THE USEFULNESS OF IT INNOVATION CLASSIFICATION FOR BUSINESS MODEL INNOVATION

Master’s thesis Ruurd de Schipper

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UNIVERSITY OF TWENTE.

Deloitte.

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Deloitte.

We believe that each man must find the truth that is right for him.
Reality will adapt accordingly.
The universe will readjust.
History will alter.
We believe that there is no absolute truth
excepting the truth that there is no absolute truth.

- Steve Turner

Acknowledgments

This thesis is my final work at the University of Twente and it indicates the end of my master study Industrial Engineering and Management. It is also marks the end of my time as a student. A time which I thoroughly and intensely enjoyed from start to finish. The experiences and skills one obtains during university are one of a kind and are far broader than only study-related. For this I would like to thank the friends who made this time so incredibly awesome.

The goal of this research is to link IT innovations with their impact on business models. The qualitative nature and ambiguous nature of this project has been the source of many ups and downs. In the end there is nothing more interesting than constantly being busy with the new things people invent and have to offer. Progress is an interesting and surprisingly circular phenomenon.

I would like to thank Deloitte for giving me the opportunity to work on this interesting subject during my master thesis. The informal atmosphere and the desire to help of colleagues made me whistle while walking towards the building to work on my thesis. Unfortunately, this whistling could sometimes turn into frustration when I faced difficulties with my thesis. At those moments I could always drink some coffee with the other interns to discuss our thesis or just life in general. Thanks for these refreshing conversations.

I would also like to thank the interviewees who participated in my research. The helpful business model experts, the guiding Deloitte case experts and the open and honest people at the banks. Special thanks to Chintan Amrit at the University of Twente for his help in desperate times.

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I hope you, the reader, will enjoy reading this thesis. Personally I think it is an interesting read, but my opinion could very well be a bit biased.

Management summary

The increasing speed and quantity with which IT innovations are developed change the business models of companies at an equally increasing speed. Banks for example are losing their position as an intermediate for payments and to industry entrants that have an online only or direct payment business model. On the other hand, the profound automation of standard processes leads to huge reorganizations and employee cuts. Banks therefore have a need to change their business model. A mapping of IT innovations and their impact on a business model would help banks to direct and structure these necessary changes.

Business model literature often focuses on start-ups, but recently there is a call for research to focus more on the impact of specific IT innovations on an existing business model. Scholars mainly explain business model change using large case descriptions, making it difficult to gain a quick overview. There is a need of developing the business model concept towards a suitable concept for comparison in empirical research. The following research question has the purpose to find the relation between IT innovations and business model changes within a bank by developing such a concept:

What is the impact of an IT innovation on the business model of a bank?

The aim of this research is thus to design such a mapping of the adoption of an IT innovation with its impact on the business model of a bank. Literature on business models and on IT innovations provide the basis for a framework to measure business model changes and their impact and to classify the IT innovations that cause them. Qualitative case research on six cases, divided into three IT innovation classes, leads to knowledge on how an IT innovation changes and impact the business model of a bank.

Remarkable results include:

- This study shows promising consensus on business model ontologies.
- This study evolves the business model concept towards a suitable concept for empirical research on business model change.
- This study proposes a framework which maps IT innovation types to business model changes.
- This study empirically shows that IT innovations in general have a positive impact on the business model of a bank.
- This study empirically validates the view that product innovations have a large impact on the value proposition while process innovations have a large impact on the value finance.
- This study shows banks opportunities to extend the impact of process innovations towards the value proposition dimension.
- This study shows a clear distinction between the large impact of administrative process innovations and the small impact of technical process innovations on the business model of a bank.

Banks should use the results to match the desired business model changes to the IT innovation it needs to adopt to achieve these changes. They should also use the mapping to become aware of specific changes of an IT innovation adoption and focus their change programme to this part of the business model. Business model innovation process and ideation movements will help to identify the match between IT innovation and desired business model changes. The framework suits the purpose of a knowledge management tool by providing a methodology to expand the mapping beyond industries and thus creating and sustaining knowledge on business model changes due to the adoption of an IT innovation. Consultancy companies can thus use the developed framework to benchmark the adoption of an IT innovation.

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Part 1 – Problem formulation

1 Introduction

The banking sector is one of the sectors that is likely to be largely disrupted by technological innovations (Fenwick, 2014). Although the basic activities of lending and insuring are still in place, banks are getting more and more entangled into IT. Advancements in computing power and data analytics increase automation of processes in these financial institutions. These IT innovations however, empower new entrants to threaten the role of traditional retail banking with innovative lending models such as peer to peer and internet-based payday loans. Multiple competing mobile banking and payment platforms cause a rising use and acceptance of these platforms. Meanwhile the advancements in IT innovations also cause growing complexity of risk management and threat of fraud to top it off. At this moment there are no generic methods to counter these threats or seize the opportunities of IT advancements. Banks therefore have a need to change their business model. A mapping of IT innovations and their impact on a business model would help banks to direct and structure these necessary changes.

A business model of a company can be seen as the blueprint of the company. It is “a conceptual coherent framework that provides a holistic but abstract understanding of the underlying business logic of an organization” (Mutaz M Al-Debei & Avison, 2010). It links the strategy of an organization with its organizational structure (Mutaz M Al-Debei & Avison, 2010; A Osterwalder, 2004). External forces can bring opportunities and threats to a business model, resulting in the desire to change the business model of a company. Brick and mortar companies for instance, are threatened by technological changes in the form of e-businesses. The latter can use their lack of building and staff costs as an advantage to keep the sales prices low (Laroche, Yang, McDougall, & Bergeron, 2005). The brick and mortar companies are therefore forced to revise their business model in order to keep up with competition (Bernstein, Song, & Zheng, 2008; Xia & Zhang, 2010). One of the most successful examples of this is Wehkamp. In the dawning decade of the internet they were a pioneer in gradually changing their business model towards e-commerce through the adoption of IT innovations (Keuning, 2011).

IT innovations are being developed with increasing speed and quantity, making it more difficult to know which IT innovation adoption will lead to the desired business model. In order to reduce time and costs at the process of choosing an innovation and during adoption, it is necessary to know more about the impact of these innovations on the business model of the company (Cearley, 2014). In current practice a business case is usually combined with pilot phases to determine whether an IT innovation is implemented and if so, which one. The lean start-up movement advocates an agile way of continuously adopting innovations and focuses on iteration (Ries, 2011). Although this method reduces trial and error in innovation adoption, a proven relation between the IT innovation and changes in a business model possibly speeds up adoption and can provide direction in the implementation process.

This research therefore examines how IT innovations change the business model of a bank. The methodology to create a mapping between IT innovations and business model impact can then be used further to expand the knowledge on how IT innovations impact business models.

1.1 Research relevance

Deloitte Nederland provides consultancy services to a broad spectrum of customers. The service line IT Strategy is the division which advises on the strategy regarding IT specific operational excellence and innovation adoption. Advice on IT innovations can be sustained by gaining a better understanding on the impact of present and future IT innovation on clients' IT landscape and market conditions.

Banks are losing their position as an intermediate for payments and therefore money storage to industry entrants that have an online only or direct payment business model. On the other hand, the profound automation of standard processes leads to huge reorganizations and employee cuts. Banks therefore have a need to change their business model. A mapping of IT innovations and their impact on a business model would help banks to direct and structure these necessary changes.

The business model literature has the potential to describe accurately the impact of innovation. It often focuses on the entrepreneurial application (Bouwman, Faber, Haaker, Kijl, & Reuver, 2008; George & Bock, 2011; A Osterwalder, 2004; D. J. Teece, 2010) but recently there is a call for research to focus more on the impact of specific IT innovations on a business model (De Reuver, Bouwman, & Haaker, 2013; Fichman, Santos, & Zheng, 2014). Scholars mainly measure business model innovations using big case descriptions (Bourreau, Gensollen, & Moreau, 2012; Matzler, Bailom, Eichen, & Kohler, 2013; Sosna, Trevinyo-Rodríguez, & Velamuri, 2010), making it difficult to gain a quick overview. Zott et al. (2011) therefore indicate the need of developing the business model concept towards a suitable concept for empirical research.

1.2 Purpose and scope

The purpose of this research is to find a mapping of IT innovations to business model changes in order to strengthen the business case for an IT innovation. Knowing the impact of an IT innovation can thus reduce and shorten pilot phases of IT innovations. To gain this knowledge, this research tries to identify business model change due to the adoption of an IT innovation. The motivation for this adoption or to business model change is therefore out-of-scope.

There are an extremely large amount of business models in the world, spread over many industries. This study has to choose a specific business model to be able to compare results. It therefore identifies a scope by specifying an industry or branch within an industry. In a recent large survey, Deloitte questioned chief information officer (CIO) respondents about IT innovations in their industry regarding the degree of operationalization within the respondent's company and the potential impact on the industry (Hofman & van Dijk, 2014). It defines transformative IT innovations as innovations that have potentially a big impact on a company and are of interest since a big change probably means a measurable change. Data from this survey indicates that the financial service industry (FSI) implements more transformative IT innovations compared to other industries and does this in a relatively early stage (Hofman & van Dijk, 2014). This means that the latest IT innovations with transformative potential can be found implemented within the FSI.

Examples include Unicredit implementing biometric authentication (Unicredit, 2012) or the use of telematics within the insurance branch (H. Morris, 2013). However, within the FSI there are still different types of business models, resulting in a need to narrow down the scope even more. The scope is set on the traditional banking business model as a baseline business model since many interesting cases have emerged in an explorative research. Following the focus on the banking sector the overall research question becomes:

What is the impact of an IT innovation on the business model of a bank?

Sub-questions are formulated to answer elements of the research question. The overall research question contains three elements. The "IT Innovation", the "business model" and the link between them.

The business model

The term business model has already been written forty-six times by now, but it is still a vague concept despite of a short definition in the introduction. The first sub-question is dedicated to define and concretise the concept of a business model.

1. What is a business model?

The definition of a business model concept provides the possibility to describe a business model of a bank. However, the overall research question indicate this is not enough as the concept looked for is business model change. The second sub-question is used to explore business model change and how this can be measured.

2. How can change in a business model be measured?

The answers to the first two sub-questions should be able to explain the element business model and how the change it encounters can be measured.

IT innovation

The next element under investigation is the IT innovation, or to be more specific, the kind of IT innovations. A classification has to be defined to distinguish different types of IT innovations. The following sub-questions therefore examine the possible classifications of IT innovations.

3. What is an IT innovation?
4. What different types of IT innovations exist?
5. How can IT innovations be classified into these types?

The big amount of IT innovations leads to the conclusion that not all IT innovations can be examined. The selection of IT innovations that will be examined depends on these three sub-questions.

The changes

The changes on the business model by different types of IT innovations are identified by combining the frameworks from the previous sub-questions.

6. What changes do different IT innovations cause in the business model of a bank?

Design

The knowledge of the changes caused by IT innovations is important knowledge. The last two sub-questions aim to identify how this knowledge can be used within banks or within a consultancy practice like Deloitte.

7. How can knowledge on the impact of an IT innovation help a bank?
8. How can the knowledge on the impact of an IT innovation help Deloitte?

1.3 Thesis structure

This thesis is structured in four parts. The first part gives an overview of the research by providing an introduction in chapter 1 and the used methodology in chapter 2. Part 2 consists of the literature review which provides the framework that is used to classify and identify the results. This part is divided in four chapters. Chapter 3 finds the definition of a business model, chapter 4 explains how to measure business model changes and chapter 5 searches for a definition and classification of IT innovations to be able to generalize the results. The last chapter in this part, chapter6, combines the findings of the literature research into a framework. Part 3 discusses the results and interpretations of these results. Chapter 6 provides the selected cases and the results in these cases. It also elaborates on implications for the hypotheses on which chapter 8 builds to provide interpretations of the results. Finally, part 4 provides the conclusion in chapter 9 and the discussion in chapter 10. Table 1 relates the research questions with their methods, deliverables and the chapter that answers the question.

Research question	Methodology	Deliverable	Chapter
The business model			
1. What is a business model?	Literature study	Selection of business model ontology	Chapter 3
2. How can change in a business model be measured?	Literature study	Ways of measuring business model change	Chapter 4
IT innovation			
3. What is an IT innovation?	Literature study	Definition of an IT innovation	Chapter 5
4. What different types of IT innovations exist?	Literature study	Classes of IT innovations	Chapter 5
5. How can IT innovations be classified into these types?	Literature study	Method to map cases into classes of IT innovations	Chapter 5
The changes			
6. What changes do different IT innovations cause in the business model of a bank?	Interviews	Case results and interpretations of business model changes	Chapter 7
Design			
7. How can knowledge on the impact of an IT innovation adoption help a bank?	Analysis of results	Added value for a Bank	Chapter 8
8. How can the knowledge on the impact of an IT innovation help Deloitte?	Design of ensemble artefact	Added value for Deloitte	Chapter 8

Table 1: Research overview

2 Methodology

The purpose of this research, as formulated in the previous chapter, is to find a mapping between the impact of IT innovation adoptions and business model change within banks. This research uses earlier scientific research to ensure rigor and furthermore designs a mapping that is helpful in practice. With that it follows the description of a design and action theory (Gregor, 2006; Hevner, March, Park, & Ram, 2004).

A specific design science approach builds on design research with the integration of action research, creating the so called action design research (ADR) (Sein, Henfridsson, Purao, Rossi, & Lindgren, 2011). ADR focuses on case research and promotes an iterative and agile way of doing research. This research has a topic which is fairly new in literature on first sight, which means that frameworks might change along the way. The iterative and agile approach of doing case research therefore suits this research well (Sein et al., 2011).

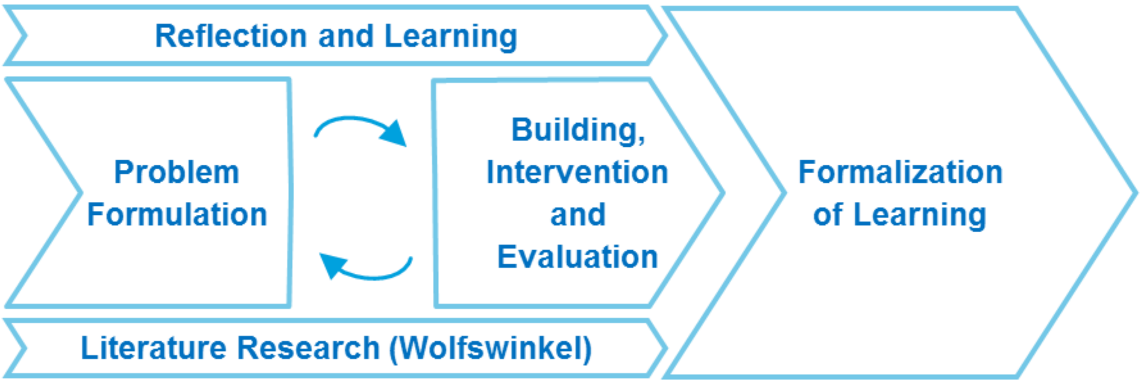

Figure 1 Action Design Research adapted from Sein et al. (2011)

Figure 1 visualizes the ADR approach and consists of four stages and a continuous literature search. The problem formulation stage specifies and conceptualizes the research goal with the help of a literature search. The building, intervention and evaluation (BIE) stage creates an artefact that improves with the help of multiple BIE cycles. These two stages follow each other iteratively, the researchers start a new problem formulation stage when the BIE stage does not produce the desired deliverable. The reflection and learning stage acts as project management and keeps track of the research goals to notice when it is necessary to change tracks. The formalization of learning stage generalizes the results and communicates it to the relevant stakeholders in the form of a presentation, paper or thesis.

2.1 Data collection

The building, intervention and evaluation (BIE) stage creates and improves an artefact through the so called BIE cycle. The artefact consists of six cases and each of these six cases evolves through one BIE cycle, resulting in six BIE cycles in this research. The result of each BIE cycle is therefore the impact of a specific IT innovation on the business model of a bank and together they form the artefact which provides insights into the impact of IT innovations on the business model of a bank. Thus, the artefact helps to answer the design sub-questions and the main research question.

2.1.1 The BIE cycle

This research chooses the IT dominant BIE cycle to emphasize the focus IT innovations (see Figure 2). Exploratory talks with Deloitte experts first lead to an Alpha 0.1 model on the impact of an IT innovation of a bank. A validation interview with a business model expert then leads to an Alpha 1.0 model, which is a hypothesis of changes and their impact of the IT innovation. The next validation interview focuses on a specific case in which the IT innovation is used. It is with a case expert at Deloitte and this leads to the Beta model, which is a preparation for the case interview. This final interview with the project manager of the case within a bank leads to a part of the artefact. The six cases, and thus BIE cycles, together form the artefact (see Figure 2).

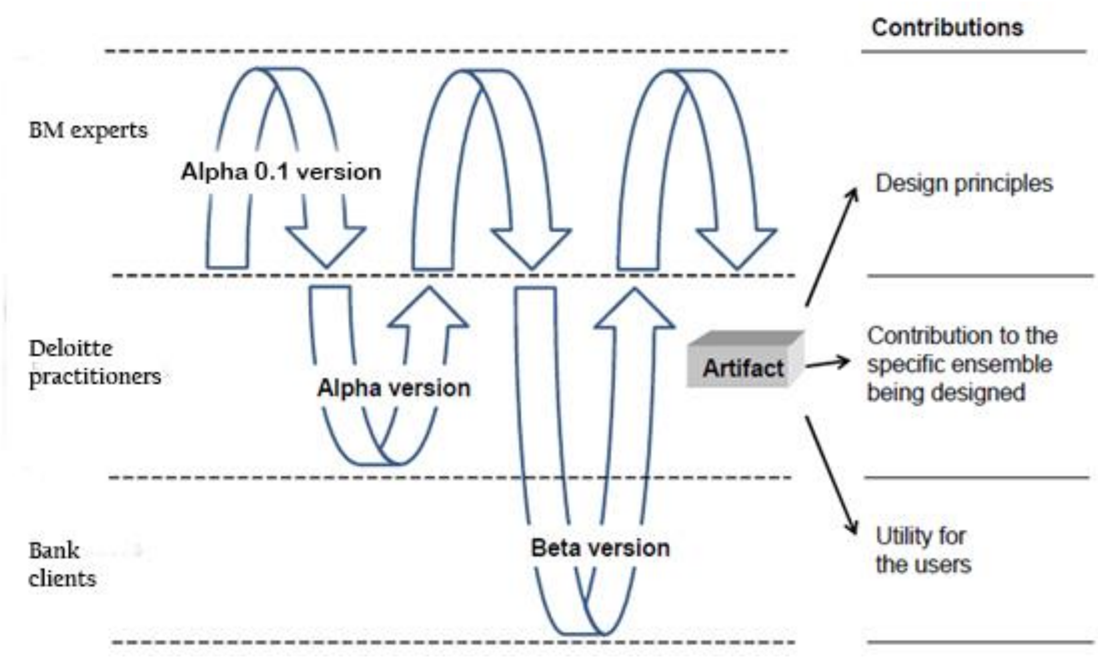

Figure 2: The Building, Intervention and Evaluation cycle adapted from Sein et al. (2011)

Each BIE cycle thus involves three interviews: one with a business model expert, one with a Deloitte case expert and one with the project manager at a bank. This gives eighteen interviews in total for the six IT innovations. All these interviews give the possibility of documenting contextual information about the cases. Expert knowledge and practitioner descriptions are a valuable asset in understanding why a construct (the business model) has changed. The next section provides the interview framework which is needed to maintain rigor in the research.

2.1.2 Interview Framework

The selected approach requires a semi-structured interview (see Table 2). Structured topics make it possible to analyse each case in depth by asking open questions. The main questions of the interview aim to provide explanations for RQ6 and can be found in Table 2. Follow-up questions are used to narrow down and specify answers when they are not immediately clear (Rubin & Rubin, 2012). It is important to get the reasoning as clear as possible in the case of the fourth interview question. The sub-questions of the fourth interview question therefore examine what is changed, why it is changed and how it is changed within the business model. Furthermore, the interviews with business model experts contain three extra questions to assess the quality of the interview. The business model experts all responded no changes would be missed with this interview structure, but that it is very important to maintain the same formulations in questioning in order to compare results.

Lead	**Subject**	**Estimated Time**
Deloitte	Introduction	10 min
Researcher & Company	Explain Trends & Tune definition of IT innovation 1. *Could you give us a definition of [IT innovation]?*	5 min
Researcher	Check whether BMC is known and explain function and overview. 2. *Are you familiar with the business model canvas?*	5 min
Researcher	Explaining and questioning of each (9 times) business model element. • Explain [BM element] 3. *Do you think the hypothesis on [BM element] is correct?* 4. *Why is it not correct? (value or reasoning)* a) *What is changed?* b) *Why does it cause the value change?* c) *How does it cause the value change?*	30 min
Researcher	Gather contextual/extra information when there is time left 5. *What is in your opinion the most important change due to the adoption of [IT innovation]?* 6. *Is there something you would like to add to the interview?*	10 min
Researcher	Questions to test the interview structure I. *Was it possible to give estimations close to the truth?* II. *Was the business model appropriately questioned?* III. *Are changes in the company missed by the interview approach?*	

Table 2 Interview structure and questions

The interview framework leads to qualitative data on the changes within a business model. Interviewees can then assess the perceived impact on each business model element through the use of an ordinal scale in order to visualize the impact of these changes (see Figure 3). Note that the scale is not used to gather quantifiable data but merely acts as visualization of the case results.

