognised potential applications and underlined to do more with big data mining (not controversial). It became clear that this pattern is promising to a wide extent.

Current initiatives are about the essence of insurers to do statistical analysis to translate risks in a certain context to opportunities that insurers need to reimburse clients and the way how this is financed. Other current initiatives for health and damage insurances focused on adding and mining other information/data sources. Insurers aim to improve predictions and analyses.

Insurers recognised potential applications that are not specified for health or damage insurances. The previous patterns entail many valuable information/data (sources). Insurers may generate more accurate insights and relationships between information/data (sources) when they generate, for example, individual or crowd behavioural insights (pattern 1 and 5). Insurers predicted that big data mining becomes more important to improve products/services in the future. This may benefit individuals, insurers and the society as a whole. Insurers noticed that it is impossible to bring the whole world together through big data mining. Small steps are required.

Insurers underlined that the generic restrictions are important to apply big data mining. Mainly technologies and smart employees who can deal with all these information/data sources are required. One insurer mentioned that big data mining becomes a main profession in the future. Ethical dilemmas and privacy (laws) are also restrictions of this pattern as it is likely and possible that information/data will be gathered by applying the previous patterns. As shown in the following example, this restriction should not be underestimated.

### *Example: Critics on big data mining initiative, the ING case*

In 2014, ING got a lot of criticism when a director shared the plan to share customer data with other organisations. The director stated in the Dutch financial newspaper that grocery stores could offer better deals when they have better insights in buying behaviour of individuals (big data mining).

Insurers stated that they need to take the impact of big data mining on the society into account. Insurers applied this pattern already but plan to do more with big data mining since competitors are also working on this pattern. They notice to keep the restrictions in mind.



## 8. Conclusion, discussion and limitations

The second part of the ‘research report’ phase is described in this chapter. Paragraph 8.1 contains the conclusion in which the main research question is answered. In paragraph 8.2, the discussion focuses on deriving and studying the applicability of the patterns. The discussion is further elucidated by focusing on the contribution of this research in paragraph 8.3, the limitations of this research in paragraph 8.4, and recommendations for further research in paragraph 8.5. This chapter and report ends with some concluding remarks in paragraph 8.6.

### 8.1. CONCLUSION

The main research question can be answered based on answers of the four sub-questions of this explorative research.

#### *1. What are information driven innovations in the context of the digital enterprise?*

Based on literature review of relevant concepts in the context of this research, there was not much research done regarding the digital enterprise and information driven innovations concept. It was important to constitute a definition of information driven innovations in the context of the digital enterprise. By extending the definition of Gartner (2014b) of ‘information innovation’ with key activities regarding data of Hartmann et al. (2014), the following definition of information driven innovations was composed: fundamental technology changes by generating, acquiring, processing, aggregating, analysing, visualising, and/or distributing data and information in new ways to improve operational and/or business performance.

#### *2. What are business models and key activities regarding data of information driven innovations?*

A research framework was developed to study eight information driven. Based on Osterwalder and Pigneur (2010), BMC’s were developed to understand the value that is created, delivered and captured by the information driven innovations. In addition, based on Hartmann et al. (2014), key activities regarding data were investigated to understand how information/data was used. In total, three cases were studied through desk research and five cases through field research. The case analyses were included in chapter 5.

### *3. Which information driven business model patterns can be derived?*

Two main dimensions ('data source' and 'target of value') were determined through multiple steps, such as identifying possible dimensions, dividing cases among these dimensions and mapping dimensions on each other to find the optimal classification. The data source was identified as main dimension, because either behaviour or information/data were the basis in the business model and/or key activities regarding data. The other dimension focused on the question for whom value was created for: either individuals(s), other organisation(s) or a crowd. Cases were classified and grouped with these dimensions. From there, seven information driven business model patterns were derived via an iterative process and explained in chapter 6:

- Pattern 1: Individual behavioural insights;
- Pattern 2: Individual behavioural stimulation;
- Pattern 3: Individual behavioural pricing;
- Pattern 4: Individual behavioural input;
- Pattern 5: Crowd behavioural insights;
- Pattern 6: Real-time matching;
- Pattern 7: Big data mining.

A pattern approach was applied and six main elements were described of every pattern (Alexander, 1979; Gamma et al., 1994; Fowler, 1997): pattern name, context, problem, solution, consequences, and known uses.

### *4. To what extent can information driven business model patterns be applied in the insurance industry?*

The applicability of the patterns in the insurance industry was studied through semi-structured interviews at four insurers and the Dutch Association of Insurers. Based on Fowler (1997) and Osterwalder and Pigneur (2010), the BM patterns were used as a starting point to study the applicability of the patterns. Current initiatives, potential applications and restrictions of the applicability were studied. As shown in chapter 7, insurance companies validated the patterns and recognised their successful application in the studied information driven innovations. Insurers did not implemented initiatives that were in line with the pattern description of pattern 2, 4, 5, and 6. Except for pattern 4, insurance companies recognised potential applications for every pattern. Insurers underlined that they should take the restrictions into account. Based on these restrictions, insurance companies had different opinions regarding the applicability of pattern 1, 2, 3, and 6. These patterns were identified as controversial patterns. If insurers decide to adopt a pattern in their BMC, they need to take the restrictions into account.

## Research question

### *How can insurance companies innovate and do remain competitive by applying information driven business model patterns?*

The study of the applicability of the patterns underlined that insurance companies can innovate and do remain competitive by applying the patterns for different insurances. As noted in chapter 2, gaining a competitive advantage is a main reason to innovate business models. This research question is answered more in detail by focusing on:

- How insurance companies can innovate and do remain competitive;
- The fact that insurance companies should not underestimate the restrictions;
- Possibilities that multiple patterns entail to diversify and gain competitive advantages.

