Customer analytics maturity of Dutch SME finance banks

Designing a maturity assessment framework for customer analytics implementation at the Small and Medium-sized Enterprises finance banks in the Netherlands

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Preface

This thesis report is the proof of my six year journey at the faculty of Technology, Policy and Management at the Technical University of Delft. With this thesis I complete my Master of Science program: Systems Engineering, Policy Analysis and Management (SEPAM). Writing my thesis at Ernst and Young Financial Services Advisory was a great experience. I am very glad that they gave me the opportunity to conduct case studies at two SME finance banks in the Netherlands and learn how consultants operate in the financial sector.

The aim of this research was to design a maturity assessment framework for customer analytics implementation. From a scientific viewpoint no such framework was found in the literature. From a practical viewpoint this framework could be useful for SME finance banks and IT-consultants to measure maturity of customer analytics deployment.

I would like to thank everyone that has contributed to my thesis. My family and friends who supported me during my internship; my close friend Imran Hyder, who helped me with structuring the story; the interviewees from bank A and bank B; my colleagues at Ernst and Young, especially Rudo Gischler, Alex Maruta and Sander Ardinios who always provided me with useful feedback; my colleague and fellow student Hao Dinh for his feedback; my graduation committee for their motivating feedback: Marijn Janssen as the inspiring chair, Andre Teixeira as my first TU Delft supervisor, who reflected my work during the past 6.5 months, and Haiko van der Voort as motivating second TU Delft supervisor. Special thanks for Jacco Jacobs, Avinash Ramkhelawan and Xander van den Berg who made it possible for me to graduate at Ernst and Young.

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Executive summary

Research problem

Small and Medium Sized Enterprises (SMEs) are of key importance to the Dutch economy, since 99 % of the Dutch firms are SMEs. SMEs are firms with fewer than 250 employees, with a turnover of less than 50 million euro, and total assets less than 43 million euro. SMEs do not have access to capital markets or the ability to issue stocks and bonds, making SMEs highly dependent on loans from SME finance banks. Due to recent developments in the field of IT and big data, SME finance banks have increasing access to stored customer (SME) data. Big data describes the exponential growth in volume and availability of data, as well as the variety and speed at which data is produced and transferred. This large amount of stored customer data, provides the SME finance banks with the opportunity to enhance their businesses by obtaining an enterprise view of the SME customer. This is done by performing and integrating (predictive) data analytics, on the stored customer dataset, with automatic decision making. Enabling the SMEs finance banks to get a better understanding of their customers and drive revenues. This type of analytics is called customer analytics.

For the Dutch financial sector there is a lack of adoption regarding the use of customer analytics. Several factors, like regulation and the technological development of data analytics cause this lack of adoption. This may be explained by an immaturity of these factors at Dutch SMEs finance banks. Maturity describes the state of being complete or ready to reach a desired state. Maturity models help organization to assess the current state, maturity, of a certain technological development. There are no existing maturity models for customer analytics implementation, by SME finance banks in the Netherlands. This results in the following research question:

"How can a maturity assessment framework be designed for customer analytics implementation for the SMEs finance banks in the Netherlands?"

Aim and research approach

The aim of this research is to design a maturity assessment framework that is able to assess the maturity of customer analytics implementation at the SMEs finance banks in the Netherlands. This contributes to an unexplored research field, since there are no existing maturity assessment frameworks on this topic. Given the fact that this research field has not been explored before, the research approach is of an explorative nature (Baxter and Jack, 2008). Specifically, the research is of a qualitative character, since literature, experts interviews and case study interviews will be used. To structure and guideline the explorative research, the system engineering research methodology from

Sage and Armstrong (2000) is used. Basically the methodology consist of the three design phases: (1) define and conceptualize, (2) develop and test, and (3) evaluate.

The design process of the framework

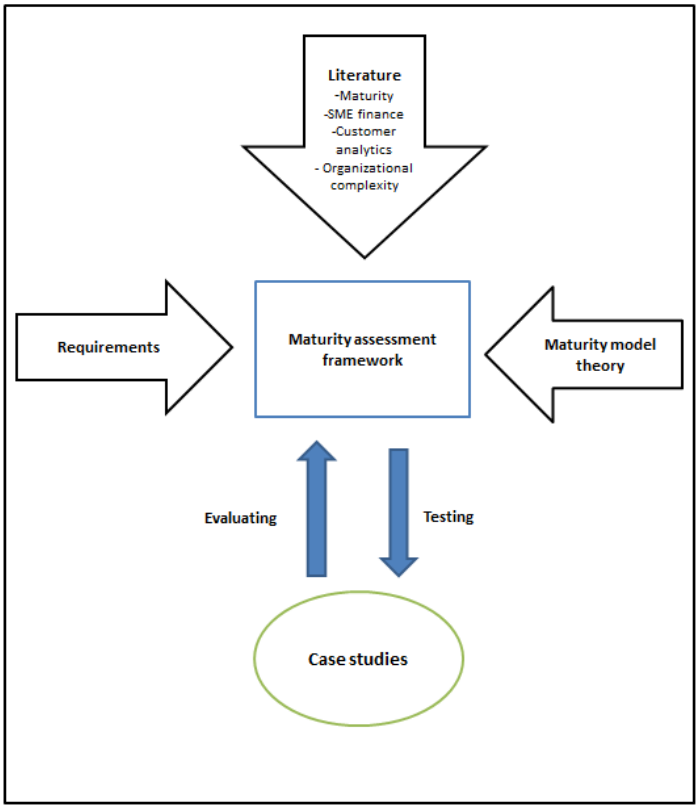

Figure 1: Design process of the maturity assessment framework

In figure 1 the design process of the framework is given. A literature research is conducted to explore SME finance and customer analytics. The relationship between SME finance banks and the SME client has become more customer-oriented, due to recent IT and big data developments. Customer analytics usage increased due to IT developments and the new customer oriented relationship between the client and the SME finance banks. Customer analytics for SME finance banks is about collecting, cleansing , validating, integrating and analyzing raw data gathered from various tough points and analyzing them to draw meaningful insights about the banks' SME customers. The difficulties around measuring maturity and organizational complexity are explored too, by using the Mintzberg (1993) model. Measuring maturity is difficult for organizations due to co-interactions between actors, the multi-value aspect of maturity and dynamics within organizations. Organizational theory from Mintzberg describes the differences within organizations and the theory is used for

structuring the case studies.

Maturity model theories are reviewed and the CMMI theory is selected for designing the maturity assessment framework. This selection is made based on the ability of the CMMI model to assess both organizational and technical aspects of an organization. According to the CMMI theory, the maturity assessment should be hierarchical designed. Starting with leverage domains, which are built up of key domain areas. These key domain areas should be measurable by the critical variables. Expert interviews are conducted and the outcomes of the interviews are reviewed by scientific literature to define the requirements for conducting customer analytics at Dutch SME finance banks. The requirements are: *Data integration, up to data legacy infrastructure, data quality, data governance, software and correct tools, Data-warehousing (central distribution), privacy, PSD2, knowledge* and *management.*

By conceptualization the framework, all the elements from the previous research steps areas brought together (see figure 1). Regulation, organization, governance and technology are the leverage domains of the maturity assessment framework, the requirements serve as key domain areas of the framework: see table 1 for the overview. The maturity levels of the key domain areas are assessed by its critical variables. As can be seen in table 1, the maturity assessment framework assess both technical and organizational elements of customer analytics implementation, regulation and governance are also included. The results of the framework are the measurement itself (see figure 2) and the discussion around the measurement. All the involved actors from the SME finance bank should be included in the discussion, what makes the assessment richer.

Table 1: The key domain areas and the leverage domains

Key domain areas	Leverage domain
Privacy	*Regulation*
PSD2	
People	*Organization*
Management	
Data quality	*Governance*
Internal rules regarding data	
Consultation regarding data	
Data sharing	*Technology*
Software tools	
Technical knowledge	

After the conceptualization, the maturity assessment framework is developed and tested by conducting case studies at two SME finance banks in the Netherlands. Case studies help answering

the research question and testing the framework. Conducting case studies is done by interviewing experts from different departments within the SME finance banks. The rationale behind interviewing different departments is to cope with co-interaction, multi-value and the dynamics in the bank. These departments are marketing, data science, data warehouse and finance/risk, making the framework a mulit-level assessment framework. Testing the framework is done by using dashboards to visualize and presenting the results of the maturity assessment of the two participating SMEs finance banks. Dashboards support the interpretation of maturity assessment scores, while using numbers do not provide enough insights and are easily interpreted differently from the original meaning. In figure 2 a dashboard is shown. The interpretation should be done by the experts from the SME finance banks.

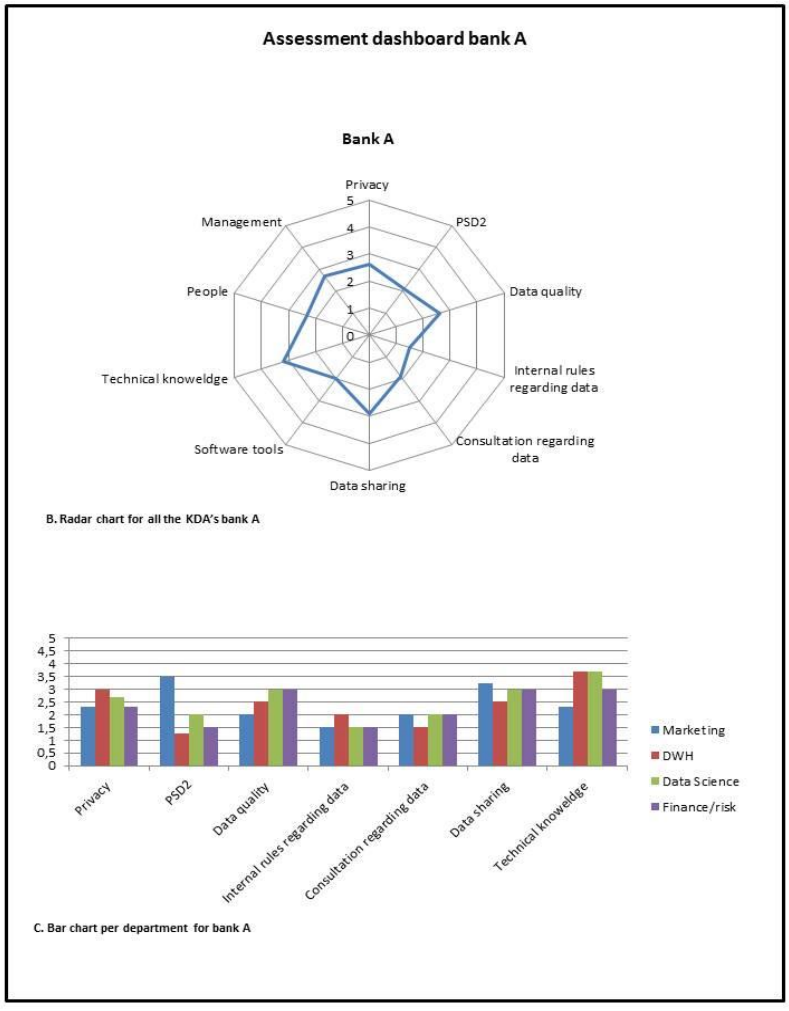

Figure 2: Dashboard with the maturity assessment scores

Reflection and conclusions

This research is unique due to the multi-perspective approach of the design process. The main scientific contribution is the design of a new maturity assessment framework with an academic

foundation, which has not been done before. Existing customer analytics frameworks focus on either technology or organizational aspects of customer analytics implementation. While this research focusses on different domains: regulation, organization, governance and technology. This framework aims at assessing the maturity of customer analytics implementation, while the existing frameworks aim at implementing customer analytics or creating awareness for customer analytics implementation. Also, case studies are conducted at two out of the four SME finance banks in the Netherlands. IT-consultants and SMEs finance banks could use this framework to measure organizational maturity of customer analytics implementation, which is the main practical contribution. The framework is used to gather insights on the maturity of different topics, like regulations, data governance, technology and organization. Also the framework provides insights on different departments of a SMEs finance banks, making the framework a multi-criteria and multi-level framework. The lack of adoption may be explained by the immaturity of the certain domains: organization, regulation, governance and technology.

This research contains limitations. Some elements are excluded from the framework, like current regulations, compliancy with new regulations, current amount of professionals working on data related issued, talent scouting and quantitative elements. Another important element that is excluded from the framework is costs. Meaning that being mature according to the framework, does not necessarily mean that a SME finance bank is able to adopt customer analytics, due to high costs. Desired maturity of the SMEs finance banks is not taken into account in the research and the assessment dashboards. In this research four departments were interviewed in the case studies, in reality a SME finance bank consists of more departments. Another lacking element is the fact that one interview has been taken per department. More interviews should be taken at every participating department to increase the reliability of the results. Due to a lack of time, conducting more interviews was not possible. Also, the interpretation by the experts from the participating SMEs finance banks was not possible.

Further research

For further research the requirements of the framework should be expanded, where missing elements, like quantitative elements, compliancy regarding regulations and costs, should be included in the framework. Furthermore, more interviews may be conducted at the SMEs finance bank. Interviewing experts from the same department, but also experts from different departments, is recommended for further research. Conducting additional case studies to test the framework at other SME finance bank is important to improve the framework. The research is mainly based on a literature review. It is recommended to enhance the quality of the empirical data of the framework

requirements, this should be done by interviewing experts from different sectors. This research could be seen as the starting point for further research on maturity assessments for customer analytics implementation at the Dutch financial sector.

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1. Introduction

1.1 Research problem

The financial sector is crucial for the economy (Norden, 2015). Frictions in the financial sector, like asymmetric information and transaction costs, are the reason for the existence of financial intermediaries, e.g. banks (Boot, 2000). The core activities of banks are deposit taking and lending (Norden, 2015). Demand deposits, that can be withdrawn at any time, are transformed into investment loans for companies. Banks are essential for transferring money from the central bank into the economy and banks operate as the cash and non-cash payment system for the economy. Banks finance the economy, from (small and large) businesses to individuals.

SME (Small and medium-sized enterprises) are of key importance to our economy (Norden, 2015). SMEs are firms with fewer than 250 employees, with turnover of less than 50 million euro, and total assets less than 43 million euro (European Commission, 2006). In the Netherlands 99% of all firms are SMEs, and SMEs are the engine of the Dutch economy (MKB, 2014). Financing SMEs is challenging for banks, because SMEs are more informationally opaque, lending money to SMEs is more risky, more financially constrained, and more bank-dependent than large firms (Norden, 2015). Because SMEs don't have the access to capital markets or the ability to issue stocks or bonds that larger firms do, they are largely dependent on bank loans and trade credit to raise external finance. This means that 99 % of the Dutch firms are largely dependent on bank loans. This research focusses on the role that banks play for or a specific subset of companies, Small and Medium-sized Enterprises (SMEs), financing the SMEs.

In recent years the interest from the *financial sector* in big data increased (Set and Chaudhary, 2015). Competitive forces have forced financial institutions to increasingly capitalize on recent developments in the field of IT and big data related tools (Fhom, 2015). The phenomenon 'big data' describes the exponential growth in volume and availability, as well as the variety of data and speed at which it is produced and transferred (Fohm, 2015; Amudhavel et al, 2015). Data is generated with a vast range of devices and processes. The amount of stored customer data is expanding fast for the financial sector (Fohm, 2015). Gandomi and Haider (2015) distinguish between big data and big data analytics. The difference lies in various process stages of extracting information from big data which ranges from: 1. Acquisition and recording , 2. Extractions, cleaning and annotation, 3. Integration, aggregation and representation to 4. Modeling and analysis and 5. Interpretation. The first three stages refer to (big) data management and the fourth and fifth stage refer to (big) data analytics. Analytics have been used to measure business performance for many years (Gandomi and Haider, 2015).

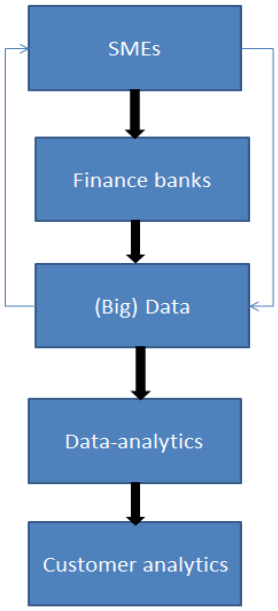


Figure 3: Overview from SMEs to Customer analytics

The large amount of stored customer data (big data) provides the SMEs finance banking sector with a huge opportunity to enhance their businesses (Sun et al, 2014). This enables SMEs finance banks to conduct large-scale customer experience analytics and gain insights about their customers. Integrating predictive data analytics with automatic decision-making, makes a bank understand the preferences of the customers, identify high potential customers, promote products to the suited customers, improve customer experience and drive revenue (Sun et al, 2014). This integrated data analytics is called customer analytics. Customer analytics is widely used by banks in the financial sector in the United States of America, China and India and some European countries, notably the United Kingdom (Srivastava and Gopalkrishnan, 2015 and Sun et al, 2014). In the Netherlands there is a *'lack of adoption'* regarding the implementation of customer analytics in the financial sector, see section 1.2 for a detailed discussion on the lack of adoption in the Netherlands.

Different frameworks exist (Sun et al, 2014; Bekmamedova and Shanks, 2014; Bose, 2009; Chan, 2005) for assessing the value of customer analytics for financial institutions worldwide. These frameworks are not developed for the Dutch financial institutions, with different regulations, technological development and organizational structure. There is a missing link between Dutch financial institutions, with a focus on SMEs finance, and the implementation of customer analytics.

1.2 Lack of adoption

The lack of adoption in the Netherlands is the main motivation for this research. In the literature, no clear answer is given why there is a lack of adoption regarding the implementation of customer

analytics in the Netherlands. Therefore two experts on customer analytics were anonymously asked why there is such a lack of adoption in the Netherlands. One expert works in the financial industry in the Netherlands and the other expert is a data-analytics advisor from a multinational IT consulting firm. The question list can be found in Appendix A.

There was no single disagreement between the interviewees. Both interviewees argued that the usage of customer data for other purposes than normal transactions by banks in the Netherlands is very difficult, because banks in the Netherlands have separated IT data systems with different data sources. Data sharing between these systems is not mature in the Netherlands. This makes the integration of data, which is required for customer analytics (Sun et al, 2014), more difficult. Regarding regulation there is also a huge difference between the Netherlands and other countries. In the Netherlands banks are able to legally block third parties from accessing the bank's customer data. In other countries, like the UK, USA and China, banks are obliged to share their customers' data with third parties, with the permission of their customers. This will change in the near future, when the new European directive will be launched (EC, 2015d) , that obliges banks to share their customer data with third parties, like commercial organizations. Another very important element is the cultural issue in the Netherlands. Both interviewees emphasized that Dutch citizens have a negative attitude against sharing their financial data with third parties or with the financial institution itself, compared with other countries. A newspaper article from the Dutch daily financial news (het Financieel Dagblad), where several experts are interviewed on the same topic, state the same: Dutch citizens don't like the idea that their bank data is used for other purposes than their own financial transactions (Financieel Dagblad, 2015).

The lack of adoption may be caused by several facts: the regulation differs from other countries, Dutch citizens (still) have problems with other usages of their financial data and the organizational IT data structure of banks is not mature enough for deploying customer analytics. These elements on the lack of adoption will be further examined in this research. The lack of adoption could be seen as the immaturity of certain domains; technology, regulation and governance, of the Dutch SMEs finance banks regarding the implementation of customer analytics. This possible immaturity will be further discussed, reviewed and described in the research.

Maturity describes the state of being complete or ready to reach a desired state of development (Lahrmann et al, 2011). Maturity models help organization to assess their maturity. The purpose of maturity models is to assess the current situation of technological improvements in order to evaluate strengths and weaknesses of a technology (Iversen et al, 1999; Salah et al, 2014). In the Netherlands there are no maturity models for assessing customer analytics for the financial sector.

1.3 Research methodology

1.3.1 Research objective

Based on the previous sections, the suggestion is made that there is a lack of adoption in the Netherlands regarding the implementation of customer analytics by the financial sector. There is a missing link between SME finance banks in the Netherlands and deploying customer analytics. The objective of this research is to explore the missing link between the SME finance banks and the implementation of customer analytics, this will be done by exploring the maturity of SME finance banks regarding customer analytics implementation. Maturity assessment frameworks help organizations to assess their maturity. Maturity assessment frameworks are used by IT-consulting firms, but without any academic foundation. Maturity is a normative concept (Donnellan et al, 2007; Mettler, 2011), the difficulties around measuring maturity will be explored in this research. Customer analytics is already used by financial institutions and Dutch banks are familiar with the customer analytics concept. Designing a framework that assesses the maturity level of customer analytics for the SME finance banks in the Netherlands is the essences of this research. According to the scientific literature different frameworks for *using* customer analytics exist (Sun et al, 2014; Germann et al, 2014; Srivastava and Gopalkrishnan, 2015).The goal of this research is to develop such a maturity assessment framework that is able to assess maturity levels of both organizational and technical domains within the SME finance bank, and gather insights on what the requirements are for deploying customer analytics, from both a technical and an organizational perspective. The research objective is defined as follows:

> *To design a framework that assesses the maturity level of customer analytics implementation at SME finance banks in the Netherlands*

1.3.2 Research questions

In this section the main research question and the sub-questions will be formulated. Based on the previous sections the main research question will be addressed:

How can a maturity assessment framework for customer analytics implementation be designed for the SME finance banks in the Netherlands?

The focus is the Dutch SME finance bank. In order to answer the main research question five sub-questions are formulated:

a) *What is the relation between a modern Dutch SME finance bank and the SME customer?*
b) *What is customer analytics and for what purpose could customer analytics be used at a SME finance bank?*
c) *Why is measuring maturity difficult for organizations?*
d) *What maturity model theory is suitable to design a maturity assessment framework for customer analytics implementation for the SME finance banks in the Netherlands?*
e) *What are the requirements for deploying customer analytics at SME finance banks?*

1.3.3 Research motivation

Given the fact that this research field has not been explored before, the research approach will be of an explorative nature (Baxter and Jack, 2008). The objective of this research is to design a maturity assessment framework and gather new insights on what the requirements are of deploying customer analytics, which is also explorative. The scientific contribution and the practical contribution will be described below.

Scientific contribution

The research contributes to the scientific knowledge by gaining more insights on the maturity of SME finance banks regarding customer analytics implementation. This is done by identifying the requirements for conducting customer analytics at SME finance banks. Because this research field has not been explored before, the main scientific contribution is the design of a new maturity assessment framework for customer analytics. The existing frameworks (Sun et al, 2014; Bose, 2009; Chan, 2005; Bekmamedova and Shanks, 2014) focus on specific elements of customer analytics; like organization awareness (Bekmamedova and Shanks, 2014), integrating different frameworks to one singe framework to enhance the customer relations (Chan, 2005) and customer analytics implementation (Sun et al, 2014 and Bose, 2009). The maturity assessment framework from this research focusses on different domains within the organization, like regulation, governance, technology and organization. Making the framework a multi-criteria framework instead of focusing on one single element. The framework contributes also to the research field in the sense that it proposes a new method for assessing the maturity of customer analytics implementation, instead of creating organizational awareness or implementing customer analytics.

Another contribution is the academic foundation that will be given on the use of maturity level assessments. Measuring maturity is characterized by difficulties, which will be discussed by means of a literature research. Empirical data will be used in this research to design and test the

maturity assessment framework. Literature research will also be conducted to explore customer analytics, to explain what customer analytics is and where it is used for. To determine what the requirements are for deploying customer analytics, findings from expert interviews will be combined with a literature research.

Additionally this research provides the opportunity to conduct case studies at 2 out of 4 major Dutch SME finance banks. This provides a possibility to compare the maturity level of their customer analytics deployment and their competitive position in the local Dutch market, by making a benchmark between the two banks.

Practical contribution

If the research is of an explorative nature, using case studies is one of the suitable approaches (Baxter and Jack, 2008). Also the boundaries of customer analytics implementation at SME finance banks and its context are unclear (Yin, 2003). The use of customer analytics is expanding very fast in the financial sector, therefore more clarity is necessary on how customer analytics could be implementation at SME finance banks.

There is a clear need for SME finance banks to gather more insights on how customer analytics could be implemented, what the requirements are for customer analytics and how mature the organization is. This research uses empirical data to explore the research field. The main contribution is that the new proposed maturity assessment framework can be used by IT-consulting firms and SME finance banks to gather insights on customer analytics implementation.

1.3.4 Research approach and thesis outline

To formulate an approach for designing such a maturity assessment framework, system engineering theory from Sage and Armstrong (2000) will be conducted. Sage and Armstrong (2000, pp 56) define the primary goals of systems engineering as follows:

The creation of a set of high-quality and trustworthy operational products that will enable the accomplishment of desired tasks that fulfill identified needs of a client group, or user group, or enterprise.

This defined goal of systems engineering matches with the research objective of this thesis. In line with the defined goal of the system engineering approach, the maturity assessment framework will be the operational product. In this research the systems engineering method will be used as a guideline to structure the approach of the research objective. The systems engineering method

defines three phases: (1) Definition and conceptualization, (2) Develop and test and (3) Evaluation.

The first phase results in the identification of the needs, activities and objectives for the end-product (Sage and Armstrong, 2000). Information is a necessary ingredient, it serves as the input to the rest of the process. Information is also required to set up the requirements for the framework. This will be captured in Chapter 2, 3 and 4. In Chapter 2 a literature review will be conducted to explore the new relationship between SMEs finance banks and the SME. Also customer analytics will be discussed, what customer analytics is and where it could be used for. Different existing frameworks will be shortly reviewed to position the maturity assessment framework later on in the research. Measuring maturity is difficult for organizations, this will be discussed in Chapter 2 too. Lastly, the departments of a SMEs finance banks will be explored in Chapter 2, by using organizational theory. This will be also used to structure the case studies. The insights from the literature review will be used in the further research. Chapter 3 reviews different maturity model theories and a selection will be made for the theory that suits the research objective. Maturity models help organization with assessing current developments and processes. The requirements of the maturity assessment framework will be defined in Chapter 4, based on interviews with experts and a literature review. The next step in the definition phase is to develop a concept. A preliminary concept design that is responsive to the requirements should be obtained (Sage and Armstrong, 2000). The conceptualization of the framework is captured in Chapter 5. In this Chapter all the findings from Chapter 2,3 and 4 will be brought together. In the conceptualization phase, the framework will be positioned in the research field and the process of use will be explained. The development phase, the designing phase, also consists of two steps: detailed design and testing (Sage and Armstrong, 2000). Because the research is of an explorative character, case studies will be used (Baxter and Jack, 2008). The case studies and testing phase are represented in Chapter 6 and 7. In Chapter 6 the case studies will be presented. Two SME finance banks in the Netherlands participated in the research. In Chapter 7 the testing, based on the case studies, of the designed maturity assessment framework will be visualized by using dashboards. In this phase case studies will be used to test the maturity assessment framework. In the third phase the product, process or systems is implemented for evaluation (Sage and Armstrong, 2000). In Chapter 8 a reflection on the framework and the research will be presented. Once the implementation has occurred, the evaluation can occur. All these phases are conducted iteratively (Sage and Armstrong, 2000). See figure 4 for the thesis outline.

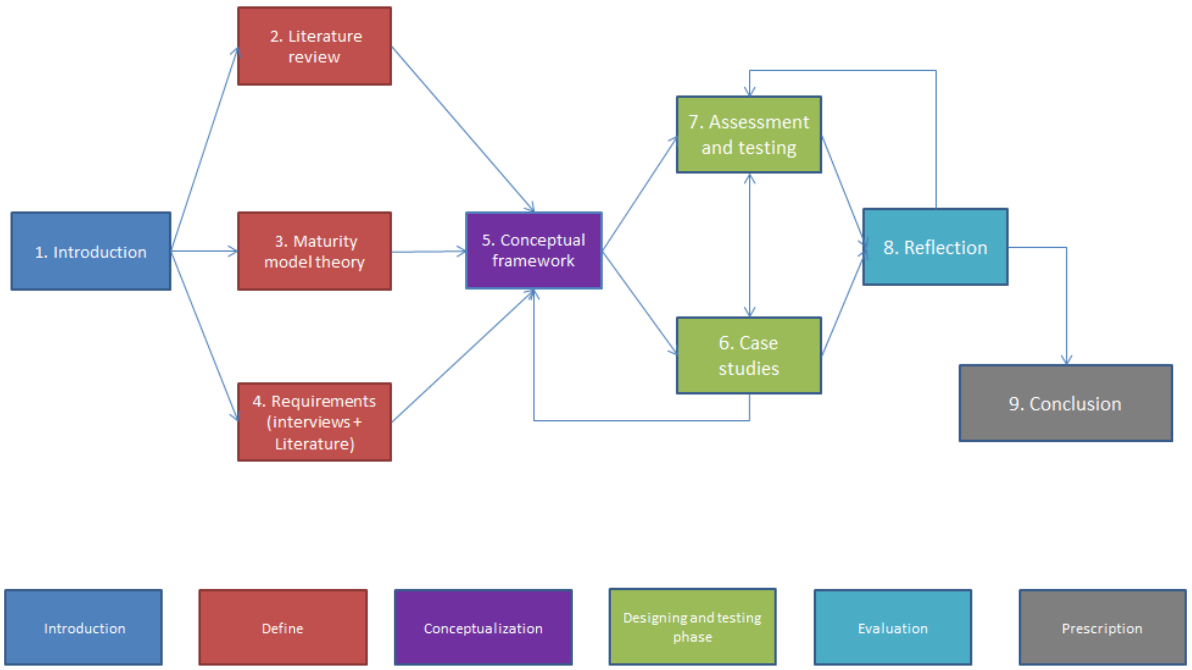


Figure 4: Research flow diagram

Figure 4 shows that the research outline consists of six different 'phases'. These phases are related to Sage and Armstrong (2000).