Significantly negative	Negative	Slightly negative	Neutral	Slightly positive	Positive	Significantly positive

Figure 3: Used scale for perceived impact

The scale is defined as: The impact of change in the specific business model element for the company. For example, the question "Why is the given value applicable for the company?", can yield different levels of results. Key is to include the context in the answer. An answer in the form of *"We replaced software vendor x with software vendor y."* is a change, but not particularly a change in business value. The desired response describes what is changed and why this affects the value obtained from the business model element. An example answer would be: "*Software vendor y has broad solutions. By replacing software vendor x with software vendor y, we can leverage the partnership and easily ask for more extensive systems. Thus obtaining more value from our partners assessing it as a positive change."* This example uses a business model element like partners or network.

2.2 Data Quality

Where quantitative research is used to statistically indicate causality and correlation, qualitative research through case studies can provide more detail on the context of the changes and thus provide valuable information to link practice and theory (Yin, 2003). This study cannot determine the exact measure of data quality and therefore turns to the tactics that Yin (2003) proposes to ensure the quality of the obtained data. The construct validity is the degree to which a measure represents the construct(Bhattacherjee, 2012). The researcher ensures construct validity by using multiple sources, establishing a chain of evidence and letting key informants review the draft case study report (Yin, 2003). This study gathers data from literature and three interviews per case thus ensuring multiple sources. Each case runs through one BIE cycle which exists of three interviews. The interviewee validates the transcript of the interview and a recording and transcript provides the possibility to track the conclusions back to the data, thus establishing the chain of evidence.

The internal validity is the degree to which the observed change in a dependent variable is caused by a change in the independent variable and therefore aims to exclude that other factors are in play (Bhattacherjee, 2012). This study uses tactics within the data analysis to increase the internal validity. First it identifies patterns across cases and secondly it does explanation building by identifying causal links within the data analysis. The cases that were selected all were traditional and licenced banks to further improve internal validity.

The external validity examines the generalizability of the sample cases towards other organizations, contexts and time (Bhattacherjee, 2012). This study uses a replication logic over multiple cases as proposed by Yin (2003) to increase the external validity. Finally, reliability aims to minimize errors and bias (Bhattacherjee, 2012). This study uses the same data collection procedure in every case with a consistent set of questions in each interview. It also develops a case study database of all transcripts and notes to further strengthen the reliability of the study.

2.3 Literature search methodology

The literature search provides answers to the knowledge research questions about business models and IT innovations. This research conducted three separate searches in order to find definitions and frameworks on 1. business models, 2. how to measure them and 3. IT innovations.

2.3.1 Business model literature review

The goal of the first literature search is to explore the history and the concept of the business model. Zott et al. (2011) recently conducted a rigorous literature review on the business model concept. This research builds on the previous work done by them (Amit & Zott, 2001; C. Zott & Amit, 2007; Christoph Zott & Amit, 2009) and provides an update on articles which were written previously. The methodology of this literature search is based on Wolfswinkel (2011), which on its turn is based on the guidelines of Webster and Watson (2002). Following Wolfswinkel (2011), the researchers formed selection criteria, identified fields of research, selected sources and defined specific search terms in order to structure the selection of articles (see Appendix 12.2 “Literature search specification” for details). The criteria led to the following search query:

TITLE("*usiness mode*") OR KEY("*usiness mode*")AND PUBYEAR > 2010 AND (SUBJAREA(COMP OR BUSI))

This search yielded 1725 results which after the citation criterion shrunk to 314 articles. A total of 47 articles were left after title selection where the article needed to be about the business model on a conceptual level or higher level strategy. 8 articles remained upon reading the abstract with the same criteria. 2 articles were added after applying backward citation search with the same title and abstract criteria. 6 of the 10 articles remained after reading. The articles which are listed in the research of Zott et al. (2011) and the six articles found through the search provide the information for the next chapter in which the business model concept is examined (see Appendix 12.2 “Literature search specification” for details).

2.3.2 Business model measurement

The goal of this part of the literature search is to find possible measurement frameworks of business models and it follows the methodology proposed by Wolfswinkel (2011). Osterwalder (2004) gives an overview of the occurrences of the term business model in scholarly journals divided in abstract, title and as keyword. The first occurrence of the term is in 1995 and it is therefore not necessary to search earlier than 1995 for business model or a combination with business model. The previous search query fits the new time window through a slight adjustment into the following query:

TITLE("*usiness mode*") OR KEY("*usiness mode*")AND PUBYEAR > 1994 AND (SUBJAREA(COMP OR BUSI))

The search yielded 4511 results from which after citation filtering 674 results remained. Title selection based on conceptual discussing of business model change shrunk the total to 33 articles. The same criterion was used while reading the abstract, after which 21 articles remained. One article was not available and from the remaining 20 articles, 17 were selected after reading. Backward citation search led to 2 extra articles, making a total of 19 articles (see Appendix 12.2 “Literature search specification” for details).

2.3.3 IT innovations

A thorough literature review on the definition of an IT innovation and the different types of IT innovations is necessary to answer the three associated sub-questions. The search term “classif*” OR “typology” OR “taxonomy” did not yield interesting results in combination with “IT innovation”. The researchers introduced the search term “character*” since a classification is often build from differences in characteristics:

TITLE-ABS-KEY(("IT innovation" OR "Information Technology Innovation") AND "character*")

This search gave 213 results from which after citation filtering 38 usable articles remained. A total of 16 were left after title selection based on the possibility of the paper discussing innovation classification or characteristics on a conceptual level. The same selection was done on the abstract and 8 articles remained. Since one article was not available, 7 were used after reading the articles. Backward and forward citation resulted in 8 extra papers.

The content of the papers was not directly satisfying so Google scholar was used for a new search. The exact key word “IT innovation classification” resulted in 5 extra usable paper. Extra searches for white papers were done using google and key words like Gartner, Forrester and multiple consultancy agencies and resulted in 13 white papers. After reading, 5 of them were used (see Appendix 12.2 “Literature search specification” for details).

Part 2 – Literature Review

3 What is a Business Model?

A business model of a company can be seen as the blueprint of the company. It is

"a conceptual coherent framework that provides a holistic but abstract understanding of the underlying business logic of an organization" (Mutaz M Al-Debei & Avison, 2010).

This definition is however not as simple as it seems. Business model literature is highly dispersed and a context is needed to grasp the definition. This chapter therefore first provides context before it moves to an overview of the literature. A useful and congruent definition is then chosen by finding consensus in the literature first.

3.1 A history of the business model concept

The business model concept was born out of the fast rise of e-businesses, which on its turn was made possible by IT innovations. IT innovations such as the internet gave companies new possibilities and ways of doing business. As the amount of IT innovations rapidly increased, the question emerged whether IT innovation adoptions did create business value. Although numerous cases seem to prove this (Dedrick, 2003), at the same time the competitive value of IT was questioned (Carr, 2003). This led to research on IT business value and how to create it (Melville, Kraemer, & Gurbaxani, 2004). While research on IT business value arose, brick and mortar pioneers already began to research new strategies to be better reachable to customers. This resulted in the so called click and mortar companies and e-commerce businesses (Chang, Jackson, & Grover, 2003; Gulati & Garino, 2000).

The move of companies towards the online world caused a shift in how companies do business, catching the interest of scholars. Research on these changes started in the nineties with a renewed concept of a business model, focusing on value creation and transfer between IT and business (M. Morris, Schindehutte, & Allen, 2005). As the research started from e-commerce, it is not surprising that many business model ontologies focus on these kind of businesses (M M Al-Debei & Fitzgerald, 2010; J. Gordijn & Akkermans, 2001; Timmers, 1998). The internet and subsequent innovations resulted in a connected world, providing opportunities for companies to work together. This is presented by Gordijn & Akkermans (2001) by emphasizing the network of a company in their business model ontology.

Recent research aligns the business strategy with business processes through the use of a business model (Mutaz M Al-Debei & Avison, 2010; Casadesus-Masanell & Ricart, 2010) . The concept of a business model however, is widely still dispersed (C. Zott et al., 2011). Bouwman et al. (2008) have kept different business sectors in mind from the beginning, but see IT clearly as a facilitator. Although the ontology of Osterwalder et al. (2004) was originally designed for e-commerce as well, the operationalized model provided visual simplicity which made it usable in more business sectors.

Probably due to the absence of consensus on the meaning of the term business model there are more fields of research interested in business models (Shafer, Smith, & Linder, 2005), which on its turn can contribute to the exponential growth of the usage of the term business model (see Figure 4). Reasons of this lack of consensus are sought in the dispersed literature because of many research field participating (Pateli & Giaglis, 2004; Shafer et al., 2005) and a lack of literature classification (C. Zott et al., 2011). A few literature overviews provide a handle to classify the literature and reach a meta-perspective on the business model literature. These are elaborated in the next section.

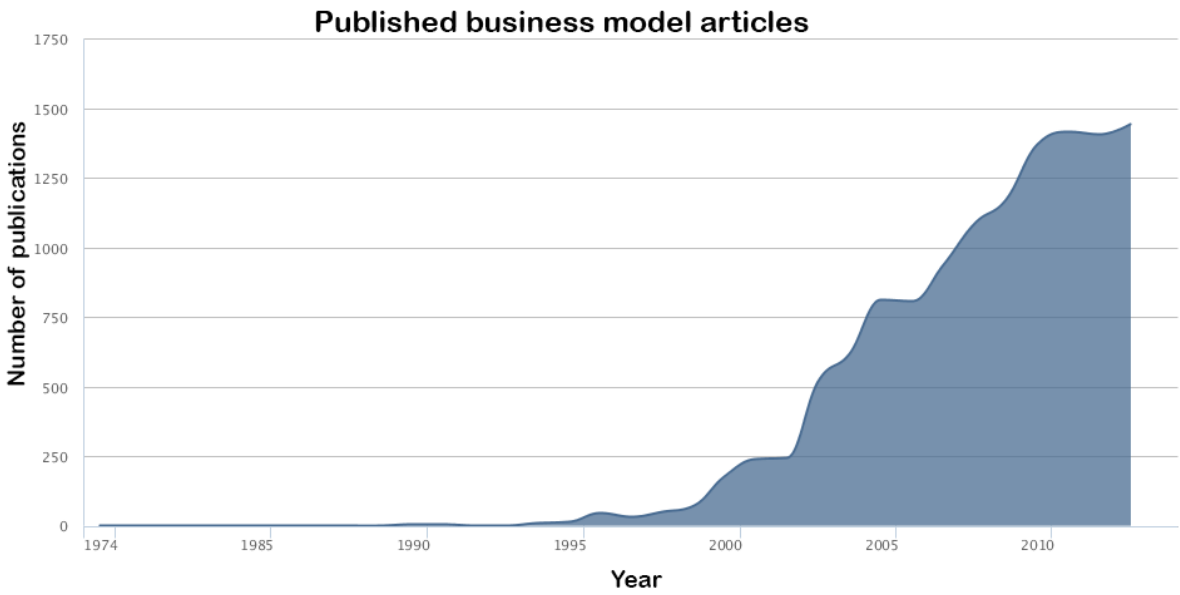

Figure 4: Published business model articles from 1974 until 2014 retrieved from Scopus.com

3.2 Gaining a meta-perspective

A classification of business model literature is made by Onetti et al. (2012), who divide the literature into e-business and main stream. Zott et al. (2011) also call for a classification of business model literature in their overview, but they suggest that there are three clear lines to be found in the field. The fact that scholars use the term business models in the different categories is one of the reasons for the lack of consensus in the field. At the same time Wirtz (2011) also made a classification of literature based on chronological development versus subject. Although the two classifications are not interchangeable, they both point out the class of business models on e-business which was regarded as the start of research on business models. An extensive overview regarding business model definitions is given in the table provided by Zott et al. (2011), which can be found in Appendix 12.4. The classification of Wirtz (2011) on the other side, provides an excellent chronological overview of the business model literature which can be found in Appendix 12.2. These overviews give reason to follow Albers et al. (2013) when he quotes Kuhn (1970) that the business model field is still in a "state of prescientific chaos". The highly unstructured state of the research field requires every additional research to be clear in their view of the term business model (C. Zott et al., 2011). The business model definition this paper follows is explained in the next section.

3.3 Promising consensus

Another literature review is done by Al-Debei & Avison (2010) and they conclude a business model is the missing link between strategy and operation. They classify the ontological structure of a business model into four dimensions: Value Proposition, Value Architecture, Value Finance and Value Network. Although not all scholars include the Value Finance perspective, there seems to be a consensus on the other three dimensions from the definition of a business model of early contributor Timmers (1998) to the definition of recent contributor George & Bock (2011). Timmers (1998) says the business model is "An architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues." George & Bock (2011) also mention the resource structure, transactive structure and value structure. An ontology like this is needed in this research to describe the current and desired business model. Reducing the business model to four dimensions makes it easier to create a usable overview, while at the same time it is exhaustive enough to describe the complete business model (Frankenberger & Weiblen, 2013). An ontology should not be used in pieces without further research and therefore this research includes the value finance dimension as well when following the business model ontology of Al-Debei & Avison (2010)

The value proposition describes the offering value structure. It includes the products and services a company offers to its customers. The value architecture describes the technological architecture and organizational infrastructure. It includes the core competencies of a company as well as its resources, which together account for the tangible and intangible assets of a company. The value finance dimension describes the financial setups and returns like the costs, pricing mechanisms and revenue structure. The value network describes the business and customer actors' web. It provides insights in how the different stakeholders exchange value through particular channels. (Mutaz M Al-Debei & Avison, 2010).

3.4 A layered business model ontology

The careful consensus on the dimensions of a business model brings hope for a scholarly approach of the business model. However, the business model canvas of Osterwalder (2004) is widely known in practice with a million copies sold of the book describing how to use it (A Osterwalder, 2014). It has an internal focus, in contrast with for example the STOF model of Bouwman et al. (2008). The internal focus is helpful since this research wants to find the internal changes in order to help a business achieve this changes. On top of that it is important that companies are already somewhat familiar with the concept of a business model.

The similarities between the paper of Al-Debei et al. and the dissertation of Osterwalder are striking (Habtay, 2012). Their definitions of a business model are close to the same and they share the view of the position of a business model: between strategy and operations. The ontologies themselves are also very similar. There are nine business model elements divided into four pillars in the ontology of Osterwalder. These four pillars of Osterwalder are defined almost the same as the four dimensions of Al-Debei et al. It is interesting to see that Al-Debei et al. and Osterwalder reach similar conclusions as Al-Debei et al. have conducted a rigorous literature study six years after the dissertation of Osterwalder. (Mutaz M Al-Debei & Avison, 2010; A Osterwalder, 2004)

The holistic research and view of Al-Debei et al. and the similarities to Osterwalder provide the basis for linking the two to bring practice and research closer together (Mutaz M Al-Debei & Avison, 2010; A Osterwalder, 2004). By linking the business model canvas to the research field, both scientific and practical value is added to this research.

To link these two models it is only necessary to move the partnership element to the customer interface pillar and the target customer element to the product pillar, thus creating dimensions similar to the value network and the value proposition dimension of Al-Debei et al. The resulting ontology relates the business model elements to the four dimensions of Al-Debei et al. and can be seen in Table 3 (Mutaz M Al-Debei & Avison, 2010).

BM Dimensions (Al-Debei & Avison)	Business Model Blocks (Osterwalder)	Description Osterwalder
Value Proposition	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.
Value Network	Distribution Channel	A distribution Channel is a means of getting in touch with the customer.
	Relationship	The relationship describes the arrangement of activities and resources that are necessary 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.
Value Architecture	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.
Value Finance	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.

Table 3 Business model ontology: Al Debei & Avison vs Osterwalder

The business model definition of Al-Debei & Avison (2010) is followed since their ontology is used as the scholarly art of our business model ontology. So the definition of a business model in this research is:

"The BM is a conceptual coherent framework that provides a holistic but abstract understanding of the underlying business logic of an organization." (Mutaz M Al-Debei & Avison, 2010)

This chapter has given an overview on business model literature. It has led to the definition of a business model and the selection of a business model ontology, thereby providing a way to describe a business model. The next chapter examines how to measure business model changes and map structure them.

4 Measuring the business model

The previous sections provided an overview on business model ontologies and the evolution of the term business model. With this basis, this section elaborates on how change within the business model can be measured. Literature on change within a business model use the term business model innovation. A short overview of literature is given before the literature is then examined in depth to find how a change in the business model can be measured. The process of business model innovation is elaborated as well to pinpoint the added value of this research in changing a business model.

4.1 Overview of Business Model Innovation

The concept of a business model is now almost twenty years old. Originally a business model was used to explain the rise of the disruptive e-businesses. Companies were being overthrown by entrepreneurs who leveraged new technologies into disruptive business models. Examples can be found in the rise of Amazon and Netflix, of which the latter partly caused the downfall of Blockbuster (Casadesus-Masanell & Ricart, 2010; Peterson, 2013). Therefore, incumbents want and need to get ahead again by innovating their own business model (Baden-Fuller & Morgan, 2010; Casadesus-Masanell & Ricart, 2011; Henry Chesbrough, 2007; D. J. Teece, 2010). Johnson et al. (2008) approach the concept from a strategy perspective. They explain when a fundamental change is in place and when this change becomes innovation (M. W. Johnson et al., 2008). Case studies on change in business models emerged (Matzler et al., 2013; Sosna et al., 2010) and typologies of business model changes followed (Amit & Zott, 2012; Cavalcante, Kesting, & Ulhøi, 2011). These typologies suggest that the definition of business model innovation lies in the change of activities and processes. Bucherer et al. (2012) acknowledges this, but broadens it by stating that business model innovation itself is “a process that deliberately changes the core elements of a firm and its business logic” (Bucherer et al., 2012). Although it is suggested that the end result of this process is known (Amit & Zott, 2001), this process of changing does not necessarily follow a clean path. In fact, necessity of experimentation is mentioned often in literature (Bourreau et al., 2012; Demil & Lecocq, 2010; Frankenberger & Weiblen, 2013).

Three main branches emerge from this overview: the definition of business model innovation; typologies of business model changes and the process to reach a business model innovation. The next sections search for an approach to measure business model change by elaborating on the first two themes. The third theme is used to pinpoint the added value of this research.

4.2 A matter of perspective

Scholars use the ontologies discussed in the previous chapter to describe change in a business model. Johnson et al. (2013) uses the e3-value model of Gordijn & Akkermans (2001) to monetize a business model probability. They use different business model elements and estimate an amount of money on each attribute of the elements, thus measuring the elements objectively (P. Johnson et al., 2013). Bourreau et al. (2012) do the same but with a more abstract and less numeric business model ontology. They use the focus on value creation and capture that in a business model which can also be used to examine an industry change in depth. They describe five potential business models through extensive elaboration and validate them in the field (Bourreau et al., 2012).

There are however scholars who provide a new business model ontology in order to map innovation. Huarng (2013) sees business model innovation as the consequence of a product innovation since he takes an entrepreneurial view. This product innovation is therefore the starting construct of his ontology and this can be cautiously mapped to the value proposition of Osterwalder (2004). The starting perspective of an innovation is the only differentiator for this ontology since the measurement of a business model happens by describing the various constructs like in the aforementioned ontologies. These ontologies are usually used to provide a single view in time perspective of a business model. Demil & Lecocq (2010) refer to this as a static view. They argue that a business model evolves through internal and external factors. This is exemplified by identifying the business model changes in a case using their own ontology as a framework, defined as the dynamic view (Demil & Lecocq, 2010). The dynamic view of a business model is not only used by Demil & Lecocq (2010). The following section discusses articles which have a dynamic view on business models in order to find the options for measuring change in a business model.

4.3 Devising a measuring approach

Business model innovation is described as a sequential and iterative process, but has only abstractly been explained in literature (Amit & Zott, 2012; Henry Chesbrough, 2007; D. J. Teece, 2010). Johnson et al. (2008) define business model innovation as a change within each of the four elements of a business model, the elements being value proposition, profit formula, key resources and key processes (M. W. Johnson et al., 2008). These elements are very similar to the value dimensions of Al-Debei & Avison (2010). It is also similar to the four elements suggested by Frankenberg & Weiblen (2013), who in contrast mildly state that "a change of one or multiple components" can be regarded as a business model innovation (Frankenberger & Weiblen, 2013). Matzler et al. (2013) use a strategic perspective on the focus of value capture and value creation and state that a business model innovation is accomplished when the business model comprises of "1. An innovative, unique position; 2. A consistent product and service logic; 3. An appropriate value creation architecture; 4. An effective sales and marketing logic; and 5. A profit formula that works" (Matzler et al., 2013).