### *How insurance companies can innovate and do remain competitive by applying the BM patterns*

Except pattern 4 (individual behavioural input), every pattern can be the basis to drive on the business model innovation process of an insurance company. Current initiatives and/or potential applications can be applied and developed. Insurers need to pay attention to these patterns to remain competitive, since competitors think or work already on current initiatives and/or potential applications.

- *Pattern 1: Individual behavioural insights*

Current initiatives focus mostly on individual behaviour or third parties. Technologies make it possible to generate individual behavioural insights of clients. Insurers recognised different potential applications and noticed that they can and should do much more with individual behavioural insights. Potential applications were recognised for different insurances that enhance value for individuals, insurers and the society as a whole. For example, individual health behavioural insights that is generated by using apps and wearables. When insurances become more customised, prevention and recovery may improve. In addition, insurers predicted that care costs and premiums may decrease and, as a result, the competitive position of insurers may increase.

- *Pattern 2: Individual behavioural stimulation*

This pattern builds upon (value that can be created by applying) pattern 1. Insurers expect that behavioural insights lead automatically to behavioural stimulation. Insurers recognised potential applications that enhance more value for individuals, insurers and the society as a whole, because behaviour can be stimulated positively. For example, an insurer mentioned

that it is possible to link behavioural insights to expected care costs. Based on these insights, individuals become conscious and individual behaviour can be stimulated positively. As a result, insurance companies can create added value by putting more effort in clients. In addition, the competitive position may increase, since (health care/damage) costs and prices of insurances may decrease.

- *Pattern 3: Individual behavioural pricing*

This pattern builds upon (value that can be created by applying) pattern 1. Insurers recognised potential applications that enhance more value for individuals, insurers and the society as a whole. Insurance companies expected that costs will decrease for these parties when individual behaviour is linked to the pricing mechanism. As noted earlier, insurers need to investigate how and if they may apply individual behavioural pricing for health insurances. Multiple insurers predicted that insurances will be based more on usage instead of ownership in the future. Insurers can innovate and remain competitive by applying this pattern. They create added value for individuals who do not want to pay for damages that others make anymore (the traditional solidarity crumbles). Interesting examples were discussed in the previous chapter.

- *Pattern 4: Individual behavioural input*

Insurers did not recognise current initiatives and potential applications for individual behavioural input, since it is impossible that individuals automatically adopt insurances. It is not likely that an individual may change insurances automatically and create value for a crowd. There are conflicting interests regarding insurances and insurance conditions are fixed. Thereby, this pattern is not applicable to innovate and remain competitive.

- *Pattern 5: Crowd behavioural insights*

Individuals may and can create value for a crowd via crowd behavioural insights. It was interesting to see that none of the insurance companies noticed current initiatives for this pattern, but they all underlined potential applications. In addition, insurers noticed to do more with this pattern for both health and damage insurances. The crowd benefits from behavioural insights that are generated by and for the crowd, since people can and want to compare their behaviour more nowadays. These insights are also valuable for insurers to improve understanding of the demands of individuals and for other data analyses. Thereby, this pattern may enhance the business model internally and externally.

- *Pattern 6: Real-time matching*

Regarding the applicability of real-time matching, insurers did not identified initiatives, but underlined the importance and (potential) value to do more with real-time matching. Potential applications were noticed for both health (e.g. improve waiting list mediation) and damage (e.g. improve time slack between accidents and repair) insurances. Many things that an individual possesses/demands regarding damage insurances has potential for real-time matching, such as reducing the time slack between accidents and recovery. This pattern is also in line with the prediction that insurances will be based more on usage instead of ownership. Thereby, real-time matching enhances the transparency of insurances and may benefits individuals and insurers. Insurance companies can innovate and become more competitive when they focus on this pattern, since technologies proved the possibilities. In addition, insurers noticed that they think about this pattern in the customer journey of the future.

- *Pattern 7: Big data mining*

Big data mining is the essence of an insurer to analyse risks in a certain context. Insurance companies noticed potential applications to create more accurate insights and relationships by mining more information/data (sources). This data and information may result from the promising patterns 1, 2, 3, 5 ,and 6. Insurers mentioned that it is required to do more with this pattern to remain competitive whereas competitors are also working actively on it.

This research showed that insurers can innovate and remain competitive by applying different information driven business model patterns. Insurers who recognised potential applications for a certain pattern should compare and investigate current initiatives, potential applications and restrictions in order to decide if and how their organisation can be reinforced. The restrictions are discussed more extensively.

*Insurance companies should not underestimate the restrictions*

- Technologies, money and smart employees are required to apply patterns. Interviewees mentioned that organisations should not underestimate this, because the implementation of these patterns is hard. For example, a lot data (sources) are available for big data mining (pattern 7), but accurate technologies and smart employees are required to generate valuable insights and relationships;

- Especially ethical dilemmas and privacy (laws) became topics of interests during interviews. Multiple patterns result in customised products, but the perception of clients regarding insurers should not be harmed. Due to the trust crisis, this is an important restriction. Insurers face also legal limits. Studied information driven innovations recognised also that it is really important for organisations to pay attention to the privacy of individuals and data, whereas unsatisfied clients that distrust organisations will not buy products or use services;
- Studying the applicability of patterns resulted in several controversial patterns, because insurers doubted how far they want and may go. Insurers doubted, for example, if it is their role to stimulate individual behaviour (pattern 2). This is also an important restriction due to the trust crisis that insurers face.
- Individual behavioural pricing (pattern 3) revealed another main restriction: it becomes an actuarial challenge to relate prices to individual behaviour (preferably without much time slack).