Chapter 2 Literature review

2.1 Introduction

In this Chapter a literature research will be conducted. This Chapter is part of the definition phase based on Sage and Armstrong (2000). The aim of this Chapter is to explore the research field. In order to help answering the main research question, a literature research will be conducted. Insights from this Chapter will be used in the next Chapters of this research. Section 2.2 describes the new relationship SME finance banks have with their SMEs customers. The transition from a traditional bank to an advisory bank, a more customer oriented bank, will be explained based on available literature and public available reports of the four biggest Dutch SME finance banks. In the third section the use of customer analytics will be explained based on findings from the literature. Different exiting customer analytics frameworks will be shortly reviewed to position the designed framework in Chapter 5 and to examine what the contribution is of this research to the research field of customer analytics frameworks.

Difficulties around measuring maturity will be described and the complexity within an organization will be explored too. Section 2.4 discusses why determining maturity is problematic for organizations. In Chapter 3 different maturity models will be reviewed. It is important to review why maturity is difficult to measure for organizations and with what kind of problems organizations have to deal with, when they want to measure their performance (de Bruijn, 2003). In the fifth part the departments of a bank will be discussed, based on organizational theory from Mintzeberg (1993). The model will be used to described what the (typical) different departments within an organization are and gather insights will be used in Chapter 6, when the case studies will be conducted. In the last section a conclusion will be given.

2.2 The relationship between Dutch SME finance banks and SMEs

In this section the new function of banks will be discussed. As mentioned in section 1.2 two experts were interviewed on the lack of adoption regarding the implementation of customer analytics in the financial sector in the Netherlands. They suggested that the role of banks is changing from a traditional financial services organization to a bank that combines traditional financial services with advisory. See figure 5 for a schematic overview. The traditional relationship between the SME finance banks and their SME customers will be explored through a literature research and the new relationship SME finance banks have with their SME customers will be examined through the public available annual reports of the SME finance banks.

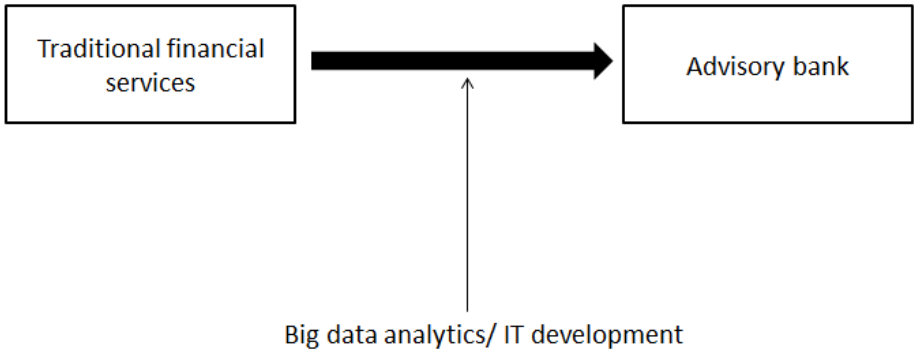


Figure 5: Overview of the transition of the SME finance bank

De la Torre et al (2010) examined the relationship banks have with the SME. They argued that given the 'conventional wisdom' on SME finance , supply-side factors are the root of inadequate financing of SMEs. Additionally, the way in which financial institutions are operating is biased against offering SME financing. De la Torre et al argue that many banks are not interested in servicing SMEs. The main factor why banks are not interested in servicing the SMEs is that SMEs are opaque (Norden, 2015; Berger and Udell, 1998; Cole et al, 2004; Hyatinen and Pajarinen, 2008). Opaque means that it is difficult to ascertain if a SME has the capacity to pay or they have the willingness to pay (De la Torre et al, 2010). Opaque particularly undermines lending from institutions that engage in more impersonal or arms-length financing that requires hard, objective, and transparent information (De la Torre et al, 2010, pp 2280). To cope with this opaqueness, banks use transactional lending technologies like: (i) financial statement lending, (ii) small business scoring, (iii) asset-based lending, (iv) factoring, (v) fixed-asset lending and (vi) leasing (Norden, 2015). These technologies rely on impersonal hard information about the borrower/collateral. Hard information means recorded information like numbers and is much more easy to store and transmit in impersonal ways (Peternson, 2004). The obvious way to cope with opaqueness of the SMEs is relationship lending (Norden, 2015; De la Torre et al, 2010; Berger and Udell, 2006; Kano et al, 2006). Relationship lending is based on private and soft information trade credit that cannot be easily classified, sharing features of relationship and transactional lending (Norden, 2015). Soft information is mostly communicated in text with a collection process that is dependent on the content (Peterson, 2004). Relationship lending may reduce and mitigate opacity problems because it relies primarily on the soft information that is gathered by the loan officer through continuous, personalized, direct contacts with SMEs, their owners and managers, and the local community in which they operate (Berger and Udell, 2006; De la Torre et al, 2010). Relationship lending is the most important lending technology

for SMEs and for many private firms it is the key source of external financing (Berger and Udell, 2002; Bharath et al, 2011; Petersen and Rajan, 1995; Beck et al, 2005; De la Torre, et al, 2010; Beck et al, 2011; Norden, 2015). Relationship lending is an important element that describes the relationship between the SME finance bank and the SME customer. Close bank-borrower relationships might create benefits for both sides if the inefficiencies created by the informational problems are reduced (Norden, 2015). The bank acquires an informational monopoly over the borrower, because the bank observes up to date and quick information about the borrower and the borrower is not able to transfer the private information to another bank. Informational monopoly is the another element that describes the relationship between bank and SME customer. From the literature (Degryse and Ongena, 2005; Ioannidou and Ongena, 2010; von Thadden, 2004; Kim et al, 2003; Rajan, 1992; Sharpe, 1990; Greenbaum, et al, 1989; Norden, 2015) the conclusion is drawn that a close back-borrower relationship might create a lock-in effect, due to the emerging informational monopoly, if the SME doesn't have sufficient alternative banking relationships or the SME faces high switching costs. Concluded, traditionally banks have a 'top-down' relationship with the SMEs, this is because of the elements relationship-lending, informational monopoly of the SME client and close back-borrower relationship between the SME finance bank and the SME customer. Due to the opaqueness of the SMEs, banks have basically two types of lending with the SMEs: transactional leading technologies lending and relationship lending.

Innovative technologies have enabled new communication channels for the financial industry, which were quickly adopted by banks (Shu and Strassman, 2005). Advanced data analysis techniques are currently used to evaluate risk in credit approval (Huang et al 2004) and fraud detection (Ngai et al 2011). Besides the traditional banking services such as loaning, deposits management and investments in capital markets, the banking industry is enlarging their domains under influence of the technological progress (Berger, 2003). New communication channels that support e-banking services are raised from this technological progress. Banks increased investments in customer retention, customer relationship management (CRM) and targeting (e.g., Karakostas, Kardaras, & Papathanassiou (2005)).

To get better insights on the effect of new technologies (big data related) on the role of the banks, the annual reports of the four largest Dutch banks are discussed, see Appendix C for the annual revenues of the top four Dutch Banks. These reports are: *Jaaroverzicht 2015* from ING (2016), *ABN AMRO annual report 2015* from ABN AMRO (2016), *Bankieren met de menselijke maat, jaarverslag 2015* from SNS (2016) and *Jaarverslag 2015* from Rabobank (2016). In the ING (2016) report, these strategic priorities could be found: (1) becoming a 'home bank', (2) better analysis to understand and advise the customers, (3) quicker innovation to fulfill the customer demands and (4)

starting using new business models and new advisory services besides the traditional services. In the ABN AMRO (2016) annual report, it is stated that one of the strategic priorities is to enhance client centricity. Literally: (pp 56) *We offer our products and services through an extensive network of 260 branches and through Advice & Service Centres. A broad range of financial advisors and specialists are available to advise clients at every stage of their life.* From the SNS (2016) annual report: 'We are a human-focused bank". They invest in their relation with the customers. Providing customers with up-to-date and useful advise when necessary. From the Rabobank (2016) annual report: "we want to achieve an excellent relationship with our customers". The Rabobank report makes clear that Rabobank wants to be the excellent financial advisor for their customers. These annual reports show that the big Dutch SMEs finance banks try to also become a financial advisor for their customers, by enhancing their relationship with the customers. This can be seen as relationship lending, since relationship lending basically requires soft data, that is gathered through personal contacts with the SME. From the literature the conclusion is drawn that new technologies have an effect on this switch from traditional financial service to financial services with an advisory component.

2.3 The use of customer analytics

2.3.1 Customer analytics

As mentioned in the introduction of this research, a lack of adoption regarding customer analytics exists in the Netherlands. Customer analytics could be used to enhance the relationship with the banks customer, by gathering meaningful insights about the customer (Sathyanarayanan , 2012). This fits the new role of the bank to become an advisory bank. Therefore, the use of customer analytics will be discussed. The approach that is used to discuss the current state are interviews with experts and a literature research.

The use of data analytics is emerging (Miles, 2014). The big data revolution around the 21st century has found a resonance with banking firms, considering the valuable data they have been storing since many decades (Srivastava and Gopalkrishnan, 2015). These data have unlocked secret money movements, they could be used to understand customer behavior using specific analytics. Davenport (2006) defined analytics as the extensive use of data, statistical and quantitative analysis, exploratory and predictive models, and fact-based management to drive decisions and actions. Customer analytics is a type of predictive analytics based on customer data that is used for customer based decisions making (Sun et al, 2014). Sathyanarayanan (2012, pp 46) defined customer analytics as follows:

Customer analytics is about collecting, cleansing, validating, integrating and analyzing raw data gathered from various touch points and analyzing them to draw meaningful insights about the organization's customers

In this research the focus is on SMEs finance. Sun et al (2014, pp 2-4) argued that a distinction should be made between hard and soft data. Hard data is recorded as numbers and much more easy to store and transmit in impersonal ways (Peternson, 2004), whereas soft data is mostly communicated in text with a collection process that is dependent on the content. The focus of customer behavior analytic techniques is mainly on the hard data (information). According to Ngai et al. (2009) and Kracklauer et al. (2004), customer behavior analytics includes four dimensions: customer identification, customer attraction, customer retention and customer development. This is visualized in figure 6.

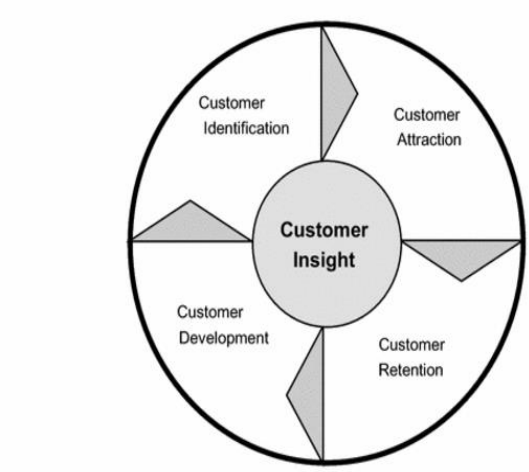


Figure 6 : The concepts of customer management (Kracklauer et al. (2004)).

Customer identification is already implemented in the banking industry, it includes customer segmentation and targeting. After the identification of the customers, banks try to adopt appropriate marketing strategies to attract specific customers (Sun et al., 2014). An essential element of customer analytics is to improve customer retention and identifying the cause of customer attrition. The last dimension (Customer development) includes customer lifetime value analysis, up-selling/cross-selling, and an affinity analysis (Sun et al., 2014). Customer analytics can be applied to many different applications. The most important applications are addressed in the table below:

Table 2: Three different categories of customer analytics, based on Sun et al. (2014).

Application	Explanation
Customer segmentation and preference analysis	This produces fine-grained customer segmentations in which customers share similar preference for different sub-branches or market regions. Based on the results, banks get deep insights in their customer characteristics and preferences, improving customer satisfaction.
Potential customer identification	This module helps a bank to identify potential high-revenue customers who are likely to become profitable to the bank, but are currently not customers. Targeting customers
Customer network analysis	By understating and product affinity through analysis of social media networks, customer network analysis may improve customer retention, cross-sell and up-sell.

The main aim of customer analytics is to create a deeper understanding of customers and their behavior to maximize their lifetime value to the company (Sun et al, 2014).

Analytics has been used for many years to measure business performance (Miles, 2014). By using analytics from multiple customer touch points, customer interactions with the firm can be optimized by providing a unified view of a customer (Chan, 2006). The focus of this research is the SMEs finance banks. The financial relationship between the lenders (banks) and the SMEs is described in section 2.2. The interest of the financial sector in customer analytics is undisputed. However using analytics to measure SMEs is still relatively new (Miles, 2014). To address the lack of academic research on the use of analytics with SMEs, a new practical approach is found to examine the use of analytics by SMEs. Miller and Nyauncho (2015) developed such a practical approach to use data-mining and analytics for SMEs banking. By using different analytics, like a client profile analysis, dependency analysis and segmentation at an individual customer level (in this case SME level), may identify needs and prospects. If banks offer SMEs banking services that are distinct from traditional loans to retail and corporate customers, data analysis is the most suitable way to both understand the SME and assess what the SME profile could look like (Miller and Nyuancho, 2015). Making such a SME profile provide the lender (bank) with opportunities like:

- Identifying cross-selling opportunities for retail business and to SMEs
- Determining what products logically follow-on from an existing product set (types of loans)
- Estimating wallet size and profit potential per SME
- Determining sector and industry concentrations
- Segmenting customers for targeted value marketing
- Looking for upstream and downstream clients

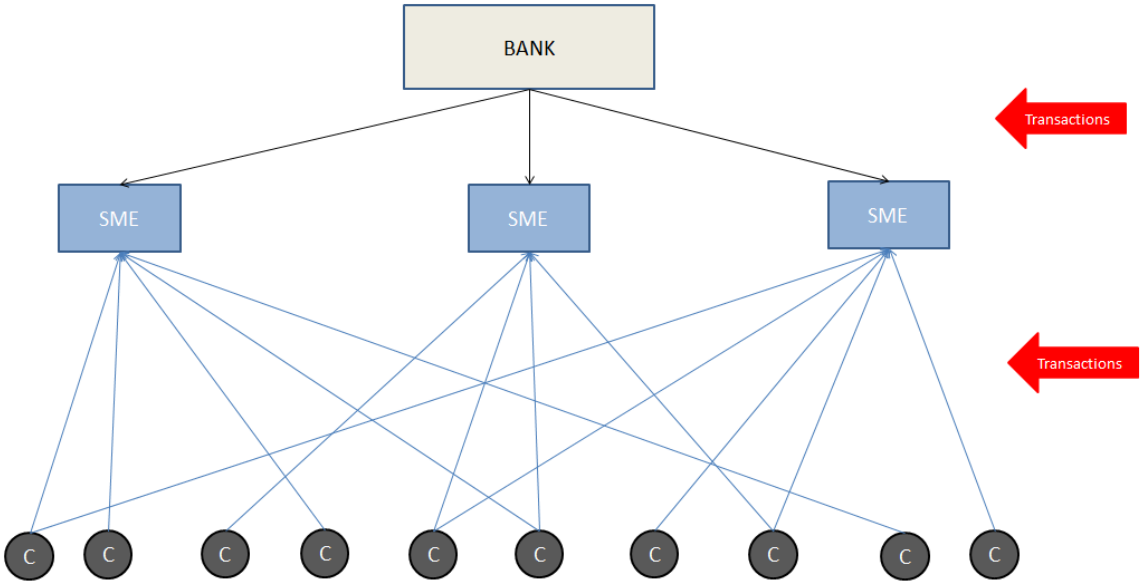


Figure 7: Overview of the bank's relationship with the SMEs

2.3.2 Customer analytics frameworks

From the introduction, it became clear that there are no maturity assessment frameworks for customer analytics implementation in the Netherlands. However, frameworks for assessing the value of customer analytics exist.

Different customer analytics frameworks will be shortly reviewed. In Chapter 5 the framework will be conceptualized and the framework will be positioned and discussed. In the literature a distinction is made between the different purposes of the existing customer analytics frameworks. In the table below an overview is given of the different frameworks and their purposes.

Table 3: Overview of customer analytics frameworks

Customer analytics framework	Aim of the method
iCare for big data-based banking customer analytics (Sun et al, 2014).	*The Intelligent Customer Analytics for Recognition and Exploration (iCARE) framework is presented as a method to efficiently analyze customer behavior using banking big data* (Sun et al, 2014, pp 1)
Advanced analytics: opportunities and challenges (Bose, 2009)	*This study aims to investigate these three mining technologies in terms of how they are used and the issues that are related to their effective implementation and management within the broader context of predictive or advanced analytics* (Bose, 2009, pp 154).
Social Media Analytics and Business Value: A Theoretical Framework and Case Study (Bekmamedova and Shanks, 2014).	*A framework that provides insights on how organizations can achieve value with social media analytics (*Bekmamedova and Shanks, 2014).
Toward a Unified View of Customer Relationship Management (Chan, 2005).	*The CRM enterprise model proposed in this paper provides the integrated framework for the creation of a unified customer view amongst disparate systems, processes and channels across the enterprise* (Chan, 2005, pp 32).

The iCare framework from Sun et al (2014) aims at analyzing customer behaviors from banking big data, through analytical modeling methodologies and techniques designed for a key business scenario. Basically the framework defines four phases in the design solution: Data acquisition, data preparation, data modeling, and various business applications. In the first phase, data acquisition, data from internal and external sources is gathered. To ensure the consistency and the accuracy of data (structured and unstructured), one standard input format is defined in the iCare framework. Data preparation is the second phase. Because unstructured data is not organized in a well-defined manner, additional work must be done to transfer the data into a regularized or schematized form before modeling (Sun et al, 2014). After the preparation and the cleaning of the data, a data integration process is conducted. Data from multiple sources are merged and integrated in a data warehouse. In the third phase, the data modeling phase, new developed statistical methods are introduced, based on parallel-programming algorithms (Sun et al, 2014). In the last step customer analytics is applied to many business applications. In the iCare solution a lot of different applications are included like, customer segmentation, customer retention, preference analysis etc. See the figure below for an overview:

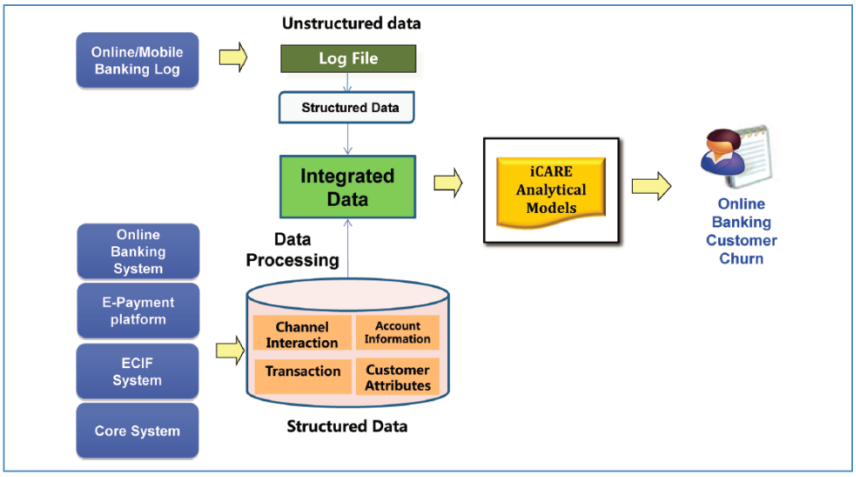


Figure 8: Overview of the iCare framework (Sun et al, 2014).

The advanced analytics framework from Bose (2009) aims to execute a successful business intelligence (BI) strategy. Therefore the IT infrastructure must be aligned with business needs in a way that the infrastructure supports the business in achieving goals and objectives. The successful BI infrastructure must be able to transform disparate data and systems into an efficient flow of information, analyze data with a forward-looking view, and deliver key information to decision makers on demand (Rose, 2009, pp158). See the figure below for an overview.

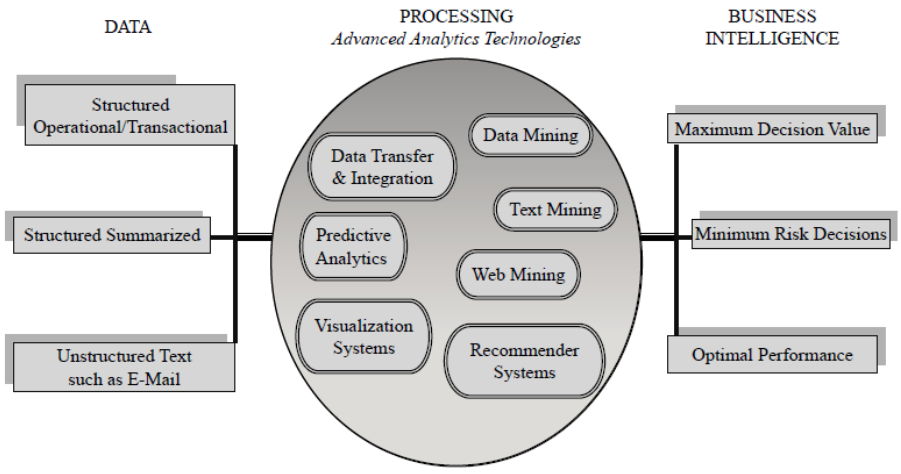


Figure 9: Overview of the advanced analytics framework from Bose (2009).

The framework consists of three components: data integration, advanced analytics or data processing and business intelligence (Bose, 2009). Data integration means the capability for both structured and unstructured (such as text) data connectivity, data quality, ETL (extract, transform, and load), data migration, data synchronization, and data federation. Advanced analytics means

data, text, and web mining capabilities, visualization systems, recommendation systems, predictive and descriptive modeling, forecasting, optimization and simulation of the data (Bose, 2009). The last component is the capability to deliver the BI timely for effective decision making for competitive advantage across the enterprise.

The Social Media Analytics (SMA) framework from Bekmamedova and Shanks (2014) focusses on the organizational and managerial value of SMA. Aiming at creating awareness for conducting customer analytics at organizations. The framework is based on four major components: Awareness motivation, IT assets and SMA capabilities, dynamics capabilities and awareness benefits. See the figure below for an overview. IT assets and SMA capabilities and dynamics capabilities are combined to SMA resources.

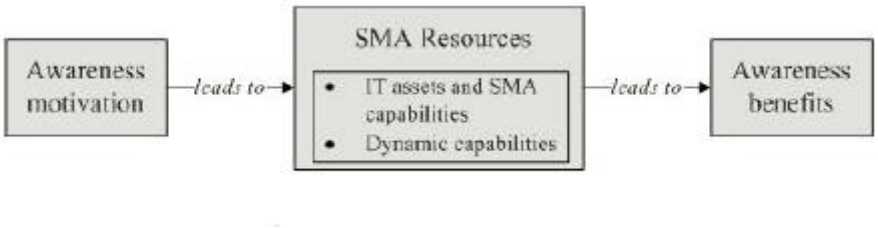


Figure 10: SMA framework overview (Bekmamedova and Shanks, 2014).

Awareness motivation is defined as collecting and analyzing social media data in order to increase organizational knowledge or understanding about issues related to customer-empowered environments (Bekmamedova and Shanks, 2014). The main goals are: developing insights, understating the impact and effectiveness of online marketing and discovering new ideas for brand reputation. The SMA resources are IT assets and SMA capabilities and dynamics capabilities. IT assets are combinations of IT hardware, software and networks that provide the foundation for shared IT services. Providing a flexible base for SMA initiatives, enabling the development of new applications for improved business performance (Bekmamedova and Shanks, 2014). SMA capabilities are interlocking systems of competences and practices that enable organizations to utilize SMA applications to perform SMA tasks. The ability of IT assets and SMA capabilities to provide organizational benefits may change over time in turbulent environments, what is called dynamic capabilities (Bekmamedova and Shanks, 2014). The last component is the awareness benefit, which are achieved through the SMA resources. Bekmamedova and Shanks (2014) define three types of awareness: customer-related benefits, financial-related benefits and organizational effectiveness benefits.

The key concept of the integrated Customer relation management (CRM) framework from

Chan (2005) is the physical separation of the conceptual external and internal views of the enterprise, but yet preserving their logical connections. The CRM framework is constructed through three different levels: the external view, the conceptual view and the internal view of the enterprise (Chan, 2005). See the figure below for an overview

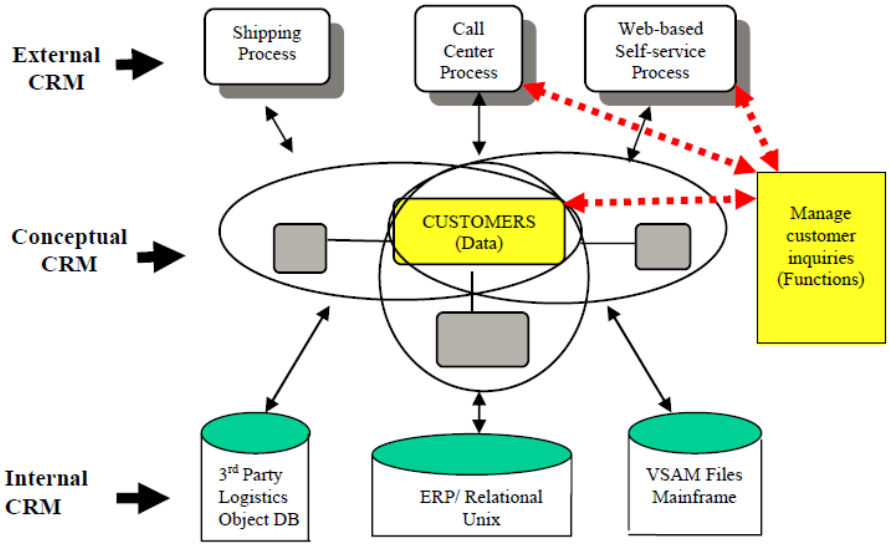


Figure 11: Overview of the integrating CRM framework (Chan, 2005).

The enterprise information defines various processes and technology representations to the conceptual CRM through the mappings of corresponding components in the integrated framework (Chan, 2005). The conceptual CRM therefore provides a unified view of CRM tying together the associated processes and technologies in the external and internal levels. The figure above illustrates how different processes and technology implementations are be bound together and coordinated through the enterprise model (Chan, 2005). The framework allows the consolidation and coordination of data and events across different processes through various customer touch points and channels. Chan (2005) aims at enhancing the relationship between the customer and the enterprise.

2.4 Measuring maturity difficulties

In this section a reflection will be given on the concept of maturity. As mentioned earlier, maturity is a normative concept (Donnellan et al, 2007 and Mettler, 2011). A discussion is presented on why measuring maturity could be problematic for organizations. The term of maturity describes the "state of being complete, perfect or ready, to reach this a desired state of maturity, an evolutionary transformation path from an initial to a target stage needs to be progressed" (Lahrmann et al, 2011). Determining the level of maturity is critical for business stability, improvement and sustainability of

any organization (Albliwi et al, 2014). Still measuring maturity could be difficult for organizations (Salah et al, 2014). Several authors (Lockamy and McCormack, 2004; McCormack et al, 2008; Batenburg and Versendaal, 2008) concluded that measuring maturity means measuring the performance of an organization, there is a significant relationship between maturity and the performance of an organization. Measuring performance, in general, of an organization is always difficult. Only the direct effects (the outputs) are easy to measure (de Bruijn, 2002). The outcome, the final effect envisaged, depends on too many factors (de Bruijn, 2002). It is also very hard for organizations to gather adequate outcome data. Therefore, it is difficult to determine the performance of an organization, since it is based on the outcomes. According to de Bruijn (2002) there are three main justifications for this difficulty. Firstly, performance measurement is always poor because performance is always a trade-off between competing values. This means that performance is mostly multi-value. Secondly, performance results from co-production. Performance tends to be achieved through interactions with other people, third parties. Thirdly, performance measurement is static, but performance itself is dynamic (de Bruijn, 2002).