The definition remains somewhat abstract. A classification or typology of business model changes can lead to the difference between minor changes and business model innovation. Bucherer et al. (2012) classify a degree of business model innovation through incremental innovation, market breakthrough, radical innovation and industry breakthrough. This classification is borrowed from the product innovation field and is based on the impact it has. In contrast, Cavalcante et al. (2011) take a process perspective on business modelling and identify different business model changes in the creation, extension, revision and termination of these processes. Amit & Zott (2012) follow the process perspective and identify addition of activity, linking activities in novel ways and changing the activity performing parties as types of business model change (Amit & Zott, 2012). Demil & Lecocq (2010) speak of business model evolution instead of innovation. They state that structural changes in the cost/revenue structure are the first 'symptom' of business model evolution and that this evolution is more often incremental than radical (Demil & Lecocq, 2010). Thereby contradicting Bourreau et al. (2012) who suspect that radical business model evolutions are far more likely to sustain.

All these classifications and typologies actually classify changes in the business model while implying that every change is a business model innovation. A recent literature study suggests a separation between business model development and business model innovation (Schneider & Spieth, 2013). Business model development being incremental change within an existing business model and business model innovation being a radical change with the use of opportunities in the external environment (Schneider & Spieth, 2013). Table 4 provides an overview of the literature on business model innovation.

Authors	BM elements	BM innovation definition	BM innovation typology
Johnson et al. (2008)	• Value proposition • Profit formula • Key resources • Key processes	Change in every BM element	
Frankenberger & Weiblen (2013)	• Who • What • How • Revenue model	A novel way to create and capture value by change in one or multiple BM elements	
Matzler et al. (2013)		When the end result of BM change is a perfect position of every BM element	
Schneider & Spieth (2013)		Radical change with the use of opportunities in the external environment	
Demil & Lecocq (2010)		Change in finance is first symptom	• Incremental • Radical
Bucherer et al. (2012)		A process that deliberately changes the core elements of a firm and its business logic	• Incremental innovation • Market breakthrough • Radical innovation • Industry breakthrough
Cavalcante et al. (2011)			• Process creation • Process extension • Process revision • Process termination
Amit & Zott (2012)			• Activity addition • Linking activities in novel ways • Change the activity performing parties

Table 4: Business model innovation definitions and possible typologies of changes

To be clear, this section does not follow a specific definition or classification of business model innovation since its goal is to find a measurement approach. As a summary of this section, Table 4 shows that there are roughly two ways of measuring change in a business model. By providing an ontology and measure the change at every business model element or by identifying changes in activities or processes of a business model. The choice to use the ontology of Osterwalder (2004) to assure involvement of practice makes the choice between the two approaches of business model measurement easy. The change in every business model element of Osterwalder (2014) is measured and translated into the four dimensions of Al-Debei & Avison (2010).

The literature on business model innovation can add more than only a measurement approach. The goal of the research is to find the changes in a business model due to IT innovations to be able to help companies reach their desired business model. The process of changing the business model is a recurrent theme in the business model innovation literature. This literature is examined in order to pinpoint how the knowledge of changes in a business model due to an IT innovation can help companies to change their business model.

4.4 Pinpointing research applicability

As the necessity of business model innovation becomes clear, the question rises how to achieve a business model innovation. De Reuver et al. (2013) integrate literature on road mapping with business model literature and propose a business modelling roadmap tool to arrive at a desired business model from the current business model. The four steps in this roadmap are to 1. find desired business model change, 2. find impact on the rest of the business model, 3. translate this to activities and 4. devise a change plan (De Reuver et al., 2013). Frankenberger & Weiblen (2013) look at innovation process literature instead of road mapping literature to arrive at a framework for business model innovation (Frankenberger & Weiblen, 2013). They propose four steps to find and implement a business model innovation. The reasons for change are identified and a stakeholder analysis is done in the *initiation* phase. The results in this phase are used to generate innovative ideas in the *ideation* phase, of which the effects on the rest of the business model are searched for in the *integration* phase. Management involvement is also secured in this phase to overcome the internal resistance in the next phase, *implementation*. This last phase is usually done with pilots, trial and error and experimentation. A third process approach on business model innovation comes from Meertens et al. (2013) who use business case literature for framework development. Their steps are 1. Business Drivers 2. Business Objectives 3. Alternatives, 4. Effects 5. Risks 6. Costs 7. Alternative selection and 8. Adoption plan development (Meertens et al., 2013). The business model innovation process literature is roughly compared in figure 4.

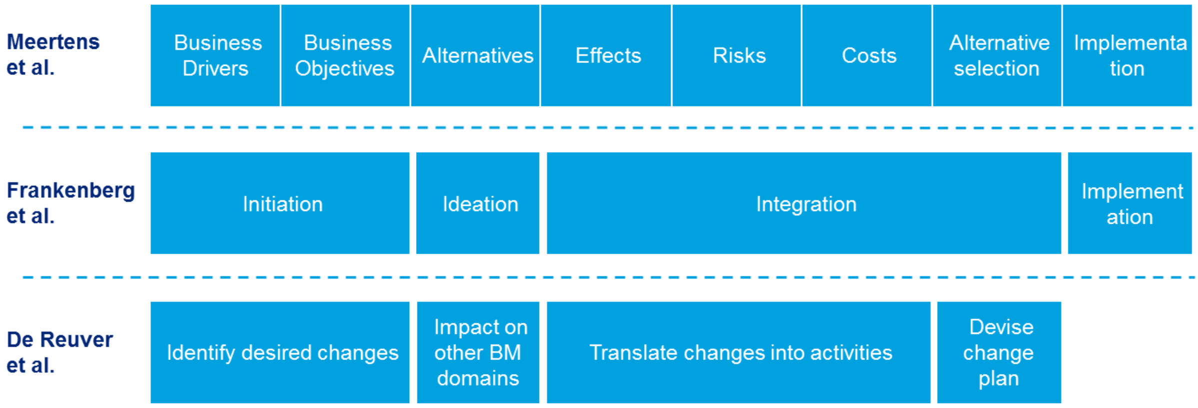

Figure 5: Mapping of BM innovation process literature

The business model innovation processes provide frameworks to achieve a business model innovation. Schneider & Spieth (2013) distinguish three branches of business model innovation research. The first being the reason and ideation of change, the second the process of innovation and lastly the effects of business model innovation. The gap in literature of the ideation phase and the lack of literature on the effect of business model innovation (Frankenberger & Weiblen, 2013; Schneider & Spieth, 2013) provide the basis for this research. It examines the impact of different IT innovations on the business model so companies can decide easier on the IT innovation that matches the desired business model changes. Within the process of a business model innovation the added value of this research can therefore be mapped at the end of the ideation phase and the beginning of the integration phase (Frankenberger & Weiblen, 2013): the part where the desired business model(s) are already made up, but the way to achieve the change is not yet clear.

A definition and understanding of the concept IT innovation is necessary to further comprehend the scope of the research. The next section explains this by searching for a classification of IT innovations.

5 IT Innovation

A definition of an IT innovation and classifications within IT innovations are given in this chapter. The IT innovations that are researched are chosen with the help of such a classification.

5.1 IT innovation

An IT innovation is regarded as an innovation with an IT component in it (Hameed, Counsell, & Swift, 2012). Scholars who do research towards the concept and classification of IT innovations tend to include research on innovations in general as that is the origin of the IT innovations. It results in a grey area in research between the two. The definition from Lyytinen & Rose (2003) on an IT innovation is followed in this research in order to create a clear distinction.

> "Information technology (IT) innovation can be defined as the creation and new organizational application of digital computer and communication technologies" (Lyytinen & Rose, 2003)

A short dive into the history of innovation research is necessary to understand the full scope of the IT innovation field and thereby the possible classifications. Progress in society is not new and as such, research on innovation has been around for quite some time as well. Through time, innovation is commonly seen as the commercial realization of an invention: "Innovation is a specific type of economic activity that is concerned with the development of products, processes or organizational methods that create novelty–the stroke of human genesis that produces originality and uniqueness." (Feldman, 2002) This definition suggests a clear classification of innovations into product, process and organizational methods. A classification as such is necessary to be able to generalize the results of case research (Fichman, 2001) or categorize theory building (Ars, 2009). However, scholars find themselves using many other classifications of innovation as well. Consistency between used classification schemes is then quickly lost (Adams, 2003; Ars, 2009; Garcia & Calantone, 2002). Innovations are for example divided between incremental and radical in one study (Schumpeter, 1934), while another divides between incremental, really new and radical (Garcia & Calantone, 2002). This lack of consistency results in comparison problems between studies into innovation and thus leads to a slow forming cumulative tradition (Ars, 2009). A proposed solution is to look at the purpose of a classification and choose the most recent fitting classification of innovations (Ars, 2009).

This research is designed to inform companies on the impact of IT innovations. A classification is therefore sought, so that practice and especially companies can benefit the most from it. With this perspective, classification provides the means to generalise through aggregation of innovations (Fichman, 2001). The possibility of generalisation gives practice tools for dealing with innovations that fall in the same category. Multiple classifications are discussed in the following section after which a classification is selected that is of the most benefit for a bank.

5.2 Research umbrellas

The research towards innovation can be split into three groups in the information technology field: technology-focused, innovativeness-focused and factor-focused (Fichman, 2001). One single innovation is researched in Technology-focused studies and the outcomes are usually in context of adoption of the single innovation. The properties that correlate with the capability of an organisation to innovate are of interest in innovativeness-focused studies. These properties are not of interest for this section since a typology of IT innovation is sought. Factor-focused research deals with the factors that determine innovation (Fichman, 2001). Most research on IT innovation is factor-focused and within this branch, there is a big chunk of research on innovation characteristics that promote adoption of an innovation (Moore & Benbasat, 1991; Teng, Grover, & Guttler, 2002; Tornatzky & Klein, 1982).

Innovation newness is then used to create an overview perspective on these factors (Adams, Tranfield, & Denyer, 2006; Hameed et al., 2012; Premkumar & Roberts, 1999).

The research in technology and factor-focused is elaborated upon in the following sections. Each umbrella provides a typology and one of them is chosen based on usefulness in this research in the section thereafter.

5.2.1 Factor-focussed

The level of generalizability depends heavily on the used innovation characteristics for classification of the innovation (Fichman, 2001). Scholars identify two branches of innovation characteristics, primary and secondary characteristics (Downs & Mohr, 1976). The secondary characteristics vary depending on the organization that is researched and thus use organizational context (Fichman, 2001). Examples are complexity, relative advantage and compatibility (Tornatzky & Klein, 1982). Primary characteristics are intrinsic, they define an innovation. Within the information technology field and industry, context is enough to define a characteristic as intrinsic (Fichman, 2001). Examples can be found in different recent classifications of innovations like "use of cloud" (Deloitte, 2012). Finally, a secondary characteristic can be considered primary within one study if all the researched organizations have the same value for the characteristic (Fichman, 2001).

Research on innovation adoption leaped with the innovation diffusion model of Rogers (1995). Many studies on factors that promote the adoption of innovation conclude with secondary characteristics. Compatibility, complexity and relative advantage are found to be positively correlated (Tornatzky & Klein, 1982) and a bit later market externality and start-up time investment are added (Teng et al., 2002). One can argue to include research on information system success factors as classifying characteristics of innovation (Davis, 1989; Karahanna, Straub, & Chervany, 1999). However, it is difficult to arrive at a classification of innovations using these factors as innovation characteristics since they vary greatly depending on organization and innovation.

The most straight-forward classifications come from the intrinsic value of the unit of analysis and therefore the primary characteristics (Downs & Mohr, 1976). Classification can be done through characterizing an innovation by its industry saturation stage or adoption speed (Teng et al., 2002). An even simpler categorization can be done through two similar axes which Hameed et al. (2012) calls the stage of innovation adoption and the type of innovation. The stage of innovation adoption construct has three possible values indicating how far the adoption within an organization is: initiation, adoption-decision and adoption. On the other axis an IT innovation can either be product or process within the type of innovation construct (Hameed et al., 2012). Although it can qualify as a primary characteristic, the stage of an innovation is a difficult construct to measure and it will result in an arbitrary classification scheme. (Adams et al., 2006).

Grover et al. (1997) empirically validated a typology of IT innovations proposed by Swanson (1994). The three types of innovations are divided in 1. Administrative and Technical Process Innovation in the Functional IS Core 2. IS Product and Business Administrative Process Innovation and 3. IS Product and Business Technological, Product and Integration Innovation. Subcategories are formed as these categories are quite broad (Swanson, 1994). These categories and subcategories are reorganized and extended with an IT base by Lyytinen & Rose (2003) into the three umbrellas 1. IT Base, 2. System Development and 3. Services. This typology is clearly top-down and takes an organizational perspective. A bottom-up typology which appeared at the same time focuses on capability characteristics of an IT innovation (Mulligan, 2002). It distinguishes three classes depending on the IT attributes integration, system scope, system focus and accessibility (Mulligan, 2002).

Both these typologies are useful to indisputably form a classification in an organizational context, but they are relatively old. This leads to a classification of IT systems instead of IT innovations. The latter can be applied in more systems at once, creating an overlap between classes. Software as a Service for instance, can be implemented as a base service capability innovation and as an administrative process innovation in both the system development as the services IT innovation sets. Typologies like these are therefore difficult to use as a classification of an IT innovation.

A more recent literature research provided an overview of possible classification dimensions of an innovation in an organizational context (Crossan & Apaydin, 2010). Each dimension has two or three possible values and an IT innovation can thus be classified through each dimension. The dimensions with their possible values are shown in Table 5. This typology is made for innovations in general, but it is placed in an organizational context, where the main form of innovation is found in the field of information technology. This makes the typology applicable for research towards IT innovation that takes on an organizational perspective. Therefore it is the best typology found under the umbrella of factor-focused research.

Dimension	Types
Level	Individual; Group; Firm
Driver	Resources; Market opportunity
Direction	Top-down; Bottom-up
Source	Invention; Adoption
Locus	Firm; Network
Form	Product/Service; Process; Business Model
Magnitude	Incremental; Radical
Referent	Firm; Market; Industry
Type	Administrative; Technical
Nature	Tacit; Explicit

Table 5: Dimensions of Organizational Innovation (Crossan & Apaydin, 2010)

Two dimensions jump out of the typology of Cossan & Apaydin (2010). The dimensions form and type are used throughout time in the line of factor-based research on primary characteristics (Grover et al., 1997; Lyytinen & Rose, 2003; Swanson, 1994). A recent publication of Fichman et al. (2014) speaks of digital innovation and uses the distinction of process and product innovation. Business model innovation is named as well, but seems to be regarded as digital product innovation in the remaining article. This research does not include the business model class as there seems to be a large overlap with product innovations. The article of Fichman et al. (2014) also uses a distinction of administrative and technical innovations. They argue however that these are subcategories of process innovation. Crossan & Apaydin (2010) seem to concur with this view through their definition of these two types of innovation.

As discussed, classification of an IT innovation strongly depends on the level of generalization of the study in question. Literature on IT innovation classification can be divided in three branches. innovativeness-focused, technology-focused and factor-focused (Fichman, 2001). The technology-focused classification implicitly and problematically suggests that innovations are homogenous within a specific category (Adams et al., 2006). This can be the cause of the small amount of literature on the classification of innovations in this area. Therefore we turn to non-scholarly literature to further investigate innovation classifications with this focus.

5.2.2 Technology-focused

A classification of IT innovations is necessary in order to work with them in practice. Non-scholarly sources are therefore reviewed on classifications based on a technology-focus perspective. Sources are selected on the basis of access and found using the term "Tech trends" in combination with a research institution like Gartner or a consultancy company like Deloitte.

A publication of Forrester divides technologies in a business context into three themes: cloud services for business, data analytics and insight and mobile enablement of people and process (Mines, 2013). This is followed in recent research of Deloitte (Hofman & van Dijk, 2014), while research of Gartner acknowledges the importance of cloud services and mobile trends to collect data which can improve context of information (Cearley, 2014). The social aspect that arises is then seen as a focus, deeply embedded within these themes. (Cearley, 2014). The definition of the three themes can be found in Table 6.

IT Theme	Definition (Mines, 2013)
Cloud Services	Cloud services grew up as a way for businesses to reduce the cost of dedicated, on-premises infrastructure to support computing applications; the perceived benefits of cloud computing are now shifting toward the promise of business agility.
Data	A wide array of tools are increasing companies' ability to analyse, understand, and predict events that change their demand outlook or competitive position, particularly as mobile devices and sensors accelerate the growth in volumes of data.
Mobile & Engagement	Mobile is the flashpoint for a broad shift to systems of engagement that provide context and information to always-connected customers and employees.

Table 6: IT Themes definitions from Forrester Research

5.3 Classification Framework

Two perspectives for the IT innovation research were discussed in the previous section: technology-focused and factor-focused (Fichman, 2001). The technology-focused research has mainly resulted in classifications from practice. Although these classifications are without doubt very usable for companies, a classification is sought that is not time-dependent. An IT theme like cloud services is perfectly applicable nowadays, but the nature of innovations change over time. Fifteen years ago we did not yet have IT classifications in the cloud while in fifteen years from now the cloud can very well be the standard. Therefore it loses the sharp border between IT innovations that is needed to arrive at a classification needs.

The typology and overview of Crossan & Apaydin (2010) provides the basis for a classification from a factor-focused perspective. The innovation classification is therefore built upon the cumulative tradition of the line Daft (1984), Swanson (1994), Lyytinen & Rose (2003), Crossan & Apaydin (2010) and Fichman et al. (2014). This highlights the use of a typology divided in product innovations versus process innovations. The innovation types administrative and technical are a subcategory of the process innovations (Fichman et al., 2014).

Both Crossan & Apaydin (2010) and Fichman et al. (2014) see business model innovation as a third class of innovation next to product and process innovations. They follow Teece (2010) by stating that it "defines how the enterprise creates and delivers value to customers, and then converts payments received to profits". This definition and our previous section on business models show that business model innovation is not an IT innovation. Business model innovation is therefore excluded from the used IT innovation classification. Definitions and examples of the different classifications of IT innovations that are used can be found in Table 7.

IT innovation type		***Definition*** (Crossan & Apaydin, 2010)	***Example*** (Crossan & Apaydin, 2010)	***Example*** (Fichman et al., 2014)
Product/ Service		Product/service innovation is 'the novelty and meaningfulness of new products introduced to the market in a timely fashion.'		• ERP • Smartphone
Process		Process innovation is the 'introduction of new production methods, new management approaches, and new technology that can be used to improve production and management processes'	• Issuing credit cards • Managing accounts receivable • Producing maple syrup	
Process	Administrative	Administrative innovations are indirectly related to the basic work activity and more directly related to its managerial aspects such as organizational structure, administrative processes, and human resources.		• New organizational forms or governance structures
	Technical	Technical innovations include products, processes, and technologies used to produce products or render services directly related to the basic work activity of an organization.		• Warehouse automation technology • Use social media to improve feedback loop from customers

Table 7: Definition and examples of innovation types

The possibility of distinguishing adoption of an IT innovation as a supplier or adopter is a big advantage of using this classification above the technology-focus classification (Fichman et al., 2014). Software as a Service (SaaS) can for instance be viewed from the company delivering the innovation or from the company implementing it. The first company will probably see SaaS as a product innovation, whereas it is used as a process innovation in the second company. Needless to say, both viewing points have a different impact on the business model of a company as one focuses on the value proposition and the other on the value architecture.

It is clear that the level of abstraction of an IT innovation has a big impact on the validity of the classification. To recall the previously defined four levels of abstraction: general, class, trend and case (see Figure 6). The previous paragraph shows the different application possibilities of an innovation trend and the implications for a classification. It is therefore necessary to classify innovations on the case level to gain knowledge on the impact of specific IT innovation classes.

The context of the case is thus important to classify the IT innovation as a product, technical process or administrative process innovation. Using this context and the definition and examples of the IT innovation types in Table 7 it is possible to classify the innovation into a class.

The next chapter combines the IT innovation classification with the business model framework and formulates hypotheses which can yield interesting results.

6 Research model

The literature review on business model measurement provides two perspectives to measure change in a business model. The static view describes a business model at one moment in time. The dynamic view emphasizes the delta between the desired/resulting business model and the current business model. The preferred ontology is the one from Al-Debei & Avison (2010) as reasoned in the review of business model literature. A framework is devised which links the types of IT innovations to business model changes using the explanation of a dynamic view on business model innovation in Table 8 (Demil & Lecocq, 2010). The changes in a business model are depicted against the types of innovation found in the IT innovation literature review. These are based on Crossan & Apaydin (2010) and Fichman et al. (2014).

Business Model Ontology / **IT innovation class**		*Value Proposition*	*Value Network*	*Value Architecture*	*Value Finance*
Product					
Process	*Administrative*				
	Technical				

Table 8: Research framework IT innovation types versus business model changes

Case research can provide the data to identify the changes and impact of every IT innovation class on the business model of a bank and thus be able to compare the impact. The next section explains the use of the IT innovation trend abstraction level to find interesting and relevant cases.

6.1 Trend selection

The previous sections mentioned three IT innovation classes. Two cases of each IT innovation class are enough to explore each IT innovation class (Yin, 2003). The earlier set scope on banking means that six cases have to be found in the banking sector in which IT innovations are implemented. A recent survey from Deloitte gives direction to the search for cases. It is however necessary to ascend to the trend level to use the data from the survey. The researches identify four abstraction levels of IT innovations to clarify what level is discussed: general, class, trend and case (see Figure 6).