So, insurers need to take these restrictions into account during the application and development of (potential) initiatives. Insurers predicted that *times and views on privacy are changing*. As a result, patterns that are mainly based on individual behaviour (pattern 1, 2, 3) *become more promising patterns* that drive on the business model innovation process to create added value.

#### *Multiple patterns entail possibilities to diversify and gain competitive advantages*

As explained in chapter 7, there are several controversial patterns. Insurers have different opinions about the extent that certain patterns can be applied for health and/or damage insurances, such as individual behavioural pricing (pattern 3) for health insurances. Insurers can diversify by applying these patterns and gain more competitive power by focussing more or less on certain potential applications.

Opinions differ especially regarding pattern 1, 2, 3, and 6 and focused on restrictions of the patterns that were discussed above, like the role that an insurer (should) have. For example, is it suitable and/or allowed that insurers apply individual behavioural pricing (pattern 3) for health insurances? Different interviewees doubted also about the role of insurance companies to fulfil certain roles such as real-time matching (pattern 6) of clients (demand) and practitioners or damage repair organisations (supply).

## 8.2. DISCUSSION

The literature background underlined the importance and complexity of well-developed business models (e.g. Osterwalder and Pigneur, 2010; Bouwman et al., 2012). It is also important for organisations to innovate their business model to improve the strategic position, operational and business performances (e.g. Al-Debei and Avison; 2010; Teece, 2010). This research contributed to this, since all studied cases (information driven innovations and insurance companies) underlined the importance of (business model) innovation. During the study of the applicability of the patterns, interviewees underlined the complex and changing business model environment of insurers. Multiple trends that influence the insurance sector contribute to the complex and changing environment of insurers, such as customisation and the trust crisis. This environment is characterised by high levels of uncertainty, competition, innovation, and knowledge creation. These findings are in line with Al-Debei et al. (2008), Bouwman et al. (2008), Al-Debei and Avison (2010), and Morabito (2014). In order to drive on (business model) innovation, information driven innovations were studied, BM patterns were derived and the applicability of these patterns was studied. These aspects are discussed.

### **Studying information driven innovations**

It was a challenge to develop the research framework to study the information driven innovations, because the information driven aspects of organisations were not studied in combination with business models in literature before. The framework had to be generic, because cases from different industries were studied. After studying much literature, the widely used and cited BMC of Osterwalder and Pigneur (2010) was selected and used. Results showed how studied cases created, delivered and captured value. In addition, the key activities regarding data of the DDBM of Hartmann et al. (2014) were studied. As explained in chapter 2 and underlined by this research, the complete DDBM was not applicable to study these information driven innovations from different industries. Features of the DDBM were too broad and did not fit with the cases. For example, the target customer dimension were specified for every information driven innovations instead of B2C or B2B in the DDBM. For this research, the focus on key activities regarding data of the DDBM was sufficient to understand how cases use data and information. Results of the case analyses showed the value of the research framework to provide a complete overview how information driven innovations deal with information/data and create, deliver and capture value.



Based on the case analyses, a classification was developed to enhance the understanding of the cases and patterns (Lambert, 2006). During the study of the applicability of the patterns, studied cases understood the classification of cases and patterns. The classification was helpful to structure the study of the applicability of the patterns. In line with Bailey (1994) and Lambert (2006), this research also showed the complexity of classifying cases. Two main dimensions were identified through an iterative process.

### **Deriving BM patterns**

In this research, patterns were derived from the boxes of the classification scheme in which cases were identified. There was not scientific literature found in which a clear methodology was explained to derive patterns. BM patterns were based on the pattern approach (Alexander, 1979; Gamma et al., 1994; Fowler, 1997). Based on researchers' insights, it is possible to derive a lot related patterns (with small deviations). An iterative process was developed to derive and optimise the most important information driven business model patterns. During this iterative process, subjectivity was reduced, patterns were optimised and the scientific value of the patterns were improved. This methodology was developed to derive patterns that were close to reality, since the applicability of these patterns was studied afterwards to create also practical relevance. Based on the newness and complexity of this research, deriving patterns via a more abstract methodology, such as quantitative surveys, would have resulted in useless and less meaningful patterns.

The elaboration of the patterns focused on six main elements: pattern name, context, problem, solution, consequences, and known uses (Gamma et al., 1994). Due to time and resource constraints in this research, it was not possible to study the six elements in detail for every pattern. Pattern descriptions were made to create a clear description and foundation of the patterns. In line with the research framework, key activities regarding data and the BMC of the patterns were visualised to show the solution of a pattern. It was hard to visualise the patterns in the BMC, because organisations that apply a pattern create mainly value for individuals (clients) and their organisation (service provider). Service providers are included in the BMC visualisation to underline the value that is created for these service providers that apply a certain pattern, but service providers are not customer segments of their own organisations. Thereby, this detail in the visualisation of the patterns in the BMC could be improved in further research.

### **Studying the applicability of the BM patterns**

The patterns are not directly applicable design patterns that solve a generic design problem in a particular context (Gamma et al., 1994). As noted earlier, this was not the goal of this research to derive directly applicable design patterns, make the patterns fit in studied insurers or to develop complete business cases for the patterns. In line with Fowler (1997) and Osterwalder and Pigneur (2010), patterns were used as a starting point, not a destination. Patterns were used to drive on (business model) innovation and exploit the future for insurers. Organisations can extrapolate the patterns that fit better to an organisation. As shown in chapter 7, it became clear that the seven information driven patterns entail related initiatives and potential applications for innovation in reality. This underlines the added value of the pattern approach and studying the applicability of the BM patterns. Insurers validated the patterns. In line with Osterwalder and Pigneur (2010), insurers noticed that the patterns are an easy way to brainstorm and exploit the future. For example, multiple insurance companies mentioned that it is hard to translate (best) practices that they, for example, read in newspapers to their own organisation. Based on results of this research, the BM pattern approach drive on (business model) innovation in the insurance industry and, hopefully, also in other industries.