Single-valued maturity of an organization is not successful, because it is necessary that organizational maturity is formed in different dimensions, because maturity needs a complete movement and planning (Attafar, 2013). An organization should know what it can expect and cannot be faced with constantly new measure definitions. The problem is that all the measure definitions for a multi-value product, like maturity, are controversial (de Bruijn, 2002). Different values may underlie different definitions. The measurement covers only one value (de Bruijn, 2002). This makes it difficult to measure maturity completely (Attafar, 2013). Another characteristic of an organization is the dependency between actors (Castells, 1997). This multi-value and co-interaction between actors automatically creates great dynamic (de Bruijn, 2002). Constantly new trade-offs are made between different values within the organization. Actors within the organization change over time, 'the leaders of today may be the laggards of tomorrow' (de Bruijn and Ten Heuvelhoff, 2010). Because of the multi-value aspect of determining the maturity and the dependencies of actors within organizations, dynamic processes are created. These three justifications explain the problems for organizations, regarding the measuring of maturity for organizations. In the next section the Mintzberg (1993) model of the five core elements of an organization will be introduced and reflects the three justifications of de Bruijn (2003). In Chapter 3 maturity model theory will be introduced which helps to measure maturity in organizations.

2.5 Departments of SME finance banks

To get insights on how the organizational structure of a SME finance banks look like, the proposed model from Henry Mintzberg (1993) will be discussed. Mintzberg (1993) mentions that an organization consists of five basic cores: strategic apex, support staff, techno structure, middle line and operating core, as shown in figure 6. The determination of the different departments of an organization will be used in Chapter 6, when the case studies will be conducted. Different experts from different departments will be interviewed. In this section the typical structure of organizations will be explored based on the Mintzberg (1993) model, this shows the complexity within organizations. In practice the organizations structure differs per industry, experience, culture and other external factors, although these five components may give a good indication of how organizations looks like. In figure 6 the different basic cores are related to a SMEs finance bank. The multi-value, co-interaction between actors and the dynamic elements of measuring organizational maturity from de Bruijn (2002), what is captured in section 2.4, are reflected by the Mintzberg (1993) model. Due to the different departments with different functions, objectives and actors, complexity arises. Actors have different values and they are dynamic (de Bruijn and ten Heuvelhoff, 2010). This means that there are certain interactions between the departments in the organization. When measuring the maturity of a SME finance bank, the organizational complexity should be taken into account. This will be further captured in Chapter 6. The Mintzberg model helps to understand the organizational differences within the bank and helps to understand the organizational complexity around measuring maturity from section 2.4. The five elements of organizations are characterized by 'pulling forces' (Mintzberg, 1993). Every part of the organization tries to 'pull' to organization in a different direction. See the figure below and the explanation below the figure for an elaboration on the Mintzberg model. In Chapter 5 the maturity assessment framework will be conceptualized. The figures below and the organizational theory from Mintzberg (1993) will be used to position the framework.

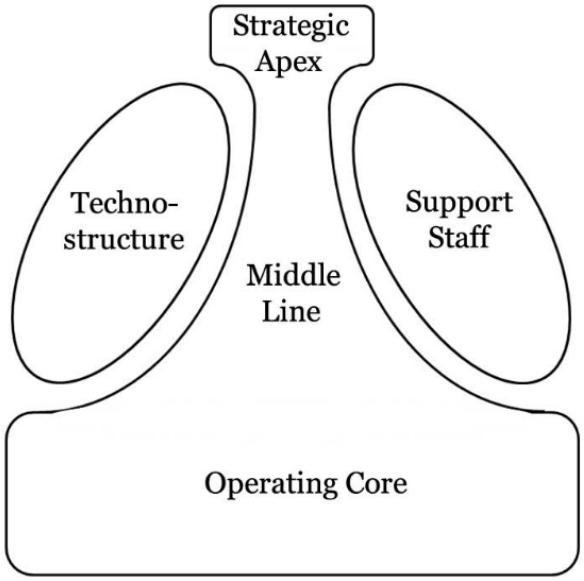


Figure 12: The five elements of Mintzberg (1993)

- **Strategic Apex**: This is the top management level of the organization. In practice this is also called the C-level. They set the objectives and the strategic direction. The represent the organization to the external stakeholders. For a bank this is would be the managing board. The strategic apex exerts a pull for centralization, retaining the control of the decision making. Achieved through direct supervising.
- **Support staff**: The administrative staff. It makes the organization work. This encompasses the administrative support department, human resources (HR) and the staff around the managing board. Traditionally the IT department belongs to the support staff. According to Mintzberg (1993) the support staff exerts a pull for collaboration in decision making.
- **Technostructure**: This is also called the technical support level. These people work in the organization, but they are now involved in generating revenue. It depends per organization what it includes. It is considered as the innovative part of the organization. Because of the growing importance of IT in the financial sector, the IT department is moving from the support staff to the technostructure. The marketing and data science department of a bank are also typically part of this technostructure. The technostructure aims at standardization of decision making, because the design of the standards is their raison d'être.
- **Operational core**: This includes the people that do the basic or production work in the organization. From a bank perspective this encompasses the finance and risk department. The operational core pulls for professionalism, typically they want to minimize the influence of the middle line and the technostructure.

- **Middle line:** The middle management is responsible for the operationalization and implementation of the strategy which is set out by top management. The strategy & organization part of a bank is typically the middle line of the organization. Splitting the organization in different market-bases units, is the pulling force of the middle line. Drawing power form the strategic apex and the operational core.

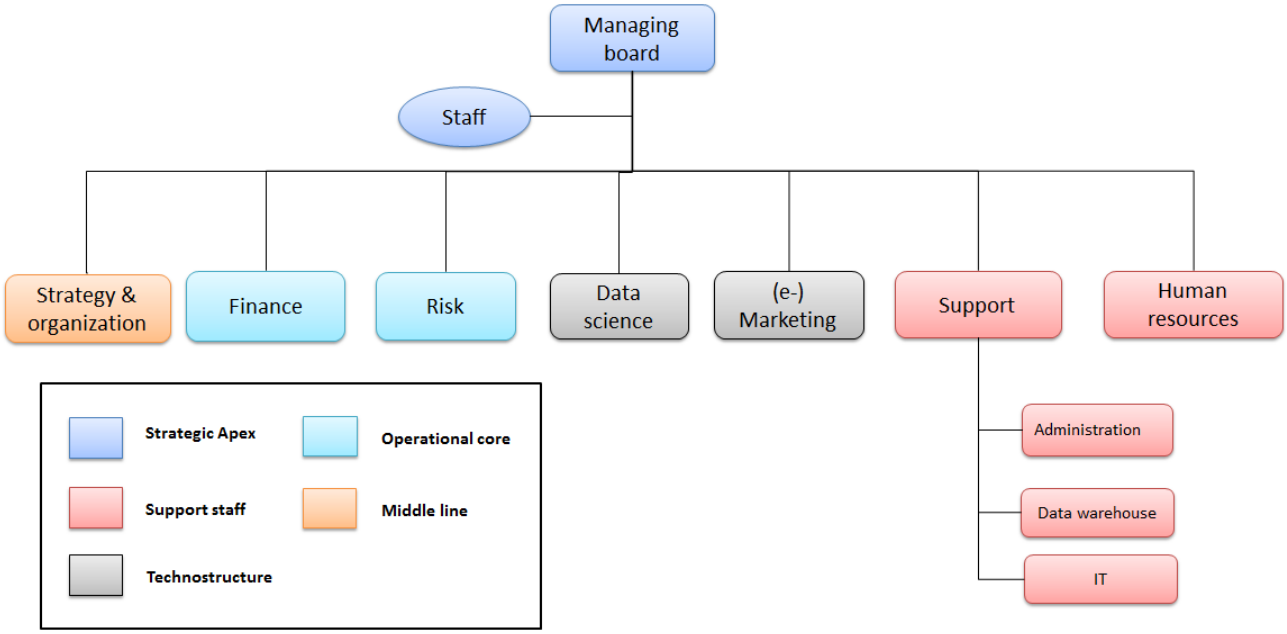


Figure 13: Organizational structure of a bank.

The figure above shows the typical organizational structure of a bank related to the Mintzberg (1993) model. Because of the new function of banks, becoming an advisory bank, the relationship with the customer is getting more important. Marketing is typically the department where banks try to get in contact with their current customers or potential customers. Therefore further research is done to examine whether this idea is supported by the literature.

The capabilities of marketing are described and divided by Vorhies and Morgan (2005). The relevant capabilities for the banking industries are: channel management, marketing communication, market planning and marketing implementation. Ensuring a strong relationship with customers to attract and retaining the best customers belongs to channel management. Marketing communication is the developing and executing of advertising programs. This also includes management skills. Segmentation, targeting and developing creative marketing strategies belongs to market planning. Allocating marketing resources for monitoring performance and market strategies

are part of the marketing implementations. In the table below a small overview is given for what ends customer analytics can be used per marketing capability.

Table 4. Marketing capabilities

Marketing capability	*Customer analytics use*
Marketing communication	Customer analytics can be used for targeting customers, using these insights for communications ends
Market planning	Customer analytics helps to target and segment customers (Sun et al, 2014).
Market implementation	Customer analytics helps to monitor marketing performance (Rygielskie et al, 2002)
Channel management	Customer analytics helps to predict customer lifetime value (Sun et al, 2014; Berry and Linoff, 2004).

2.6 Conclusion

In this Chapter a literature research is conducted. Exploring the research field, in order to help answering the main research question and the sub-questions, is the aim of this Chapter.

New IT developments caused a change in the way banks provide services to their customers. Besides the traditional way of financial services, such as loaning, deposits management and investments in capital markets, the banking industry is enlarging its domains by adopting new technologies. These new IT technologies support e-banking services and banks increased their investments in e-banking and related services. Technological progress made banks switch to providing customer-oriented financial services with an advisory component. In the public available annual reports of the four largest SMEs finance banks this switch to an advisory banks was clearly noticeable. One very important technological progress is the use of (data) analytics. New available data of the bank's customers provide banks with the opportunity of gathering new insights of their customers by performing customer analytics. Customer analytics is about collecting, integrating and analyzing data, gathered from various touch points and analyzing them to draw meaningful insights about customers. It can be used for several purposes. For SME finance banks, using customer analytics on their SMEs clients may identify needs and prospects on their clients. Customer analytics is a suitable way to assess how a SME portfolio looks like, this provide the SME finance banks with opportunities like: identifying cross-sell and upsell opportunities for SME, determining what products logically follow-on from an existing product set, estimating wallet size and profit potential per SME, determining sector concentrations, segmenting customer and looking for new clients. Four different customer analytics

frameworks are reviewed. Every framework has its own focus and purpose. Some frameworks focus on technology, while the other frameworks focus on organizational awareness or integration of existing models. Also, the aim of the frameworks are different, some aim to implement customer analytics, while other frameworks aim at creating awareness or enhancing the relationship with the customer. In Chapter 5 the conceptual maturity assessment framework will be positions related to the reviewed frameworks.

The determination of maturity for organization is difficult. Measuring maturity is always a trade-off between competing values, a multi-value problem. In large organization actors are dependent of each other, what makes it more difficult to measure maturity. The measurement of maturity is static, while maturity itself is dynamic. The three justifications for the difficulty of measuring maturity are: co-interaction between actors, multi-value aspect of maturity and dynamics in organizations. In the next Chapter different maturity models will be reviewed and discussed, to cope with the difficulty of measuring maturity. Also the model from Mintzberg (1993) is used to explore the organizational complexity of SME finance banks. The different departments, with different actors, of a SME finance bank makes the organization complex and explains the multi-value, co-interaction and the dynamic elements of an organization. This makes it difficult to measure maturity, Chapter 3 will elaborate on that. To examine in which departments customer analytics could be used by banks, the Mintzberg (1993) model of organizations is consulted. Typically the IT department is part of the support staff, they make the organization work. The marketing department is typically the technostructure. Customer analytics is used to get useful insights on the customers. This idea is supported by the literature, customer analytics could be used for marketing capabilities. Supported by the IT departments, e-marketing is emerging.

The insights from this Chapter will be used in the next Chapters. The complexity between departments and around measuring maturity will be used in Chapter 6 and maturity models will be reviewed in Chapter 3. Every element of an organization tries to pull to organization on a different way. These pulling forces describe how each part of the organization wants to achieve his goals. This will be used in Chapter 5 where the framework is conceptualized.

3. Maturity models

3.1 Introduction

To design a framework that assesses the maturity of customer analytics implementation for the SME finance banks in the Netherlands, it is important to review the concept of maturity models. Maturity is difficult to measure as described in the previous Chapter. Measuring maturity could be problematic because measuring the performance of an organization is always multi-value, dependent on several actors (co-interaction) and it is dynamic (see section 2.4). This makes it difficult for organizations to measure their maturity. Maturity models are designed to help organizations with assessing their maturity. Reviewing different maturity model theories and selecting a maturity model theory that suits the research objective is the aim of this Chapter. This contributes to the research by selecting a maturity model theory that is able to assess the maturity level of customer analytics implementation for the SME finance banks in the Netherlands. The theory will be used in the upcoming Chapters of this research. This Chapter will elaborate on maturity models and maturity model theory. At the end of this Chapter a maturity model theory will be selected and used in the next Chapters. This Chapter belongs to the definition phase of the research methodology from Sage and Armstrong (2000).

In section 3.2 maturity models will be explained. This section describes what maturity models are and why we use them. In the next section the fundamentals of maturity models will be explained, for what purposed they could be used and what the design principles are for maturity models. Section 3.4 gives an overview of the suitability of using maturity models for this research. In section 3.5, following from the contents from section 3.2 and 3.3, maturity assessment models will be compared and a decision will be made what model theory fits this research. This model should serve as a guideline for the conceptual framework in Chapter 5.

3.2 What are maturity models?

Maturity models are normative reference models (Salah et al, 2014). They embrace the assumption of predictable evolution and change patterns (Iversen et al, 1999). The main purpose of maturity model is to assess the current situation in order to evaluate the strengths and weaknesses, and prioritizing and planning the future improvements (Iversen et al, 1999; Salah et al, 2014). The models are used to assess as-is situations, to guide improvements initiatives and controlling progress. Maturity models typically include a sequence of levels that form an anticipated, desired or logical path from an initial state of maturity (Beckert et al, 2009; Gottschalk, 2009; Röglinger et al, 2012).

These levels signify step by step patterns of change designating the desirable or current organizational capabilities (Gottschalk, 2009). Following these steps creates a logical path of from initial state to maturity (Aranda and Marquez, 2015). An organization's current maturity level represents its capabilities as regards a specific class of objects and applications domain (Rosemann and de Bruijn, 2005). A maturity model provides an organization a framework to assess the strengths and weaknesses on a certain topic. Maturity models allows organizations to assess their practices and compare with the possible best practices intending an improvement path (Pennypacker and Grant, 2003). It could also represent the organization's current level of progress on improving business effectiveness and efficiency while the organization is working for improving innovation, flexibility and integration (Aranda and Marquez, 2015). Besides that maturity models are assessment tools they also represent improvement activities (Helgesson, 2012). Usually maturity levels have different criteria to define the different levels, roughly (Aranda and Marquez, 2015):

- Level 1: *Initial* or *unable to demonstrate*
- Level 2: *Managed* or *limited ability to demonstrate*
- Level 3: *Established* or *able to demonstrate*
- Level 4: *Quantitatively managed* or *fully able to demonstrate*
- Level 5: *Optimized* or *recognized as a global role model*

Maturity is normative in the sense that an aspect can be "more" or "less" mature (Iversen et al, 1999) and by becoming more mature, an organization can improve or evolve (Nelson et al, 2015, pp 31).

3.3 Foundations of maturity models

From the previous section the assumption is made that maturity models predict patterns of organizational change and assess the current maturity situation. Besides this assumption, the aim of maturity levels is to guide improvements and progress of the organization. Maturity models represent theories about how the organization evolves capabilities in a stage-by-stage manner along the desired path (Gottschalk, 2009). Salah et al (2012) argue that maturity models are composed of three mayor components. First the reference model, this includes the fundamental elements that should be examined in the assessment. The results of an assessment may help organizations to assess their current status and identify the weaknesses and strengths. Second the performance scale. This helps the organizations to rate the organizational preferences, regarding the examined elements in the reference model. Third the assessment procedure that provides guidance. This is composed of the maturity levels, performance ratings and other quotes. For the practical applications the

purposes of use of the maturity models are descriptive, perspective and comparative (de Bruijn et al, 2005). The maturity model can be seen as descriptive if it is used for assessments. It serves a prescriptive purposes if it indicates how to identify desirable future maturity levels and if it provides guidance on how to implement improving measures. The model is comparative if it allows for internal and external benchmarking (Röglinger et al, 2012).

Maturity models have been subjected to criticism. They are characterized as 'step-by-step recipes' that simplify the reality and lack the empirical foundation (de Bruijn et al, 2005; McCormack et al, 2009; Röglinger et al, 2012). They neglect the existence of multiple and possible equifinal maturation paths (Teo and King, 2009). Some authors (Metler and Rohner, 2009; King and Kreamer, 1984; Iversen et al, 1999 and Becker et al, 2009) criticize maturity models due to their similarity, dissatisfactory documentation, non-reflective adoption and the missing economic foundation. According to Röglinger et al (2012) the way to mitigate criticism is to deal with maturity models from a design process and design product perspective. Röglinger and Pöppelbuss (2011) designed a framework of general design principles for maturity models. They defined three relevant basic design principles.

Basic design principles

Design principle 1: Maturity models have to provide basic information about the application of the domain, the prerequisites or limitations of application and the supported purposes of use.

Design principle 2: The central constructs related to maturity and maturation need to be defined. This includes the definition of the underlying notion of maturity and the maturity levels, which means a clear description of every maturity level. The maturity model should explicate their foundations regarding the organizational capability change.

Design principle 3: Maturity models intended for a descriptive purpose of use are required to have verifiable assessment criteria for each stage and level. Maturity models can be structured hierarchically into multiple layers referring to different levels of maturation (de Bruijn et al, 2005).

3.4 Suitability of maturity models for this research

In the previous section maturity models are explained. Maturity models describe the development of an entity over time. The entity could be anything, a human begin, an organization (Klimko, 2001). To get a better understanding about maturity and why it is useful to use maturity model for this research, besides the fact that maturity models are able to assess developments in an organization, a short review on the definition of the word maturity will be given. The Oxford English Dictionary is

conducted to see how maturity is defined. Maturity is defined as ‘‘The state of being mature, the fullness or perfection of development or growth’’. It further details this description for immaterial things as ‘‘The state of being incomplete, imperfect or not ready’’ (Jimpson and Weiner, 1989). This means that if an entity is mature, it is full or perfect of development or growth and if an entity is immature it is incomplete imperfect. The requirements that are determined in the previous Chapter could be assessed as mature or immature. This could be done to determine whether a bank is ‘mature’ or ‘immature’ to deploy customer analytics. According to Wendler (2012) who examined the usages of maturity models, maturity models are mostly used for empirical studies, for developing of concepts and for assessing entities. In this research a maturity model could be used for assessing the maturity levels of the requirements for deploying customer analytics at SMEs finance banks, also an empirical research will be conducted by means of a case study. In the next section maturity model theories will be reviewed and the most suitable theory for this research will be determined. In Chapter 5 the concept will be developed and in Chapter 6 the empirical study (case study) will be conducted for testing the maturity model framework.

3.5 Existing maturity models

The maturity assessment model should have the purpose to measure or determine the maturity of the organization with an organizational perspective. Most maturity assessment models assess the technical improvements and processes (Röglinger et al, 2012). The degree of success of implementing a ICT project depends on the quality and the maturity of the ICT plan (Solar et al, 2013). Therefore Dutch SMEs finance banks need to monitor the progress towards deploying customer analytics or ICT integrations. To examine what maturity model assessment theory fits the case of deploying customer analytics, literature will be consulted. Röglinger et al (2012), Solar et al (2013) and Ozcan-Top and Demirors (2013) reviewed different maturity models. Maturity models like the Business Process Management Maturity Model from Rosemann and the Bruijn (2005), the Process Perdofrmance Index from Rummler and Brache (1990) and Business process Maturity Model from Fischer (2005) mainly focusses on the business and management processes of the organization. These models asses the maturity of the development of the business (and management) processes. The Process and Enterprise Maturity Model from Hammer (2007) focusses on software development and the legacy IT-support systems. The Agile Maturity Model from Pathel and Ramachandran (2008) is developed to enhance the purpose of enhancing the adaptability of agile software. As already mentioned, maturity models mainly focus or on business process management developments or improvements, or they focus on software development (Ozcan-Top and Demirors, 2013). In our case

it is important to assess the maturity with an organizational and a technical perspective. The development of maturity models has been a strong trend in carious technological and organizational domains (Solar et al, 2013). Capability maturity models are providing to be useful because they allow originations to assess the maturity of various aspects, organizational and technical, of their products against several benchmarks (Solar et al, 2013). Originally a Capability Maturity Model (CMM) was developed with software development processes in mind (Marchewka, 2014). See table 4 for an overview.

Table 5: Overview maturity model theories

Maturity assessment model	Scope	Author
Business Process Management Maturity Model (BPMMM)	Business and Management processes	Rosemann and de Bruijn (2005)
Process Performance Index (PPI)	Business and management processes	Rummler and Brache (1990)
Business Process Maturity Model (BPMM)	Business and management processes	Fischer (2005)
Process and Enterprise Maturity Model (PEMM)	Software development and legacy IT-systems	Hammer (2007)
Agile Maturity Model (AMM)	Enhancing the adaptability of agile software	Pathel and Ramachandran (2008)
Capability Maturity Model Integration (CMMI)	Organizational and technical aspects	CMMI (2006)

In a later stadium the CMM provided the basis for the Capability Maturity Model Integration that combines several models into a single framework to improve all types of processes across different organizations (Bush and Dunaway, 2005). Using several different models could be problematic, because a particular model may limit process improvements to a specific areas or discipline within the organization (Merchewka, 2014). In practice process improvements are not limited to a specific area. Aa a results the CMMI combined different models to a single framework, these include the systems engineering capability model (SECM), the capability model for software (SW-CMM) and the integrated product development capability maturity model (IPD-CMM) (Merchewka, 2014). Later the combined CMMI is used for several maturity assessment, because of its usefulness to assess the process improvements through several disciplines through the whole organization, like Merchewka (2014), Clarke et al (2013) and Solar et al (2013).

3.6 The capability maturity model integration

The capability of a process is an indication of how well a process works and what it is designed to do (Clarke et al, 2013), while the impact of the capabilities on a given aspect of the organization is an indication of maturity (Roseman and de Bruin, 2005). An aspect could be more or less mature and by becoming more mature, the organization could improve its capability (Iversen et al, 1999). Integrating the ideas of maturity and capability, generates a model or framework that summarizes the maturity of capability for an organization (Clarke et al, 2013). The capability maturity model is a process maturity framework, through which an organization can actively 'mature' towards a higher state of maturity (Demir and Kocabaş 2010). The capability maturity models that are the best-known are those belonging to the Capability Maturity Model Integration developed by Humphrey (2006). These models are typically constructed with five levels, where each maturity level provides a new foundation of practices on which subsequent levels are built (Solar et al, 2013). Initially these models are also developed for software products and services, although their capability maturity level structure and the mechanisms for determining those levels have been replicated by many other models in other areas (Valdes et al, 2011). Some applications of the maturity model concept in e-learning are detailed in Harris (2004), Neuhauser (2004), and Marshall and Mitchell (2006). These models are widely used for assessing the maturity levels of organizational and technical processes (Solar et al, 2013). Solar et al (2013) proposed using leverage domains. Leverage Domains generate a hierarchical structure of levels. The second level is named Key Domain Areas (KDA). These areas should be measurable and controllable and are related to a third hierarchical level called the Critical Variables (CV). The key domain areas should be founded from the literature and the critical variables are used to measure or verify the KDA (Iribarren, 2008). According to the design principles these critical variables should be clear defined. Each KDA can be measured by whether it meets its goals, which are determined by the critical variable that determines the capacity of the KDA.

3.7 Conclusion

Measuring maturity is difficult for organizations. Maturity models help organizations with measuring their maturity. In this Chapter maturity models are reviewed. Different models are reviewed and a selection is made for the maturity model theory that is able to assess customer analytics implementation on both technical and organization aspects. To design a maturity assessment framework, a desk research on maturity models is conducted. Maturity models are designed to assess the current situation of an organization in order to evaluate the strengths and weaknesses and prioritizing and planning future improvements. The models are characterized by several patterns or

levels, typically with level 1 “initial’ to level 5 “optimized”. In Chapter 5 elaborates on the maturity level determination.

Three design principles for maturity models are identified. Firstly, they should provide basic information about the application of the domain, the central constructs should be related to the maturity. Secondly, the maturation needs to be clearly defined. Thirdly, the maturity model is required to have a verifiable assessment criteria for each level. Maturity models are basically designed for assessing technological progress, mainly on software development. In this case the maturity model should be able to assess both technological and organizational processes. Maturity models could be used to assess the maturity levels of the requirements for conducting customer analytics for the SMEs finance banks. Therefore several maturity assessment theories are reviewed. Capability maturity models are useful in this case, because they allow to assess the maturity of various aspects (both organizational and technical). Leverage domains generate hierarchical structure of levels. The second levels are the Key Domain Areas, which are measurable and controllable and related to the critical variables. These critical variables are assessed in the maturity model, from level 1 to level 5. In Chapter 5 the CMMI theory will be used to conceptualize the maturity assessment framework. According to the CMMI theory, the key domain areas has to be defined. In the next Chapter the requirements for the maturity assessment framework will be examined. The CMMI theory is built up of leverage domains and key domain areas, the requirements will be defined in the next Chapter. In that chapter the key domain areas, the requirements, of the maturity assessment framework will be identified.

4. Pre-search interviews

4.1 Introduction

As concluded in the previous Chapter, the CMMI theory is the most suitable maturity model theory for this research, because it is able to assess both technical and organizational aspects. The CMMI theory consist of leverage domains and key domain areas. This Chapter aims at identifying the requirements of deploying customer analytics at a SME finance bank in the Netherlands. Requirements for the maturity assessment framework has to be defined. As mentioned and argued in Chapter 1, there is a lack of adoption regarding the implementation of customer analytics in the Netherlands. Identifying the key domain areas or the requirements is part of the definition phase of the research methodology (Sage and Armstrong, 2000). This chapter contributes to the research field by providing insights on the use of customer analytics at SME finance banks.

There is no existing framework that provides insights on the maturity levels of customer analytics implementation for the SME finance banks in the Netherlands. Chapter 2 explored the research field of customer analytics and SME finance banks. Identifying the requirements will be done by combining interviews with literature. Experts from the financial sector will be asked on what their opinion is on different customer analytics related topics. In appendix B the interview list is shown. Experts will be asked what the technical requirements are for deploying customer analytics and what the institutional requirements are for deploying customer analytics. A literature study will be consulted to review the requirements. Based on this approach, the requirements will be determined. The outcomes of this pre-search interviews and the combined literature research will serve as the requirements for the maturity assessment framework, in accordance with the CMMI theory. This will be brought together in Chapter 5. Following from Sage and Armstrong (2000) this Chapter belongs to the first phase, the definition phase. In this Chapter information will be gathered to set up the requirements for the conceptual framework in Chapter 5. The maturity of the requirements for deploying customer analytics may explain the lack of adoption. These interviews were taken in Dutch, since all the interviewees are Dutch.

In this Chapter the results of these interviews will be presented. First the interview setup will be explained. Second the propositions regarding the use of customer analytics will be presented. The experts were asked on what they think the requirements are, presented in section 4.3 and 4.4. To examine if the empirical results are supported by the literature, a literature research will be conducted. This is will be presented in section 4.4. The last section will be the conclusion.

4.2 Interview setup

Because the aim of these interviews is to gather useful information from experts on customer analytics, the decision is made to conduct open-ended interviews instead of (only) questionnaires. Questionnaires require a significant amount of participants (Bartlett et al, 2003). In this research stage a limited amount of experts were able to participate in the interviews. Although some propositions were presented that might be useful to observe some patterns, see next section. Eight interviews were conducted in person and two interviews were taken on the phone. Due to a lack of response ten people were interviewed. The interviewees should meet the criterion that they have professional experience with customer analytics in the financial sector. Preferably with different positions in the company: managers, senior managers, consultants and senior consultants. See the appendix B for the interview list.

As the main aim of the interviews is to gather as much information as possible on customer analytics in the financial sector, six 'general' open question were asked. One interview was performed to check whether the beforehand decided conditions were comfortable for the interviewee. After the first interview, some minor revisions were made in the final set up. The interview started with a general introduction by myself. In the introduction I explained the research and described what the interviewee may expect form the interview. After the introduction, the interview started with twelve propositions, which were all taken in English. The interviewee could score the propositions on a 7-point scale, where 7 indicates totally agree/totally true and 1 totally disagree/false. The list of propositions is shown in Appendix B. After the propositions, the open questions were taken in Dutch. Since the aim was to gather as much information as possible, sometimes information from previous interviews as were used as an input for the next interviews.. See Appendix D and the next sections for more information.