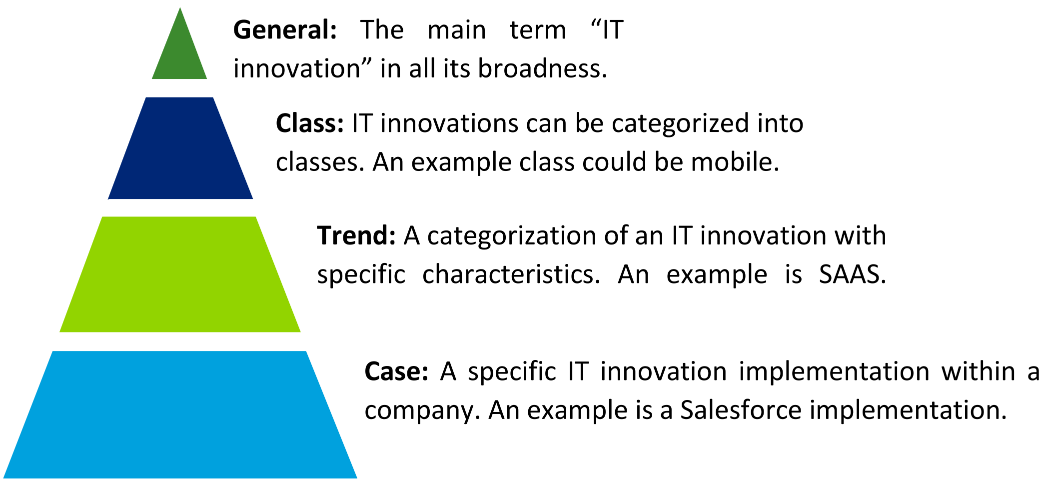

Figure 6: Abstraction levels of an IT innovation

IT innovations do not necessarily produce a big effect on the business model of a company. Some IT innovations increase efficiency instead of inflicting a large change in the business model. Transformative IT innovations have the potential to change the business model in its core through revenue extension and revenue transformation (Hofman & van Dijk, 2014). The research can however not be conducted if an innovation is not already operationalized in some cases. Since the research goal is to measure business model change, IT innovations are selected on a careful balance between operationalization and transformative potential. These are shown with their definitions in Table 9.

IT Innovation Trend	**Definition** (Hofman & van Dijk, 2014 & Interviews)
Software as a Service	Application software provided as a web-application, used in a multi-tenant model and purchased on a pay-for-use basis.
Advanced Analytics on Enterprise Data	Applying statistical techniques on complex data sets to find patterns and correlations between variables. Typical examples are outlier detection, clustering, pattern recognition and link analysis.
Enterprise Mobile Apps	Apps on mobile devices which support business processes, either for internal use or as a channel to customers.
Automatic Content Recognition	The ability of a mobile application to identify content within its proximity based on a sample (audio/video fragment, image of physical object) and through matching that sample with an online repository of all existing content. A typical example is an app from a web shop that uses the camera to identify the product it has in sight, after which it can be ordered with one touch on the screen.
Near Field Communication	Short range, contactless communication (10cm). It can be used to replace all kinds of member cards, tickets, and keys.
Big Data	Data too large to be processed by traditional database management and analysis tools. Apart from volume, other characteristics of big data are: velocity (rapidly changing) and variety (heterogeneous content)

Table 9: Selected IT innovation trends and their definitions

The previous section discusses the importance of distinguishing the adopter and the supplier of an IT innovation. It should therefore be clear in every case whether the bank is the adopter or the supplier of the innovation. The next section provides an overview of the classification of the cases into the IT innovation classes.

6.2 Overview

Every IT innovation class incorporates two cases. The common ground between these cases provide the classification of the cases in the IT innovation classes. The classification and the common ground between the cases can be found in Table 10.

IT innovation	***Cases***	***Common ground***
Product/Service	*Case 1*	These two cases market an IT innovation as a product or service to their customers and are therefore regarded as suppliers of the innovation.
	Case 2	
Administrative Process	Case 3	These two cases use an IT innovation to reduce the administrative burden by improving processes related to it.
	Case 4	
Technical Process	*Case 5*	These two cases use an IT innovation to improve the technical aspects of a process related to the key activities or products of the company.
	Case 6	

Table 10: Classification of cases into the IT innovation classes

The next section discusses every case and grounds for the classification in detail. It elaborates upon the results of every case and the implications of the results on the hypotheses.

Part 3 – Building, Intervention and Evaluation

7 Impact of IT innovation on Business Model

The business model construct and IT innovation construct are defined in the previous section through literature research. Thereby it provides the basis for the BIE stage in the action design research. This section first provides the results of the interviews on the impact of the different kind of IT innovations on a business model. Every case is a part of the artefact and leads to the complete artefact which comprises of the changes of the IT innovation classes on the business model of a bank captured within the developed framework. Therefore they all focus on adopted IT innovations within a bank. The contexts and descriptions of the cases lead to their classification into an IT innovation class. This section goes on to discuss and analyse the results of every case and the related IT innovation classes. This leads to theory building. It is important to keep in mind that every value dimension comprises of multiple business model elements. The visualization of the results are therefore an average which leads to more moderation and eliminates outliers in the results.

7.1 Product innovations

The two following cases market an IT innovation as a new product or service to their customers and are therefore regarded as suppliers of the innovation (Crossan & Apaydin, 2010; Fichman et al., 2014). Although many things can change in the business model due to a new product offering, the essence of a new offer to the customer is in the value proposition. The hypothesis is therefore that product innovations have a large impact on the business model in the value proposition.

7.1.1.1 Case 1

The first case includes a bank is broadening its horizon by providing an app that is linked with the bank itself through a subsidiary company. It is a free app which comes with a paid service. The goal of the service is to facilitate communication between customers and merchants. Ordering a drink and paying for it can be done over distance and different payment methods are integrated. The newly implemented app gives added value by giving the merchant knowledge on who is in the store and what they would probably like to buy. The relationship between the merchant and the customer is strengthened and the merchant can market customer specific discounts to engage the customer to buy something. The bank launched an app of which it is a supplier to merchants and customers. It offers new services to merchants, but also provides advantages for customers of those merchants. It is therefore also a significantly new product in the industry, classifying it as a **product innovation**.

Table 11 shows the changes in the business model in this case due to the mobile app. It shows changes in every value dimension of the business model but not all changes are big. The new activity in the value architecture is for example a minor change while the “focus on IT assets” is regarded as a big change for banks in particular. The opinion was given that it should work as a stepping stone to reach a focus on IT assets in other departments as well. The changes in the value finance dimension exist of new costs for building and maintaining the app and on the other side the revenue of the new service. In the value network dimension there is one change which is not regarded as a minor change. “Automating indirect contact” paves the way to personalize contact for every customer. It is already mentioned that the app facilitates a new service. This is a seen as a big change within the value proposition, while the change of segmentation is regarded as a minor change

Value Architecture	Value Finance	Value Network	Value Proposition
• New activity: Provide initial support for new product • Focus on IT assets & Minor changes of IT operation employees	• Investment in subsidiary app maker • Increased revenue stream by facilitating direct marketing	• New channel: Cloud for merchants & New channel: Contactless communication (ibeacon or NFC) for customers • New partner for contactless communication (ibeacon or NFC) for customers • Automating indirect contact	• New service: Direct marketing options for merchants & New service: Rewards and discounts for customers • Change of segmentation towards merchant and customer

Table 11: Changes on the business model by the enterprise mobile apps case

Figure 7 visualizes the impact of the enterprise mobile apps case on the business model of a bank. Interestingly, the results show that implementing an app does not cause a big impact in the value network although there are many changes due to the app (see Table 11). In this particular case, the app is introduced while there were already mobile channels available. The focus of the app is on the new service it provides and it does not have the goal to facilitate interaction between the bank and its customers. The interviewee states *"The app was launched primarily to engage in a larger part of the value chain of the bank's client".* It can be argued that most banks already have their digital channels in place and are now looking to extend their added value for customers through new apps. Therefore, apps that are released in the coming years may not have an impact on the distribution channels.

Figure 7 shows no positive impact in the value finance dimension. A closer look in the data shows that value finance does change slightly, but the change in costs and revenues balance each other out resulting in a neutral impact (see Table 11).

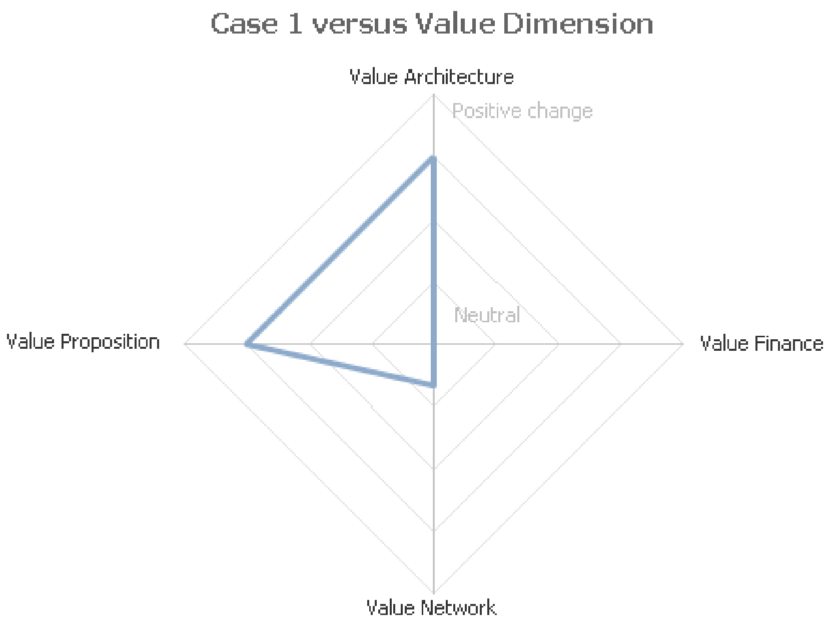

Figure 7: Impact of the enterprise mobile apps case

The positive impact on value architecture is due to the learning advantages of the changes depicted in Table 11. The positive impact at the value proposition is due to gaining a larger part of the value chain by providing new services. To recall from the interview: *"The bank can offer support for order and marketing processes of clients and therefore expand towards being a payment provider"*. This is an interesting finding on which not much is written yet. Scholars see value architecture as a necessity for product innovation (Amit & Zott, 2012; D. J. Teece, 2010), while this case shows that impact in the value architecture can be actively pursued by introducing a mobile app as a product innovation. The expected high impact of the changes in the value proposition dimension displays the thought of scholars on product innovations (Amit & Zott, 2012; Shafer et al., 2005; D. J. Teece, 2010).

To conclude, a mobile app has a large impact on the value proposition and the value architecture when it is adopted as a product innovation. The costs and revenues balance each other, but there is a big potential in the value network dimension that is not yet achieved.

7.1.1.2 Case 2

The second case involves the adoption of big data in a bank, which has a lot of advantages and disadvantages. The use of the intimate data on transactions that banks possess create anxiety in society. These data are however more and more becoming third party property with companies like Google slowly moving towards being a payment service provider. Banks are therefore examining options in which they themselves can use big data in a safe way, with the approval of society. In this example a bank uses transaction data, geographical location, weather situations and more to analyse the needs of a group of customers. All these data are aggregated and cannot be linked to an individual. However, it can be used to automatically recognize a customer as a specific type or group. The bank can facilitate marketing towards that group of customers with specific needs and thus provide added value for merchants and customers. This marketing usually involves reimbursements to convince customers. Reimbursements are automatically put on the account of the customer when he or she pays with the payment card of the bank. In this adoption of big data, the bank is supplier of a product towards merchants and customers. The product is completely new in the industry and it can therefore be classified as a **product innovation**.

Table 12 shows the business model changes in this case. New activities and resources are necessary at the value architecture dimension. They bring more productivity per resource and thus have a positive impact on the business model of the bank. Especially the new activities lead to "acting pro-actively on changes through prediction possibilities". Partners can provide more flexibility in the value network dimension by working more agile (see Result appendix). The value network also accompanies relationships with customers. The recent public reactions in the Netherlands to the statements of ING show that this part of the business model can have a very negative impact. The interviewed bank however states that the public opinion can change positively regarding big data because "*people gain personalized, transparent assistance like never before and an opt-in is necessary to use their data*". Data is thereby aggregated to ensure that it cannot be traced back to the individual.

Value Architecture	Value Finance	Value Network	Value Proposition
• New key activity: Act on link opportunities • New data centres, analytical hardware, IT software, highly educated employees & Resource fit and potential is better	• IT Costs go up & Employee costs go slightly up • Product rationalization & Tailored discounts and advertising	• New software partners • Gain indirect contact satisfaction and trust & Loss of trust is no issue	• Offering a new service: Linking needs of customers with opportunities • Loss in privacy critical/elderly people and gain in "modern" people & Adding and dropping of sub segments

Table 12: Changes on the business model by the big data case

Figure 8 visualizes the perceived impact of the big data case on the business model of a bank. It shows a neutral impact on the value finance dimension. Just like in the enterprise mobile apps case this is because of a balance between costs and revenues (see Table 12). Furthermore, it shows a positive impact on the other value dimensions. The bank argues that big data creates a new service which can provide high value for the bank and customers through *"aggregating and analysing public and account data"* and therefore leads to a positive impact in the value proposition. As with case 1, the high impact on the value proposition is a confirmation of literature (Amit & Zott, 2012; Shafer et al., 2005; D. J. Teece, 2010), but the high impact on the value architecture is interesting as it is previously seen as a necessity (Amit & Zott, 2012; D. J. Teece, 2010). The high impact on the value network is primarily based on the customer relationship potential. This is partly expected as a new product or service tries to satisfy customer needs.

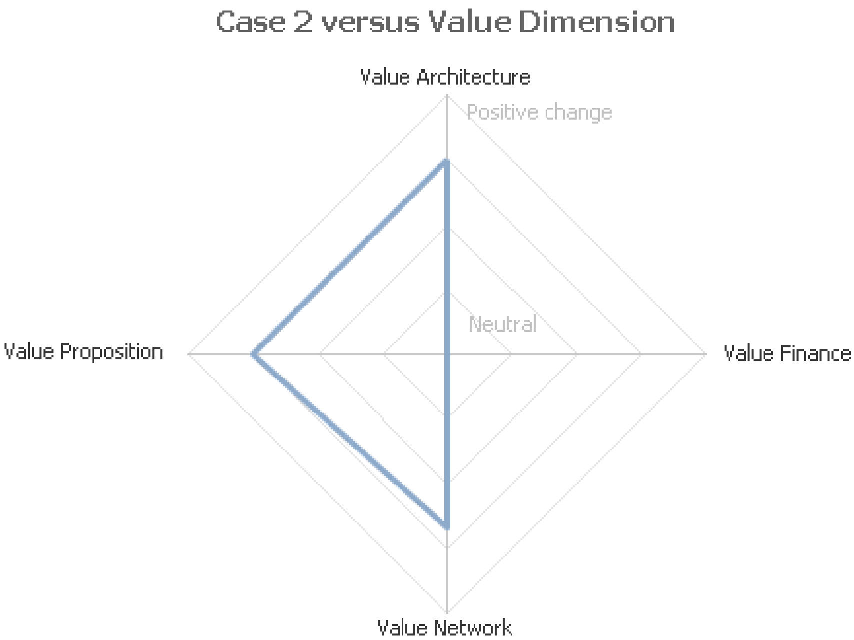

Figure 8: Impact of the big data case

To conclude, big data has a large impact on the value proposition, the value architecture and the value network when it is adopted as a product innovation while the costs and revenues balance each other. The next section searches for patterns between the two product innovation cases and elaborates on causality and the use of this information.

7.1.2 Analysis of product innovations

These cases show empirically that product innovations have a big impact on the value proposition, thereby providing ground for the recent movement regarding the value creation and value capture within business model literature that aims on at start-ups (Bharadwaj, Sawy, Pavlou, & Venkatraman, 2013; Alex Osterwalder, Pigneur, Bernarda, & Smith, 2014). However, it also shows that the value architecture dimension endures a large impact as well. It is therefore important to direct some attention to this part of the business model as well. Product innovations have the potential to have a large impact on the value network dimension as well. Banks should therefore keep this in mind as it can lead to a competitive advantage over other banks when the timing is right. Especially since banks will have to find new value propositions with the rise of standalone payment service providers.

A bank that chooses to adopt a product innovation can use movements like lean start-up (Ries, 2011) and the value proposition canvas (Alex Osterwalder et al., 2014) to focus on the value proposition. The stages of business model innovation provide guidance on the use of these movements. To recall, the four stages of business model innovation are the initiation, ideation, integration and implementation phase (Frankenberger & Weiblen, 2013). The lean start-up method (Ries, 2011) can help in the initiation phase while the business model canvas (A Osterwalder, 2004) and value proposition canvas (Alex Osterwalder et al., 2014) help in the ideation phase. The results provide useful information on the changes and impact of a product innovation within the business model. Next to the focus on the value proposition, a bank should realize that there will be a large impact on the value architecture as well. This leads to an empirically validated integration phase and therefore a more accurate plan for the implementation phase. The lean start-up method can thereby add structure to the implementation phase (Ries, 2011).

7.2 Process innovations

Process innovations are used to improve production and management processes. Process innovations are by definition implemented for the sake of integrating and improving activities within a company (Crossan & Apaydin, 2010; Fichman, 2001; Lyytinen & Rose, 2003). The value architecture is the business model dimension which focuses on the assets that are necessary for the company's activities and the activities themselves (Mutaz M Al-Debei & Avison, 2010). The hypothesis is therefore that process innovations have the most impact on the business model in the value architecture dimension.

7.2.1 Administrative process innovations

The next two cases use an IT innovation to reduce the administrative burden by improving processes related to it. Administrative process innovations lead to changes in the administrative core of a company and thus changes in the support processes (Grover et al., 1997). Support processes manage financial processes like year reports, network processes like customer management and architectural processes like hardware maintenance. Administrative process innovations thus touch three business model dimensions. However, most support processes are focused internally, like human resources and maintenance. The hypothesis is therefore that administrative process innovations have the most impact on the business model in the value architecture dimension since it is the most internally focused dimension.

7.2.1.1 Case 3

The chosen case for software as a service (SAAS) focuses on a start-up that is a daughter company of a banking group. It gives customers the option to integrate different financial accounts on one place to reach an overview of their financial situation. This integration is automated and can be done by simple logging into your financial institution through the company.

This innovative company is enabled by many IT innovations. The most important one from their point of view is however the adoption of software as a service. The founders had previously started an online bank which failed because of the high infrastructure costs. Software as a service gave them the possibility to only use the infrastructure they exactly needed and thus gain profit from the very first customer. The company implemented SAAS as a way of improving the infrastructure and the administration that comes with it. It leads to a new organizational form and is therefore an **administrative process innovation**.

The case description mainly implied impact in the value architecture dimension. The results seem to acknowledge this and show that the positive impact is due to the possibility to "focus on core activities" (see Table 13). A bit more surprising is the relative low impact on the value finance side of software as a service since it is advertised as a cost reduction. The interviewee stated that software as a service "*can even bring costs if you already have a good infrastructure in place*". Next to the relative costs to your already working infrastructure, the adoption project can cost a lot as well. It is however still positive because in this case the adoption of software as a service did provide cost reduction. The services in this bank did not yet lend themselves for changes in the value proposition. The interviewee argues that at this stage the value proposition advantages are merely for the related software companies: "*SAAS gives high engagement because of rapid response of software and rapid value proposition changes*". He also argues that there is however a big potential in the future because "*SAAS can provide a possibility of charging by channel instead of charging for everything at once*". The value proposition therefore does not endure changes yet because of the focus on the use of SAAS as a process innovation.

Value Architecture	Value Finance	Value Network	Value Proposition
• Focus on core activities • Less employees & Less IT hardware	• Downsize of employees and Hardware & Costs on SAAS package	• Fewer but higher quality relationships	• No change

Table 13: Changes on the business model by the software as a service case

Figure 9 visualizes the impact of the software as a service case on the business model of a bank. The positive impact on the value architecture dimension is due to more efficiency and less distracting activities (see Table 13). This confirms the thoughts of scholars on administrative process innovations (Fichman et al., 2014; Grover et al., 1997; Swanson, 1994).

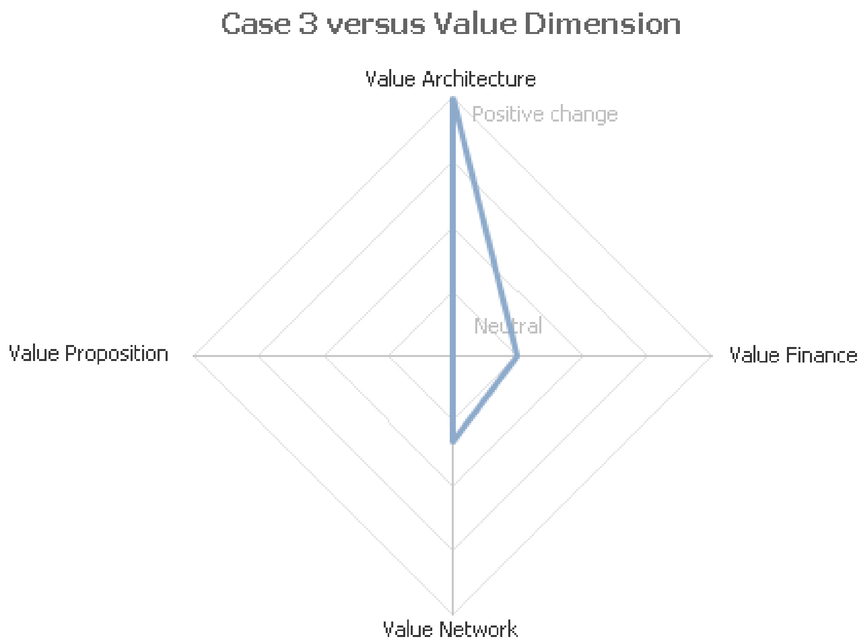

Figure 9: Impact of the software as a service case

To conclude, SAAS has a large positive impact on the value architecture when it is adopted as a process innovation and also leads to cost reduction. In the near future SAAS has the potential to lead to changes within the value proposition by changing the pricing mechanisms towards modular pricing schemes. It is an innovation that therefore should be under research at every bank but requires a big change of processes.