### **8.3. CONTRIBUTIONS**

In this research, the goals that were identified in chapter 1 are achieved. These underline also the scientific and practical contributions of this research. Several contributions are discussed in the previous paragraph. In this paragraph, main scientific and practical contributions are specified.

#### **Scientific contributions**

This research revealed multiple gaps in scientific literature. As stated before, relatively new topics of interest were studied in this research, such as the digital enterprise, information driven innovations and information driven business model patterns. In literature these topics were not discussed extensively. Based on the theoretical background, a research framework was developed in chapter 3 to study information driven innovations in a scientific and structured way. As noted earlier, results of the case analyses showed the value of the research framework to provide a complete overview how information driven innovations deal with information/data and create, deliver and capture value. This research framework was sufficient to study these elements. Thereby, this research contribute to science with a first draft to study information driven innovations.

The classification of cases contributed also to science, since organisations were not classified among information driven dimensions before. There from, BM patterns were derived via the pattern approach and an iterative process. As a result, this research contributed to science through the classification, seven information driven business model patterns and a methodology to derive these patterns in a more scientific and structured way. During the study of the applicability, insurers validated the patterns which underlined the accurateness and usefulness of the research framework and methodology.

Besides, the methodology and results regarding the study of the applicability of patterns to a specific industry contributed to scientific literature to understand how the applicability of patterns can be studied and how it may drive on (business model) innovation.

### **Practical contributions**

This research aimed to contribute to practice by studying the applicability of the patterns. The second research goal underlined exactly the main practical contribution of this research: studying the applicability of information driven business model patterns in insurance companies to innovate and do remain competitive. This research contributed to practice by driving on (business model) innovation in the insurance industry. The practical contribution is underlined by current initiatives, potential applications and restrictions that were recognised during the study of the applicability. The fact that multiple patterns may support insurers to respond to trends that the insurance sector influence justified also the practical contributions.

This research took also the wider context into account. Benefits for individuals, insurers and the society as a whole were identified multiple times. For example, individual health behavioural insights (pattern 1) may improve prevention and recovery, decrease (care) costs and premiums and increase the competitive position of insurers. Thereby, the whole society may benefit. This part of this research revealed also main restrictions that organisations need to take into account when they think about applying a certain pattern, such as ethical dilemmas and privacy (laws). Thereby, this research underlined the importance of social and ethical aspects that organisations need to take into account.

This research can also be applied in a broader context. The study of the applicability of the patterns can be done by large and small organisations that operate in other industries. Organisations can study the applicability of the patterns on their own by answering questions from appendix C. Organisations can also compare themselves with studied cases by positioning themselves in the classification scheme. In addition, other organisations may generate new ideas for (business model) innovation by comparing case analyses of studied information driven innovations. As a result, based on this research, organisations may innovate by improving their business activities and model to remain competitive.

Finally, this research contributed directly to practice since it is part of the ‘Digital We’ open innovation project of BiZZdesign and InnoValor in which a consortium of organisations from different industries participate. BiZZdesign and InnoValor may adopt these results in their (consulting) activities.

#### **8.4. LIMITATIONS**

Main limitations are discussed in detail here and stem, unfortunately, from time and resource constraints within the scope of this master thesis project. Several limitations are discussed in the previous paragraphs. In addition, the reliability and validity of the data collection, data analysis, deriving the patterns, and studying the applicability of the patterns is already discussed in chapter 4.

This study had an exploratory nature and focussed on many aspects, which is both a strength and a weakness. As a result, many topics of interest could not be studied in detail. More detail could have been given to topics such as identifying dimensions, classification of cases, description of elements of the patterns, privacy or ethical issues regarding individuals and data. For example, consequences (results and trade-offs) of patterns could be studied more in detail. These are topics for further research.

#### **Deriving BM patterns**

As stated in the previous paragraph, a methodology to derive and optimise the patterns was developed in this research. Thereby, there is a risk of bias in the researchers interpretation and categorisation of the results. For example, the selection of dimensions for the classifications was mainly based on researchers’ insights and resulted in fields without cases (Figure 40 on page 88). The classification structured the cases. Despite there were not detailed case

insights before the case studies, it would have benefitted this research if the dimensions and classification were developed before cases were selected. It was hard to classify the studied cases from different industries in one classification scheme afterwards. It is likely that other/extra patterns were derived when other dimensions and/or other cases were studied.

### **Studying the applicability of the BM patterns**

The main limitation for studying the applicability of the patterns is interviewer and interviewee bias. Due to time constraints, semi-structured interviews could not take more than 60 minutes in which the interviewer and interviewee needed to get on the same level to discuss and explore the applicability of the patterns. It became clear that the reliability of studying the applicability may be harmed. This limitation is mitigated by studying five organisations to gain more input of multiple experts from the insurance industry. This enhanced the validity of the study of the applicability whereas, in the scope of this thesis, this was the best method to accurately study the applicability of the patterns. Only current initiatives, potential applications and restrictions were discussed of every pattern. These aspects could not be discussed in detail, such as how certain current initiatives have started. Only current initiatives, potential applications and restrictions were discussed of every pattern. These aspects could not be discussed in detail, such as how certain current initiatives have started. Due to the newness of the topics and BM patterns the applicability could not be studied quantitatively. In the future, actual design workshops using the patterns are an alternative approach and will benefit this research.

## **8.5. RECOMMENDATIONS FOR FURTHER RESEARCH**

Based on this extensive and explorative research, main recommendations for further research are described.