4.3 Propositions regarding the use of customer analytics

In the expert interviews the experts were asked to score different propositions. The results of the propositions that are related to this topic will be presented. The propositions are scored with the range 1: false/totally disagree to 7: totally true/totally agree. On the proposition customer analytics is well developed and deployed worldwide by SME finance banks, the average score was 3,4 (see figure 14). On the proposition customer analytics is well developed and deployed in the Netherlands by SME finance banks the average score was 3 (see figure 15). This mean that the experts think that customer analytics is better developed and deployed worldwide than in the Netherlands. On the

propositions Dutch SME finance banks are innovative with respect to data science, the average score was 2,9 (see figure 16).

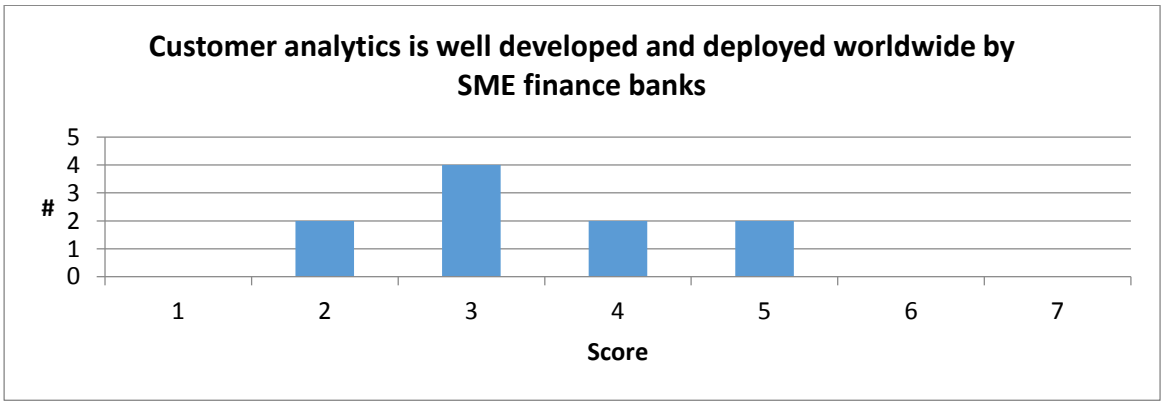


Figure 14: Proposition 1, average score 3,4.

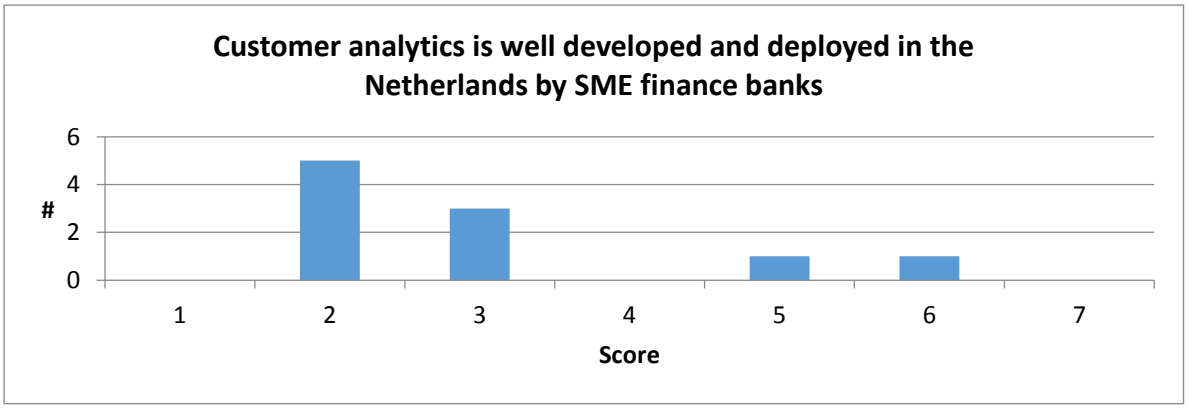


Figure 15: Proposition 2, average score 3.

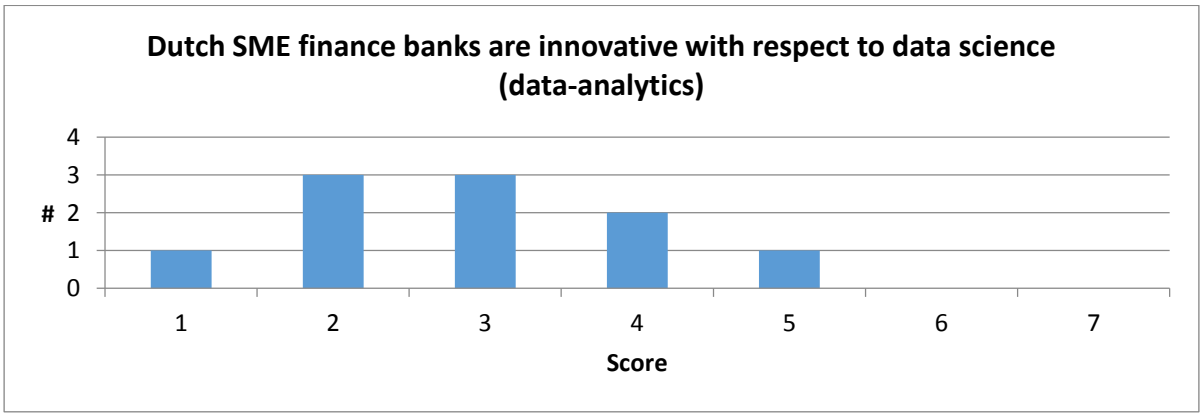


Figure 16: Proposition 3, average score 2,9.

This average scores could explain the lack of adoption that is described in section 1.2. A possible reason for the low average scores is the low maturity level of certain requirements of the SME finance banks in the Netherlands. The requirements for conducting customer analytics should be further examined and defined to determine why there is such a lack of adoption. In the next section the requirements will be defined.

4.4 Requirements for deploying customer analytics

This section investigates the requirements for deploying customer analytics by SME finance banks in the Netherlands. The requirements are divided in two parts, the technical requirements and the institutional requirements.

4.4.1 The technical requirements

Based on the expert interviews response, seven important requirements are identified. The requirements that were mentioned by at least 8 out of the 10 respondents are taken into account for further research. In the table below the requirements are shown.

Table 6: technical requirements based on the interviews

What are the technical requirements for deploying customer analytics?	**Score [#/total]**
Data integration and internal data sharing between departments	9/10
Up to date infrastructure and legacy systems	10/10
Data quality	10/10
Data availability	10/10
Data governance	10/10
Software and correct tools	10/10
Data-warehouse (central distribution)	10/10

The next step is to examine whether these requirements are supported by the literature. This is done by reviewing the requirements form the interviews.

Using multiple customer data form multiple sources in data analysis, involves integrating multiple databases or files, what is called **data integration** (Han et al, 2011). Data integration helps to reduce and avoid redundancies and inconsistencies in the resulting customer data set, which improves the accuracy and speed of the subsequent data analysis (Han et al, 2011). Data integration and governance are used by big organizations for integrating the data across multiple database systems. This requirement of integrating data across multiple database systems addresses the need to import or export data to various data sources to the **Data Warehouse Systems** (DWH) (Mazumder,

2016).

A DWH refers to a data repository that is maintained separately from an organization's operational databases (Han et al, 2011). The DWH system allows for a variety of applications integration, supporting information processing by providing a platform of historic data for analysis (Han et al, 2011). Major features of DWH systems are: subject-oriented, integrating, time-variant and nonvolatile. A DWH is usually organized around different departments with different databases, rather than concentrating on the day-to-day transactions and operations. The DWH focusses on the modeling and analysis of data, this is called *subject oriented*. This is highly desirable, yet very challenging to integrate such data and provide and efficient access to it (Han et al, 2011). The DWH is usually constructed by *integrating* multiple heterogonous sources , like relational databases (Han et al, 2011). Data are stored to provide historic information, based on the stored data in the past years. This is called *time-variant.* The DWH is always a separated store of data than the supplication data found in the operational environment (Han et al, 2011). Due to this separation the DWH does not require transaction processing, recovery and concurrency control mechanisms. Summarized the DWH is a consistent data store that serves as the implementation of a decision support data model, it supports structured queries, analytical reporting, analyses and decision making. The DWH can be seen as an architecture. The construction of such a DWH needs processes like data cleaning and data integration (Han et al, 2011). The DHW's utilization necessitates a collection of the decision support technologies, slowing managers, analysis and executives to use the DWH to obtain an overview of the data and make decisions based on information from the warehouse. Data warehousing and **data management** can be seen as the foundation of analytics (Chen et al, 2012).

In chapter 2 *Big Data Tools and Platforms* in *Big data concepts and, theories and related tools* by Yu and Guo (2016), Muzamder argues that data integration and governance technologies are of key importance for moving data from big data analytics technology to other technologies across various stages of data processing pipelines. This is also supported by LaVelle et al (2011). **Data governance and data integration** require correct and useful **software tools**. The key features that needs be covered are: ability to externalize the transformation rules through source and target system, anility to support high volume of data movement in a scalable way, ability to support variety of relational data sources and effective error reporting (Mazumder, 2016, pp 113). Specifically data governance requires some key features, like the access control, data lifecycle, specific policies/rules and metadata management (Mazumder, 2016).

These key features require **data quality**, data modeling capability and a business glossary definition. Data have quality if they satisfy the requirements of the intended use (Han et al, 2011). These factors that comprise quality are: accuracy, completeness, consistency, timeliness, believability

and interpretability. Inaccuracy means that data having incorrect attribute values. This could be caused by human or computer errors. When attributed of interest are not available or when data were not included or recorded, this is called incompleteness. Data is called inconsistent if inconsistencies occur in naming conventions, data codes or formats for input fields. Timeliness refer to incomplete storing of data in databases for a long period of time. Believability reflects how much the data are trusted by users and interpretability reflects how easy the data are understood (Han et al, 2011). Something what is strongly related to data quality, is that data cleaning (Han et al, 2011). This includes clean the data by filling in missing values, smoothing noisy data, identifying or removing outliers (errors) and resolving inconsistencies. Fang and Zhang (2016) argued in *Big Data in Finance* that data management is the basic functionality for the banking industries for deploying customer-based analytics.

4.4.2 The institutional requirements

In the interviews (see Appendix D) the experts were asked what the institutional requirements are for deploying customer analytics for SME finance banks in the Netherlands. Contradictory to the technical requirements there was not such a clear agreement in their answers, although there were some agreements between the experts. The table is based on the limited answers of the experts. See the table below:

Table 7: Institutional requirements for deploying customer analytics

What are the institutional requirements for deploying customer analytics?	**Range**
Regulation GDPR and PSD2	10/10
Awareness on the usefulness of analytics	10/10
People (knowledge)	10/10
Internal rules for data quality, data governance and data management	7/10
Data related strategy and organization structure	6/10
Cultural aspects	6/10

The most important element, which is also highlighted in the table, is regulation, especially the General Data Protection Regulation (GDPR) and the Directive on Payment Services (PSD2). In this section, these two regulations will be further described as all the experts argued that these new regulations are of key importance for deploying customer analytics. The focus of this part is the regulation.

The GDPR is still a proposal from the European Commission (2012), in a press release (EC,

2015a) the important elements of this new directive are explained. The GDPR is not a new regulation, it is just a reform the current regulation. It basically consists of two new instruments: the General Data Protection Regulation (reformed) and the Data Protection Directive, what focusses on criminal activities and terrorism. The focus of this research is the General Data Protection Regulation and therefore the second instrument is excluded in this research. Literally the European Commission states on the new reform:

"*The General Data Protection Regulation will enable people to better control their personal data. At the same time modernised and unified rules will allow businesses to make the most of the opportunities of the Digital Single Market by cutting red tape and benefiting from reinforced consumer trust.".*

This reform allows citizens within the EU to regain control over their data. This is in line with one of the fundamental rights of the EU, data protection. Some new rules and guidelines are affiliated with this reform. These new rules address the citizens' control over their personal data. These rules a summarized based on the press release of the EC (2015a) in table 7.

Table 8: New rules in line with data protection

New rules for the citizens fundamental right	*Explanation*
Easier access to your own data	*Individuals will have more information on how their data is processed and this information should be available in a clear and understandable way*
A right to data portability	*It will be easier to transfer your personal data between service providers*
Clarified right to be forgotten	*When you no longer want your data to be processed, and provided that there are no legitimate grounds for retaining it, the data will be deleted*
The right to know when you data has been hacked	*Companies and organisations must notify the national supervisory authority of serious data breaches as soon as possible so that users can take appropriate measures*

Form the bank perspective, the *easier access to your own data* element makes it more difficult to use their customer data. After the new reform all the data processes should be documented. Information on how and when should be provided to the customers. The other new rule *the right to data portability* makes it easier to transfer the personal data of customers. The *clarified right to be forgotten* could be a very hard constraint for the financial industry if they want to deploy customer analytics. It literally says that when a customer does not want his data to be processes, the data has to be deleted. There should be no *legitimate* grounds for retaining it. These rules are addressed to

protect the customers. The reform also has some impact for and on businesses. In the press release the European Commission argues that the reform will create new business opportunities and encouraging innovations. These new opportunities also include measures that SMEs will benefit from. In the table below the relevant elements based on the European commission press release (2015a) are stated:

Table 9: New rules for business

New rules for businesses	*Explanation*
Rules fit for innovation	*The regulation will guarantee that data protection safeguards are built into products and services from the earliest stage of development (Data protection by design). Privacy-friendly techniques such as pseudonomysation will be encouraged, to reap the benefits of big data innovation while protecting privacy.*
Every penny counts	*Where requests to access data are manifestly unfounded or excessive, SMEs will be able to charge a fee for providing access.*
Data Protection Officers	*SMEs are exempt from the obligation to appoint a data protection officer insofar as data processing is not their core business activity*
Impact Assessments	*SMEs will have no obligation to carry out an impact assessment unless there is a high risk*

From the first rule it becomes clear that data protection with a focus on data privacy techniques will play a significant role in future products and services. It seems to be that SMEs are exempted of appointing data protection officers because data processing is mainly not part of their core business activity. For the SMEs finance banks this new rule makes it easier to use their clients data, although SMEs would be able to charge a fee if banks request to access their data.

The other important regulation is the Directive Payment Services form the European commission (2015c). This is a revised directive on payment services in the European Union. From the press release:

"The new rules will protect consumers better when they make payments, promote the development and use of innovative online and mobile payments and make European payment services safer."

Basically the PSD2 makes payment quicker and safer (EC, 2015d). The payment service provider must give the customer the key information they need before and after the payment is made. The PSD2 opens up the payment market, allowing companies other than banks to provide payment services

(EC, 2015d). This means that competition will be created in the payment services market. In the press release (EC, 2015c) the most important changes are noted, these relevant changes are:

- Strict security requirements for the initiation and processing of electronic payments and the protection of consumers' financial data.
- Opening the EU payment market for companies offering consumer or business-oriented payment services **based on the access to information about the payment account** – the so called "payment initiation services providers" and "account information services providers.
- Enhancing consumers' rights in numerous areas, including reducing the liability for non-authorised payments, introducing an unconditional ("no questions asked") refund right for direct debits in euro.

There is similarity with the GDPR. The PSD2 enhances consumer data protection and enhances privacy. Also security measures will be taken. The most interesting and important change in the PSD2 is the opening of the EU payment market for companies. These companies (like banks) could offer consumer or business-oriented payment services based on **the access to information about the payment account.** This opens the window for customer analytics, what basically has the same aim: offering services based on knowledge gather from previous customer data (Sun et al, 2014).

Overall, the importance of these two regulations is undisputable. The other requirements form the interviewees have overlap with the technical requirements like, management. In addition to technical system implementation for conducting analytics, significant business skills like management is required (Chen et al, 2012). Another important element for using analytics is knowledge (Chen et al, 2012). Deep knowledge is required to manage data analytics. This is also supported by Buse and Zimmerman (2011), a combination of knowledge and management is required for conducting analytics.

4.5 Conclusion

This Chapter defines the requirements for conducting customer analytics at SME finance banks. Requirements have to be defined for designing the maturity assessment framework (Sage and Armstrong, 2000). According to CMMI maturity model theory, requirements need to be defined to build up the maturity assessment framework. Defining the requirements for customer analytics implementation by the SMEs finance banks in the Netherlands, is the aim of this Chapter. This provides input for the conceptualization of the framework and provides insights on the research field of customer analytics.

Interviews with experts are used to gather information on the implementation of customer analytics, which is reviewed by literature. The results from the interviews are not hard facts, but they gave an indication on the current state of customer analytics in the financial sector in the Netherlands. Combining the interview results with scientific literature, enhances the reliability of the interview output. The interviews had an open-ended structure with questionnaires. From the propositions it became clear that experts score the development and deployment of customer analytics by SMEs finance banks below the 3,5 on a score of 1 to 7. Experts scored Dutch SMEs finance banks with 2,9, when they were asked to rank the innovativeness of the banks.

The experts were asked what the technical and institutional requirements are for deploying customer analytics in the Netherlands by the SME finance banks. The next step was to examine whether the input from the experts was supported by the literature. This is done by reflecting the requirements for customer analytics implementation for SME finance banks. Based on this the technical requirements for deploying customer analytics are data integration, data governance, data quality, data availability, central distribution (data warehouse) and using the correct software. The concept of maturity levels and maturity models are described in the previous Chapter. Regarding the institutional requirements the experts mentioned that regulation, PSD2 and GDPR, the awareness (people) and the data related management are the most important requirements for deploying customer analytics. This is also reviewed and supported by the literature. The lack of adoption may be explained by the low maturity of the requirements.

In the previous Chapter maturity models were reviewed a theory is selected for designing the maturity assessment framework in Chapter 5. The next step in the research is to conceptualize the knowledge and information gathered from the previous Chapters. This will be all captured in the conceptual framework in the next Chapter. The requirements, defined in this Chapter, and the CMMI theory will serve as the input for the conceptual framework.

5. Conceptual framework

5.1 Introduction

This Chapter designs the conceptual framework based on the previous chapters. It brings all the elements together. In the previous Chapters the difficulties around measuring maturity are described. Maturity models are used to help organization to measure and assess their maturity, which is reviewed in Chapter 3. The CMMI theory is selected based on its ability to assess both technical and organizational elements. Following from Chapter 4, the requirements for deploying customer analytics at the SMEs finance banks will be included in the maturity assessment framework. Determining the maturity level of the requirements provides insights for the SMEs finance banks on how mature they are for deploying customer analytics. The maturity assessment tool that will be used to design the framework is the Capability Maturity Model Integration (CMMI), in accordance with Chapter 3. See the figure below for a schematic overview.

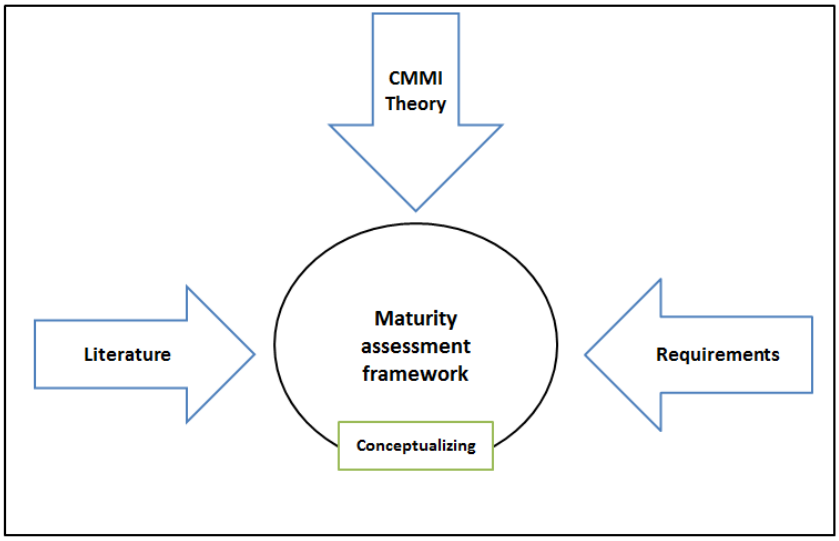


Figure 17: Conceptualizing the framework

This Chapter is part of the conceptualization phase of Sage and Armstrong (2000). The conceptual framework will be used in the next Chapter, where case studies will be conducted to test the maturity assessment. Important for designing this framework is to define the leverage domains in accordance with the requirements from Chapter 3, these are the model's core elements because they are used to establish the capability levels (Solar et al, 2013). This will be captured in described in detail in section 5.2 In section 5.3 the assumptions of the maturity assessment framework will be explained. How the framework should be interpreted is described in section 5.4. Organization theory

form Mintzberg (1993), which is used in chapter 2, is consulted to discuss the process of use of the framework. The process of use of the maturity assessment framework is explained in section 5.5. In Chapter 2 different maturity assessment frameworks are reviewed, in section 5.6 the positioning of the maturity assessment framework related to the other frameworks will be presented. This section discusses the contribution of the conceptual framework to the research field. In the last section the conclusion will be given.

5.2 The framework

Based on the previous phase in the previous Chapters, the important leverage domains are: regulation, organization, data governance and technique. In accordance with the CMMI theory and Sage and Armstrong (2000), information should be gathered to compose the requirements. This was done in the previous Chapters, see the table below for a short summary per key domain area:

Table 10: Overview of the main findings

Domain	Key Domain Areas	Literature source
Regulation	*Privacy*	*Interviews and EC (2015 a,b)*
	PSD2	*Interviews and EC (2015 c,d)*
Organization	*People*	*Interviews, Chen et al (2012) and Bus and Zimmerman (2011)*
	Management	*Interviews, Chen et al (2012) and Bus and Zimmerman (2011)*
Data governance	*Data quality*	*Interviews, Han et al (2011) and Chen et al (2011)*
	Internal rules regarding data	*Interviews, Han et al (2011), Mazumder (2016), Fang and Zhang (2016) and Lavelle et al (2011)*
	Consultation regarding data	*Interviews, Han et al (2011), Mazumder (2016), Fang and Zhang (2016) and Lavelle et al (2011)*
Technique	*Data sharing*	*Empirical results, Han et al (2011), Mazumder (2016) and Chen et al (2011)*
	Software tools	*Interviews and Mazumder (2016)*
	Technical knowledge	*Fhan and Zang (2016), Han et al (2011) and Chen et al (2011)*

Now the key domain areas (KDA) are determined. As can be seen, the maturity assessment framework includes different domains:

- Organization knowledge
- Technical knowledge
- Awareness

- Alignment
- Planning & procedures
- Management
- Technology
- Governance

Maturity models are designed to assess the current situation of an organization in order to evaluate the strengths and weaknesses and prioritizing feature improvements. The requirements of deploying customer analytics could explain the current status of customer analytics implementation, maturity models are useful methods to assess the maturity level of these requirements. In the figure below an overview is given of the maturity model:

		ML				
Domain	**KDA**	**1**	**2**	**3**	**4**	**5**
Regulation	Privacy (GDPR)					
	PSD2					
Organization	People					
	Management					
Data governance	Data quality					
	Internal rules regarding data					
	Consultation regarding data					
Technology	Data sharing					
	Software tools					
	Technical knowledge					

Figure 18: Leverage domains with their KDA's

The next step is to identify the critical variables that should be measurable and assessable within the assessment framework. According to Iribarren et al (2008) the critical variables are used to verify or measure the key domain areas. Therefore they serve as the verification element of the key domain areas. They are described below.

(REG-1) Privacy. Privacy issues influence the bank's policy regarding the data, as described in the previous Chapter. The critical variables are: *Knowledge on the contents of the GDPR; Action plan to deal with privacy issues* and *Professionals working on privacy related issues*.

(REG-2) PSD2. This new PSD2 directive may influence the policy of the bank on how they deal with customers transaction data. Critical variables are: *Knowledge on the contents of the PSD2* and *Action plan to deal with the PSD2 directive.*

(ORG-1) People. This KDA deals with people how work in the organization. The critical variables are: *People are aware of the usefulness of customer analytics; People share the same opinions on analytics* and *Consistency between the department's internal policy regarding the use of customer analytics.*

(ORG-2) Management. This KDA deals with the management the bank has regarding data management and data analytics. The critical variables are: *Monitoring and evaluation plan regarding the use of analytics (C-level); Action plan for using data analytics in the business* and *Lower level management plans regarding the use of data analytics.*

(DG-1) Data quality. This deals with the data quality within the bank. The critical variables are: *Knowledge on data quality; Arrangements within the department regarding data quality; Data quality structure* and *Professionals that monitor data quality.*

(DG-2) Internal rules regarding data. Internal rules regarding data deal with conflicts between the departments regarding the definitions of data, like conflicts on attributes. The critical variables are: *Rules regarding the definition of data* and *compliance with the rules regarding the definition of data.*

(DG-3) Consultation regarding data. The consultation regarding data means that there are consultations within the bank regarding the use of data. The critical variables are: *Consultation within the department on data quality* and *Consultation regarding the use of customer analytics.*

(TECH-1) Data sharing. This KDA deals with data sharing between departments and within the department in the bank. The critical variables are: *There is central distribution for data; Data sharing between departments; All the departments have access to data from a warehouse* and *It is possible to enrich the data.*

(TECH-2) Software tools. Software tools refer to the software environment where warehouses operate. The critical variables is: *Alignment in software environment*

(TECH-3) Technical knowledge. This KDA refers to the knowledge within the organization on data related issues. The critical variables are: *There is an analytics group with access to all the data; People know how to use SQL* and *Technical conflicts between the business and IT.*

KDA	Critical Variables	ML 1	2	3	4	5
Privacy (GDPR)	*Knowledge on the contents of the GDPR*					
	Action plan to deal with privacy issues					
	Professionals working on privacy related issues					
PSD2	*Knowledge on the contents of the PSD2*					
	Action plan to deal with the PSD2 directive					
People	*People are aware of the usefulness of customer analytics*					
	People share the same opinions on analytics					
	Consistency between the department's internal policy regarding the use of customer analytics					
Management	*Monitoring and evaluation plan regarding the use of analytics (C-level)*					
	Action plan for using data analytics in the business					
	Lower level management plans regarding the use of customer analytics					
Data quality	*Knowledge on data quality*					
	Arrangements within the department regarding data quality					
	Data quality structure					
	Professionals that monitor data quality					
Internal rules regarding the data	*Rules regarding the definition of data*					
	Compliance with the rules regarding the definition of data					
Consultation regarding data	*Consultation within the department on data quality*					
	Consultation regarding the use of customer analytics					
Data sharing	*There is central distribution for data*					
	Data sharing between departments					

	All the departments have access to data from a warehouse
	It is possible to enrich the data
Software tools	*Alignment in the software environment*
Technical knowledge	*There is an analytics group with access to all the data*
	People know how to use SQL
	Technical conflicts between the business and IT

Figure 19: KDA's with their Critical variables

5.3 Maturity level determination

According to the design principles from Chapter 3, the maturity levels should be clear defined in the model, these are shown in the Appendix D. In Chapter 3 the basic five level stages of maturity levels are described. Every KDA has its own critical variables which have capability levels of their own (Iribarren et al, 2008). In accordance with Iribarren et al (2008), to determine the maturity levels of the critical variables a set of common patterns has to be defined. This is done in accordance with the available literature on maturity levels determination (Iribarren et al, 2008; Solar et al, 2013, Demir and Kocabaş 2010; ISICA, 2012; Röglinger et al, 2012; de Bruijn et al, 2005; Röglinger and Pöppelbuss, 2011): in level 1 the capability or maturity does not exists, although the importance may be recognized by the bank; in level 2 the capability exists but is nether structured or recognized; in level 3 the capability exists and is well documented and structured; level 4 the capability is structured and the tools or processes have been defined and standardized in order to improve its effectiveness and efficiency and level 5 implies all the elements that are captured from level 1 to 4 plus the use of best practices. This patterns determine the maturity levels per critical variable. These definitions will be used for assessing the maturity levels of the critical variables. Based on previous research on the use of the CMMI model (Iribarren et al, 2008 and Solar et al, 2013) it is concluded that a suitable approach for measuring the maturity levels is to have a set of questions for each variable at each level. This is will be further captured in Chapter 6.

5.4 Assumptions for the model

As mentioned by Sage and Armstrong (2000) to develop a theory or a model, assumptions have to be made. Following form the literature review and the empirical results the leverage domains and the key domain areas are determined. The maturity assessment framework is designed based on these

assumptions. Another elements are excluded from the model. For the regulation, the decision is made to focus on the PSD2 and the privacy, with a focus on the GDPR. All the other regulations are excluded in the framework. Form the empirical results in Chapter 4, these two regulations were mentioned as crucial for conducting customer analytics. This framework is not developed for assessing the maturity level of the compliancy regarding privacy and the PSD2. It assess the knowledge and action plan regarding regulation. If a SME finance banks has a low score on the KDA's privacy and PSD2, this doesn't mean that the bank is not compliant with the regulations. Another assumption is the fact that the assessment of the KDA's may be organization structure depended. Every SME finance bank has a different management and data structure. These levels are crucial for assessing the critical variables. This will be captured in Chapter 7. This maturity assessment framework could be used for SME finance banks to gather insights about the KDA's. The framework is designed to assess the maturity level different KDA's, which are considered to be essential for deploying customer analytics for the SMEs finance banks. Banks could use this insights to adopt new business or IT governance policies. This framework could detect problems regarding the KDA's and based on these detection, developing new improvement plans.