7.2.1.2 Case 4

In the fourth case, advanced analytics on enterprise data is introduced in a bank which wanted to get more control over the arrears of its customers. Trimming down arrears is a balance between customer interest, operational costs and risk costs. Advanced analytics is used to reduce the complexity of this balance. Problem clients are recognized and approached at the first sign of trouble using the predictive power of advanced analytics. Customers can be warned and helped by recognizing the problems at an early stage causing less arrears of customers and less costs for the bank. At every product-line there is an analytics manager to make sure the predictions match the products and services of the bank. This adoption of Advanced Analytics on Enterprise Data changes the moment of engaging with customers. It also asks for a new type of managers within the product-lines. It changes governance structures and is therefore an **administrative process innovation**.

Table 14 shows the changes in the business model due to the implementation of advanced analytics of enterprise data in this case. According to the interviewee in this case, the changes in the value architecture dimension ideally have the consequence that data analytics becomes a part of everybody's job. In the current situation the changes cause good overview of collected information and capabilities to react on this information. In the value finance dimension there is a cost reduction and a revenue improvement. The changes in the value network result in personalization for customers and have a potential big impact on the value chain which is explained in the next paragraph. The biggest changes are found in the value proposition dimension where personalization is improved by tailored products and extra segmentation.

Value Architecture	Value Finance	Value Network	Value Proposition
• New key activity: Act on account analysis by employee & Management activity changes: control activities are sharpened • New analytical software & trained employees	• IT Costs go up & education costs & Cost reduction • Decreasing provision & Keeping customer & Personal product prices	• Tailored channel-selection • Potential big impact on value chain: Positive or Negative • Increased customer satisfaction	• Tailored and stable products • Extra segmentation

Table 14: Changes on the business model by the advanced analytics of enterprise data case

Figure 10 visualizes the impact of the advanced analytics of enterprise data case on the business model of a bank. It is extraordinary how big the impact is compared to the big data case, as advanced analytics is regarded as a subset IT innovation of big data.

There is a positive impact on the value network dimension through the predictive power of analytics. There potential big impact to gain or lose activities in the value chain is very interesting for a bank since it can cause a shift in the way it generates revenue. This is however not yet realized and therefore not taken into account and therefore the "*tailord channel-selection"* is the main contributor to the positive impact on the value network dimension. The changes in the value architecture lead to a high impact on this dimension because they facilitate a large increase in efficiency of the bank. The positively perceived impact in the value finance dimension are due to a cost reduction that is bigger than the costs of the innovation. Besides a cost reduction, AAED leads to a personalization of prizes and a more effective feedback loop to customers. Expected is that more customers will stay with the bank for this, increasing the revenues for the bank. The positive impact on the value network, value architecture and value finance dimensions confirm the view of scholars on administrative process innovations (Grover et al., 1997; Swanson, 1994).

This case finds the biggest impact in the value proposition. In contrast to the big data case this is not because of the exploitation of new services but by "*minimizing product risk which leads to tailored and stable products*" (see Table 14). It is however strange that there is such a large impact on the value proposition since AAED is adopted as a process innovation. This case suggests that administrative process innovations have a large positive impact on the value proposition as well, primarily because of product personalization. As no literature is found which elaborates on this relation it is an interesting finding.

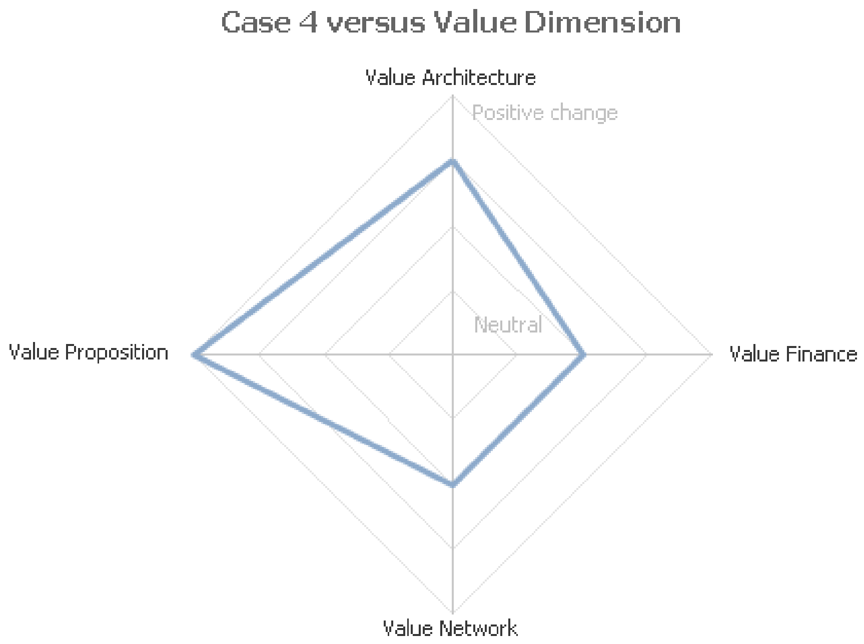

Figure 10: The impact of the advanced analytics of enterprise data case

To conclude, AAED has a positive impact on the complete business model when it is adopted as a process innovation. Scholars regard process innovations as incremental innovations and therefore as innovations which has little impact on the complete business model (Bucherer et al., 2012). The biggest surprise is the high impact on the value proposition as scholars predict little effect on the value proposition by process innovations and administrative process innovations in particular (Gopalakrishnan, Bierly, & Kessler, 1999; Swanson, 1994).

7.2.1.3 Analysis of administrative process innovations

Both administrative process innovation cases display a high positive impact on the value architecture dimension and some positive impact on the value finance and value network dimensions as was expected from literature (Fichman et al., 2014; Grover et al., 1997; Lyytinen & Rose, 2003). Case 4 displays a high positive impact on the value proposition as well while case 3 does not show changes at all at the value proposition dimension. However, there is a big potential for impact on this value dimension in case 3. The results therefore indicate that administrative process innovations might have a bigger impact on the value proposition and the overall business model than scholars think. One interviewee states that their department "*always have to find a balance between client interest, operational costs and costs of risk*". The researchers therefore expect that the high impact is due to the fact that administrative processes touch every aspect of a bank, from supply to sales. Companies and banks in particular should therefore be aware of large advantage possibilities that arise when administrative process improvement are targeted with the adoption of IT innovations. More awareness could for example lead to the realization of the big potential on pricing mechanisms and therefore partial services in the third case.

7.2.2 Technical process innovations

The following two cases use an IT innovation to improve the technical aspects of a process related to the key activities or products of the company. Technical innovations can be implemented for product development activities or for improvement of operational activities (Lyytinen & Rose, 2003). When technical innovations are being used in product development and thus the product/service offering, the impact of the change touches the internal activities as well. An operational improvement is necessarily an internal improvement which can have impact on for instance suppliers and costs but specifically the internal activities and assets. It is argued that both kind of adoptions lead to a change in the internal activities and thus the value architecture. The hypothesis is therefore that technical innovations have the most impact on the business model in the value architecture dimension.

7.2.2.1 Case 5

The use of automatic content recognition (ACR) within a bank is found at the department which processes incoming mail and documents. It can take a long time to sort and respond on these mails and documents. Automation can only be done when the physical content is transformed to digital content which is then tagged. Tagging the documents, mail and even email provides the possibility to quickly analyse and deliver them to the right person or process in the bank. It can even lead to automated responses since most of the incoming mail triggers a process on a known path. The adoption of automatic content recognition thus ensures the transformation of physical data into digital data and the tagging of digital documents to speed up processes. Automatic content recognition is adopted to speed up a specific process in this bank. It is therefore classified as a **technical process innovation**.

Table 15 shows the changes in the business model due to the implementation of automatic content recognition in this case. Although there are more changes in the value architecture and value network dimension, the interviewee regards cost reductions due to employee cuts as the biggest change. There are no changes in the value proposition because the interviewee expects that other innovations will replace automatic content recognition too quickly to base a new service on it. He states "*Short process time cannot be exploited as a service since new innovations will soon replace physical mail*".

Value Architecture	Value Finance	Value Network	Value Proposition
• New IT activities • New hardware & software & IT employees & Less employees	• New IT costs & Less employees	• Vendor lock-in • Increased satisfaction in mail processing	• No change

Table 15: Changes on the business model by the automatic content recognition case

Figure 11 visualizes the impact of the automatic content recognition case on the business model of a bank. The value finance dimension has the biggest impact on the business model. There is a cost reduction since "*the savings of employee cuts are bigger than the extra IT costs*" (see Table 15). The impact on the value network is neutral because of perceived positive impact of increased customer satisfaction and negative impact of a vendor lock-in balance each other. A small increase in efficiency causes the slightly positive impact in value architecture.

The small overall impact of automatic content recognition in this case fits the expectation of scholars that technical process innovations are small incremental innovations which focus on cost reduction (Bucherer et al., 2012; Gopalakrishnan et al., 1999; Lyytinen & Rose, 2003).

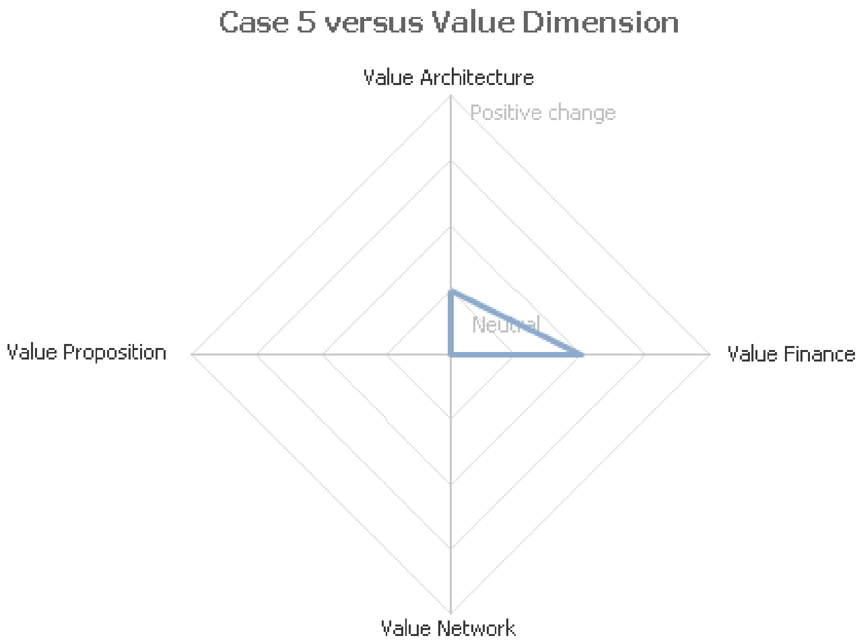

Figure 11: The impact of the automatic content recognition case

To conclude, ACR has a small positive impact on the complete business model when it is adopted as a process innovation. Scholars regard technical process innovations as incremental innovations and therefore as innovations which has little impact on the complete business model and focus on cost reductions (Bucherer et al., 2012; Fichman et al., 2014; Lyytinen & Rose, 2003). This case empirically confirms this view.

7.2.2.2 Case 6

Near field communication (NFC) is implemented in the payment cards of a few banks. The customer can engage in contactless transactions with the payment card. The time of doing a payment can thus be reduced to a few seconds. The researched bank implemented this and replaced the payment cards of all of the customers. It is known as an innovative bank and ensures its image with this adoption. NFC is adopted to speed up transactions. It is similar to the example in Crossan & Apaydin (2010) of issuing credit cards and can thus be classified as a **technical process innovation**.

Table 16 shows the changes in the business model due to the implementation of near field communication in this case. The value finance dimension only comprises of one-time costs which is seen as a minor change. In the value network dimension, the innovative image of the bank is maintained and customers remain satisfied but these are minor changes as well. The biggest change is found in the value proposition, where a new way of payment is offered to the customer. There are no changes within the value architecture dimension because architectural changes like different payment docks are for the retailer and not for the bank. The interviewees state that it is "*simply a card switch"* and that even support activities are not necessary: "*Support necessity was prevented by extensive testing"*.

Value Architecture	Value Finance	Value Network	Value Proposition
• No change	• One-off costs	• Increasing satisfaction & maintaining innovative image	• Offering a new way of payment

Table 16: Changes on the business model by the near field communication case

Figure 12 visualizes the impact of the near field communication case on the business model of a bank. The perceived impact on the value finance dimension is neutral because the one-off costs are incredibly low relative to the costs of the complete bank. The small change in the value network dimension also leads to a small impact. The slightly positively perceived impact on the value proposition dimension is due to "*a new way of payment which facilitates faster transaction times*". It is therefore regarded as a new service for the customers of the bank.

This study expected an impact on the value finance dimension since technical process innovations usually generate a cost reduction and on the value architecture because it changes internal processes (Fichman et al., 2014; Lyytinen & Rose, 2003). It is interesting to see how this bank uses the technical process innovation to achieve impact on the value proposition which they mainly achieve because other companies facilitate the infrastructure like the payment cards and the docks. They decided to focus on the service improvements and image boost that this technical process innovation brings while waiting on the next big step: mobile NFC payment.

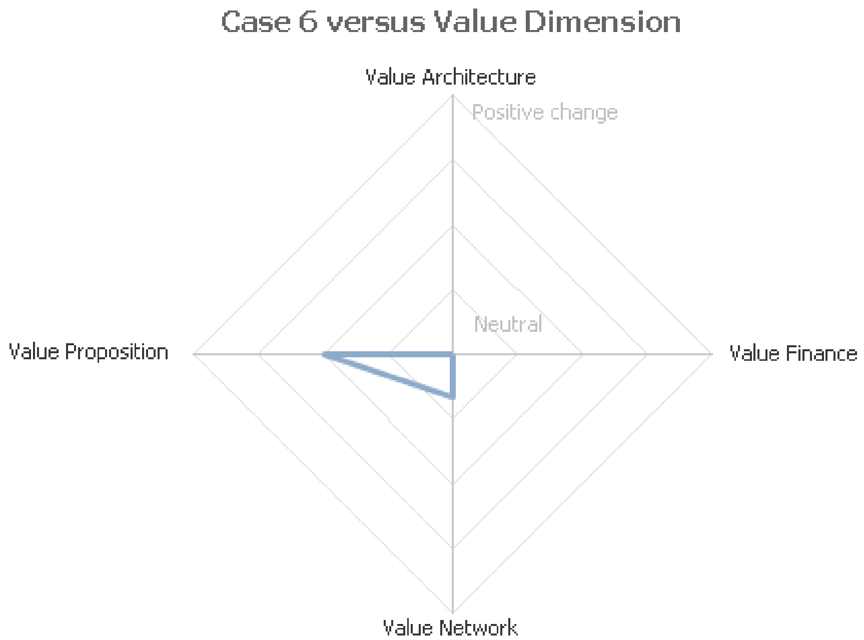

Figure 12: The impact of the near field communication case

To conclude, NFC has a small positive impact on the complete business model when it is adopted as a process innovation. Scholars regard technical process innovations as incremental innovations and therefore as innovations which has little impact on the complete business model and focus on cost reductions (Bucherer et al., 2012; Fichman et al., 2014; Lyytinen & Rose, 2003). This case empirically confirms the small impact of technical process innovations on the business model, but shows a different focus area of benefits. This bank uses the technical process innovation to gain positive impact on the value proposition instead of a cost reduction and is facilitated in this by the infrastructure of external parties.

7.2.2.3 Analysis of technical process innovations

Both the technical process innovations have a small positive impact on the business model of a bank. Another interesting pattern emerges since the interviewees regard both innovations as an interim innovation. The view of scholars that technical process innovations are incremental innovations is empirically confirmed by these two cases. (Bucherer et al., 2012; Crossan & Apaydin, 2010; Lyytinen & Rose, 2003).

These two cases do however not provide conclusive arguments regarding the focus of the areas of impact. Case 5 shows a positive impact on the value architecture and value finance while case 6 shows only positive impact on the value network and value proposition. It is not possible to find a pattern in these result but the context can provide an explanation. The goal of the innovation in case 5 is purely to increase the efficiency and reduce costs by automating internal processes. The goal in case 6 slightly involves internal automation, but more so improves external processes regarding physical payments. The difference of goals lead to a difference in business model impact.

7.2.3 Analysis of process innovations

The cases do not provide a clear pattern on the degree of impact of process innovations on the business model of a bank. Technical process innovations have a small impact while administrative process innovations have a relative big impact. The question emerges whether the statement that process innovations as a class of innovations have a small impact on the business. However, three of the four cases show a positive impact in the value architecture and value finance dimension (case 3, 4 and 5). On the other hand, three of the four cases also show a positive impact in the network dimension. Also, two of the four cases show a positive impact in the value proposition dimension (case 4 and 6) while case 3 has a big potential in this dimension.

This study shows that process innovations can not only achieve positive impact on the internal areas, but provide possibilities to turn these internal improvements into new services or value chain activities. Scholars and banks should therefore consider new revenue possibilities with the adoption of process technologies instead of focusing only cost reductions. Most consulting firms and banks have their own method of implementing a process innovation which usually regards the implementation as a project which has to be done in minimal time and costs. These results propose a small ideation phase in order to find possibilities to increase revenue through changes in the value proposition and value network dimensions. The practical work of Osterwalder (Alex Osterwalder et al., 2014) can help identify opportunities regarding the value proposition. A recent article combines business case methodology with the ideation of business models (Meertens et al., 2013). This could provide the structure to implement a process innovation while keeping the creativity to turn process innovations into new revenue.

7.3 Administrative versus technical process innovations

Although technical process innovations can lead to changes in every aspect of the business model, the change is mostly indirect via one value dimension. An example can be an improvement in a process to fabricate the product, which is a change in the product offering and thus the value proposition. It indirectly changes activities within the company to match the new process. Administrative process innovations can directly bring changes to financial, network and architectural processes. The hypothesis is therefore that the impact on a business model due to administrative process innovations is larger than the impact due to technological process innovations.

Administrative process innovations involve many changes in almost all the value dimensions while technical process innovations have less changes that are focusing more on a specific value dimension. Many changes in the technical process innovation cases have just a minor or no impact as well, while the impact of the changes in the cases of administrative process innovations are quite large.

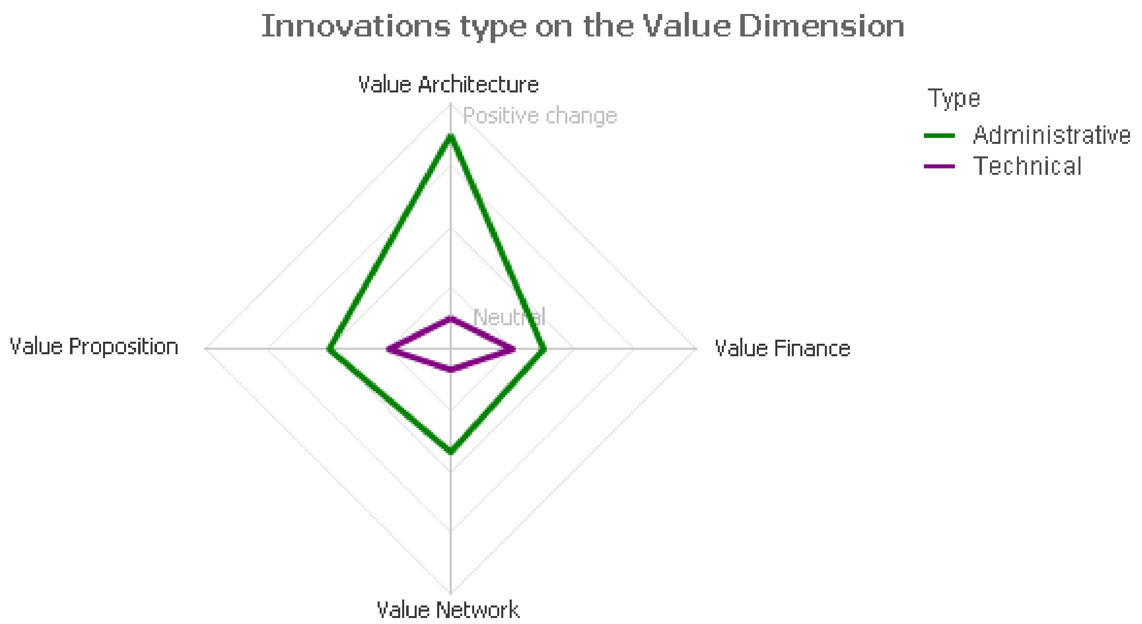

Figure 13: The impact of the two types of process innovations on the business model of a bank

Figure 13 shows the averaged visualization of the cases within the two types of process innovations against each other. It shows that administrative process innovations have more impact on the complete business model than technical process innovations. The reasoning behind the perceived impact in the case results is clear as well, making confirmation of this hypothesis the only possible conclusion. Administrative process innovations have more impact on the business model than technical process innovations.