First, it would be valuable to validate main results by repeating this research on a larger scale with more and cases from other industries. During the interviews with insurers, there were no other information driven BM patterns noticed, but it is likely that other (information driven) patterns arise in the (empty) boxes in the classification scheme when other information driven innovations are selected and studied. Based on the derived patterns, it is also possible and valuable to extrapolate other BM patterns that contribute to (empty) boxes in the classification scheme. These patterns also may drive on (business model) innovation in the insurance

industry and other industries. Repeating this research on a larger scale also contributes to the validation of the methodology to derive patterns, the patterns and the methodology to study the applicability. In addition, a more standardised methodology would benefit the reliability of further research. These new insights could be valuable for further research and (business model) innovation in the insurance and other industries.

Second, it would be beneficial for science and practice to study the applicability of the patterns and benefits of using a pattern based approach in other industries to compare differences and drive on (business model) innovation in other industries.

Third, based on the limitations, this study would benefit from a more extensive revisit of the broad range of topics that were discussed and combined. Mainly, a deeper study of the classifications of cases, composition of elements of the BM patterns and application in the insurance industry and other industries would benefit this research. For example, the consequences, linkages, interrelations, and applicability of the BM patterns could be investigated more in detail during further research. The consequences of applying a pattern would benefit further research through, for example, a longitudinal study into the evolution of BM (performances) when a certain pattern is applied. It would also be interesting to study the evolution of BM (performances) when certain organisations do not apply a pattern (control group). As a result, developing clearer and more complete business cases will benefit the application of the BM patterns. In addition, these business cases can be adjusted to current ideas and programs to innovate business models of insurers and other interested organisations. These are interesting topics for a PhD research.

## 8.6. CONCLUDING REMARKS

The patterns show its advantages and potential applications to reinforce insurance companies. Organisations that deal accurately and innovatively with information remain competitive and may win significantly over competitors. Trends that influence the business model environment of insurers drive on (business model) innovation. This research shows how BM patterns could support insurance companies to deal with certain trends. It became clear that while the patterns entail valuable insights and potential applications to innovate insurance companies, it are ultimately the insurance companies that need to exploit, develop and apply current initiatives and potential applications. Insurance companies should do this to transform innovative ways of dealing with information into new business (model) activities to become more and more **the information driven insurance company.**

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*'To turn really interesting ideas and fledgling technologies into a company that can continue to innovate for years, it requires a lot of disciplines.'*

Steve Jobs

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# Appendices

## A. LIST OF ABBREVIATIONS

API	Application Programming Interface
B2B	Business to Business
B2C	Business to Consumer
BM (patterns)	Business Model (patterns)
BMC	Business Model Canvas
CEO	Chief Executive Officer
DDBM	Data-Driven Business Model framework
FNOL	First Notification of Loss
FTE	Full Time Equivalent
GPS	Global Positioning System
ICT	Information Communication Technology
IS	Information System
IT	Information Technology
PND	Personal Navigation Device
R&D	Research & Development

## B. INTERVIEW QUESTIONS INFORMATION DRIVEN INNOVATIONS

### *Generic*

- Which product of your organisations is the most information driven innovation? In what way does your organisation contribute to information driven innovations?
- Who are competitors of your organisation regarding the information driven innovations?

### **Part 1: Business Model Canvas**

Goal: Develop the BMC of the information driven innovation

Note: Not all questions need to be asked. There is overlap between questions. If a building block is clear we go to the following building block.

#### *Customer segments*

- Who are your customers?
- Who are your most important customers?
- Characteristics: international/national/regional, age, gender, income class etcetera?

#### *Value proposition*

- What is the product and/or service that your organisation delivers/offers to each customer segment?
- Which customer needs does your organisation satisfy?
- What value does your organisation deliver to the customer?
- Why do or should customers buy at your organisation?

#### *Channels*

- Through which channels do you communicate your value proposition to each of your customer segments?
- How do you get in touch with your customers?

#### *Customer relationships*

- How do different customer segments interact with your organisation?
- Do customers have direct (personal) or indirect (non-personal) contact with your organisation?
- Is the relationship based on one way communication or do customers participate in the creation of products and/or services (customisation)?

### *Revenue streams*

- What is the main revenue stream for your organisation regarding the information driven innovation?
- Do you have different revenue streams for different value propositions and/or customer segments?
- Do customers pay for additional services?

### *Key activities*

- What are key activities in your organisation regarding the information driven innovation?
- Which key partners provide support for these activities?
- How do these activities differ among different value propositions and customer segments?

### *Key resources*

- What are the key resources in your organisation regarding the information driven innovation?
- Which key partners does your organisation have for these key resources?
- Which key resources are needed to offer the value proposition for the customer segments?

### *Key partners*

- Who are your key partners? For what goals are they key partners?
- Which key activities do partners perform?

### *Cost structure*

- What are the most important costs in your organisation?
- Which key resources and/or key activities require the most important costs in your organisation?

Discuss the BMC that we developed before starting the interview

## **Part 2: Key activities regarding data**

Goal: Identify key activities regarding data regarding the information driven innovation.

Note: Not all questions need to be asked. When an aspect is clear we go to the following aspect.

### *Generic*

- What are key activities regarding data that are related to the information driven innovation?

### *Data acquisition and generation*

- How does the product acquires and/or generates information/data?
- Does your organisation use internal or external data sources?
- Which key partners are needed for the acquisition and/or generation of information/data?

### *Processing and analytics*

- What does your organisation do with information/data that is acquired/generated by the product?
- What kind of information/data is therefore needed?
- Which key technologies are used to handle this data?
- Which key partners are used to process or analyse the data?

### *Aggregation*

- How does your organisation aggregate data that is generated by the product?
- How and by whom is this aggregated data used/analysed?
- For what goals is this data used?
- Which key partners are needed for this?