5.5 Process of use

The framework is designed to assess the maturity of customer analytics implementation at the SME finance banks in the Netherlands, based on the defined key domain areas. For the process of use, the Mintzberg (1993) organization model from section 2.5 is used to discuss who is going to use the maturity assessment framework.

Customer analytics is used to gather better insights on the banks' customer as described in Chapter 2. Marketing is the department where banks get in contact with their customers and potential customers (Vorhies and Morgan, 2005). Data science department is the innovative department of the bank regarding data analytics and the use of data. They use data form the IT or DWH department, the support staff (see the Mintzberg (1993) model in section 2.5), to perform analytics. Both the marketing and data science department are the 'core' users of the maturity assessment framework, since they are strongly involved in the use and the development of customer analytics. Another departments that are users of customer analytics may be the finance and risk department, since these departments also use customer data for their own purposes (Akkizidis & Stagars, 2016). Typically these departments belongs to the operational core (Mintzber, 1993). From the pulling forces theory from Mintzberg (1993), the technostructure 'pulls' to standardize processes within the organization, while the operational core aims at professionalizing processes. The support staff aims are collaboration, while the main users aim at standardizing processes. Therefore the

framework should be used in collaboration between the IT department and the technostructure, since they are the core users of the maturity assessment framework. For the quality of the process, the collaboration could be standardized.

The core results of the maturity assessment framework are twofold. Firstly the maturity assessment framework results in a measurement. Secondly the process of interaction between the involved actors (de Bruijn, 2002). The maturity measurement of the SME finance banks will be presented and discussed in Chapter 7. With the process of interaction the discussion around the maturity assessment is meant. Based on Mulgan (1997) and de Bruijn (2002), the interaction between involved stakeholders carry advantages like:

- Both manager and professional are given the opportunity to give their meaning to the measurement. Offering space is to the discussion is important since establishing the measurement figures is one thing and having a meaning is another thing. For the discussion space means that there are fewer incentives to fully conform to the system.
- When the different opinions are confronted, the ultimate meaning will be richer than if there was just one single opinion.
- If the manager and the professional fail to arrive at one meaning, this would be an important fact for the discussion. It may cause the manager to react to the measurement with reserve.

These advantages show that the discussion around the measurement is very important, besides the actual measurement. In this research the actual discussion is not presented, however guidelines for the discussion will be shortly explained.

For the discussion around the maturity assessment framework, it is important to involve all stakeholders from the technostructure and the support staff (the IT department). If the operational core intents to use customer analytics, the same discussion design is proposed: operational core + support staff. Data is provided from the IT department to the technostructure, therefore it is important to include both departments in the discussion. Both departments have different preferences (Mintzberg, 1993), the support staff aims at collaborating, while the technostructure prefers to standardize. The basic element of discussion would be the assessment/measurement. A Dialog between managers and professionals form the technostructure and the involved actors form the support staff may enrich the assessment figures (presented in Chapter 7 for this case) (de Bruijn, 2002). This may lead to new products which have not been included in the system. Also, the assessment figures may be an important tool in the dialog between the involved actors (de Bruijn, 2002).

Maturity is a normative concept (Salah et al, 2014). It is very hard to determine when an

organization or when a process of an organization is mature. All the different elements from the organization (Mintzberg, 1993) have different preferences regarding the decision-making and processes within the organization (the different pulling forces). Therefore the discussion around the maturity assessment is a very important complement on the actual assessment.

5.6 Positioning the framework

In section 2.3.2 different customer analytics frameworks are reviewed. In this section the conceptual framework will be positioned related to the existing frameworks. Table 11 summarizes the reviewed customer analytics frameworks and their purposes.

Table 11: Overview of existing customer analytics frameworks

Customer analytics framework	Aim of the method
iCare for big data-based banking customer analytics (Sun et al, 2014).	*The Intelligent Customer Analytics for Recognition and Exploration (iCARE) framework is presented as a method to efficiently analyze customer behavior using banking big data* (Sun et al, 2014, pp 1)
Advanced analytics: opportunities and challenges (Bose, 2009)	*This study aims to investigate these three mining technologies in terms of how they are used and the issues that are related to their effective implementation and management within the broader context of predictive or advanced analytics* (Bose, 2009, pp 154).
Social Media Analytics and Business Value: A Theoretical Framework and Case Study (Bekmamedova and Shanks, 2014).	*A framework that provides insights on how organizations can achieve value with social media analytics (*Bekmamedova and Shanks, 2014).
Toward a Unified View of Customer Relationship Management (Chan, 2005).	*The CRM enterprise model proposed in this paper provides the integrated framework for the creation of a unified customer view amongst disparate systems, processes and channels across the enterprise* (Chan, 2005, pp 32).

The iCare framework from (Sun et al, 2014) and the advanced analytics framework from Bose (2009) present a method to efficiently analyze customer data. Where Sun et al (2014) describe a method how structured and unstructured customer data could be cleaned and prepared and how it could be integrated, where eventually how banks could perform analytics on the customer dataset. Bose (2009) proposed a framework that consists of data integration, data processing and business intelligence applications. Bose (2009) focusses on the different data processing techniques, like text mining and data mining. The framework focusses on the data processing part of the chain.

Bekmamedova and Shanks (2014) proposed a framework that provides insights on the organizational value of SMA. It basically consists of four steps: awareness motivation, IT assets and SMA capabilities, dynamics capabilities (SMA resources) and awareness benefits. Aiming at creating awareness at an organization to conduct social media analytics. Chan (2005) integrated CRM enterprise models at three different levels. This is done by integrating conceptual, internal and external views to one singe framework, to gather a more complete view of the customer.

The next step is to examine where the conceptual maturity assessment framework belongs. Sun et al (2014) and Bose (2009) developed a framework that focusses on data processing, the technical part of data analytics, where Bekmamedova and Shanks (2014) focus on the organizational awareness of conducting analytics. Chan (2005) focusses on the integration of different customer related processes. Sun et al (2014) and Bose (2009) aim at eventually implementing data analytics, while Bekmamedova and Shanks (2014) aim at assessing organizational value of customer analytics. Chan (2005) aims at enhancing the relationship between the organization and the customer.

The framework from this research differs from the reviewed frameworks in the sense that it considers customer analytics as a multi-criteria phenomenon, looking at customer analytics from different views: technology, organization, regulation and governance. The other frameworks focus deeply on one single element. Another difference is that the reviewed frameworks, define a process that organization have to follow: from gathering data to conducting analytics or from awareness motivation to awareness benefits (Bakmamedova and Shanks, 2014). In this research, no process is defined. No different methods are integrated to one single framework. The maturity assessment framework is independently designed. Another difference is the fact that this framework aims at assessing the maturity of customer analytics implementation, contradictory to the other frameworks, which aim at implementing customer analytics or creating organizational value of customers analytics.

5.7 Conclusion

The aim of this Chapter is to conceptualize the maturity assessment framework. This is done by combining all the insights from the previous Chapters: maturity model theory, requirements for the framework and literature. This Chapter presented the conceptual framework based on the CMMI theory. All the elements from the previous research are combined in the maturity assessment framework in figure 12 and 13. The leverage domains and KDA's are determined based on the literature review and interview results from the Chapter 4, the requirements are determined. The organizational context differs per bank, this is also an important notion for using the model. This

framework is not designed to assess the compliance of the SME finance bank regarding the regulation. The maturity assessment framework is designed to provide insights on the implementation of customer analytics and how mature the bank is for deploying customer analytics. Based on the outcomes of the maturity level assessment, banks could adopt new policies or develop new improvement strategies related to the KDA's. The maturity assessment framework will be mostly used by the technostructure and the support staff. A discussion and the actual measurement are the two results of the framework. First the assessment will be made, presented in Chapter7, and after that a discussion in necessary between the technostructure, both managers and professionals, and the support staff, since they provide the customer data. It is necessary to have a discussion because of the interactions between the involved actors in the organization. The discussion gives the professionals and the managers space to give their meaning on the assessment, what makes the actual assessment richer. Regarding the positioning of the framework, which are reviewed in Chapter 2, it differs on various aspects: no process is defined, no integration of different methods is proposed in the maturity assessment framework. The main distinction is that the framework focusses on different elements; organization, governance, technology and regulation. Other frameworks mainly focus deeply on one single element. Also, existing frameworks aim at implementing customer analytics or creating organizational value of customer analytics, while this framework aims at assessing the maturity of the domains: regulation, organization, governance and technology.

The next step in accordance with Sage and Armstrong (2000) is to test the conceptual framework. This will be done by conducting case studies, what is presented in Chapter 6. The case studies will be used to examine if the framework could be use in practice. Visualizing the assessment results will be presented in Chapter 7.

6. Case studies

6.1 Introduction

In this Chapter the case studies will be presented and discussed. According to the design phases of Sage and Armstrong (2000), the next step after the conceptualization is the test phase. The conceptual framework is designed in the previous Chapter based on the requirements from Chapter 4 and the maturity model theory in Chapter 3. The case studies will be used to test the conceptual framework. The main research question is how a maturity assessment framework can be designed for customer analytics implementation for the SME finance banks. To help answering the main research question, a case study is conducted to gather new insights. The reason for conducting case studies is to examine whether the framework could be used in practice and how it could be used. As mentioned earlier, measuring maturity is difficult for organizations, therefore maturity models are designed to help organization in measuring their maturity. Conducting case studies helps to measure the maturity of the organizations, related to the framework in Chapter 5. The actual assessment will be presented in Chapter 7. The leverage domains from Chapter 5: regulation, data governance, organization and technology and their key domain areas will be explored by means of a case studies. In Chapter 2, the difficulties for measuring maturity are described and the Mintzberg (1993) model is introduced to reflect the difficulties around measuring maturity. This will be used for positioning the case studies.

This Chapter will elaborate on that. In section 6.2 the motivation for conducting case studies is described. The positioning of the case studies will be explained in section 6.3. In section 6.4 the setup of the case studies will be described. In the next section the interview contents will be discussed. The results of the case studies are presented in Appendices E,F,G and H. This is will be further explained in section 6.6. In the last section a conclusion will be given.

6.2 Motivation for using case studies

According to Yin (2003) a case study should be considered when the research satisfies the following criteria:

- The focus of the study is to answer “how” questions.
- You cannot manipulate the behavior of those involved in the study
- Covering contextual conditions is not desirable because you believe that these conditions are relevant for the study

In our case the main research question (see section 1.3) is a 'how' question. The other two criteria are also satisfied, since it is impossible to manipulate the SME finance bank and the contextual conditions are of key importance for the study. If the research satisfies these conditions, the next step is to define the case. 'A case' is defined by Miles and Huberman (1994) as the phenomenon of some sort of occurring in a bounded context; it is the unit of analysis of the study. The primary unit of analysis of the current study is customer analytics at the Dutch SME finance banks.

Once the unit of analysis is determined, it has to be determined what is excluded as the unit of analysis, in other worlds define your case properly. Yin (2003) and Stake (1995) suggested to place boundaries on the case to ensure that your case remains reasonable in scope. A case should be bound by (1) time and place (Creswell, 2003), (2) time and activity (Stake, 1995) and (3) definition and context (Miles and Huberman, 1994). The scope of the research is already described in the previous Chapters. The focus of this research is the SME finance banks in the Netherlands. This means that all the other banks in the Netherlands, whom don't provide business accounts are excluded in this research. Furthermore, the Dutch banks should provide business accounts to all the SME segments. In other words they should provide business accounts to both micro enterprises and medium sized enterprises. The definition of customer analytics that will be used for the case studies is the same definition that is used in Chapter 2 (Sun et al, 2014):

Customer analytics is about collecting, cleansing, validating, integrating and analyzing raw data gathered from various touch points and analyzing them to draw meaningful insights about the organization's customers

Yin (2003) defines three types of case studies, explanatory, exploratory and descriptive. Since the outcomes of the research and the case study are not clear, an exploratory approach would be suitable for the case study. The other distinction Yin (2003) made is between single and multiple-case studies, Sake (1995) distinguishes between intrinsic, instrumental and collective case studies. From Baxter and Jack (2008, pp 549), they define, based on Stake (1995), an instrumental case study as case studies that are used to accomplish something other than understanding a particular situation. It provides insight into an issue or helps to refine a theory. Conducting a case study is the main method for testing a theory or framework (Gillham, 2000). The case is of secondary interest; it plays a supportive role, facilitating our understanding of something else. The case is often looked at in depth, its contexts scrutinized, its ordinary activities detailed, and because it helps the researcher pursue the external interest.

Since a conceptual framework is designed in Chapter 5 and the purpose of the case studies is

to test this maturity assessment framework the case study approach will be instrumental multiple case studies with an exploratory nature.

6.3 Positioning the case studies

As discussed in section 2.4 banks are large organizations that consists of several departments. The interaction between departments, the multi-actor and multi-value aspect of measuring maturity is reflected by the Mintzberg (1993) model in section 2.4. Complex organization cannot be measured by one single instrument (Maheshwari et al, 2011). The complexity of measuring maturity is described in section 2.4. Mintzberg (1993) describes the different elements of an organization and the interactions between departments and their actors. The theoretical departments were detailed described in Chapter 2, roughly:

- **Strategic Apex**: For a bank this is would be the managing board.
- **Support staff**: Traditionally the IT department belongs to the support staff.
- **Technostructure**: The marketing and data science department of a bank are currently typically part of the technostructure.
- **Operational core**: From a bank perspective this encompasses the finance and risk departments.
- **Middle line:** The strategy & organization part of a bank is typically the middle line of the organization.

To conduct the case studies, it is important to get a complete view of the SME finance bank. In section 2.4 it is described that customer analytics is mainly used for marketing purposes. This research uses the broad definition of customer analytics. Every analytics where customer data is used to get insights about the bank's customer, is considered as customer analytics. Customer data is also used for finance and risk purposes by the financial industry (Akkizidis & Stagars, 2016). The IT department typically supports the technostructure and the middle line with providing data and other IT related issues, as described in Chapter 2. Therefore, for conducting the case studies it is important to have interviews with experts from the marketing, the warehouse and data science department. To create a complete view, an expert form finance or risk department will also be interviewed. This because the finance or risk departments use customer data for other purposes than marketing. Another problem that could occur, when assessing or measuring the maturity of on organization is that measurement is based on one single generic level (Bannister, 2007; Kunstelj and Vintar, 2004). This might result in adverse effect and the measurement will have limited practical meaning

(Bannister, 2007). Therefore it is necessary to measure organizations at several departments, which is done in this research. See figure 20. Also, in accordance with the framework, it is important to measure an organization at several domains. This will be visualized in the dashboards in Chapter 7.

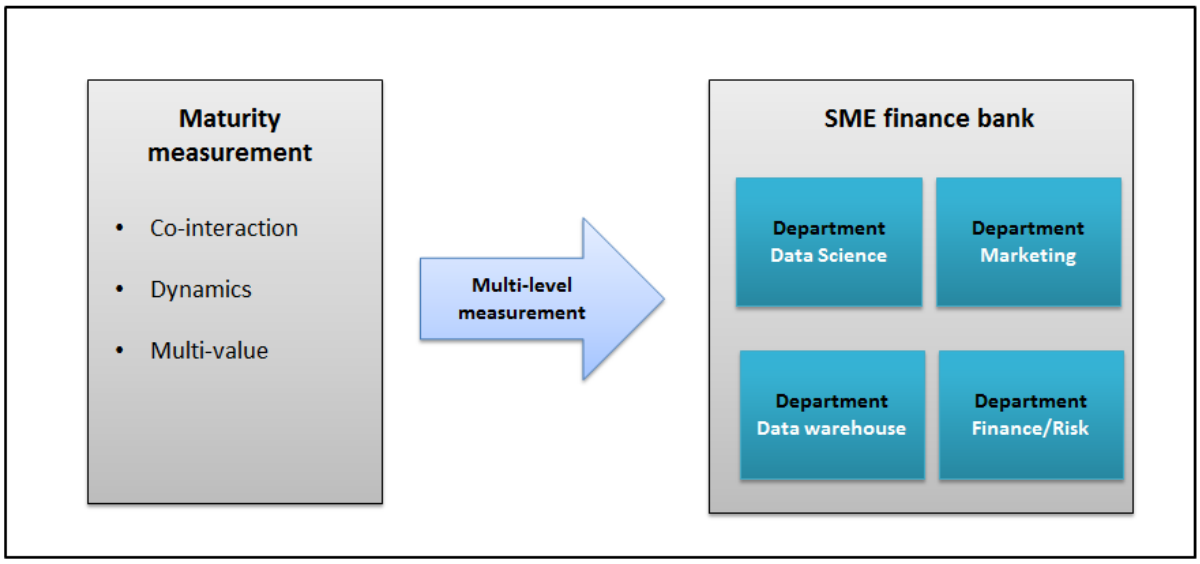


Figure 20: Multi-level measurement of the case studies.

We found two banks who fully participated at the case study, these banks satisfy the conditions described in section 6.2. These banks will be called bank A and bank B. Bank A has a [redacted]. Their total revenue in 2015 was [redacted] with a profit of [redacted], and bank A has [redacted]. In total bank A has [redacted]. Bank B focusses on both the [redacted]. It has a revenue of [redacted] and a profit of [redacted]. Bank B has [redacted]. Bank B has [redacted] customers, with [redacted] customers in the Netherlands. This means that two banks will participate in the case study and at both banks four experts, from the departments mentioned above, will be interviewed.

6.4 Case study setup

As described in the previous sections, the aim of conducting case studies is to test the maturity assessment framework. Case studies are mostly questionnaire based studies (Venkatesh & Morris, 2000). In our case using fixed questionnaires may be problematic, because it is difficult to determine what good questions are. This might result in missing insights. Questionnaires may not be very feasible, as there are a limited number of people involved in the case studies (Bartlett, Kortrlik, &

Higgins, 2001). Therefore the decision is made to use interviews. According to Gillham (2000, pp 62) you use interviews when:

- Small number of people are involved.
- They are accessible.
- They are 'key' and you can't afford to lose any.
- If the material is sensitive in character so that trust is involved.

In our case eight people are involved in the case studies. All the experts were accessible via the Ernst and Young network. The only way to find out how banks function is to interview the experts from inside the bank. Information that is gathered from both bank A and bank B is very sensitive. Experts from both banks agreed to participate under strict circumstances, like covering the interview results and anonymizing the names. In other words the interviews consists of sensitive material.

For conducting interviews instead of questionnaires it is important that you know who the interviewees are (Gillham, 2000). The desired method for interviewing experts is to have 'natural occurring conversations'. The idea behind this concept is to decide on a small amount of questions (preferably three or four) where you want answers to and ask these questions as the opportunity naturally arises (Gillham, 2000). The experts in the setting know the purpose of the interview, so they expect questions to be asked. Because the experts are formally not interviewed, they may give revealing answers (Gillham, 2000). These answers should not be recorded but the interviewer should verbatim them as soon as possible (during the interview).

6.5 Interview setup

As described in the previous section the interview method is natural occurring conversations. The decision is made to conduct the interviews in Dutch, because all the interviewees are Dutch experts. All the interviews took place at the offices of bank A and bank B. When the appointments were made for conducting the interviews, we also made an appointment for verifying the answers by means of a phone call. The main questions are divided in the sub domains from the maturity assessment framework. For every main question, a checklist exists what could be found in the Appendix. These checklist are related to the critical variables in Chapter 5. The whole interview setup can be found in Appendix E. The main questions are divided in four parts. The first question is a general question to start the conversation. The second main question concerns the Leverage Domain Area: Regulation. The third main questions concerns the organizational aspects of deploying customer analytics and the data related governance of a bank. The fourth main questions concerns the technical and also

governance related issues of deploying customer analytics by a SME finance bank. The questions are related to the leverage domains from the maturity assessment framework in Chapter 5. The main questions are broadly defined, but as already mentioned they are divided in sub questions and elements, that eventually will determine the maturity level of certain critical variables as described in Chapter 5 and will be presented in Chapter 7. The main questions (general, regulation, organization/governance and technical/governance) should be seen as starting point questions for further questions.

1. **General**

Main question: *What has changed the last 5 years regarding data and data analytics at the SME finance bank?* This is the first question to be asked. This questions is initiated by a short introduction. This introduction is related to the section 2.2 "The new function of SME finance banks". The conversation starts with the story that the role of the bank has changed from only providing traditional services to become an advisory bank with a strong customer focus, caused by the IT-evolution. This is the central starting point of the interview.

2. **Regulation**

Main question: *Under the new regulations, what are the customer analytics opportunities for SME finance banks?* This is the second main question. For this main question there is also a list with checklist questions. The experts were asked if they knew about the new regulation, if they didn't know about the regulation the regulation was explained and the question was asked again.

3. **Organization/governance**

Main question: *From an organizational perspective, how is data organized at the SME finance bank?* This is the third main question. There is also a checklist related to this main question. The aim of this question is to provide insights on the governance structure of data, management, people and what the experts think on how the organization deals with data related issues. This is all captured in the checklist.

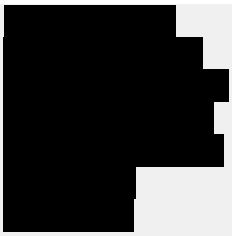
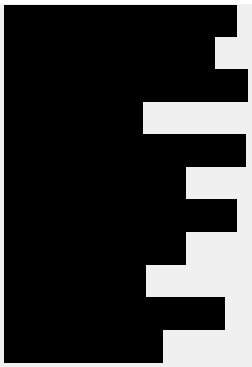
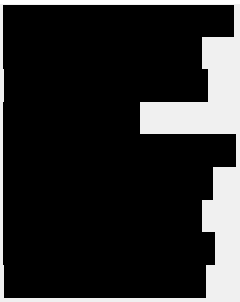
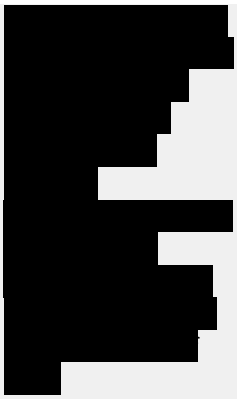
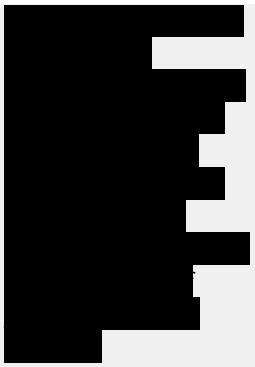
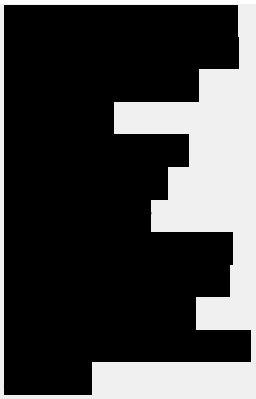
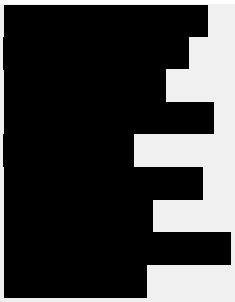
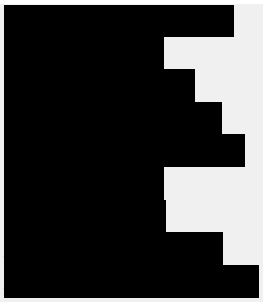
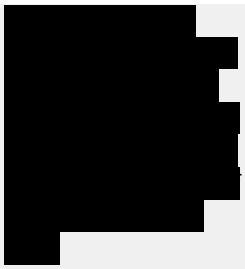
4. **Technology/governance**

Main question: *From a technical perspective, how is data organized at the SME finance bank?* The last main question concerns mainly the technical issues, like the software environment, technical knowledge and data sharing. Also questions concerning data governance are presented in the checklist.

6.6 Interview results

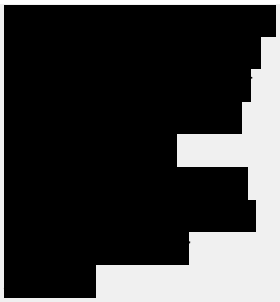
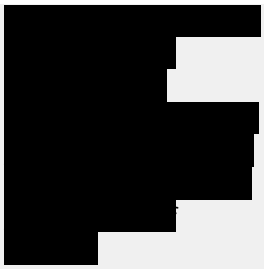
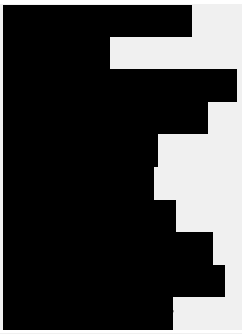
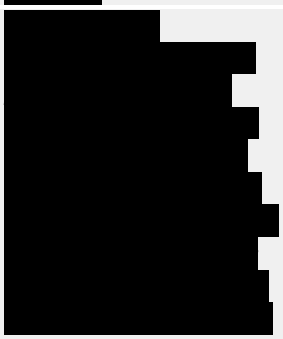
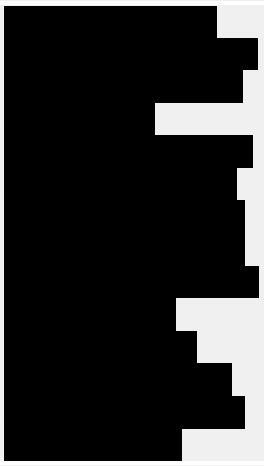
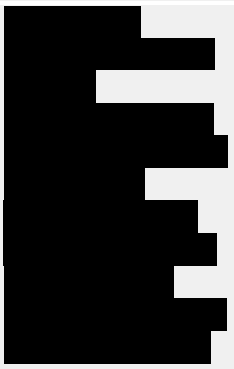
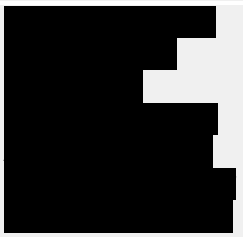
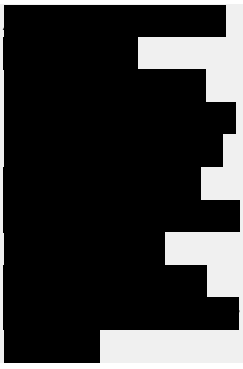
In this section a short summary of the results will be given. The summary result of bank A and B are shown in table 12 and 13. From there on the result will be separated per department, for every interview: marketing, finance/risk, data science and warehouse. The full interview results are shown in Appendix F, G, H and I. For bank A, [redacted]. For bank B, [redacted]. The detailed results will be used in Chapter 7, when the assessment is presented. Because the interview results are very sensitive, it was impossible to share the results with other experts to verify their answers. The decision was made to have a phone call with all the experts to verify the results. In the next section the verified results will be given. The tables bellows present the summary of the results, the assessment will be based on the detailed interview results which are presented in the Appendix and in section 7.2 an explanation will be given on how the assessment is actually made. The summary is based on the main questions, which are described in the previous section. In the table below the results of bank A are shown:

Table 12: Summary of the interview results bank A

Bank A	Marketing (Technostructure)	Data Science (Technostructure)	DWH (Support staff)	Finance/risk (Operational core)
1. General				
2. Regulation				
3. Organizational/ governance				
4. Technology/ governance				

The same is done for bank B, which is shown in the table below :

Table 13: Summary of the interview results bank B

Bank B	Marketing (Technostructure)	Data Science (Technostructure)	DWH (Support staff)	Finance/risk (Operational core)
1. General				
2. Regulation				
3. Organizational/ governance				
4. Technology/ governance				

6.7 Conclusion

This Chapter introduced the case studies. According to the methodology from Sage and Armstrong (2000), the case studies belong to the testing phase. It is useful to conduct case studies if the focus of the study is (1) to answer a how question, (2) the behavior of the involved stakeholders cannot be manipulated and (3) if the contextual conditions are relevant for the study. The aim of conducting

the case studies is to help answering the main research question of this research. This is done by gathering information from the participating Dutch SME finance banks what will be used in the Chapter 7 when the assessment results will be visualized. Because measuring maturity is difficult for organizations and maturity models help organizations to measure maturity, case studies are conducted to test the conceptual framework form Chapter 5. The focus of this research is the SMEs finance banks and the unit of analysis is customer analytics at the Dutch SMEs finance banks. To avoid results with a limited practical meaning, the case studies are conducted on multiple generic levels, several departments within the bank. This is also reflected by the Mintzberg (1993) model where the several departments of banks are described. The purpose of conducting the case studies is to test the conceptual framework, this means that the type of cast study is instrumental. Since the outcomes of the case studies are not clear and two case studies will be conducted, instrumental multiple case studies with an exploratory nature will be used.