This difference is especially interesting since both academics and businesses regard process innovations as small incremental innovations (Bucherer et al., 2012). The results show there are big differences within the process innovations class and that sub-classification within process innovations is a necessity regarding their impact on the business model. A bank that adopts administrative process innovations should be aware of the big impact this has on its business model and should not approach it as a small incremental change.

7.4 Product versus process innovations

Internal activities need to be changed with the introduction or change of a product/service. A change in the value proposition usually therefore means that changes are necessary throughout the whole company. As a result, a change in the product/service offering will most likely have impact on the whole business model. In contrast, a process innovation is an internal improvement (Crossan & Apaydin, 2010; Fichman et al., 2014; Gopalakrishnan et al., 1999) and therefore does not necessarily have an impact on any other part of the business model than the value architecture dimension. With this reasoning, the hypothesis emerges that the overall impact on the business model of a product/service innovation is larger than that of a process innovation.

The sheer amount of changes in the product IT innovation cases seem to confirm this hypothesis (see Table 17). However, Figure 14 splits the administrative and technical process innovations and compares them with the product innovations. The perceived impact of the two cases in every class are averaged to arrive at this figure.

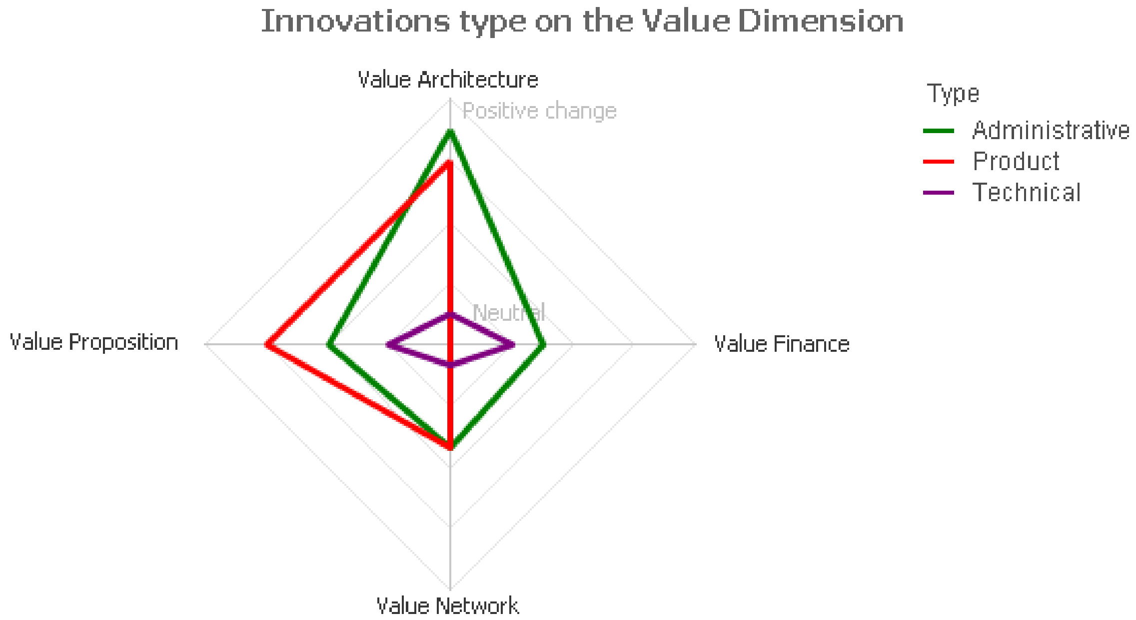

Figure 14: The impact of process versus product innovations on the business model of a bank

It visualizes the larger perceived impact of product innovations in comparison to technical process innovations, but also shows that the perceived impact of administrative process innovations is even bigger. The results show that scholars and banks should not bluntly state that product innovations have more impact than process innovations but that specification is necessary.

However, it seems that process innovations do have more impact on the value finance dimension than product innovations. This confirms the current view that process innovations focus on cost-reductions and achieve positive impact on the financials of a bank (Crossan & Apaydin, 2010; Fichman et al., 2014; Gopalakrishnan et al., 1999). Furthermore, it seems that product innovations indeed have more impact on the value proposition as scholars suggest (Amit & Zott, 2012; Fichman et al., 2014). These results show empirically that product innovations indeed accomplish the theorized change in the value proposition and process innovations lead to the theorized cost-savings.

7.5 Concluding remarks

Academic literature on business models often mention IT as an enabler of new business models (Bouwman et al., 2008; George & Bock, 2011; A Osterwalder, 2004; D. J. Teece, 2010) but recently there is a call for research to focus on the impact of specific IT innovations on a business model (De Reuver et al., 2013; Fichman et al., 2014). This research explores a framework to do so by combining literature on IT innovations with the literature on business models. The highly dispersed literature in both the business model and the IT innovation fields made it difficult to arrive at a framework to map business model changes. Many articles however call for an integration and consensus on the concept of a business model (Schneider & Spieth, 2013; C. Zott et al., 2011) and classification of IT innovations (Adams, 2003; Ars, 2009; Crossan & Apaydin, 2010; Garcia & Calantone, 2002). This research provides an overview on literature of both fields and builds on it by showing promising consensus on business model ontologies and a time-independent classification of IT innovations.

This study shows empirically that process and product innovations have the theorized impact on the business model dimension (Crossan & Apaydin, 2010; Fichman et al., 2014; Gopalakrishnan et al., 1999; Lyytinen & Rose, 2003). Product innovations have a large positive impact on the value proposition, while process innovations have a large impact on the value finance. Interestingly, it shows that there is an important distinction between administrative and technical process innovations. While the impact of technical process innovations is small, the impact of administrative process innovations is large. The reigning view that product innovations have a larger impact than process innovations (Lyytinen & Rose, 2003) is therefore not valid without specifying the distinction between administrative and technical process innovations. Lastly, and most importantly, two cases show that banks can turn the impact of process innovations towards the value proposition dimension. Thus creating extra revenue from unexpected innovations. These differences in impact empirically show that the IT innovation classification is one that scholars can continue using (Crossan & Apaydin, 2010; Fichman et al., 2014).

Furthermore, the cases show that the perceived impact of all the innovations are positive. This is a promising result in favour for the adoption of new innovations as the value finance dimension is taken into account. The aforementioned link then also permits convenient statements like: “banks should adopt product and process innovations evenly” (Damanpour & Gopalakrishnan, 2001). Table 17 shows all the changes of the different cases and thereby the different classes of IT innovations. It is the result of the BIE stage: the artefact. The next section discusses the practical implications of the artefact and analysis of it.

IT innovation		Value Architecture	Value Finance	Value Network	Value Proposition
		Business Model Ontology			
Product/Service	*Case 1*	• New activity: Provide initial support for new product • Focus on IT assets & Minor changes of IT operation employees	• Investment in subsidiary app maker • Increased revenue stream by facilitating direct marketing	• New channel: Cloud for merchants & New channel: Contactless communication (ibeacon or NFC) for customers • New partner for contactless communication (ibeacon or NFC) for customers • Automating indirect contact	• New service: Direct marketing options for merchants & New service: Rewards and discounts for customers • Change of segmentation towards merchant and customer
	Case 2	• New key activity: Act on link opportunities • New data centres, analytical hardware, IT software, highly educated employees & Resource fit and potential is better	• IT Costs go up & Employee costs go slightly up • Product rationalization & Tailored discounts and advertising	• New software partners • Gain indirect contact satisfaction and trust & Loss of trust is no issue	• Offering a new service: Linking needs of customers with opportunities • Loss in privacy critical/elderly people and gain in "modern" people & Adding and dropping of sub segments
Administrative Process	*Case 3*	• Focus on core activities • Less employees & Less IT hardware	• Downsize of employees and Hardware & Costs on SAAS package	• Fewer but higher quality relationships	No change
	Case 4	• New key activity: Act on account analysis by employee & Management activity changes: control activities are sharpened • New analytical software & trained employees	• IT Costs go up & education costs & Cost reduction • Decreasing provision & Keeping customer & Personal product prices	• Tailored channel-selection • Potential big impact on value chain: Positive or Negative • Increased customer satisfaction	• Tailored and stable products • Extra segmentation
Technical Process	*Case 5*	• New IT activities • New hardware & software & IT employees & Less employees	• New IT costs & Less employees	• Vendor lock-in • Increased satisfaction in mail processing	No change
	Case 6	No change	• One-off costs	• Increasing satisfaction & maintaining innovative image	• Offering a new way of payment

Table 17: Resulting Artefact: overview of changes in the business model

8 Practical implications

The previous chapter presented and analysed the case results. This chapter translates the results and hypotheses into the practical implications which are at the basis of answering research question 7 and research question 8. First research question 7 elaborates on the implications specific for banks and then research question 8 provides implications specific for Deloitte.

8.1 The bank

The previous chapter shows that it is possible to organize IT innovations in different classes with regards to business model changes. As such it should be possible to classify an IT innovation and suggest a focus for changes with the adoption of this IT innovation. A case example is using the IT innovation trend bring your own device (BYOD) exemplifies this. BYOD is the choice of companies to let their employees choose and buy their own mobile device for business use (Hofman & van Dijk, 2014). In this example case, a bank uses BYOD specifically for mobile phones and intends to improve productivity through the familiarity of recognizable products. The innovation in this case is an administrative process innovation as it is aimed at an administrative aspect of the business processes: Ensuring accessibility of employees. Section 7.2.1 states that there should be a focus on the changes in the resources and activities in the bank since that is where the biggest impact is expected. The bank should also anticipate other changes as the total impact of an administrative process innovation can be large. In the same way, an IT innovation classified as a bank adopting a technical process innovation does not have to anticipate many changes and big impacts but the results fail to provide a focus area. The last classification is a product innovation. Adopting this kind of an IT innovation needs a focus on the value proposition and target segments from which the other business model changes can be derived logically. With the adoption of a product innovation a bank should anticipate many changes and large impacts.

The IT innovation in this example is only applicable as an administrative process innovation. Many IT innovations can however be classified in multiple classes, depending on their use and scope within a case. Social media for example can be seen as an IT innovation which can be adopted by a bank. It can be classified as an administrative process innovation when a bank adopts social media as a tool for their customers to provide feedback. On the other hand it can be seen as a product innovation if a bank offers a product in which social media is used for providing information that can be shared. This classification therefore takes the different adoption possibilities of an IT innovation into account as these probably result in different business model changes.

The research goal that is pinpointed in section 4.4 leads to the question: Which IT innovation can be implemented when a specific business model is desired? This section searches for the answer by examining every value dimension one by one and bearing in mind the different ways of adoption as explained in the previous paragraph. The first value dimension is the value architecture. Three cases involve positive changes within the value architecture: case 3, case 4 and case 2. When a bank would like to improve the effective use of its resources and/or its capabilities there are thus three concrete options to consider. The best result would come from adopting software as a service as an administrative process innovation. Other options are to adopt advanced analytics on enterprise data as an administrative process innovation or big data as a product innovation. Two cases have mentionable impact in the second value dimension which is the value finance. Adopting automatic content recognition as a technical process innovation (case 5) or again adopt advanced analytics of enterprise data as an administrative process innovation (case 4) can reduce costs and/or improve revenues. The best option to improve in the value network dimension is to adopt big data as a product innovation (case 2). Adopting advanced analytics on enterprise data as an administrative process innovation (case 4) is the second option to improve the value the bank gains from external parties, relationships and ways of interaction. Three cases provide options to achieve improvements in the value proposition dimension and thereby the target segments. The best option is again advanced analytics on enterprise data adopted as an administrative process innovation (case 4). Enterprise mobile apps adopted as a product innovation (case 1) and big data adopted as a product innovation (case 2) are however good second options to improve in the value proposition dimension. These statements are strengthened by the visualization in Figure 15.

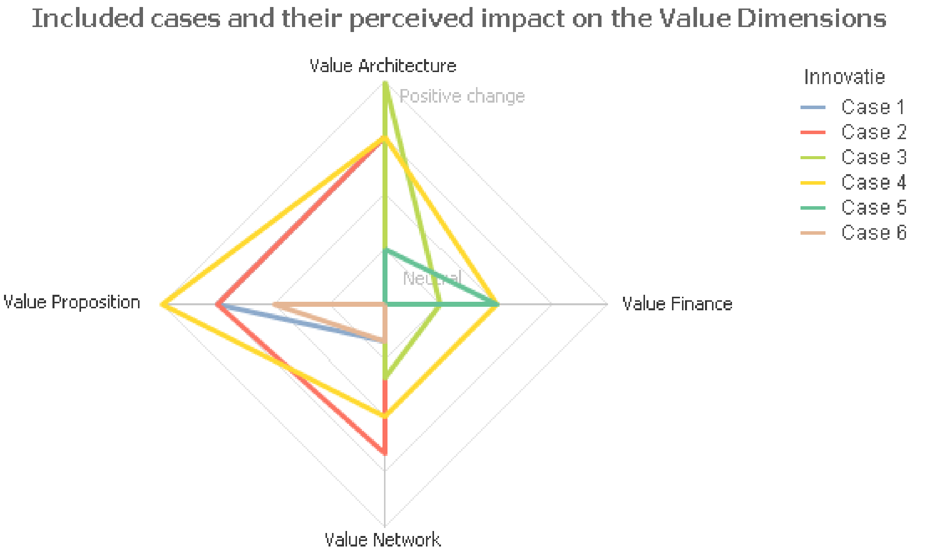

Figure 15: The impact of the selected IT innovations on the business model dimensions of a bank

The results allow for more general insights based on the IT innovation classes. These insights are however based on two cases per class and should therefore be approached carefully and for now only for the banking sector. The first insight comes from a focus on the value architecture dimension where a positive impact can be achieved by adopting an administrative process innovation or a product innovation. These classes of IT innovations will lead to a more effective use of resources and capabilities. Process innovations are preferred to reduce costs and/or improve revenues or, easier said, to improve the financial situation on a short term. Adopting administrative process innovations and product innovations lead to slight improvements in the value network dimension and thus the value from the external factors. Adoption of product innovations is preferred to improve the value proposition although the adoption of administrative process innovations is an option as well. To sum up:

- A bank should adopt a product innovation to achieve maximum impact on the value proposition dimension.
- A bank should adopt a process innovation to achieve maximum impact on the value finance dimension.
- A bank should choose between an administrative process innovation and a product innovation to achieve maximum impact on the value architecture dimension.

Furthermore, two cases show that banks can turn the positive impact of process innovations towards the value proposition dimension. Thus creating extra revenue from unexpected innovations. A bank should therefore always be aware of opportunities that arise from process innovations. The process innovation cases also show that there is a big difference in impact on the business model between administrative and technical process innovations. A bank should be aware of the large impact of administrative process innovations and the small impact of technical process innovations.

The practical implications for banks are thus advices on the adoption of different kinds of innovations. The next section elaborates on how this knowledge effects the consultancy company Deloitte and its employees.

8.2 Deloitte

This research provides insights and results of six IT innovation cases. The perceived value of the changes in these cases in general is positive and the banks in the cases regard the adoption to be rather successful. Whether the cases are best practice cannot be concluded with certainty. They are each however pioneers in using the IT innovation trends in the banking sector. Deloitte should use the developed framework of classification against business model dimensions and elements to benchmark these results against other companies. The results for a specific bank become more accurate with more interviews per case. Through the use of this framework it is possible to provide accurate and interesting benchmarking for banks in which the changes due to the adoption of an IT innovation trend and the perceived value from them can be compared. The framework is not specifically created for the banking sector but it can be applied on all sectors. Therefore it is possible to identify best practices in other sectors and use this same framework to start benchmarking in other sectors as well.

Every Deloitte project has to be formalized through a report which is added on an online knowledge management database. Project members can use the practices in previous projects to guide their current project. Knowledge management is very important within a company like Deloitte where employees work for an average of five years. The integration of this framework with the end of project reports will quickly enlarge the database on the impact of IT innovations, thus improving the quality of the knowledge database and allowing this framework and results to be useful for Deloitte. This is achieved by asking on the nine business model elements and their perceived impact. The framework can then help visualize the impact of a project, but more importantly, it can add a search function based on the impact of projects. Deloitte can use the database, for example, to select high impact cases or cases with a specific impact for brainstorm sessions with clients.

The suggestions and advices in the previous section already provide a mapping of IT innovations and the specific classes of IT innovations with the business model of a bank. Deloitte should strengthen its proposals by providing this knowledge on the effects of adopting an IT innovation. This knowledge can be used, not only to anticipate on the changes but also to choose an IT innovation that can bring about a desired change. If, for example, a bank searches for ways to improve the value from their partners, Deloitte knows it can use administrative process innovations to do so. Deloitte can identify the IT innovation trends that classify as such an innovation and are also applicable in this case and strengthen a proposal with it. If the question is how the bank can adopt for example a product innovation, Deloitte can also provide the knowledge that for such an innovation it is important to anticipate the most impact in the value proposition and/or target segments of the bank and that other changes follow logically from these first changes. Deloitte should also be aware of the opportunities of process innovations in the value dimension and can provide more added value within these projects.

The following approach is developed in order to help Deloitte use this framework to measure the business model changes and visualize it for customers and easy benchmarking. The visualization should therefore be able to group the IT innovation trends and classes, but also show individual cases. Detail and fast access is crucial to use and compare the results to advice customers on business model impact. This is done by building a Qlikview dashboard which can be deployed in a browser (see Figure 16). The impact and results can be viewed from an innovation class perspective or from an innovation trend perspective. The view for trends is at this moment a case view since there is only one adoption researched for every IT innovation trend.

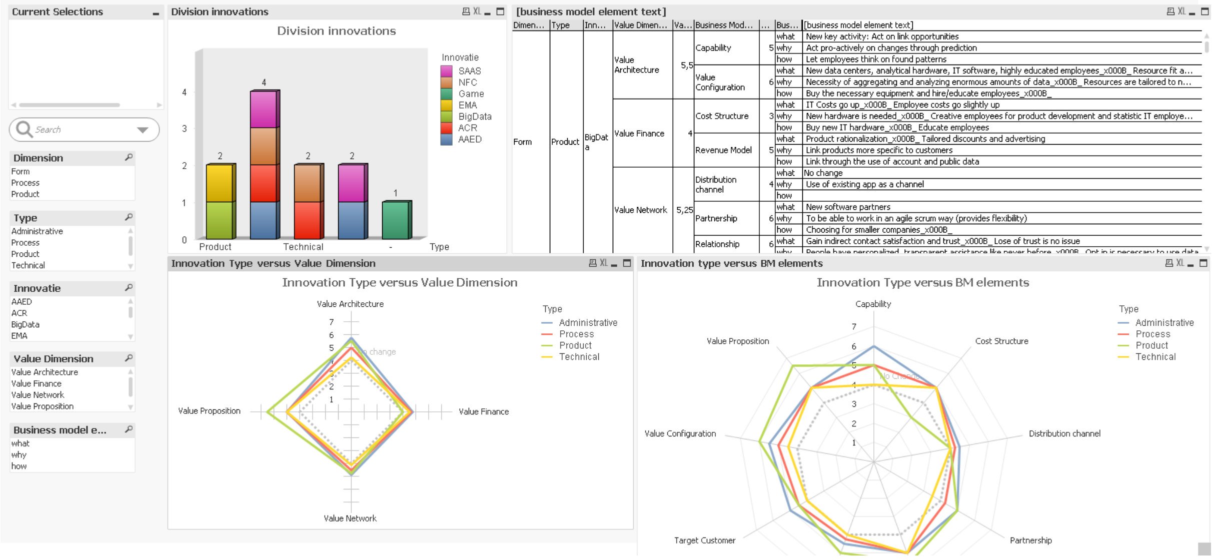

Figure 16: Qlikview dashboard to show impact and reasoning

KPMG uses a website which uses social media appearances to grade the popularity of trends ("KPMG Technology Trends Index," 2014). Deloitte could for example use this research by building on the methodology of the interview to extract more cases from practice and enrich their data. The following approach gathers and processes this data into Qlikview. It first uses a PowerPoint template to ensure the same data are asked every interview (see Appendix 12.7). Then the right classification of the innovation can be put in an Excel sheet and using the VBA code in Excel all these data are extracted from the PowerPoint template and put in the right order in an Excel sheet (see Appendix 12.8 for the code). From here it is a simple step to refresh the data in Qlikview to have the information available that can be used in the dashboard shown in Figure 16.

To conclude, Deloitte should use this research:

- As an extension for the current knowledge management tool
- As a benchmark for new projects using the insights on these six cases
- As a benchmark for new projects using the insights on IT innovation types
- To strengthen project proposals with these insights
- To brainstorm with clients for new ideas on business model innovation

This chapter concludes the BIE stage as the BIE cycle has produced the three deliverables. This study contributes by finding new design principles regarding the measurement of business model change which fit research on IT innovations. This research provides an artefact which maps changes in the business model onto IT innovation classes. On top of that it provides a methodology to expand the artefact, thereby increasing its usefulness. The chapter on practical implications then explains the utility of the artefact for the users.