### *Visualisation and distribution*

- How is the data that is acquired/generated by the product visualised and distributed?
- Which key partners are needed for the visualisation and distribution of the data?
- Which minor costs are related to the way you use data regarding the previous discussed activities?

**Extra: Privacy**

- How does your organisation deal with the privacy of individuals regarding the way how information/data is handled for the product? Can this be seen as a key activity?

**Extra: Big data**

- How does your organisation use big data besides the product that is discussed before?
- Does your organisation acquire/generate information/data from the market? What is done with this external information/data?
- Which channels do you use to gather this information/data? Are these channels changed to gather more easily certain information/data?

## C. INTERVIEW QUESTIONS INSURANCE COMPANIES

### Part 1: Trends in the insurance industry

Goal: Understand (the importance of) innovation in the insurance industry.

- Currently, what are opportunities and threats that your organisation face?
- How does your organisation deal with these opportunities and threats?
- What are the plans to innovate the business model of your organisation?

### Part 2: Studying the applicability of the BM patterns

Goal: Discuss the applicability of the patterns

Note: It depends on the interviewee if we base this question on the cases and/or patterns.

Explain cases, classification and derived patterns

- Do you recognise this pattern?
- Did your organisation thought already about (implementing) such a pattern? Current initiatives?
- Do you see potential applications for this pattern in your organisation? For which insurances is this pattern feasible?
- What are pros, cons and restrictions?
- What is the added value for your customers to apply this pattern?
- What can be the added value for your organisation to apply this pattern?

### Overall conclusions

- Which patterns can be applied in/create value for your organisation? Why? Restrictions?
- How important is it for your organisation/the insurance industry to do something with these patterns?

## D. IMPRESSIONS METHODOLOGY TO DERIVE THE PATTERNS



Figure 50: Impression session to explore information driven business model patterns

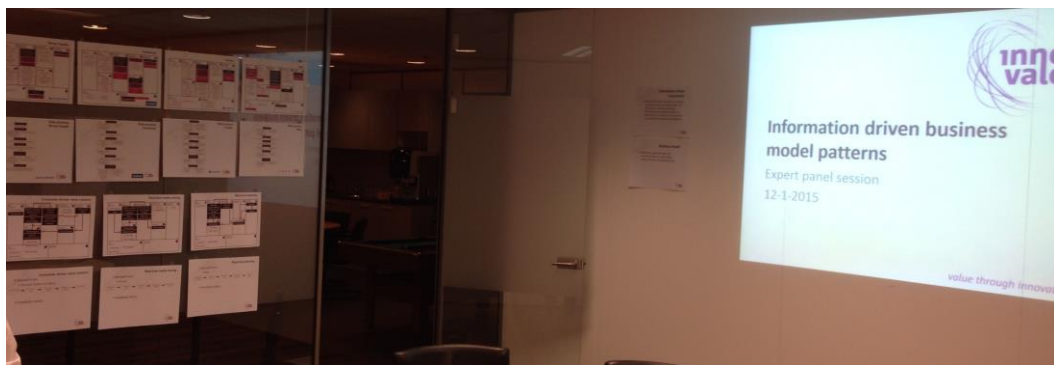


Figure 51: Impression focus group 1

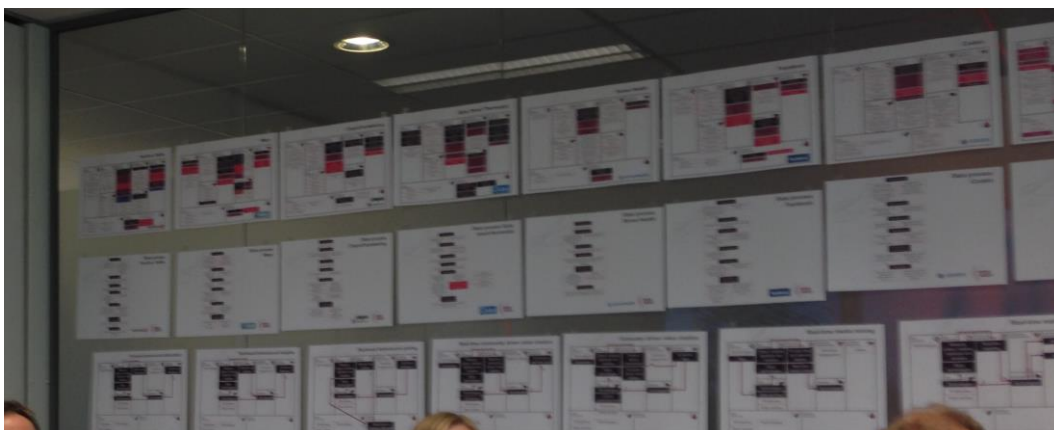


Figure 52: Impression focus group 2



Figure 53: Impression individual session to process feedback of the focus group



## E. DATA OF THE STUDY REGARDING THE APPLICABILITY OF THE PATTERNS

- *Applicability pattern 1: Individual behavioural insights*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Prevention: Provide individuals control information how they should behave;</li> <li>• Recovery: Provide individuals control information for a prosperous recovery;</li> <li>• Multiple platforms where individuals share information, experiences and individual (behavioural) insights.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Behavioural insights regarding prescription of medicines and referral behaviour of practitioners. Goal to enhance quality.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Generate and analyse individual driving behaviour;</li> <li>• Behavioural insights regarding, for example, quality of damage repair companies.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• From aggregated to individual insights;</li> <li>• Technologies entail endless possibilities.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Individual behavioural insights by using health apps and wearables (quantified self);</li> <li>• Improve prevention and recovery, decrease (care) costs and premiums and increase the competitive position of insurers. The whole society may benefit;</li> <li>• Different opinions in the market about the applicability of this pattern.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• liability, burglary, or building insurances by using apps and/or devices; Create insurances based on usage instead of ownership. Ownership entails risk. Risks are determined by usage;</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Organisation of the application (e.g. technologies, money and smart employees);</li> <li>• Ethical dilemmas;</li> <li>• Privacy (laws);</li> <li>• Insights result in insights of the financial risks of individuals. Insurers should be careful, because this is close to the core competence of an insurer;</li> <li>• Take the perception and personas of clients into account. Not everyone is willing to share insights;</li> <li>• Create benefits for individuals. Reward individuals to share insights with free services, lower premiums or a wearable.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Why should individuals share behavioural insights with an insurer that they distrust?;</li> <li>• Privacy of individuals and data is really important.</li> </ul>