For conducting the case studies and to obtain a complete view of the SMEs finance bank, experts from several departments are interviewed. These experts are from the marketing, data-warehouse, data science and finance or risk department. The rationale behind these departments is because customer analytics mostly used for marketing purposed (see Chapter 2), customer data has to be extracted from a warehouse, the data science department is responsible for analytics innovation and an experts from finance or risk is useful to obtain a complete view of the bank. Two Dutch banks participated in the case studies, these banks will be called bank A and bank B. The decision is made to use the natural occurring conversations approach for interviewing. These kind of conversations typically imply that the interviewer should have four main questions in mind and tries to ask them when the opportunity naturally arises. The questions are asked in Dutch, because the interviewees are also Dutch. The four main questions are divided in four categories, the general question was is the first question to be asked. This question is introduced by a small story based on Chapter 2. The other main questions are related to regulation, organizational/governance and technique/governance. A short summary on the interview results is given in section 6.6 and the results will be used in Chapter 7 for the assessment testing. In Chapter 7 the assessment will be made based on the interview results that are presented in this Chapter which is the last step of the design and testing phase of Sage and Armstrong (2000).

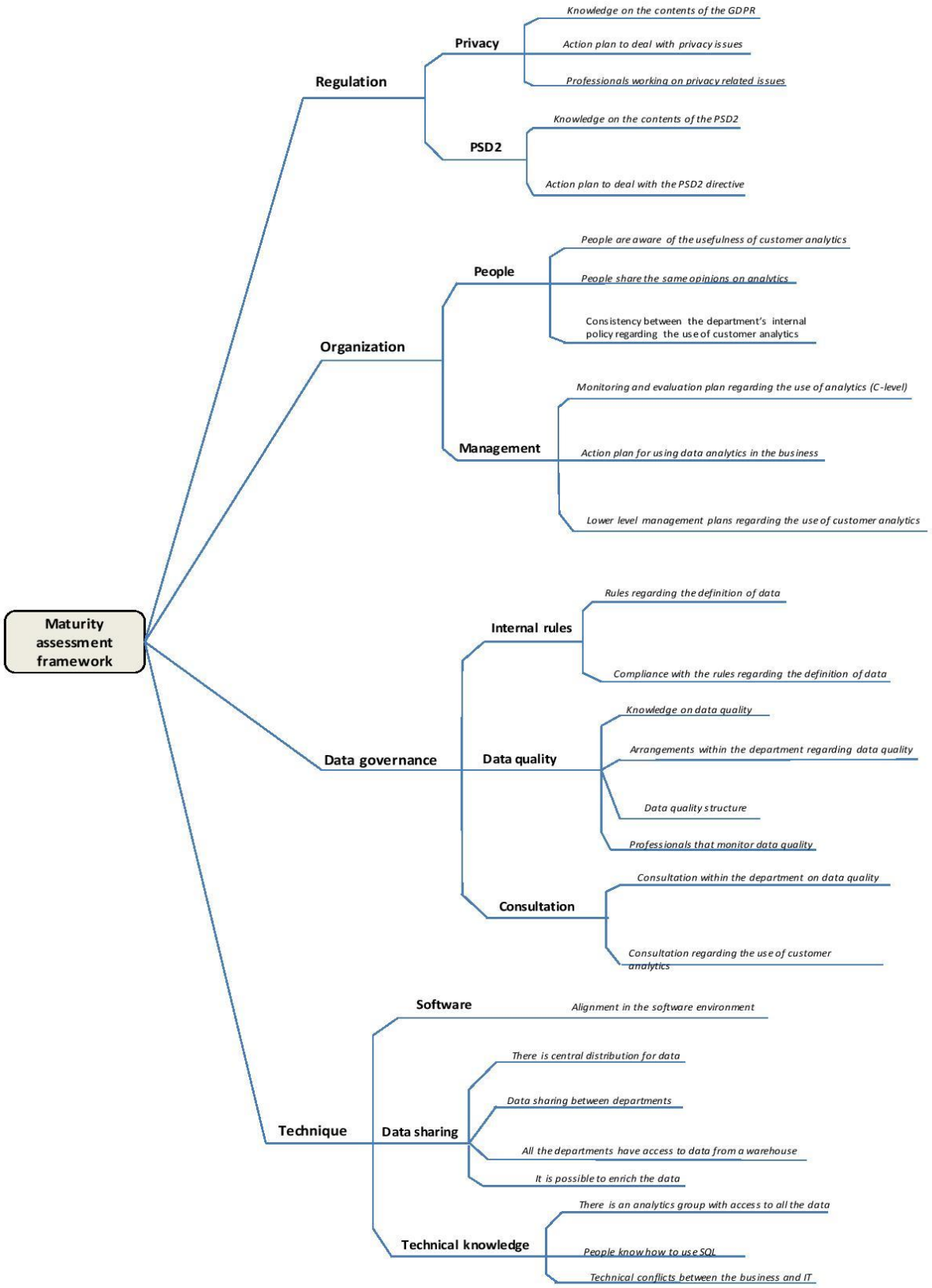


Figure 21: Hierarchal structure of the maturity assessment framework

7. Maturity assessment testing

7.1 Introduction

In the previous Chapter the case studies are presented. This is part of the design and testing phase of the Sage and Armstrong methodology (2000). The results from the case studies, Chapter 6, and the conceptual framework, Chapter 5, will be used to make the maturity assessment and test the maturity assessment framework in practice. In Chapter 6 an introduction is given on the reasoning behind measuring and assessing the maturity of organizations, this Chapter will elaborated on that. The aim of this Chapter is to assess the maturity level of the different departments, that are presented in Chapter 6, of bank A and bank B. Different key domain areas and their related critical variables will be assessed. Assessing maturity is aimed at determining the maturity based on the criteria that are presented in the previous Chapters. The contribution to the research is to test if the framework could be used in practice. It is not only testing the framework, but also reflecting the maturity assessment framework. Also, the presentation and visualization of maturity level assessments will be presented in this Chapter. This will be done for bank A and bank B. Besides assessing the different departments based on the key domain areas and the critical variables from the framework, a benchmark will be presented too. Benchmarking is the activity to compare the resulting scores with some kind of norm (Maheshwari and Janssen, 2013). In this case the benchmark will be made between bank A and bank B.

This Chapter introduces assessment and benchmark dashboards and presents and visualizes the assessment results from the case studies. In section 7.2 the assessment methodology will be explained. How the final maturity level score is determined is explained in this section, elaborating on the previous sections. Measurement and benchmark dashboards will be used to visualize the maturity assessment, the theory behind using measurement and benchmark dashboards will be explained in section 7.3 The assessment and benchmark dashboards are presented in section 7.4. In accordance with Maheshwari and Janssen (2013) assessment and benchmark dashboards should be evaluated and validated by experts. This will be captured in section 7.5 and in section 7.6 experts will be interviewed. In the last section the conclusion will be drawn.

7.2 Assessment methodology

This section elaborates on section 6.5 and 6.6, where the interview setup and the interview results of the case studies are described. Measuring the status of maturity of the process and procedures for bank A and bank B is not easy, as there exist no measurement mechanism to determine the maturity of the project and processes. One of the design principles form Chapter 3 is that every maturity level

should be clear defined, captured in Appendix D. The determination of the maturity levels is based on the interview results (see Appendix F,G,H and I) and presented in Appendix J and K. Natural occurring conversations is the approach that is used to interview the experts from bank A and bank B (Gilham, 2000). This means that the experts were not asked to determine the maturity level of the specific critical variable. The reason behind this, is that experts may give 'wrong' answers (Gilham, 2000). Experts may not give the correct answers and may not admit that specific critical variables are immature, therefore the check list (presented in Appendix E) will be used to structure the interviews. To illustrate this, an example will be given. Based on section 5.3, where the maturity level determination is described, the maturity levels of the critical variable *consultation within the department on data quality* is defined as follows (see Appendix D for all the maturity level descriptions):

Level 1: [redacted]
Level 2: [redacted]
Level 3: [redacted]
Level 4: [redacted]
Level 5: [redacted]

When the interview [redacted] at bank A was conducted, the question was asked, if they had consultations within [redacted] regarding data quality. In accordance with the natural occurring conversation approach. The expert answered [redacted] Therefore [redacted] at bank A has a maturity level score of 2 for this critical variable. This method is used for all the interviews. This is all captured in Appendix I and J. As mentioned in Chapter 3, the aim of determining the maturity of an organization is to guide improvements and progress of the organization.

7.3 Assessment and benchmark dashboards

Measurement and benchmarking is not a one-time activity that results in some actions (Maheshwari and Janssen, 2013). It is a continuous process of measuring, benchmarking and improving. In Chapter 6 the reasoning behind measuring maturity at different departments is described. Due to the complexity of organizations, the Mintzberg (1993) model and knowledge from de Bruijn (2002) is

used to explore the difficulties around measuring maturity in organizations. Also, because of this complexity, single score maturity measurements may have limited use (Maheshwari and Janssen, 2013). Therefore it is necessary to measure maturity using multiple scores. This is done by measuring maturity at different departments, with different domains and different criteria. The outcomes of the assessment will be visualized using dashboards. Visualization of different elements is required to enable organizations to evaluate the effects of their actions (Maheshwari and Janssen, 2013). Visualization supports the interpretation. Using an index showing the measurement scores, for example, does not provide enough insights and can easily be interpreted differently from the original meaning (Bannister, 2007; Petrovic et al, 2012). Therefore there is need to visualize the measurement and the benchmark scores (Maheshwari and Janssen, 2013). Dashboards can be used to support interpretation of the outcomes. A dashboard is a visual display of the most important information needed to achieve one or more objective, consolidated and arranged on a single screen so the information can be monitored at a glance (Few, 2004, pp 31). This means that the outcomes of the assessment and the benchmark need to be visualized in an easy to understand way (Maheshwari and Janssen, 2013).

Maheshwari and Janssen (2014) defined several steps for an open measuring, benchmarking and improvement process. Since the aim of the assessment is not to improve, the first three steps will be used to visualize the assessment. Step 1 is to define the indicators. Before anything can be measured good indicators need to be defined (Maheshwari and Janssen, 2014). In this research these are the Key Domain Areas and the Critical Variables form the previous Chapters. Step 2 is measuring, data collecting using multiple data sources (Maheshwari and Janssen, 2014). Data collecting is done in Chapter 6, the case studies. The last step is Benchmarking, comparison with some kind of yardstick (Maheshwari and Janssen, 2014). A single maturity level measurement allows bank A and B to determine the current status of the key domain areas per department, where the benchmark provides useful insights for improvements suggestions.

7.4 Bank A and bank B dashboard

In this section the measurement and benchmark dashboards will be presented. In Appendix J and K the measurement scores are presented. The measurement is based on the case study result from the Appendices F,G,H and I. To make the assessment the four departments of the banks will be assessed separately. The organizational KDA's: People and Management will be assessed for the whole organization. The critical variables of the KDA's are organizational broad depended. This is also the case for the KDA: software tools. The assessment is made based on the maturity level determination

what is described in section 5.3 and in Appendix D. Four interviews were conducted at bank A and bank B. This will be captured in the framework below. The first step is to assess the critical variables, the assessment is based on the levels that are described in Appendix D. Per department an assessment will be made. The next step is to assess the organizational broad KDA's: software tools, people and management. When all the critical are assessed, the KDA's can be assessed. From there on the whole organization could be assessed. For bank A and B the assessments are presented in the figures 22, 23, 24, 25, 26 and 27. To avoid confusions and wrong utilization of dashboard, necessary information should be visualize within the boundaries of a screen (Few, 2006). It is important to provide sufficient contextual data and correct use of colors, pictograms and charts.

The dashboards below reflects five elements, these are:

A) Radar chart per department (for both bank a and b)
B) Radar chart for the whole bank
C) Bar chart per department
D) Relative benchmark radar chart per department for bank a and b
E) Relative benchmark radar chart for the whole bank

A. Radar chart per department (for both bank A and B)

In the radar charts the maturity levels are presented. The maturity level scores are based on the interview results from the case studies in Chapter 6. The measurement constructs on a 1-to-5 scale, form a low to a high maturity. Four radar charts are presented per department for bank a and bank b. The maturity level scores are shown per key domain area. As mentioned before, the key domain areas: software tools, people and management are measurement for the whole organization.

B. Radar chart for the whole bank

In the assessment dashboard for bank a and bank b, a radar chart with the maturity level for the whole bank is shown. The total maturity level score are based on the interview results from the previous Chapter. The total score is calculated for the KDA's. This is done by calculating the average score. Using average scores in the maturity assessment is also done by Luftman (2007) and Solar et al (2013). This is done because weights could be too subjective (Luftman, 2007). Based on this the maturity level for both bank a and b are determined.

C. Bar chart per department

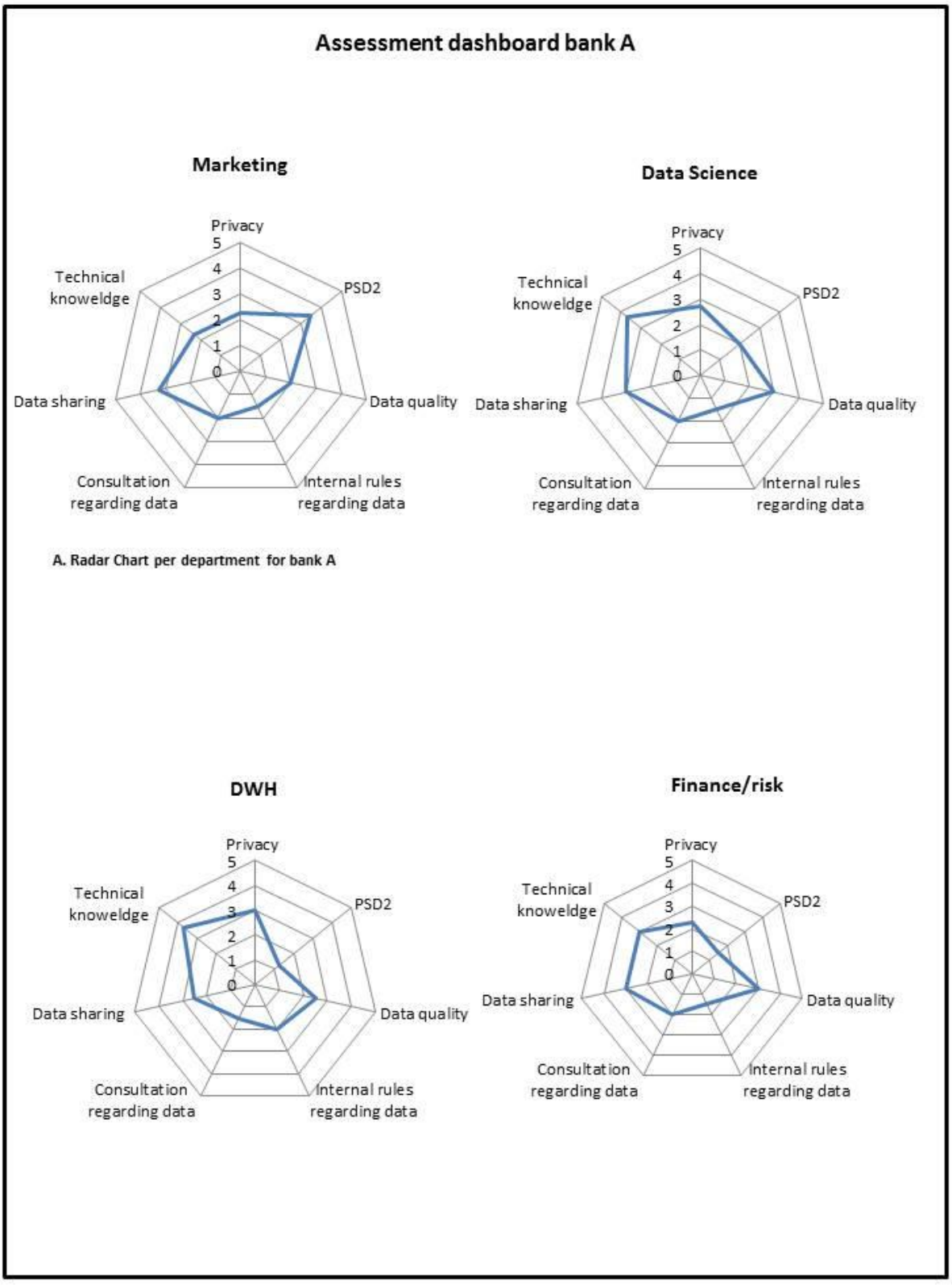
The bar charts represent the differences in maturity level scores per department for the key domain areas. It visualizes the maturity level scores. Given an overview of the differences per department for bank A and bank B.

D. Relative benchmark radar chart per department

The dashboard in figure 26 show the relative benchmarking outcomes, where the maturity of bank A is shown in blue and bank B is shown in red. This is done per department on a maturity level scale from 0-to-5.

E. for the whole bank

Regarding the total maturity assessment scores, presented and visualized in figure 27, also a radar chart is shown. It shows the differences between the total scores of bank A and bank B.



A. Radar Chart per department for bank A

Figure 22: Dashboard assessment bank A (1)

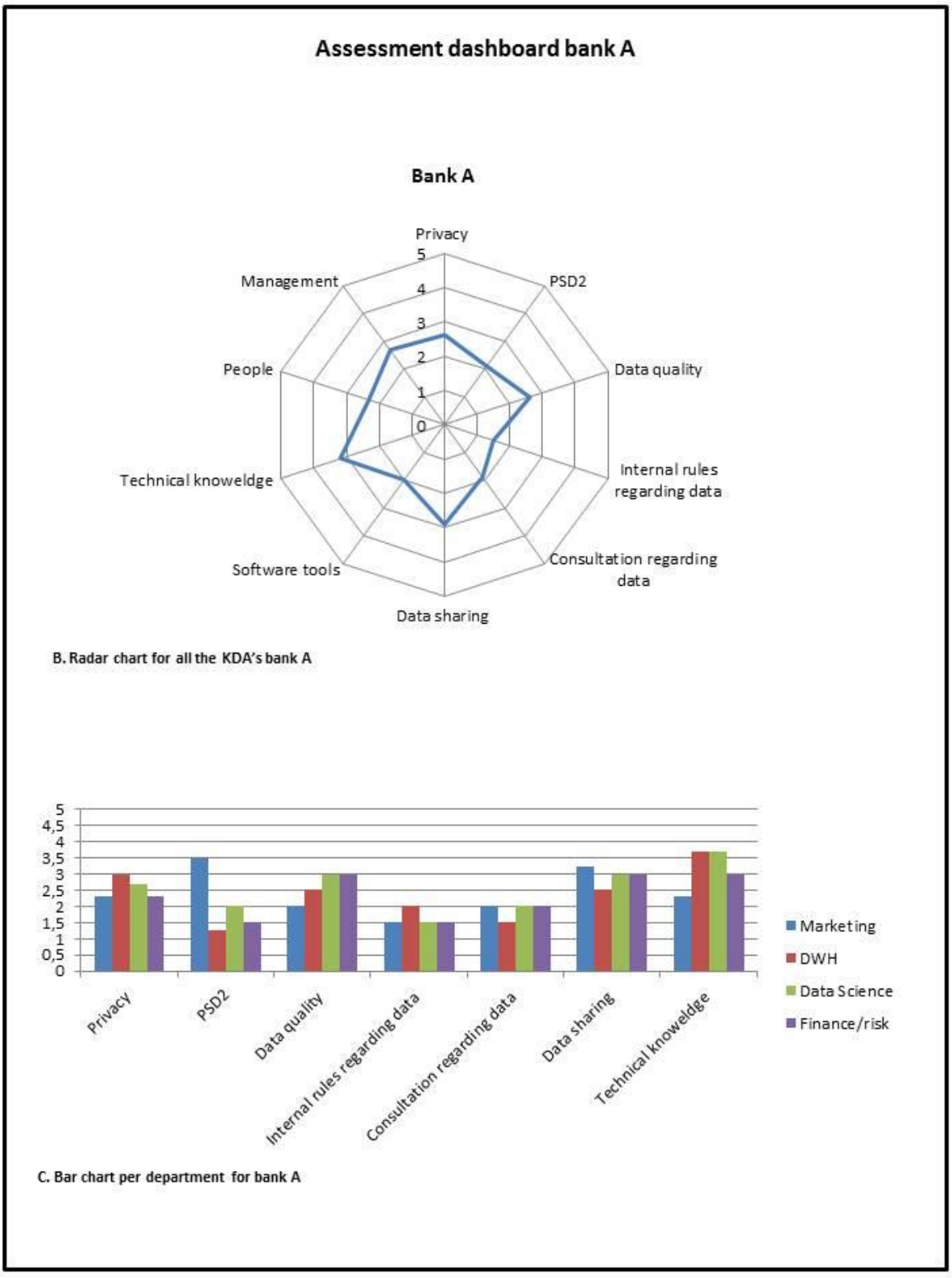


Figure 23: Dashboard assessment bank A (2)

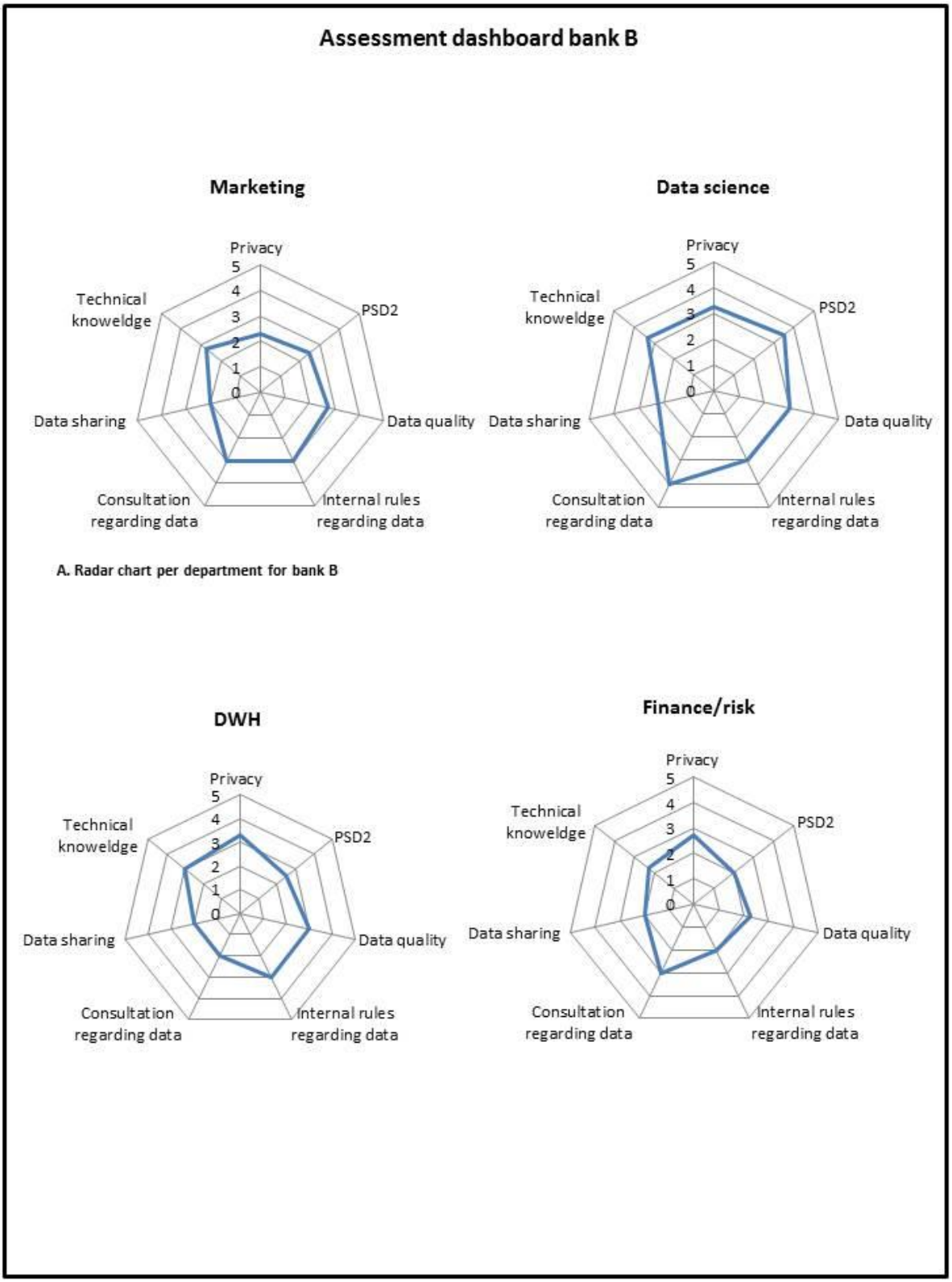


Figure 24: Dashboard assessment bank B (1)

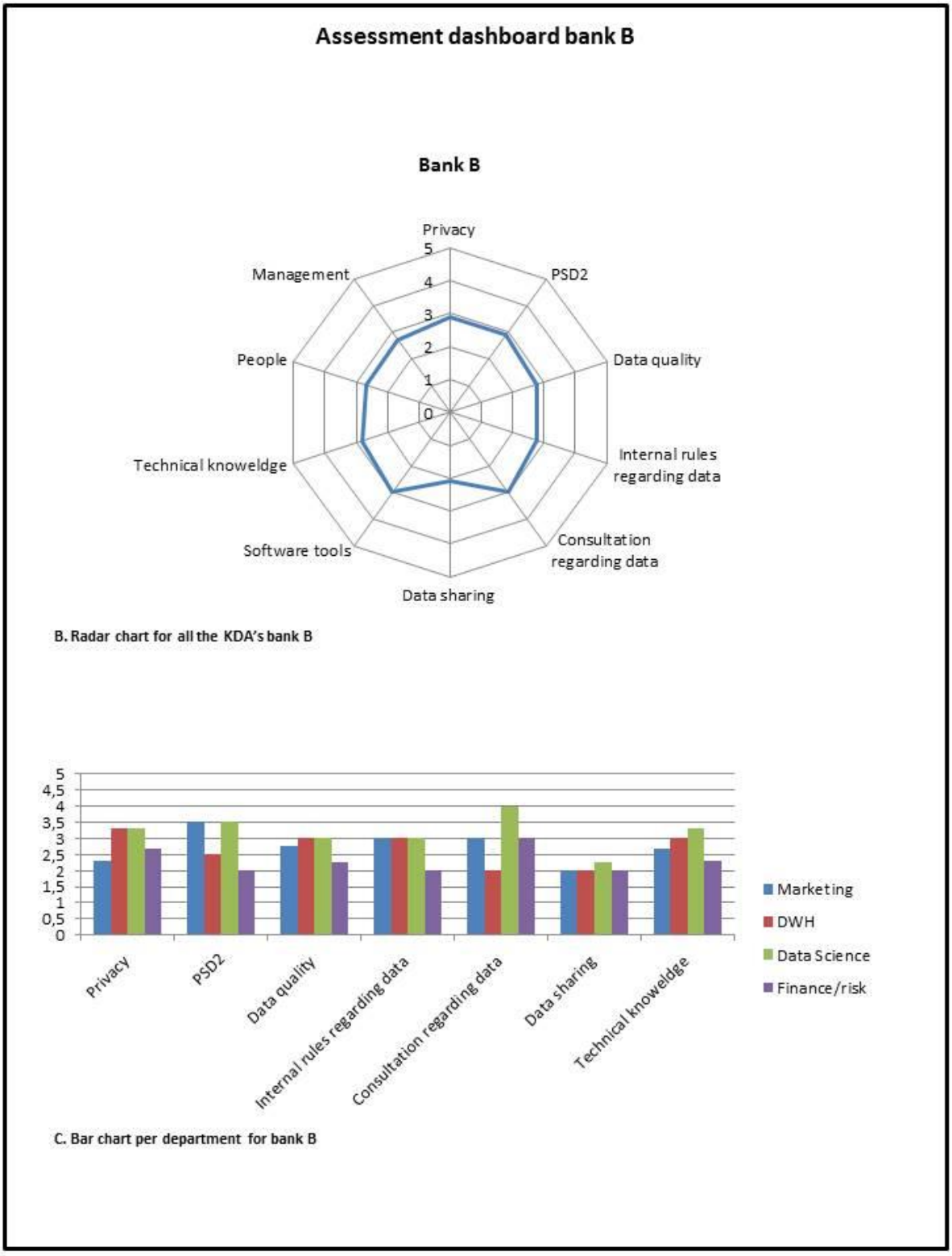


Figure 25: Dashboard assessment bank B (2)