Part 4 – Formalization of learnings

9 Conclusion

The goal of this chapter is to provide an answer on the main research question: *What is the impact of IT innovations on the business model of a bank?* Sub-questions were formulated to answer elements of the main research question. This section first elaborates on the results of each sub-question before the chapter arrives at a final conclusion of the main research question.

Business model

1. *What is a business model?*

A business model is "a conceptual coherent framework that provides a holistic but abstract understanding of the underlying business logic of an organization" (Mutaz M Al-Debei & Avison, 2010). The business model comprises of nine business model elements (A Osterwalder, 2004) that can be mapped onto four value dimensions (Mutaz M Al-Debei & Avison, 2010). The four dimensions are value architecture, value finance, value network and value proposition. The value architecture dimension includes the business model elements value configuration and capability. The value finance dimension exists of the business model elements cost structure and revenue model. The business model elements distribution channel, relationship and partnership are found in the value network dimension and in the value proposition dimension the business model elements are called value proposition and target customer.

2. *How can change in a business model be measured?*

A business model has two perspectives, the static and the dynamic view. The dynamic view acknowledges that a business model constantly changes (Demil & Lecocq, 2010). The focus on changes in a business model is emphasized by only measuring the changes in a business model and not measure the initial and resulting business model. The business model value dimensions found in the first research question provide the structure from which business model changes are measured.

IT innovation

3. *What is an IT innovation?*

Scholars who practice research towards the concept and classification of IT innovations tend to include research on innovations in general as that is the origin of the IT innovations. It results in a grey area in research between the two. This research follows the definition from Lyytinen & Rose (2003) on IT innovations in order to create a clear distinction. As such, an "Information technology (IT) innovation can be defined as the creation and new organizational application of digital computer and communication technologies" (Lyytinen & Rose, 2003)

4. *What different types of IT innovations exist?*

To look at different types of IT innovations is to look at different ways of classifying an IT innovation. The classification possibilities are endless but most classifications still have overlap in their classes. A classification needs to address intrinsic characteristics to reach a distinct classification independent of the organization context (Downs & Mohr, 1976; Fichman, 2001). The least overlap of classes is identified in the classification of IT innovations by their application (Fichman, 2001; Grover et al., 1997; Swanson, 1994). IT innovations can then be classified into product and process innovations. Within process innovations there are two more classes: administrative and technical innovations (Crossan & Apaydin, 2010; Fichman et al., 2014).

5. *How can IT innovations be classified into these types?*

This research identifies four abstraction levels for IT innovations. There are two abstraction levels beneath the class level: trend and case. An IT innovation trend can be classified in different classes depending on the application. An IT innovation is therefore classified at the case level to ensure no overlap exists between the classes. A case is identified as an IT innovation class by comparing the definitions and examples of these IT innovation classes with the case description.

The changes

6. *What changes do different IT innovations cause in the business model of a bank?*

The three classes of IT innovations bring different changes in the business model of a bank. The results show that product innovation have the most impact in the value proposition dimension of a bank. The results and interviews indicate furthermore that other changes with a large in the business model are necessary following the change in the value proposition dimension. Process innovations cause less changes in the value proposition and have the largest impact in the value finance dimension.

There is a clear difference between administrative process innovations and technical process innovations regarding the changes they cause in the business model of a bank. Administrative process innovations have a larger impact than technical process innovations and is. No clear pattern emerges however within technical process innovations themselves while administrative process innovations have a large impact on the value architecture dimension of a bank.

Design

7. *How can knowledge on the impact of an IT innovation help a bank?*

There are differences in the way IT innovation classes have an impact on the business model of a bank. This research has mapped the changes in a business model of a bank to the IT innovation classes. A bank can use this knowledge to its advantage at two situations, to focus the effort of change or to identify a useful IT innovation for desired changes.

A bank that needs to change its business model can adopt a specific IT innovation trend to achieve the desired business model changes. The impact of an IT innovation trend depends on how it is applied and as such it is necessary to specify the class with the adoption. Changes in the value architecture require the adoption of software as a service as an administrative process innovation. For desired changes in the value finance a bank should adopt automatic content recognition as a technical process innovation or advanced analytics of enterprise data as an administrative process innovation. A bank can adopt big data as a product innovation to achieve the largest impact in the value network dimension while the adoption of advanced analytics of enterprise data gives a largest impact in the value proposition. Careful generalization provides suggestions on an IT innovation class level. An administrative process innovation has a positive impact on the effectiveness of the resources and capabilities of a bank, while process innovations in general have a slightly positive impact on the financial situation. Changes in external entities and communication with them requires an administrative process innovation or product innovation. A product innovation is thus used to achieve positive changes in the product offering of a bank as well. Therefore:

- A bank should adopt a product innovation to achieve maximum impact on the value proposition dimension.
- A bank should adopt a process innovation to achieve maximum impact on the value finance dimension.
- A bank should can choose between an administrative process innovation and a product innovation to achieve maximum impact on the value architecture dimension.

Furthermore, two cases show that banks can turn the positive impact of process innovations towards the value proposition dimension. Thus creating extra revenue from unexpected innovations. A bank should therefore always be aware of opportunities that arise from process innovations. The process innovation cases also show that there is a big difference in impact on the business model between administrative and technical process innovations. A bank should be aware of the large impact of administrative process innovations and the small impact of technical process innovations.

8. *How can the knowledge on the impact of an IT innovation help Deloitte?*

Deloitte can use the results of this research to strengthen proposals and help identify the change path of a bank when an IT innovation is adopted. Deloitte can thereby use the framework of IT innovation classification and business model concept to measure and benchmark the adoption of IT innovation trends. It is possible to include other sectors through extension of the cases in multiple sectors using the approach developed during this research which provides a Qlikview dashboard at the end stage. The Qlikview dashboard provides a clear overview of the specific changes within a business model and can quickly relate inquiries of new clients to the obtained knowledge. The approach to benchmark or expand the database is summarized in these steps:

1. Identify a suitable case
2. Use the PowerPoint template for an interview
3. Use the Excel template to extract data from the PowerPoint and prepare it for Qlikview
4. Use Qlikview to present all the data at once
5. Compare data and obtain insights

Deloitte can achieve fast expansion of the database by integrating these methodology with their knowledge management tool. Thus creating a large database for brainstorms, research proposals and benchmarks.

The answers to all the sub-questions provide the information to given a final answer on the main research question.

What is the impact of IT innovations on the business model of a bank?

This study empirically shows that process and product innovations have the theorized impact on the business model dimension (Crossan & Apaydin, 2010; Fichman et al., 2014; Gopalakrishnan et al., 1999; Lyytinen & Rose, 2003). Product innovations have a large positive impact on the value proposition, while process innovations have a large impact on the value finance. Interestingly, it shows that there is an important distinction between administrative and technical process innovations. While the impact of technical process innovations is small, the impact of administrative process innovations is large. The reigning view that product innovations have a larger impact than process innovations (Lyytinen & Rose, 2003) is therefore not valid without specifying the distinction between administrative and technical process innovations. Lastly, two cases show that banks can turn the impact of process innovations towards the value proposition dimension. Thus creating extra revenue from unexpected innovations. These differences in impact empirically show that this IT innovation classification is one that scholars should use when researching business models (Crossan & Apaydin, 2010; Fichman et al., 2014). This study also shows that the perceived impact of all the innovations are positive. This is a promising result in favour for the adoption of new innovations in general as the value finance dimension is taken into account.

Zott et al. (2011) indicate the need of developing the business model concept towards a suitable concept for empirical research. This research paves the way for more objective research by developing a framework to measure changes in a business model. Moreover, the used IT innovation classification proves to be a useful and time-independent starting point to compare business model changes. As such, it provides a link between IT innovation research and business model research that has not clearly existed before by using a pre-existing IT innovation classification (Crossan & Apaydin, 2010; Fichman et al., 2014) and business model ontologies (Mutaz M Al-Debei & Avison, 2010; A Osterwalder, 2004). This link paves the way to combine research on these types of IT innovations (Damanpour & Gopalakrishnan, 2001; Gopalakrishnan et al., 1999) with that of business model research (Mutaz M Al-Debei & Avison, 2010; Meertens et al., 2013; A Osterwalder, 2004; Schneider & Spieth, 2013; D. J. Teece, 2010).

10 Discussion

Not many scholars have used action design research in the innovation and business model fields. This research proves that the iterative methodology is a successful way to tackle highly dispersed topics that are difficult to link to practice. Being able to rigorously redirect the research proved to be essential and is the most valuable addition in the method. There are however limitations in every research, not the least of which is the scope. The next section discusses the limitations that arise in this research.

10.1 Limitations

The most important limitation of this research is the generalizability in two directions: IT innovations and business sectors. Ideally, it is possible to generalize the results of the cases into all four of the previous defined abstraction levels of an IT innovation. Such a generalization however requires far more cases to be examined. Careful generalization into the defined innovation classes is possible but generalization into IT innovation trends or IT innovations in general is not possible. The different ways of adopting an IT innovation cause a wide range of business model changes and it therefore becomes difficult to generalize into IT innovation trends. Generalization can also occur in the direction of different industry sectors. This research focuses only on the banking sector which makes statements about other industry sectors unrealizable.

Subjectivity of the interviewee is a limitation which follows from the methodology. This research limits itself to one interview at a bank, which can cause a biased view of the changes in the company. The results would become more accurate when they are validated with more employees of the same company.

Another limitation of this research flows from the fact that an IT innovation evolves during its lifetime. An IT innovation can gain more application purposes as concrete examples of the innovation are adopted. This means that a business model can still change due to the IT innovation after it is already adopted. A related limitation is that some banks can already have a better fit for the specific IT innovation than other banks. The changes of the same IT innovation case would then be different in these two banks.

The researchers have classified the IT innovations themselves as they are the only ones with an overview of the case descriptions and IT innovation class definitions. This can however cause a bias when the descriptions of the cases are not accurately transcribed. Although the researches validated the descriptions with the interviewees, the change of a potential biased view would be reduced when the researches work together with the interviewees to arrive at a classification.

These limitations give food for thought for scholars regarding future research. The next section discusses the possibilities and necessities of future research.

10.2 Future Research

The limitations provide the first leads for future research. Scholars should conduct more case research in order to obtain a general overview of the business model changes due to the adoption of IT innovations. More specific, scholars should be able to find the impact of IT innovation trends on a business model by examining more cases of a specific IT innovation trend and include cases among all industries to generalize towards different industry sectors. These cases should take the stability of the IT innovation application into account to identify whether the business model still changes due to an IT innovation adoption change over time.

Business model changes require a context to explain them. This research provides a framework in which business model changes can be measured and compared relatively objective but still capture the context. A quantifiable comparison would however benefit practice even more as they provide possibilities to automate benchmarking. Scholars could use this framework and scale of perceived impact to create a survey and use real-time data to quantify the changes and pave the road to make research on business models more objective.

This study uses the business model innovation literature to arrive at a measurement framework. Future research can take this one step further by defining business model innovation and thus mapping business model changes and impact onto gradations like incremental or radical innovation.

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12 Appendices

12.1 Method

12.1.1 Method Overview

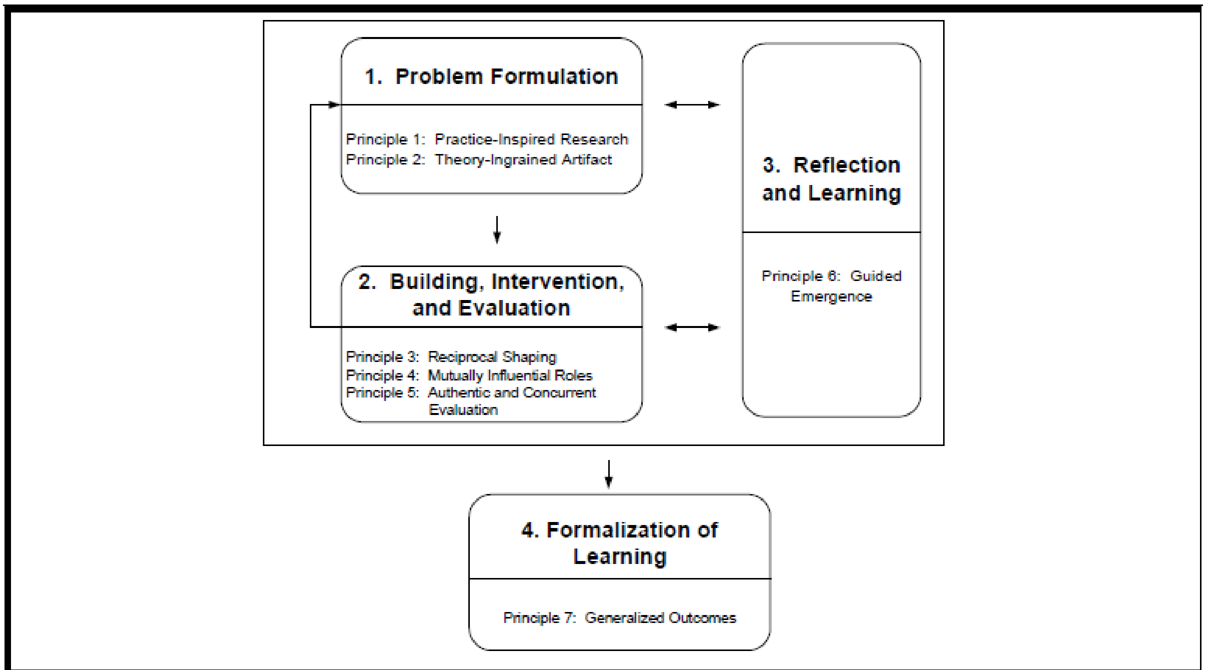


Figure 1. ADR Method: Stages and Principles

12.1.2 Task identification

1. Problem Formulation
   (1) Identify and conceptualize the research opportunity
   (2) Formulate initial research questions
   (3) Cast the problem as an instance of a class of problems
   (4) Identify Contributing theoretical bases and prior technology advances
   (5) Secure long-term organizational commitment
   (6) Set up roles and responsibilities
2. Building, Intervention and Evaluation
   (1) Discover initial knowledge-creation target
   (2) Select or customize BIE form
   (3) Execute BIE cycle(s)
   (4) Assess need for additional cycles, repeat
3. Reflection and Learning
   (1) Reflect on the design and redesign during the project
   (2) Evaluate adherence to principles
   (3) Analyze intervention results according to stated goals
4. Formalization of Learning Stage
   (1) Abstract the learning into concepts for a class of field problems
   (2) Share outcomes and assessment with practitioners
   (3) Articulate outcomes as design principles
   (4) Articulate learning in light of theories selected
   (5) Formalize results for dissemination

12.2 Literature search specification

A default selection criteria is journal impact factor. Although it is still taken into account through the choice of search indexes, the amount of citations can be preferred as a selection criteria (Seglen, 1997). The business model field is young, making it possible that good and important articles have only recently gathered citations. It is therefore decided that the amount of citations an article needs to be included in the research depends on the year it is published. Starreveld (2012) is followed and adapted to decide on the amount of citations necessary for an article to be published. The literature is thus submitted to the following inclusion criteria:

1. Only papers from 2011 to 2014 are included when using the term "business model".
2. Papers published between 2012 and 2014 should have 1 or more citations.
3. Papers published in 2011 should have 8 citations.
4. Papers must have at least 20 references.
5. Search is limited to subject areas 'business management and accounting' and 'computer science'.
6. Literature should discuss business models on a conceptual lever or higher strategy level.

Source selection is the next step that Wolfswinkel (2011) advises. With the rise of internet, indexes of scientific articles have become easily accessible and their coverage of scientific journals has become very large. Schwartz & Russo (2004) relate indexes to their coverage of top scientific journals in the IS field. They advise certain combinations of the seven best found indexes to ensure a large coverage of journals. This research however is already ten years old and a revised version has not been published. Nowadays the search engine "Scopus" has by far the largest coverage of top journals, regardless of research areas. It also incorporates most journals from the top 5 indexes mentioned by Schwartz & Russo (2004): Ingenta, INSPEC, Web of Science, EBSCO Business Source Premier, ACM Guide. Scopus is therefore used standalone to search literature.

The search term is chosen to include all research on business models and again follows Starreveld (2012), making the total search query:

TITLE("*usiness mode*") OR KEY("*usiness mode*")AND PUBYEAR > 2010 AND (SUBJAREA(COMP OR BUSI))

This search yielded 1725 results which after the citation criterion shrunk to 314 articles. A total of 47 articles were left after title selection where the article needed to be about the business model on a conceptual level or higher strategy level. 8 articles remained upon reading the abstract with the same criteria. 2 articles were added after applying backward citation search with the same title and abstract criteria. 6 of the 10 articles remained after reading (see Figure 17).

12.2.1 Business model measurement

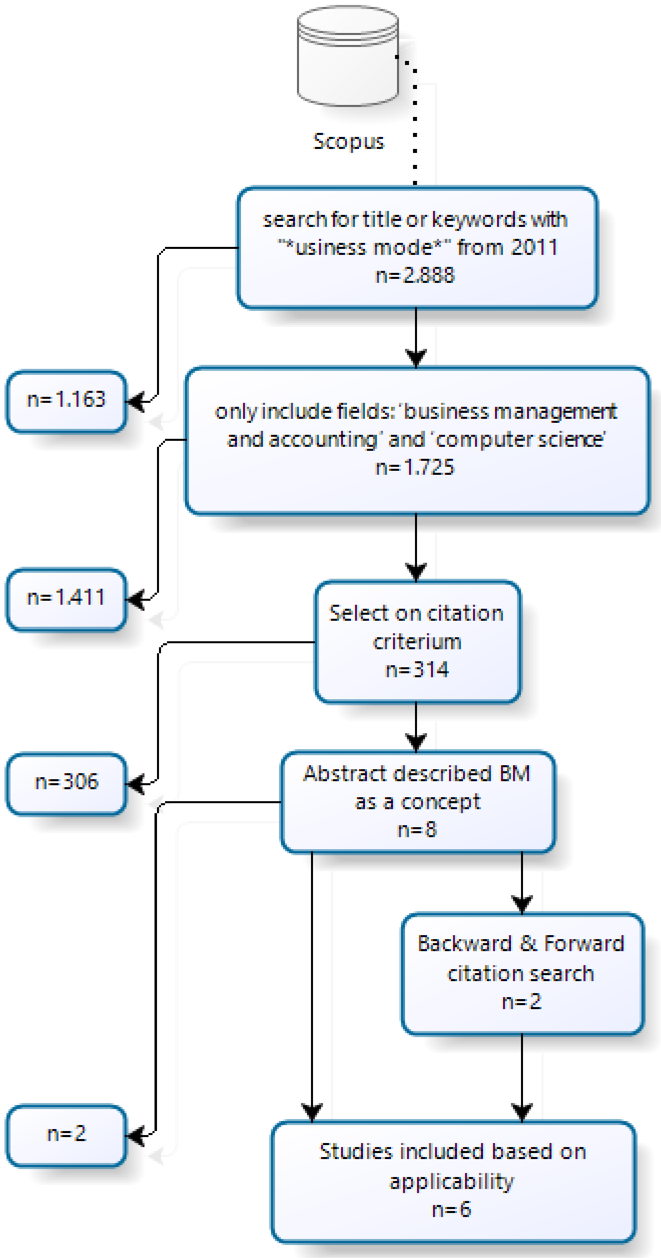


Figure 17: Literature review on business model

The goal of this part of the literature search is to find possible measurement frameworks of business models. The search is again conducted following the methodology proposed by Wolfswinkel (2011). Osterwalder (2004) gives an overview of the occurrences of the term business model in scholarly journals divided in abstract, title and as keyword. The first occurrence of the term is in 1995 and it is therefore not necessary to search earlier than 1995 for business model or a combination with business model. However, there is fewer written on business model change and innovation since it is a subcategory of business model literature. The articles published before 2010 should therefore have 15 citations instead of 20. The criteria that are changed in comparison to the business model concept literature search are summed up below.

1. Only papers from 1995 to 2014 are included when using the term "business model".
2. Papers published before 2010 should have more than 15 citations.
3. Papers should discuss business model change on a conceptual level.

The previous search query is used and slightly adjusted to fit the time window criteria. The search term remains the same since all the research on business models will come up. Selection based on title is then used to select literature specific on business model innovation.

TITLE("*usiness mode*") OR KEY("*usiness mode*")AND PUBYEAR > 1994 AND (SUBJAREA(COMP OR BUSI))

The search yielded 4511 results from which after citation filtering 674 results remained. Title selection based on conceptual discussing of business model change shrunk the total to 33 articles. The same criterion was used while reading the abstract, after which 21 articles remained. One article was not available and from the remaining 20 articles, 17 were selected after reading. Backward citation search lead to 2 extra articles, making a total of 19 articles (see Figure 18).