<ul style="list-style-type: none"> <li>Insurers may learn more and more from new aggregated insights and, thereupon, improve their own business.</li> </ul>	<b>Damage</b> <ul style="list-style-type: none"> <li>Create insights is less difficult for damage instead of health, because the privacy issue is less important and sensors become cheaper;</li> <li>How do you define and measure ‘good’ behaviour?</li> </ul>
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Table 12: Applicability of pattern 1 (individual behavioural insights) in the insurance industry

• *Applicability pattern 2: Individual behavioural stimulation*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<b>Generic</b> <ul style="list-style-type: none"> <li>Builds upon current initiatives of pattern 1, because insights often result in stimulation.</li> </ul>	<b>Generic</b> <ul style="list-style-type: none"> <li>Builds upon potential of pattern 1;</li> <li>Different opinions if it is the role of insurers to actively stimulate individual behaviour;</li> <li>From (aggregated) group stimulation to individual stimulation.</li> </ul>	<b>Generic</b> <ul style="list-style-type: none"> <li>Builds upon restrictions of pattern 1;</li> <li>Doubts among insurers how to adopt behavioural stimulation in their activities. Is it a role of insurers to stimulate individual behaviour?</li> </ul>
<b>Health</b> <ul style="list-style-type: none"> <li>Stimulate health behaviour of groups, such as employees, on aggregated levels;</li> <li>Stimulate health behaviour via tripartite agreements (individual, insurer and practitioner) to stimulate individual behaviour in a certain direction during recovery.</li> </ul>	<b>Health</b> <ul style="list-style-type: none"> <li>Improve prevention and recovery, decrease (care) costs and premiums and increase the competitive position of insurers. The whole society may benefit;</li> <li>Stimulate individual behaviour by generating effect of behaviour on expected care costs.</li> </ul>	<b>Health</b> <ul style="list-style-type: none"> <li>No other restrictions are recognised.</li> </ul>
<b>Damage</b> <ul style="list-style-type: none"> <li>Programs to stimulate (driving) behaviour. These programs do not focus on individual behaviour and stimulate behaviour of groups.</li> </ul>	<b>Damage</b> <ul style="list-style-type: none"> <li>Apps and devices such as smart thermostats enhance the possibilities for this pattern;</li> <li>Train individuals to drive safer via dashboards.</li> </ul>	<b>Damage</b> <ul style="list-style-type: none"> <li>Doubts if individual behaviour can be stimulated, because a lot damage occurs through behaviour of others such water damage that is caused by neighbours or all kinds of damages that is caused by younger children.</li> </ul>

Table 13: Applicability of pattern 2 (individual behavioural stimulation) in the insurance industry

- *Applicability pattern 3: Individual behavioural pricing*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Builds upon current initiatives of pattern 1, because individual behavioural pricing is based on individual behavioural insights.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Reward individual behaviour (earning points) if individuals behave ‘good’ by going, for example, three times a week to the gym or upload photos of healthy meals;</li> <li>• Create a feedback loop when individual behaviour is rewarded.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Focus on prevention;</li> <li>• Chipin/Fairzekering case is a good example;</li> <li>• Collective behavioural pricing: ‘good’ behaviour of the group results in lower premiums for everyone. During the acceptance, individual (e.g. driving) behaviour is analysed.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Builds upon potential of pattern 1;</li> <li>• Enhance transparency of insurances.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Different opinions in the market regarding the applicability of this pattern;</li> <li>• Insurers need to accept everyone for the basic health insurance and pricing does/may not help;</li> <li>• Possibilities to stimulate and reward individual behaviour when insurers know how to deal with the restrictions.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Measure behavioural insights regarding travel, liability, burglary, or building insurances by using apps and/or devices;</li> <li>• Especially with this pattern, the focus of insurances shifts from ownership to usage;</li> <li>• Sensors can generate data if individuals protect and prevent a building (behaviour) sufficient to get a premium discount.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Builds upon restrictions of pattern 1;</li> <li>• May harm the solidarity that insurers need to guarantee;</li> <li>• Doubts among insurers if/how to adopt behavioural pricing in their activities;</li> <li>• Actuarial challenge: premiums of insurances are based on statistics of aggregated data (long term). This pattern focuses on individual pricing and data (short term);</li> <li>• Take perception and personas of individuals into account and create win-win through, for example, discounts.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Investigate legal limits;</li> <li>• To what extent may insurers price individual (health) behaviour?</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Doubts if individual behaviour can be priced, because a lot damage occurs through behaviour of others (see restrictions pattern 2).</li> </ul>

Table 14: Applicability of pattern 3 (individual behavioural pricing) in the insurance industry