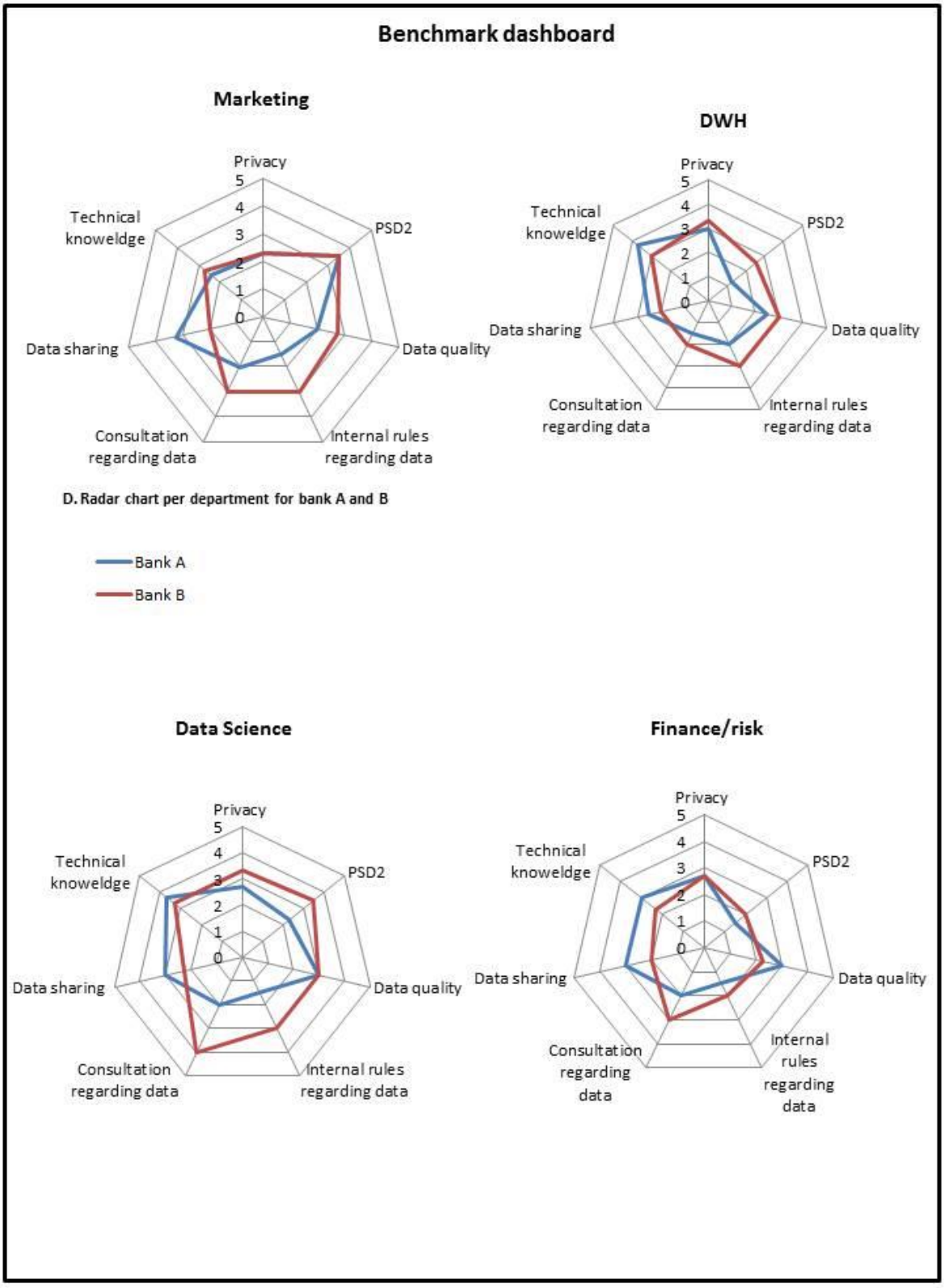


Figure 26: Dashboard Benchmark bank A and B (1)

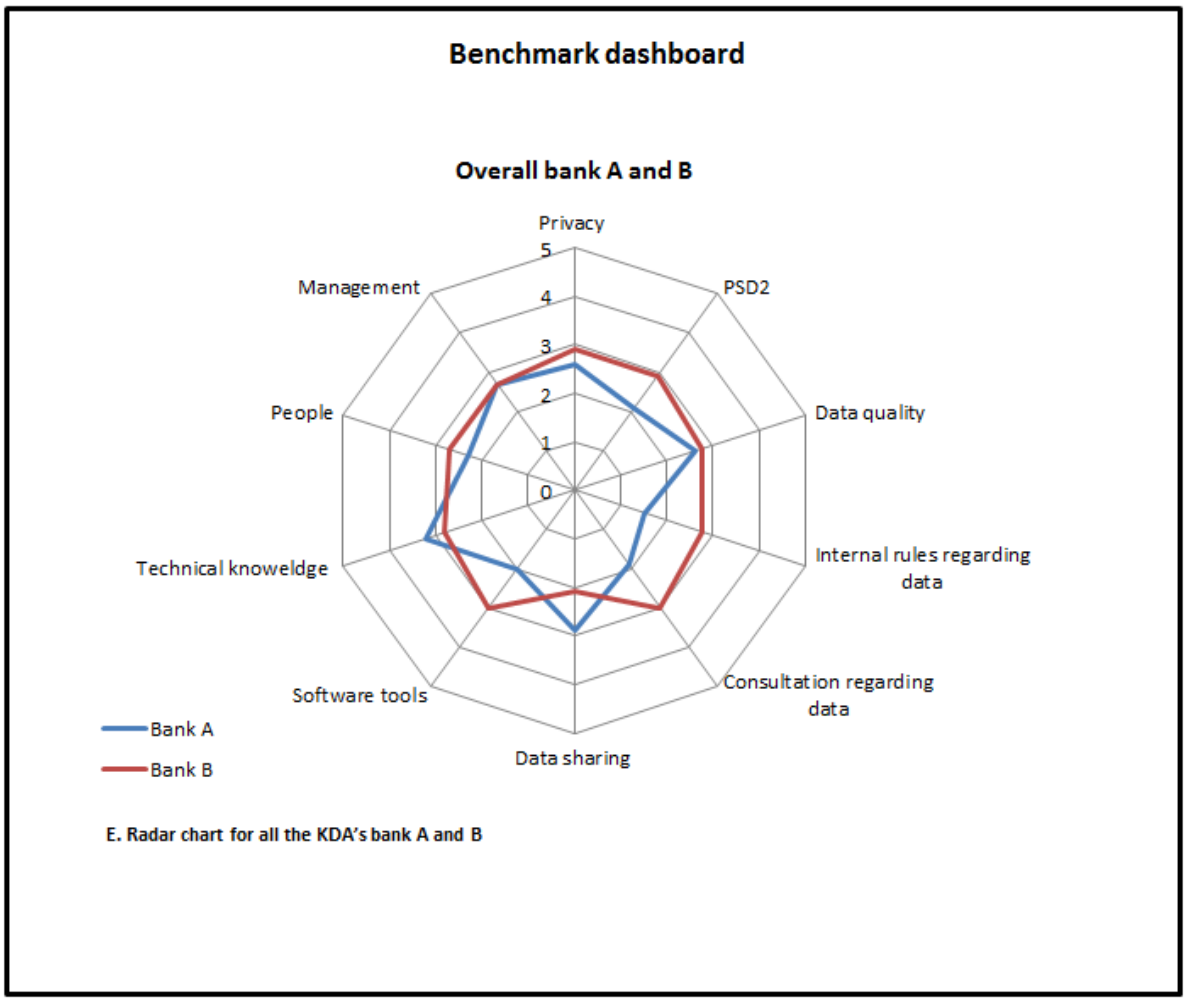


Figure 27: Dashboard Benchmark bank A and B (2)

7.5 Evaluation

The assessment and benchmark dashboard should be evaluated (Maheshwari and Janssen, 2013). Starting with the interpretation. The interpretation should be done by the SME finance banks (bank A and bank B) themselves. Due to a lack of time, it was not feasible to ask bank A and bank B on their opinion on the assessment results. The dashboards show a number of benefits. The maturity level assessment is made for four different departments within the bank. The main benefit is that the framework contains multiple measurement levels, containing organizational, technical, regulation and governance indicators. The use of multiple measurement levels, different domains and different departments, enhances the benchmark ability and it allows for customization (Maheshwari and Janssen, 2013). Organizations are heterogeneous by nature, because they operate within varying context and they have different goals (Maheshwari and Janssen, 2013). The dashboards allow also

for *internal* benchmarking. Because of the assessment per department, the differences in maturity level scores per key domain area could be presented in the bar chart. Benchmarking on a single score of an organization has often limited use, whereas benchmarking on similar aspects can provide much more insights (Maheshwari and Janssen, 2013). Benchmarking has the purpose to improve. Therefore assessing the maturity level scores of different departments on different the different key domain areas within the bank allows for understanding which areas are doing well and which not. Benchmarking between organization should not only facilitate comparison, but should also enable organizations to learn from each other (Maheshwari and Janssen, 2013). The dashboards in figure 26 and 27, the benchmark dashboards, show the differences in the maturity level scores per bank. In figure 26 the differences per department per bank are shown. In figure 27 the dashboard presents the total differences, based on the averages of the maturity level scores. In the radar chart per key domain area the maturity level is shown. The difference between the red and blue line shows the comparison.

Measurement and benchmarking is only a single activity that is part of the organization's continuous improvement activity (Maheshwari and Janssen, 2013). This means that assessing the maturity of bank A and bank B is an activity that is done once, but it should be done annually. This is to check the improvement. Of course the assessment contains limitations, these are described and discussed in section 5.4.

7.6 Expert testing

In addition to the evaluation of the model, it is useful to validate the model by using expert knowledge (Maheshwari and Janssen, 2013). Three experts were interviewed to test the assessment model. It was not able to ask the professionals from bank A and bank B to reflect and interpret the dashboards, therefore experts from another financial institutions were asked to reflect the dashboards. This section discusses the expert testing interviews. The experts were selected based on their experience in the financial sector and their position within the organizations (principals, partners and executive directors). A summary of the interviews are described below. Due to the sensitivity of the information, the experts are not called by name.

Interview with expert 1: [redacted]

The expert has 14 years' experience in the financial sector. His field of expertise is financial data analytics, data management and IT-audit. According to him the framework should contain three

important dimensions: organization, processes and technology. It is very important that assumptions of the framework and the assessment are made clear. [redacted]. He suggested to use dashboards instead of numbers. Later on these numbers were moved to the appendix. Also, he suggested to underpin the key domain areas and the critical variables, because they are the foundations of the maturity assessment framework. [redacted]

Interview expert 2: [redacted]

The expert has 22 years of experience in the financial sector. His field of expertise is IT-outsourcing, IT-audit, financial data security, data analytics and financial advisory. [redacted], and examine how they dealt with objectivizing the maturity level scores. [redacted]
Another suggestion was to use different colors and charts. In a later stadium, the assessment with numbers moved to the appendix and dashboards are used to visualize the results.

Interview expert 3: [redacted]

This expert has 13 years of experience in the financial sector. His mean field of expertise is data analytics, data management and IT-audit. For assessing the maturity of organizations, it is important to define the variables and think about best practices. The maturity assessment makes sense, but for further development it is required to measure the best practices. [redacted]

7.7 Conclusion

This Chapter presented and visualized the maturity level assessment results for both bank A and bank B. The aim of this Chapter was to assess the maturity levels of the different departments of bank A and bank B. The assessment is successfully presented and visualized by using dashboards. Another important element of this Chapter was to test the framework, this is done successfully. It was able to present and visualize the assessment results of bank A and bank B. The maturity level of the key domain areas were successfully assessed and presented. It is difficult to determine the

maturity levels, because there are no measurement mechanisms. Therefore in accordance with the design principles from Chapter 3, the maturity levels are defined in Appendix D. The maturity level score is given based on the interview results from Chapter 6. The actual assessment is presented in the Appendices J and K. Using numbers to show the maturity assessment scores does not provide enough insides and it is easy to misinterpreted the results. Numbers also allow for different interpretations. Visualizations support the interpretation. Dashboards are a useful way to present the measurement and benchmark results. For bank A and bank B dashboards are designed. For every participated department, selected in Chapter 6, a radar chart is made for the maturity level scores of the key domain areas from the conceptual maturity assessment framework in Chapter 5. A bar chart is included in the dashboards for internal benchmarking, for every department the differences in the maturity level score on the key domain areas are shown. A benchmark between bank A and bank B is also presented, for every department and for the whole organization. Hereby the difference in the maturity level scores are shown. The dashboards provide benefits, like the visualization of the maturity level scores of different departments on different domains for two banks, because the maturity levels are measurement on a multi-level way. This provides more insights on the benchmark. The limitations of the framework are described in section 5.4 and the benchmark process should be seen as a continuous process, instead of an activity that is done at once. The interpretation of the assessment results should be done by the professionals of bank A and bank B. Due to a lack of time, this was not feasible to ask them on time. Expert validation was used to give a short reflection on the maturity assessment dashboards and suggestions for improvements were given. The next step and last step in the research is to evaluate the maturity assessment and the research results, what will be done in the next Chapter.

8. Reflection

8.1 Introduction

In the previous Chapters the research results have been presented. The first step was to conduct a literature review to explore the research field, which is done Chapter 2. The relationship between SMEs and their financers has changed. SME finance banks became more customer oriented in their relationship with the SME and provide traditional financial services with an advisory component to the SME client. Customer analytics could be used to enhance the relationship with the banks' customer, by gathering meaningful insights about the customer and providing them with useful information on their loans, mortgages, insurance and pensions for example. Measuring maturity is difficult due to different interaction within organizations, due to co-interactions between actors, the multi-value aspect of maturity and dynamics. In Chapter 3, different maturity model theories were reviewed and the most suitable theory that is able to assess both technical and organizational components, the CMMI theory, has been selected to help assessing maturity. The third step was to take interviews with experts and review the outcomes of the interviews with a literature research to set up the requirements for the framework, what is done in Chapter 4. A conceptual framework was designed in Chapter 5. In Chapter 5 all the key findings were brought together to a maturity assessment framework for customer analytics implementation. This is a multi-level framework, see figure 17. In Chapter 6 the case studies were introduced to test the framework at bank A and B and in Chapter 7 the assessment results are visualized and presented. The last step in research methodology is to evaluate and reflect the research results. In accordance with Sage and Armstrong (2000), this Chapter belongs to the evaluation phase, which is the last phase of the research methodology. In this section the research will be reflected.

The aim of this Chapter is to evaluate all the research results, in order to examine if the research satisfies the expectations from the introduction. In accordance with the research methodology, the designed operational product has to be evaluated (Sage and Armstrong, 2000). The objective of this research is to design a maturity assessment framework for customer analytics implementation for the SMEs finance banks in the Netherlands, what needs to be evaluated. Maturity models are, as described in section 3.3, subject to criticism. Design principles from Röglinger et al (2012) and Röglinger and Pöppelbuss (2011) were consulted to mitigate the criticism, what will be reflected. How the framework could be used and what the limitations are of the framework will be reflected in this Chapter. This will be done by reflection on several parts of this research. In section 8.2 the research results will be reflected. An overview of the framework will be given and the usage of the framework will be evaluated. As stated in the introduction there is a lack

of adoption in the Netherlands what could be explained by an immaturity of the requirements. This will be reviewed in 8.2 too. In section 8.3 the quality of the research results will be discussed. In this section the quality of the contents will be reflected and the case studies will be reflected too. Also the difficulties around measuring maturity, what is described in section 2.4 will be evaluated. In section 8.4 the research process will be reflected. This consists of the research methodology, the research approach and the literature review process. In the last section a conclusion will be given.

8.2 Reflection on the research results

The purpose of this research is to design a maturity assessment framework for customer analytics implementation at SME finance banks. This framework assesses the maturity level of certain topics within the SME finance bank and provides insights in the necessary context that needs to be created when customer analytics will be implemented at the SMEs finance bank. This is done by an extensive literature research and interviews with experts to define the important requirements for the framework. The insights of the two case studies were also used to design the framework. According to the reviewed theories in Chapter 3, the CMMI theory is the most suitable theory to design a maturity assessment framework for the SMEs finance banks in the Netherlands, which will be reflected upon. Due to the fact that the CMMI maturity model is able to assess both organizational and technical aspects of an organization. The designed maturity assessment framework has a hierarchical structure. According to CMMI theory the framework is built up of different layers. After the framework is reflected and evaluated the usage of the maturity assessment framework will be reviewed.

8.2.1 Overview of the framework

In Chapter 3 different theories are reviewed. The decision was made to use the Capability Maturity Model Integration (CMMI) approach for designing the maturity assessment framework. Aiming at measuring the maturity of the SME finance bank on both organizational and technical perspectives, the CMMI theory is the most suitable theory, supported by the literature see table 3. All the maturity model theories have the purpose to assess the maturity of the business and management processes and IT-development. Measuring maturity has been subjected to criticism, as described in section 3.3. Maturity models simply the reality, they neglect the existence of multiple and possible equational maturation paths and due to their similarity, they are classified as dissatisfactory documentation (de Bruijn et al, 2005; McCromack et al, 2009; Röglinger et al, 2012; Iversen et al, 1999; Becker et al,

2009 and Metler and Rhoner, 2009). To mitigate the criticism three design principles from Röglinger et al (2012) and Röglinger and Pöppelbos (2011) were consulted to design the maturity assessment framework. The design principles are (1) maturity models have to provide basic information about the application of the domain, (2) that the central constructs related to maturity and maturation need to be defined, this includes a clear description of every maturity level, and (3) that maturity models are required to have verifiable assessment criteria for each stage and level, using multiple layers. The first design principle indicates that the framework should provide basic information on the application of the domain. Information on the application of the domain, which is customer analytics, is given in the framework description. Customer analytics implementation for the SME finance banks in the Netherlands is the topic of the maturity assessment framework. In Chapter 5 the basic information is given. The second design principle mentions that all the maturity levels should be clearly defined and the definition of maturity should also be clear. Definitions of the maturity levels are given in Appendix D. In the maturity level description list an emerging pattern could be seen. This means that the level 1 indicated a low maturity and level 5 a high maturity. The last design principle concerns the multi-level character of the maturity model. The CMMI model is built up of several levels. Starting from the leverage domains. These leverage domains consist of key domain areas and these key domain areas should consist of critical variables. Critical variables should be clearly defined and measurable, according to design principle 2. For example, the leverage domains are regulation, organization, data governance and technology. The leverage domain regulation consists of two key domain areas, PSD2 and privacy. Both the key domain areas have critical variables which are defined in Chapter 5 and are detailed described in Appendix D. The framework consists of several levels, however the framework requires to have verifiable assessment criteria. Not all the criteria were verifiable. This will be captured in section 8.3.1.

In Chapter 2 the difficulties for measuring maturity are described. Due to dynamics, co-interaction and the multi-value aspect of performance measurement, it could be problematic to measure maturity. The CMMI framework is built up of different domains, the leverage domains. For this research these are regulation, organization, technology and data governance. This multi-value aspect of maturity is captured in the CMMI theory. However, dynamics and co-interaction are not captured by the CMMI theory. To deal with these issues the case studies are reflected on, see section 8.3.2.

Some key domain areas like regulation should be rethought after a couple of years. Relevant regulations change over time. Technical key domain areas like data sharing and technical knowledge should also be rethought. As mentioned in the introduction, IT is developing. In a couple of years, IT related elements of banks could change, aspects like data warehousing but also knowledge.

Therefore the framework should be considered as both dynamic and static. Some elements will change over time, while some are 'static'. The quality of the life cycle of the framework is enhanced through a regular use of the framework on a yearly basis, which means applying the maturity assessment framework and reviewing all the key domain areas by the professionals of the SME finance banks.

8.2.2 The usage of the maturity assessment framework

The next step in reflecting framework is to evaluate the usage of the framework. This will be done by reviewing two aspect of the framework. First, how the framework could be used. Second, for whom the framework is designed, what is described in section 5.5.

First, since the objective is to design a maturity assessment framework for customer analytics implementation of the SMEs finance banks in the Netherlands, it is important the explore how the SMEs finance banks could use the framework. Critical variables are the indicators of the key domain areas. It is important to mention what the key domain areas mean in the framework. The critical variables determine what the key domain area means. For example, the key domain area PSD2 has two critical variables: *Knowledge on the contents of the PSD2* and *Action plan to deal with the PSD2 directive.* This means that a high maturity for the KDA PSD2, means that the SME finance bank score a high maturity level regarding the knowledge and regarding an action plan to deal with the PSD2 directive. In the table below an overview is given of the key domain areas and how they are measured.

Table 14: The key domain areas and how they are measured

Key domain area	Indicators
Privacy	- Knowledge on the contents of the GDPR - Action plan - Professionals working on privacy related issues
PSD2	- Knowledge on the contents of the PSD2 - Action plan
People	- Awareness on customer analytics - Sharing the same opinions regarding customer analytics - Consistency between internal policy regarding the use of customer analytics
Management	- Monitoring and evaluation plan regarding the use of analytics on C-level - Action plan - Lower level management plans regarding the use of customer analytics
Data quality	- Knowledge on data quality - Arrangements within the department regarding data quality - Data quality structure* - Professionals monitoring data quality
Internal rules regarding data	- Rules regarding the definition of data - Compliancy with these rules
Consultation regarding data	- Consultation within the department on data quality - Consultation regarding the use of customer analytics
Data sharing	- Central distribution for data - Data sharing between departments - Access to data from a warehouse - Possibilities to enrich the data
Software tools	- Alignment in the software environment
Technical knoweldge	- There is an analytics group with access to all the data - People know how to use SQL - Technical conflicts between the business and IT

* The data quality structure is not easy to measure, several interviews were taken to verify and investigate the data quality structure at both bank A and bank B, see Appendix G and I for the examples.

The table shows how the key domain areas are defined and measured. This means that a SMEs finance bank in the Netherlands could use this maturity assessment framework for assessing all the key domain areas. Important limitations are that the leverage current regulations are exempted of the framework. Also privacy and PSD2 do not concern compliance regarding these regulations. The recruiting of new knowledge and the current amount of professionals working at the SME finance

bank are not included in the framework. The framework itself also excludes the interactions between departments. Therefor in accordance with the literature review in Chapter 2 and the assessment results in Chapter 6 and 7, the decision was made to measure maturity at different departments at a SME finance bank. The measurement includes the different departments. Therefore different departments (within the SMEs finance bank) should be measured, to gather a total view of the bank and explore the interactions. Regarding the data quality, no quantitative elements are taken into account. The numbers of data quality checks or the number of data quality errors are excluded from the framework, this is also very difficult to measure. Costs are also excluded from the framework, therefore this framework provides insights on the organizational and technical elements for customer analytics implementation, not on the costs. This means that even if a SME finance bank is fully mature for customer analytics implementation, it could be still too expensive. In order words the framework could help SME finance banks with adopting customer analytics, but the costs of customer analytics are excluded from the framework. Due to a lack of time, it was not able to ask the professionals from bank A and B to review the assessment dashboards. The interpretation of the dashboards is important for the SME finance bank to keep their maturity high or improve certain processes.

Chapter 7 shows the assessment testing results. Dashboards are used to visualize the assessment results. In this research a benchmark is presented between bank A and bank B. The desired maturity of bank A and bank B, the best practices are not taken into account. Due to a lack of time, the option to ask the professionals from bank A and bank B what the desired maturity is, was not possible.

Second, as mentioned before, the technostructure of the SME finance banks are the main users of the framework. Data is provided from the IT departments (DWH), support staff. Bothe departments (technostructure and support staff) have different preferences regarding the 'pulling forces' from Mintzberg (1993). In section 5.5 it is proposed to use the framework in collaboration between the technostructure and the support staff. Standardizing this process of use would be preferred by the technostructure. The indicators from the table above do not only influence the technostructure and the support staff. Privacy, for example, effects the whole organization. The should be taken into account that the framework will be mainly used by the technostructure, but the indicators are not specifically chosen for the technostructure.

The usage of the framework is described above. It is very important to realize that the key domain areas are measured on a specific way and a lot of elements are excluded from the framework. Due to a lack of time and a demarcated scope, some specific decisions have been made.

8.3 Quality of the research results

In this section the quality of the research results will be evaluated. In the previous section the maturity assessment framework as an end-product is reflected on. In this section the quality of the framework requirements and the case studies will be evaluated. The quality of the maturity measurement will also be evaluated. The framework requirements and the case studies will be reviewed based on their internal validation, the reliability and the generalizability. Internal validity means the extent to which the conclusions of a research are warranted (Alexander et al, 2015). Reliability describes the ability for other researchers to repeat the research and gather similar results (Yin, 2009). Generalizability means to what extent the conclusions of the research can be generalized to other situations (Tipton et al, 2016).

8.3.1 Framework requirements

The requirements of the framework have been identified in Chapter 4. This is done by combining interviews with a literature research. Reliability means that another researcher would define the same requirements if he decides to design a maturity assessment framework for the SMEs finance banks in the Netherlands. The reliability of the requirements of the framework will be evaluated in this section. Reliability of qualitative research is inherently limited as compared to quantitative research. Important elements were distinguished from less important elements by having the interviewees talking freely in an open interview. For the requirements, the interviews had the focus on qualitative research, supported by scientific literature. Based on interviews with experts the requirements were defined, this is done with a semi-scientific approach. The experts were asked on what the institutional and technical requirements are for deploying customer analytics. Reflecting the interview results with the literature enhances the internal validation of the interview results, because the requirements of the framework are based on impressions from experts and on literature. The decision was also made to look only at the requirements that were named by at least eight of the ten experts. All the requirements that were named less than six times, were regarded as less important, but not ignored. For the generalizability of the interview results regarding the framework requirements, the main limitation is that only ten interviews were conducted mainly with experts from the IT financial consulting sector. One expert is interviewed from the financial sector. This means that the consultants (with different management functions) might have specific influences. For enhancing the generalizability of the framework requirements, more interviews has to be conducted at different institutions, like different IT-consulting firms and more financial institutions.

8.3.2 Case studies

The aim of conducting the case studies at bank A and bank B was to help answer the main research question and to test the framework. Measuring maturity at organizations is difficult and has been reviewed in Chapter 2. The case studies have been used to measure maturity at the SMEs finance banks. The three justifications of de Bruijn (2003) for the difficulties of measuring performance are co-interaction, multi-value aspect and dynamics. Designing the case studies to interview experts from several departments has the purpose to deal with the co-interactions and the dynamics within an organization, also different domains (values) are measured.

The case studies had a qualitative research focus. As already mentioned, the reliability of the of qualitative research is inherently limited as compared to quantitative research. The approach for interviewing the experts at bank A and bank B is the so called natural occurring conversation method. Interviewing protocols, like the natural occurring conversation method and using a 'checklist', are used to enhance to reliability of the research. The critical variables were defined before the case studies were conducted, therefore a checklist, related to the critical variables, was made to guide the experts during the interview. This can be found in Appendix D and E. The internal validity of the case studies knows some limitations. First, only one expert was interviewed per department, due to a lack of time. To get a complete view, at least two experts should be interviewed. Also the position of the experts plays a role. It differs when an interview is taken with experts in different positions (managers, directors etc.). The last main limitation is that, due to lack of time, only four departments were interviewed. A SMEs finance bank consists of much more departments. For further research this should be taken into account. Enhancing internal validity is done by reflecting the case studies results, the interview results, with the interviewed experts themselves. This is done on the phone. Regarding the generalizability of the case studies, the scope of this research is the SME finance bank in the Netherlands. According to this demarcation four SMEs finance banks satisfy this condition, of being a SME finance banks. To increase the generalizability of the maturity assessment framework the other two SME finance banks in the Netherland should be included in the case studies. Due to a lack of time, it was not possible to conduct more than two case studies. However, this means that two out of four SME finance banks in the Netherlands are interviewed, which is 50 %.

8.4 Reflection on research process

In this section the research process will be reflected on. Specific choices were made during the research process and they will be reflected in this section. Chronologically the research methodology, the research approach and the literature review will be reflected.

8.4.1 Research methodology

The main research methodology that is used in this research is based on the Systems Engineering methodology of Sage and Armstrong (2000). The primary goal of systems engineering is:

The creation of a set of high-quality and trustworthy operational products that will enable the accomplishment of desired tasks that fulfill identified needs of a client group, or user group, or enterprise.

The creation of an operational product is the maturity assessment framework. The product should enable the accomplishment of the desired task. The desired task is the implementation of customer analytics. The desired task fulfills the needs of a client group, user group or enterprise. The users of the operational product are the SMEs finance banks in the Netherlands. The goal of the systems engineering methodology matches with the goal of objective this research:

To design a maturity assessment framework for customer analytics implementation for SMEs finance banks in the Netherlands

An important element of this methodology is that the creation of the operational product, in this case the framework, is done iteratively. The methodology defines three phases: definition, design and development and evaluation. The three phases were important for this research because they brought structure to the research. In the definition phase, information on the research field and requirements for the framework should be gathered and the framework should be conceptualized. In this stage a literature review was conducted to reflect the difficulties of measuring maturity and the complexities of measuring maturity were identified. Also the current relationship between SMEs and their financers was reviewed, customer analytics was explored and the Mintzberg (1993) was used to reflect he complexities in organizations. The literature review served two goals: firstly, it explored the research field and secondly, it provided input for the later stages. The requirements were defined for the framework and different maturity model theories were reviewed. The conceptualization is also part of the definition phase. The next phase in the methodology is to test the framework, the design and development phase. The research is of an explorative character. The research field has not been explored before, therefore using cases studies is the most suitable way to test the framework (Baxter, 2007) and its provide more detail on the design of the framework. This is done by conducting

the case studies at two SMEs finance banks and the application of the maturity assessment framework is also done to test the framework. In the last phase the framework should be evaluated, which is done in the previous sections.