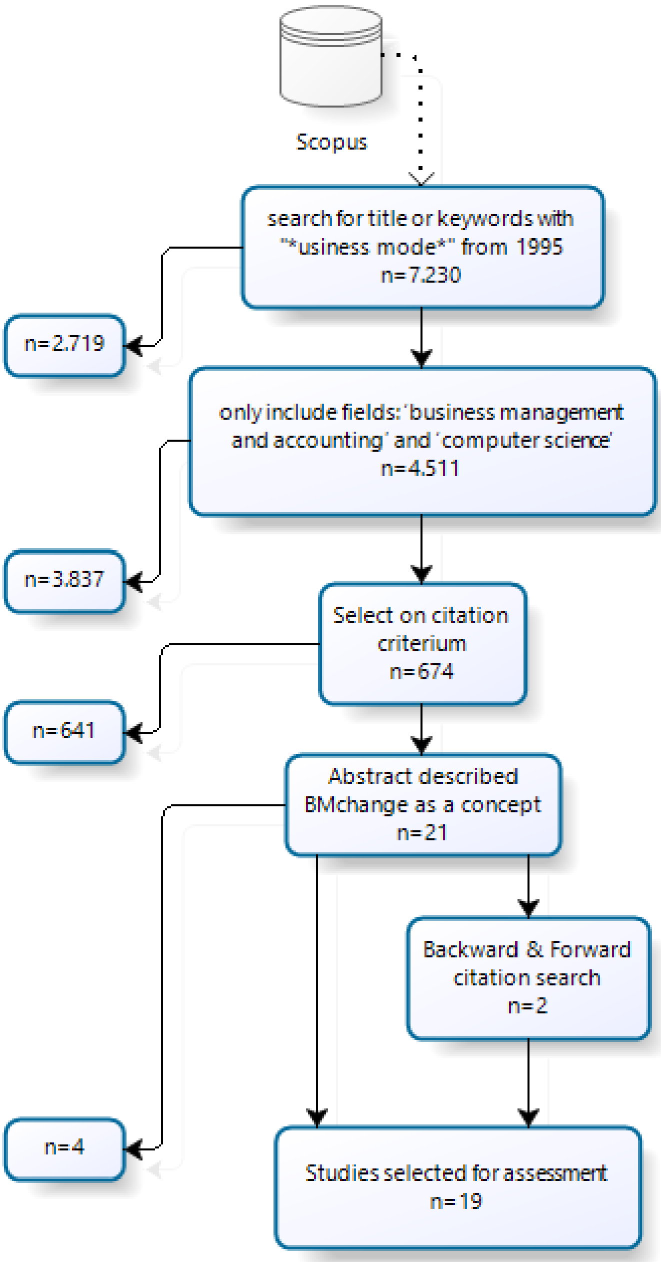


Figure 18: Business model measurement literature review

12.2.2 IT innovations

A thorough literature review on the definition of an IT innovation and the different types of IT innovations is necessary to be able to answer the three associated sub-questions. The time window and the search terms are changed in comparison with the business model measurement literature search.

The search term "classif*" OR "typology" OR "taxonomy" did not yield interesting results in combination with "IT innovation". The search term "character*" is therefore introduced since a classification is often build from differences in characteristics:

TITLE-ABS-KEY(("IT innovation" OR "Information Technology Innovation") AND "character*")

This search gave 213 results from which after citation filtering 38 usable articles remained. A total of 16 were left after title selection based on the possibility of the paper discussing innovation classification or characteristics on a conceptual level. The same selection was done on the abstract and 8 articles remained. Since one article was not available, 7 were used after reading the articles. Backward and forward citation resulted in 8 extra papers.

The content of the papers was not directly satisfying so Google scholar was used for a new search. The exact key word "IT innovation classification" resulted in 5 extra usable paper. Extra searches for white papers were done using google and key words like Gartner, Forrester and multiple consultancy agencies and resulted in 13 white papers. After reading, 5 of them were used (see Figure 19).

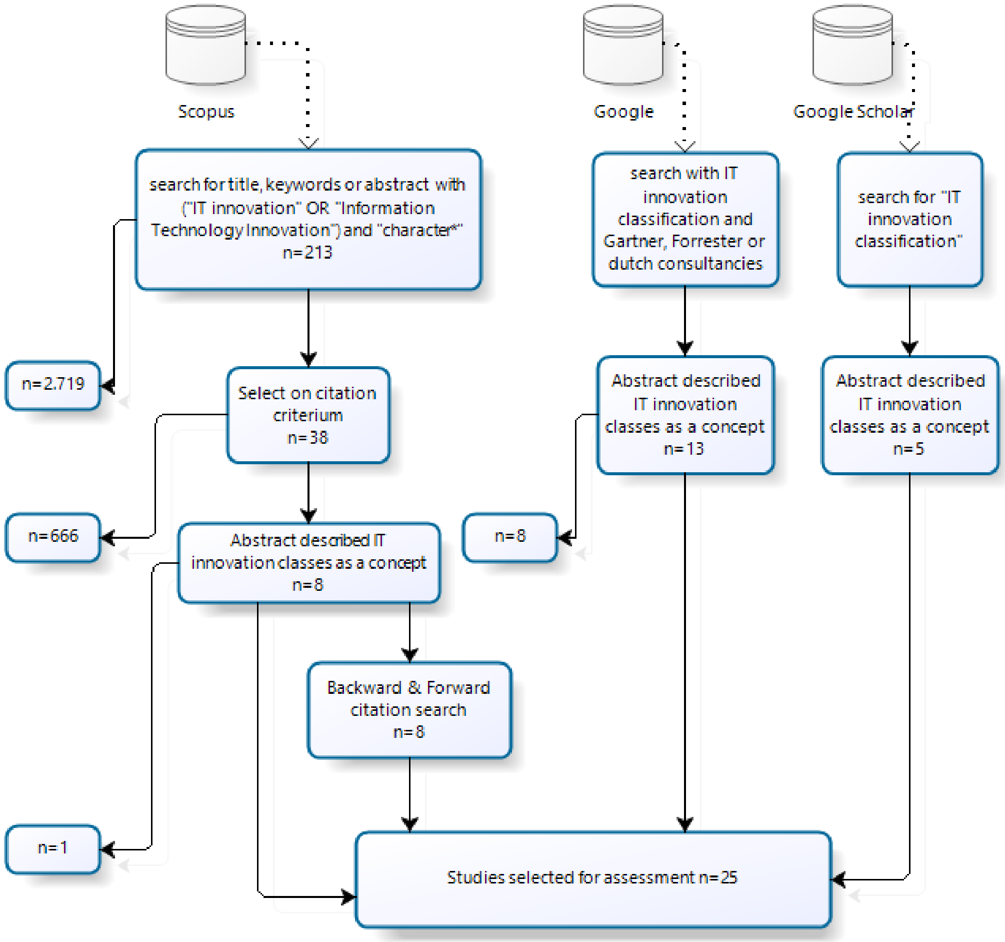
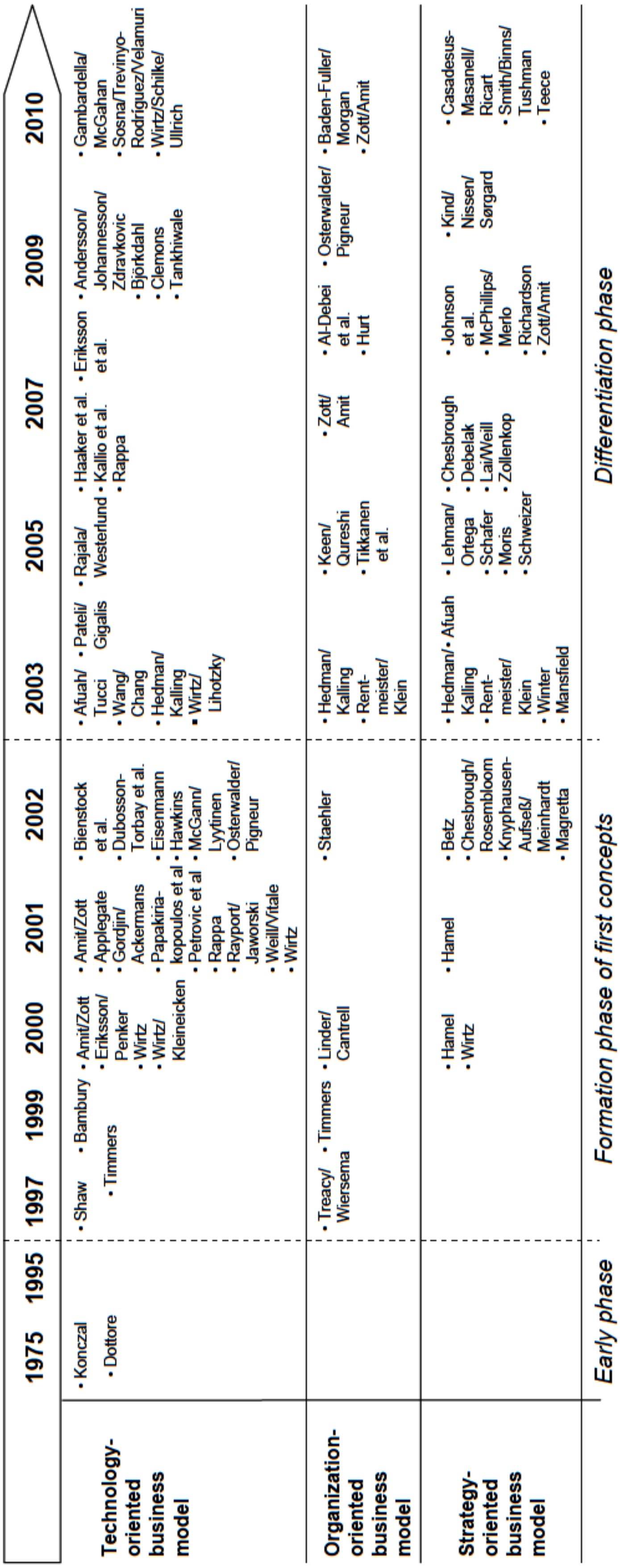


Figure 19: IT innovation literature review

12.3 Chronological view business model literature



12.4 Overview of significant business model literature

This overview is adapted from Zott et al. (2011) and additions are made in red.

Author(s), Year	Most prevalent business model definition	Classification (C. Zott et al., 2011)	Classification (Wirtz, 2011)	Papers Citing the Definition
(Timmers, 1998)	The business model is "an architecture of the product, service and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenues" (p. 2).	• E-commerce	• Technology oriented • Organization Oriented	(Hedman & Kalling, 2003; Mason & Spring, 2011)
(Amit & Zott, 2001; Christoph Zott & Amit, 2009)	The business model depicts "the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities" (2001: 511). Based on the fact that transactions connect activities, the authors further evolved this definition to conceptualize a firm's business model as "a system of interdependent activities that transcends the focal firm and spans its boundaries" (2010: 216)	• Strategy	• Technology oriented, 2001 • Organization oriented, 2010	(George & Bock, 2011; Hedman & Kalling, 2003; M. Morris et al., 2005; C. Zott & Amit, 2007; Christoph Zott & Amit, 2007)
(H. Chesbrough, 2003)	The business model is "the heuristic logic that connects technical potential with the realization of economic value" (p. 529).	• Technology and innovation Management	• Strategy oriented	(H. W. Chesbrough, 2007; Henry Chesbrough, Shane, Megan, & Stephane, 2006; Henry Chesbrough, 2007; D. J. Teece, 2007; D. J. Teece, 2010)
(Magretta, 2002)	Business models are "stories that explain how enterprises work. A good business model answers Peter Drucker's age old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?" (p. 4).	•	• Strategy oriented	(Demil & Lecocq, 2010; Ojala & Tyrväinen, 2007; Seddon, Lewis, Freeman, & Shanks, 2004)
(M. Morris et al., 2005)	A business model is a "concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in	•	• Strategy oriented	(Calia, Guerrini, & Moura, 2007)

	defined markets" (p. 727). It has six fundamental components: Value proposition, customer, internal processes/competencies, external positioning, economic model, and personal/investor factors.			
(M. W. Johnson et al., 2008)	Business models "consist of four interlocking elements, that, taken together, create and deliver value" (p. 52). These are customer value proposition, profit formula, key resources, and key processes.	• Technology and Innovation Management	• Strategy oriented	(M. W. Johnson & Suskewicz, 2009)
(Casadesus-Masanell & Ricart, 2010)	"A business model is . . . a reflection of the firm's realized strategy" (p. 195).	• Strategy	• Strategy oriented	(Baden-Fuller & Morgan, 2010; Burkhart et al., 2012; Hurt, 2008)
(D. J. 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" (p. 179).	• Strategy	• Strategy oriented	(Gambardella & McGahan, 2010)
(Onetti et al., 2012)	"the way a company structures its own activities in determining the focus, locus and modus of its business" (p. 360)	• Strategy	• Organization oriented	
(Mutaz M Al-Debei & Avison, 2010)	"..the BM is a conceptual coherent framework that provides a holistic but abstract understanding of the underlying business logic of an organization." (p. 365)	• Strategy	• Organization oriented	

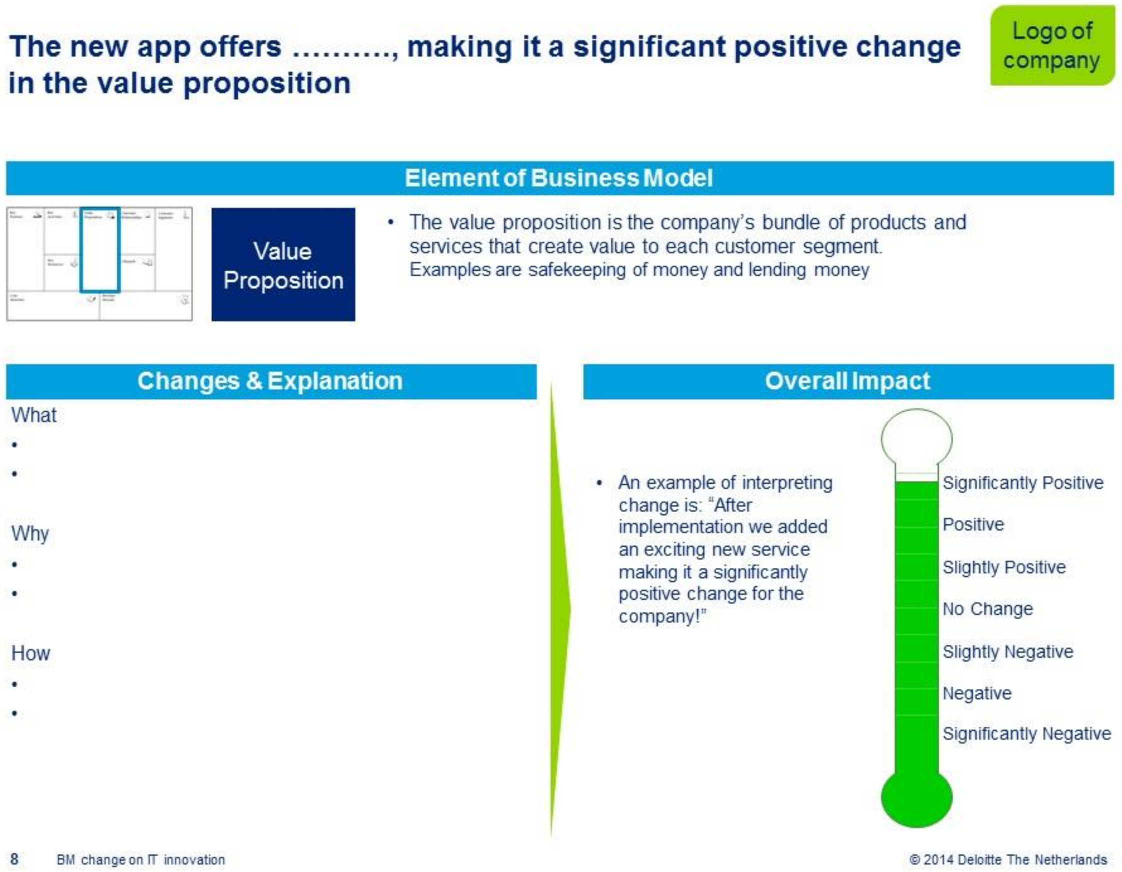
12.5 Case results

This appendix is confidential

12.6 Evolution of case results through different model stages

Results Overview	Case 3	Case 4	Case 1	Case 5	Case 6	Case 2
Alpha 0.1 model						
Alpha model						
Beta model						
Artifact						

12.7 PowerPoint template for interview



12.8 VBA code in excel to get text from PowerPoint

```
Sub PPTMacro()
    Dim celltxtBME As String
    Dim celltxtINN As String
    Dim celltxtReason As String
    Dim SlideNumber As Long
    Dim Hpptpath As String
    Dim Rpptpath As String
    Dim Path As String

    Dim oTxtRng As Object
    Dim openTag As Object
    Dim closeTag As Object
    Dim endRange As Long
    Dim startRange As Long
    Dim DesiredText As String

    'set global path
    Path = "C:\Users\RDESCHIPPER\Dropbox\_Afstuderen\Maart versie\interview\"

    'the text is searched for in these rows
    For i = 2 To 380

    'finds the variables needed in the excel row
    celltxtBME = Range("G" & i).Text
    celltxtINN = Range("C" & i).Text
    celltxtReason = Range("J" & i).Text

    'finds which slide needs to be opened depending on business model element
```

```
    Select Case celltxtBME

        Case "Value Proposition"
            SlideNumber = 9

        Case "Target Customer"
            SlideNumber = 8

        Case "Distribution channel"
            SlideNumber = 10

        Case "Relationship"
            SlideNumber = 11

        Case "Partnership"
            SlideNumber = 15

        Case "Value Configuration"
            SlideNumber = 13

        Case "Capability"
            SlideNumber = 14

        Case "Cost Structure"
            SlideNumber = 16

        Case "Revenue Model"
            SlideNumber = 12

    End Select

    'finds which PowerPoint needs to be opened depending on the innovation
    Select Case celltxtINN

        Case "EMA"
            Hpptpath = "2. Na proffesor interviews\20140506_EnterpriseMobileApps.pptx"
            Rpptpath = "4. Na case interviews\20140721_EMA_Raboview_voorverwerking.pptx"
            'Hpptpath = "4. Na case interviews\20140717_EnterpriseMobileApps_Rabobankview.pptx"

        Case "NFC"
            Hpptpath = "2. Na proffesor interviews\20140617_NFC.pptx"
            Rpptpath = "4. Na case interviews\20140711_NFC_Knab.pptx"

        Case "Game"
            Hpptpath = "2. Na proffesor interviews\20140506_Gamification.pptx"
            Rpptpath = "4. Na case interviews\20140717_EnterpriseMobileApps_Rabobankview.pptx"

        Case "AAED"
            Hpptpath = "2. Na proffesor
interviews\20140506_AdvancedAnalyticsofEnterpriseData.pptx"
            Rpptpath = "4. Na case
interviews\20140708_AdvancedAnalyticsofEnterpriseData_ING.pptx"

        Case "ACR"
            Hpptpath = "2. Na proffesor interviews\20140520_AutomaticContentRecognition.pptx"
            Rpptpath = "4. Na case
interviews\20140618_AutomaticContentRecognition_RaboSTP.pptx"

        Case "SAAS"
            Hpptpath = "2. Na proffesor interviews\20140512_SAAS.pptx"
            Rpptpath = "4. Na case interviews\20140520_SAAS_22Seven.pptx"

        Case "BigData"
            Hpptpath = "2. Na proffesor interviews\20140506_BigData.pptx"
```

```
        Rpptpath = "4. Na case interviews\20140522_BigData_ING.pptx"

    End Select

    'find which text needs to be feched
    Select Case celltxtReason
        Case "what"
            SearchOpen = "What:"
            SearchClose = "Why:"

        Case "why"
            SearchOpen = "Why:"
            SearchClose = "How:"

        Case "how"
            SearchOpen = "How:"
            SearchClose = "bladiebladiebal"

    End Select

    'open ppt with right path
    Dim PPTApp As Object
    Dim PPT As Object
    Dim SlidePPT As Object
    Dim oShp As Object

    Set PPTApp = CreateObject("Powerpoint.Application")
    PPTApp.Visible = True

    'Use the variables set before to open the right slide in the right PowerPoint
    Set PPT = PPTApp.Presentations.Open(Path & Hpptpath, True, False)
    Set SlidePPT = PPT.Slides(SlideNumber)

        'Search for textframes in the powerpoints and depending on the variable whether the what,
why or how txt is used
        For Each oShp In SlidePPT.Shapes
            If oShp.HasTextFrame Then
                Set oTxtRng = oShp.TextFrame.TextRange
                Set openTag = oTxtRng.Find(findwhat:=SearchOpen, MatchCase:=True)
                Do While Not (openTag Is Nothing)
                    Set closeTag = oTxtRng.Find(findwhat:=SearchClose, MatchCase:=True)
                    If closeTag Is Nothing Then
                        endRange = oTxtRng.Length
                    Else
                        endRange = closeTag.Start - 2
                    End If
                    startRange = openTag.Start + openTag.Length
                    DesiredText = oTxtRng.Characters(startRange, endRange - startRange + 1)
                    DesiredText = Trim(DesiredText)

                    'put the right text into the right excel field
                    Range("K" & i).Value = DesiredText

                    Set openTag = Nothing
                Loop

            End If
        Next oShp

    'set difficult system variables free
    PPT.Close
    Set PPTApp = Nothing
    Set PPT = Nothing
```

```
    Next

End Sub
```