- *Applicability pattern 4: Individual behavioural input*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<b>Generic</b>	<b>Generic</b>	<b>Generic</b>
<ul style="list-style-type: none"> <li>• Several insurers have online platforms and communities for individuals to share opinions and experiences. This input is not automatically processed in products and/or services;</li> <li>• Platform on which insurances are offered and insurers ask individuals to provide automatically input (feedback): a new way of customer panels. This input is not automatically processed in products and/or services;</li> <li>• Crowdfunding platforms to organise and develop new ideas with input of a crowd.</li> </ul>	<ul style="list-style-type: none"> <li>• Hard to make statements regarding the potential applications of this pattern;</li> <li>• Currently, besides automatic price determination, automated learning is not done much.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Personal health dossiers may integrate with other systems and share insights/input with the crowd (if individuals provide consent).</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No potential applications are recognised.</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance companies did not have clear in mind how this pattern can be applied. Therefore, generic restrictions are added;</li> <li>• Organisation of the application (e.g. technologies, money and smart employees);</li> <li>• Ethical dilemmas;</li> <li>• Privacy (laws);</li> <li>• It depends on the input of individuals to provide input. Ethical dilemmas and privacy (laws) are not main restrictions but need to be taken into account.</li> </ul>
<b>Health</b>		
<ul style="list-style-type: none"> <li>• No current initiatives are recognised.</li> </ul>		
<b>Damage</b>		
<ul style="list-style-type: none"> <li>• No current initiatives are recognised.</li> </ul>		

Table 15: Applicability of pattern 4 (individual behavioural input) in the insurance industry

- *Applicability pattern 5: Crowd behavioural insights*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Insurance companies did not recognise initiatives that are in line, but underlined the importance and (potential) value for individuals and insurers to create crowd behavioural insights.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• No current initiatives are recognised.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No current initiatives are recognised.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Crowd behavioural insights may have value for individuals and insurers;</li> <li>• Individuals want to benchmark their behaviour;</li> <li>• Insurers may improve prevention and recovery programs.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• How can individuals become healthier? Which health insurance do individuals with certain health characteristics have? Create aggregated crowd insights in behaviour.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Prevention of damages by providing crowd insights via dashboards;</li> <li>• Individuals may value crowd behavioural insights. Which car insurance do others have with car X from brand Y that is built in 2010? Improve customisation of products.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Organisation of the application (e.g. technologies, money and smart employees);</li> <li>• Ethical dilemmas;</li> <li>• Privacy (laws);</li> <li>• Individuals need to provide consent to share insights.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Ethical dilemmas are less important since data is anonymised and aggregated;</li> <li>• Privacy of individuals and data is really important.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Less difficult for damage instead of health insurances, because the privacy restriction is less important.</li> </ul>

Table 16: Applicability of pattern 5 (crowd behavioural insights) in the insurance industry

- *Applicability pattern 6: Real-time matching*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Insurance companies did not recognise initiatives that are in line, but underlined the importance and (potential) value for individuals and insurers to apply real-time matching.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Related initiative: insurers do already waiting list mediation.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No current initiatives are recognised.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Enhances transparency of insurances. Related initiative is to show real-time if something will be reimbursed;</li> <li>• Potential for real-time element: focus on reducing the time slack between accident and recovery;</li> <li>• Different opinions if it is the role of insurers to be apply real-time matching;</li> <li>• Add a ranking system to ensure the quality.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Improve waiting list mediation by focusing more on the real-time element by matching home care (like buuv.nu) or physiotherapy;</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Many things that an individual possesses/demands has potential for real-time matching;</li> <li>• Real-time matching for breakdown services;</li> <li>• Although the influence on recovery of damage is relatively high, there is potential to do more online and increase the scale of the professional supplier chain to repair damages.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Organisation of the application (e.g. technologies, money and smart employees);</li> <li>• Ethical dilemmas;</li> <li>• Privacy (laws);</li> <li>• It can be cheaper and more efficient if individuals arrange things mutually. Doubt: what can be/is the role of an insurer?;</li> <li>• Doubts among insurers how to adopt real-time matching in their activities;</li> <li>• It is important to study to what extent an insurer may apply real-time matching regarding legislation. Currently, Uber faces multiple lawsuits.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• No specific restrictions are recognised.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No specific restrictions are recognised.</li> </ul>

Table 17: Applicability of pattern 6 (real-time matching) in the insurance industry

- *Applicability pattern 7: Big data mining*

Current initiatives	Recognised potential applications	Restrictions of the applicability
<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Data mining is the essence of an insurer to analyse risks in a certain context. Insurers calculate prices and ways to finance the risks.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• Adding and mining other information/data sources. Improved predictions of health risks of individuals by focusing on their age, gender and/or place of residence.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• Adding and mining other information/data sources. Improved predictions how much damage individuals with a certain gender, age, place of residence, car type and/or car brand make.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• The previous patterns entail a lot of valuable information/data (sources). Potential for insurers to create more accurate insights and relationships;</li> <li>• Offer an open API with anonymised data to parties who can do ‘smart things’ with (aggregated) data;</li> <li>• Impossible to bring the whole world together via big data mining. Small steps are required;</li> <li>• New initiatives to improve big data mining and analysis by adding new information/data sources and apply new technologies (big data);</li> <li>• Focus on adopting new, structural and valuable insights in data centres and working processes to improve products/services.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• No specific potential applications are recognised.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No specific potential applications are recognised.</li> </ul>	<p><b>Generic</b></p> <ul style="list-style-type: none"> <li>• Organisation of the application (e.g. technologies, money and smart employees);</li> <li>• Ethical dilemmas;</li> <li>• Privacy (laws);</li> <li>• Difficult to do accurate and valuable big data mining to develop relationships. Do not underestimate the previous bullets: technologies and smart employees are needed;</li> <li>• Insurers need to take the impact on the society into account;</li> <li>• All these information/data and insights may have (monetary) value in itself for insurers.</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>• No specific restrictions are recognised.</li> </ul> <p><b>Damage</b></p> <ul style="list-style-type: none"> <li>• No specific restrictions are recognised.</li> </ul>

Table 18: Applicability of pattern 7 (big data mining) in the insurance industry