Concluding, the research methodology of Sage and Armstrong (2000), provided structure for this research. Iteratively the research phases are followed. The research is divided in these phases. In this research the focus was on first two phases, the definition and the design phases.

8.4.2 Research approach

Given the fact that this research field has not been explored before, the decision was made to use an explorative character for this research. Therefore at several moments in the research interviews were conducted. Performing qualitative research, such as using interviews, always contains limitations. However, it also brings valuable insights on the field. The limitations of the interviews and the case studies are described above, but the interviews provided insights on the research field. The maturity assessment framework is of a practical use for the SMEs finance banks. Combining literature with explorative research is the foundation for the maturity assessment framework.

8.4.3 Literature

Literature is used in this research for several purposes. In Chapter 2 a literature review was conducted to explore the research field. Difficulties around measuring maturity and the usage of the Mitzberg (1993) model to explain the interactions and the dynamics between departments were reviewed and this provided input for conducting the case studies on a different way. The initial idea was to conduct one single interview, but the Mintzberg (1993) model provided input for conducting the case studies at different departments, to get a more complete view of the SMEs finance bank. Also the Mintzberg (1993) model helped to examine which departments will eventually use the framework and how do they, according to the theory, act. For the requirements of the framework literature is also used. This provided more detail to the requirements. Two scientific books on data-warehousing and big data from Han et al (2011) and Muzamder (2016) were used as guidelines to explore the concepts of data warehousing. Literature is also used to review different maturity models, this was very important in the research.

8.5 Conclusion

The aim of this Chapter is to reflect on the research results. In accordance with the research methodology, the designed framework has to be evaluated. Reflecting the framework and the research results is successfully done and it closes the design approach from Sage and Armstrong

(2000). Different criticisms regarding maturity models, like that they simplify the reality and they neglect the existence of multiple and possible equational maturation paths, should be mitigated by using design principles. The framework is designed according the three design principles from Chapter 3. Key domain areas like new regulations, technical knowledge and data warehouse, should rethought over time. Due to the IT development and regulatory changes, this key domain areas will change over time.

The maturity assessment framework provides basic information on customer analytics implementation by SME finance banks. The different maturity levels are clearly defined and described the multiple layers. The usages of the framework is also reviewed, the framework has limitations. Some elements are excluded from the framework, these are: the interactions between departments, the current regulations, compliancy with the new regulations, current amount of professionals working on data related issues, recruiting and no quantitative elements are included in the framework. Cost is excluded from the framework. Meaning that being mature according to the framework, does not necessary imply that a SME finance bank is able to adopt customer analytics, due to high costs. Therefore, the framework could help organizations in adopting customer analytics. However, costs are excluded from the framework, which means that the maturity assessment framework is constraint by the costs.

The interpretation of the framework and assessment dashboard by the professionals of bank A and bank B is also excluded from this research, due to a lack of time. Assessment dashboards are used to visualize the maturity measurement and benchmark result. The assessment dashboards do not include the desired maturity of bank A and bank B. The key domain areas should be interpreted, based on how they are defined by the critical variables. Regarding the quality, the framework requirements and the case studies are reflected on the reliability, the internal validation and the generalizability. The framework requirements are defined based on expert interviews and scientific literature. Reliability of qualitative research is inherently limited as compared to quantitative research, which is also applicable on the case studies. Regarding the internal validity, the interview results are reflected with literature, which enhances the internal validity. For the generalizability the main limitation is that more experts has to be interviewed, preferably from different sectors. The aim of conducting the case studies was to test the framework. The difficulties around measuring maturity, co-interaction, multi-value and dynamics, are captured in the case study approach. Different departments are interviewed to gather a complete view of the SME finance bank. Although some limitations are identified, caused by, mainly, a lack of time. More experts should be interviewed for every department, only one expert per department was interviewed. Also only 4 departments were interviewed, see Chapter 6 and 7. A SMEs finance bank consists of more

departments, in this research only four departments were interviewed. The research methodology provided a structured approach and guidelines for this research. Iteratively the design processes of Sage and Armstrong (2000) was followed.

9. Conclusion

In the previous Chapters the research results have been presented and reflected. All the elements of this research are brought together in this Chapter. This will be done by drawing the conclusions of the research in section 9.1. This section aims to describe the insights and knowledge that is gained in the whole research process. The research questions will be answered too, step by step. By answering the sub questions the main research questions will be answered. A synthesis will be given too. In the last section a recommendation for further research is given.

9.1 Conclusions of the research

The financial sector is important for the Dutch economy. It serves several tasks, like transferring money from the central bank into the economy and it operates as a cash and non-cash payment system for the economy. Another important function of banks is financing the economy, from individuals to SMEs. Dutch SMEs are of high importance to the society, since 99% of the Dutch firms are SMEs. SMEs are highly depended on loans provided from banks, because they don't have access to capital markets and they are not able to issue bonds or stocks. This research focuses on the Dutch banks who finance the SMEs in the Netherlands. Since the last years SMEs finance banks have had access to (stored) customer data, caused by recent IT-developments. These IT-developments are for example big data storage and big data analytics. Performing analytics on customer data provides the SMEs finance bank the opportunity to enhance their businesses. This is done by integrating predictive data analytics with automatic decision making, called customer analytics. The lack of adoption regarding the implementation of customer analytics by SME finance banks, may be explained by a low maturity level of the Dutch SME finance banks. See figure 28 for a schematic overview of the introduction's storyline.

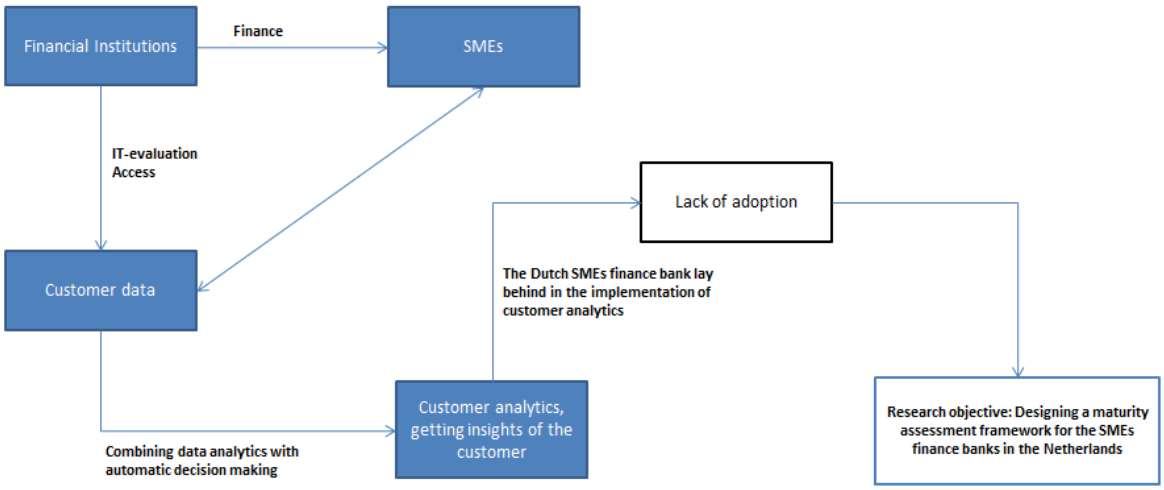


Figure 28: Schematic overview of the storyline of the introduction.

Typically maturity for organizations describes the state of being complete, perfect or ready to reach a desired state of maturity, from an initial to a target. Maturity models could be used to assess the current state of a certain development or improvement of an organization. Maturity models are typically used for IT processed of organizations. There are no existing maturity models that assess the maturity of customer analytics for the SMEs finance banks in the Netherlands. This all lead to the following main question of the research:

> ***How can a maturity assessment framework for customer analytics implementation be designed for the SMEs finance banks in the Netherlands?***

As presented in the introduction five sub questions are defined in order to help answering the main research question:

a) *What is the relation between a modern Dutch SME finance bank and the SME customer?*
b) *What is customer analytics and for what purpose could customer analytics be used at a SME finance bank?*
c) *Why is measuring maturity difficult for organizations?*
d) *What maturity level assessment theory is suitable to design a maturity assessment framework for customer analytics implementation for the SME finance banks in the Netherlands*
e) *What are the requirements for deploying customer analytics by SME finance banks?*

To answer the main research question an extensive literature research has been performed, interviews were taken with experts and case studies were conducted at two SMEs finance banks in

the Netherlands. An assessment has been made and dashboards were presented in Chapter 7, after the assessment a reflection on the research and the framework is made. In figure 29 a schematic overview is given of the storyline of the research. For answering the main research question, the sub questions will be answered and a synthesis will be given.

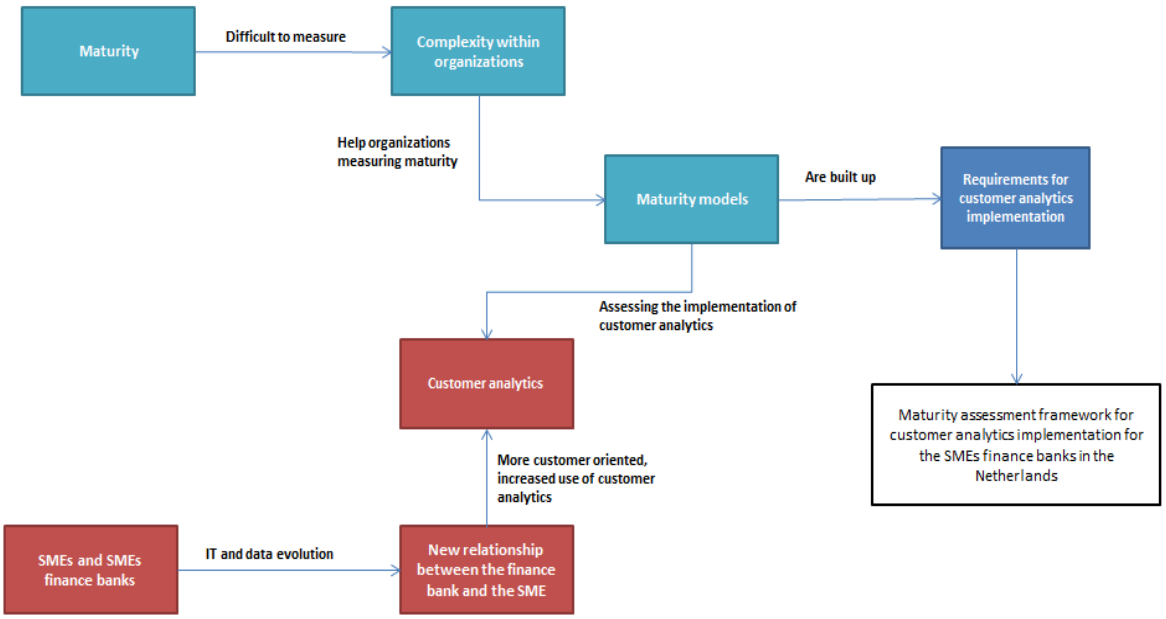


Figure 29: A schematic overview of the storyline of the research.

The relation between a modern Dutch SME finance bank and the SME customer

Many banks are not interested in servicing SMEs, because SMEs are opaque, which means that it is difficult to determine if a SME customer has the capacity to pay their loans, like mortgages, back to the bank or that the SME has the willingness to pay. Coping with the opaqueness of SMEs, banks use specific lending technologies, like financial statement lending, small business scoring, asset-based lending, factoring, fixed-asset lending and leasing. These technologies are based on hard information, which means impersonal recorded information. Relationship lending, a lending technology which is based on soft personal information, is the most obvious way for banks to deal with the opaqueness of the SMEs. It is the most important lending technology for SMEs and for many other private firms. Relationship lending reduces and mitigates opacity problems because it relies primarily on the soft information that is gathered by the banks through continuous, personalized, direct contacts with

SMEs. Another elements of financing the SMEs by the banks are the close bank-barrower relationship and informational monopoly. Informational monopoly is acquired over the SMEs by the bank, due to the observation up to date and quick information about the borrower by the bank and the borrower is not able to transfer the private information to another bank. The SME finance bank have a top-down relationship with the SMEs customer. From the literature, it became clear that new innovative technologies influence the relationship between the SME customer and the bank. Besides the traditional banking services such as loaning, deposits management and investments in capital markets, the banking industry is enlarging their domains under influence of the technological progress. Banks increased investments in customer retention, customer relationship management (CRM) and targeting. Public available annual reports of the top four Dutch (SMEs) finance banks were consulted. Based on their reports the conclusion is drawn that banks became more customer oriented by advising them on financial topics, like mortgages, loans, insurances and deposits. By enhancing their relationship with the customers, the Dutch SMEs finance banks are also a financial advisor for their customers. Therefore the conclusion is drawn that SME finance banks, influenced by technological developments, provide financial services with an advisory component.

Customer analytics and where it could be used for

Customer analytics could be used to enhance the relationship with the banks customer, by gathering meaningful insights about the customer and provide them with useful information. Analytics is the extensive use of data, statistical and quantitative analysis, exploratory and predictive models, and fact-based management to drive decisions and actions. Customer analytic is a specific type of analytics, it is a type of predictive analytics based on customer data that is used for customer based decisions making. The central definition that is used in this research for customer analytics is as follows:

Customer analytics is about collecting, cleansing, validating, integrating and analyzing raw data gathered from various touch points and analyzing them to draw meaningful insights about the organization's customers

The aim of customer analytics is to create a deeper understanding of customers and their behavior to maximize their lifetime value to the company. Using customer analytics from multiple customer touch points, the interaction the customer has with the bank could be optimized. This could be done by providing an unified view of the customer. For SME finance banks customer analytics could provide new insights on the SME customer. By using different analytics, like a client profile analysis,

dependency analysis and segmentation at an individual customer level (SME level), may identify needs and prospects. Making SMEs profiles provide the SME finance bank with opportunities like:

- *Identifying cross-selling opportunities for retail business and to SMEs*
- *Determining what products logically follow-on from an existing product set (types of loans)*
- *Estimating wallet size and profit potential per SME*
- *Determining sector and industry concentrations*
- *Segmenting customers for targeted value marketing*
- *Looking for upstream and downstream clients*

Difficulties for measuring maturity

Maturity of organizations means state of being complete, perfect or ready. To reach a desired state of maturity, an evolutionary transformation path from an initial to a target stage needs to be progressed. Determining the level of maturity is critical for business stability, improvement and sustainability of any organization. Measuring the performance of an organization is always problematic and difficult. The literature identifies several justifications for this difficulty. Only the direct outputs of a process are easy to measure for organization. Organizations do not have adequate data for measuring the maturity. Three justifications are defined for the difficulty of measuring maturity. The measurement of maturity is depended on too many factors, it is always a trade-off between competing values. Measuring maturity is a multi-value issue. Measuring single-valued maturity of an organization is not complete, because it is necessary that organizational maturity is formed in different dimensions, because maturity needs a complete movement and planning. Different values may underlie different definitions. The measurement covers only one value. Another justification is the co-interaction between actors within organizations. Performance of an organization is achieved through interaction with other people from other departments. The third justification follows logically from the multi-value and the co-interaction aspect of measuring maturity, dynamics. Measuring maturity is static, but maturity of organization itself is dynamic. Constantly new trade-offs are made between different values within the organization. The Mintzberg (1993) model of organizations reflect this complexity within organizations. Banks exist of different departments, due to the different departments with different functions, objectives and actors, complexity arises. Actors have different values and they are dynamic, there are certain interactions between the departments in the organization. When measuring the maturity of an organization, these elements should be taken into account.

Maturity model theories

Maturity models are normative reference models, aiming at assessing the current situation of an organizations in order evaluate the strengths and weaknesses and prioritizing and planning the future improvements. Maturity models typically include a sequence of levels that form an anticipated, desired or logical path from an initial state of maturity. Following these levels creates a logical path of from initial state to maturity, providing organizations a framework to assess the strengths and weaknesses on a certain topic. Basically maturity models consist of five levels:

- Level 1: *Initial* or *unable to demonstrate*
- Level 2: *Managed* or *limited ability to demonstrate*
- Level 3: *Established* or *able to demonstrate*
- Level 4: *Quantitatively managed* or *fully able to demonstrate*
- Level 5: *Optimized* or *recognized as a global role model*

Maturity models are mostly used for empirical studies, for developing of concepts and for assessing entities. Several maturity model theories exists. See the table below for an overview:

Table 15: An overview of the maturity model theories based on Chapter 3

Maturity assessment model	Scope	Author
Business Process Management Maturity Model (BPMMM)	Business and Management processes	Rosemann and de Bruijn (2005)
Process Performance Index (PPI)	Business and management processes	Rummler and Brache (1990)
Business Process Maturity Model (BPMM)	Business and management processes	Fischer (2005)
Process and Enterprise Maturity Model (PEMM)	Software development and legacy IT-systems	Hammer (2007)
Agile Maturity Model (AMM)	Enhancing the adaptability of agile software	Pathel and Ramachandran (2008)
Capability Maturity Model Integration (CMMI)	Organizational and technical aspects	CMMI (2006)

Most maturity assessment models assess the technical improvements and processes. For designing a maturity assessment framework that assesses customer analytics implementation for the SMEs finance banks, a maturity model theory should be used that is capable of assessing organizational

and technical aspects. As can be seen in the table, the only theory that fits this requirement is the Capability Maturity Model Integration (CMMI) theory. The capability maturity model is a process maturity framework, through which an organization can actively 'mature' towards a higher state of maturity. A higher state of maturity means being capable of adopting new improvements and processes. These models are widely used for assessing the maturity levels of organizational and technical processes. The CMMI theory exists of leverage domains generate, which create a hierarchical structure of levels. This means that the model is built up of different layers. The second layer is named Key Domain Areas (KDA). These areas should be measurable and controllable and are related to a third hierarchical level called the Critical Variables (CV). The key domain areas should be founded from the literature and the critical variables are used to measure or verify the KDAs. Each KDA can be measured by whether it meets its goals, which are determined by the critical variable that determines the capacity of the KDA.

The requirements for deploying customer analytics by SMEs finance banks in the Netherlands

For defining the requirements for customer analytics implementation by SMEs finance banks, a broad focus is chosen. Not focusing on either organizational or technical requirements, but on both. The identified requirements are: data integration, up to date data infrastructure, data quality, data governance, software and tools, data-warehouse (central distribution), privacy, PSD2, knowledge and management. See table 16 for an overview.

Table 16: Overview of the requirements based on Chapter 4

Requirements for conducting customer analytics for SMEs finance banks in the Netherlands
Data integration and internal data sharing between departments
Up to date infrastructure and legacy systems
Data quality
Data governance
Software and correct tools
Data-warehouse (central distribution)
Privacy
PSD2
Knowledge
Management

Data integration helps to reduce and avoid redundancies and inconsistencies in the resulting customer data set, which improves the accuracy and speed of the subsequent data analysis for SMEs finance banks. Data integration and governance are used by big organizations for integrating the data across multiple database systems.

The requirement of integrating data across multiple database systems addresses the need to import or export data to various data sources to the Data Warehouse Systems, which refers to a data repository that is maintained separately from an organization's operational databases. The DWH supports information processing by providing a platform of historic data for analytics . Data warehousing and data management can be seen as the foundation of analytics.

Data governance is of key importance for moving data from big data analytics technology to other technologies across various stages of data processing pipelines, using correct software tools. Another important element for conducting customer analytics is data quality. Data is called inconsistent if inconsistencies occur in naming conventions, data codes or formats for input fields. Inaccuracy in data should not occur, this means that data has incorrect attribute values. This could be caused by human or computer errors.

New regulations will have also a significant effect on conducting customer analytics by the financial institutions in the Netherlands. Privacy issues, supported by the General Data Protection Regulation, effect on the use of customer analytics. This new regulation defines what banks are allowed to do with their customer data. The Payment Service Directive 2 protects customers when they make payments. It also enhances customer data protection and privacy. Significant business skills, like management is very important if companies want to conduct analytics. Another element that is crucial for conducting analytics is knowledge within the organization. See the table below for on overview of the requirements.

Synthesis, how to design a maturity assessment framework

All the sub questions are answered. The requirements for the framework are defined and the maturity model theory is described. When bringing everything together and making the synthesis, a maturity assessment framework is proposed which is shown in Chapter 5 (see figure 20). The framework should be designed based on three design principles:

- Maturity models have to provide basic information about the application of the domain, the prerequisites or limitations of application and the supported purposes of use.

- The central constructs related to maturity and maturation need to be defined. This includes the definition of the underlying notion of maturity and the maturity levels, which means a clear description of every maturity level.
- Maturity models intended for a descriptive purpose of use are required to have verifiable assessment criteria for each stage and level.

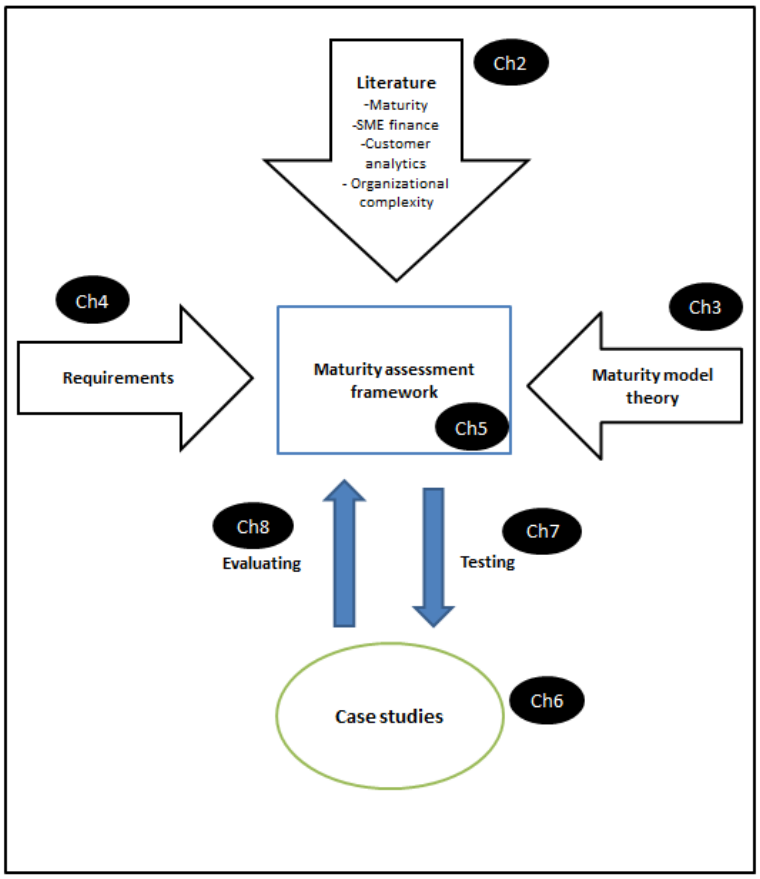


Figure 30: Overview of the maturity assessment framework design process

In the figure above an overview is given of the maturity assessment framework design process. It also shows what steps are taken to design the maturity assessment framework. On the question how can a maturity assessment framework be designed for customer analytics implementation for the SMEs finance banks in the Netherlands, the following steps are taken. In accordance with the research methodology steps, define, design and evaluate, the framework is designed. A literature review is conducted on the difficulties around measuring maturity to gather insights on why measuring maturity is difficult and how the framework should look like to deal with this difficulties. It is important to have a multi-level framework, measuring different domains with different criteria at different departments of a SME finance bank. Using organizational theory explained the differences within organizations and helped structuring the framework and the case studies. SMEs and their

financers obtained, through the years, a new relationship and the SME finance banks started to provide more customer-oriented services to the SMEs besides the traditional financial services. The relationship is more customer oriented and therefore the use of customer analytics increased and becomes more relevant for the banks, due to the large availability of customer data. Maturity model theories are reviewed and the a theory is selected. Selecting a maturity model theory that suits the objective of the thesis is done by reviewing different theories for designing the maturity assessment framework. The CMMI theory is selected because of the capability to assess both organizational and technical aspects. After the maturity model theory is selected, the requirements for the framework were defined. This is done in accordance with the CMMI maturity model theory, which give a hierarchical structure to the framework requirements. When all the elements, the sub-questions, were defined, the maturity assessment framework is conceptualized. This framework is tested by conducting case studies, which is done by interviewing to SMEs finance banks. Evaluated by making assessment and benchmarking dashboards and reflecting the framework.

The framework will be mainly used by the marketing and data science departments of the SME finance bank, according to the organizational theory they belong to the technostrcutre. Preferring to standardize work processes. A measurement of the maturity of the different domains is a result of the framework, the other result is the discussion around the measurement. Therefore, different stakeholders should be involved in the process of use. Data is provided from the support staff, the IT department, preferring to collaborate in the decision-making process. Both managers and professionals from the technostructure and the support staff should be involved in the discussion. This carry advantages like: the involved actors have the opportunity to give the meaning, the ultimate meaning will be richer after the discussions and if the involved actors fail to arrive at one meaning, it may cause some reservation in the managers opinions. The normative character of maturity models makes it difficult to determine who will be involved in the process, because all the different parts of the organization have different preferences for the work processes. By having a discussion around the measurement, the quality of the process of use is enhanced.

The framework is designed to measure maturity of customer analytics implementation at SME finance bank in the Netherlands, which consists of several departments. Large organizations cannot be measured by one single instrument, it should not be measured at one single level. Therefore it is essential to measure maturity at several departments to get a complete view of a SME finance bank. The framework should be used by measuring maturity at different departments with different domains and different criteria. In this research this is done by conducting two case studies at two SME finance banks in the Netherlands, bank A and bank B. Measurement outcomes should be visualized using dashboards, visualization of different elements is required to enable SME finance

banks to evaluate the effects of their key domain areas. Visualization supports the interpretation of the assessment scores. Using numbers showing the measurement scores, does not provide enough insights and can easily be interpreted differently from the original meaning. Therefore dashboards should be used to support interpretation of the maturity assessment outcomes. See figure 27 for an example of an assessment dashboard.

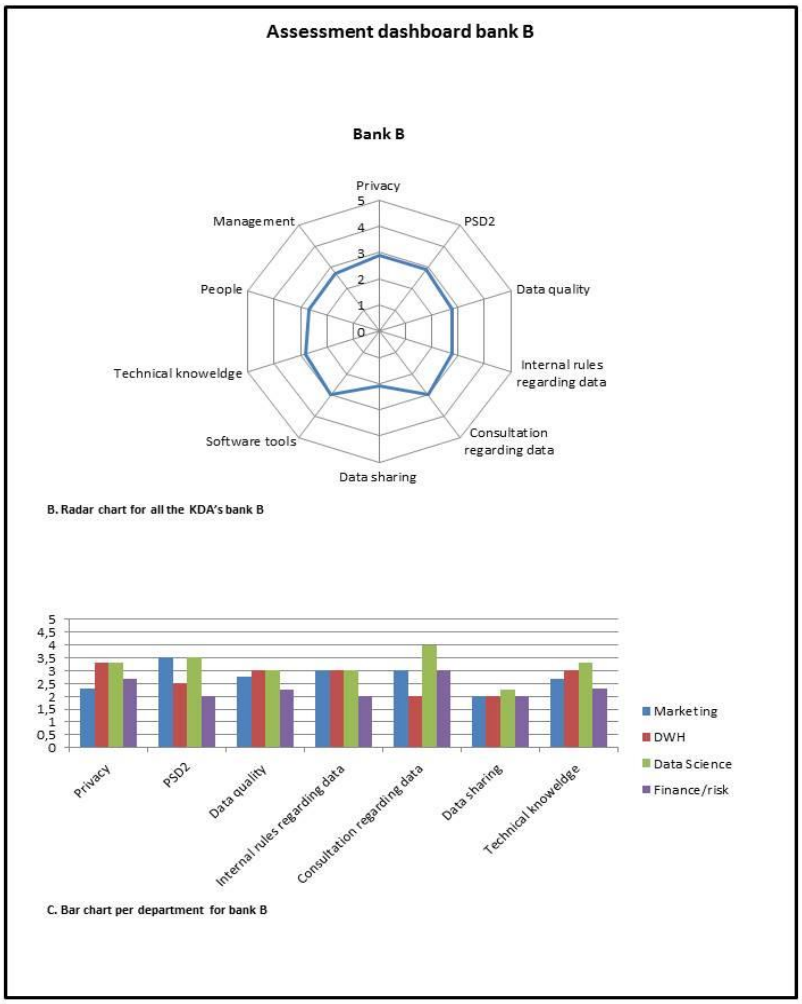


Figure 31:Example of an assessment dashboard for bank B

The assessment dashboard shows how the maturity assessment is visualized for bank B. In the radar chart the maturity scores are presented for all the key domain areas, what are the requirements for deploying customer analytics at a SME finance bank in the Netherlands. In the bar chart (C) below the different maturity scores per department are shown. Due to the multi-value, co-interaction and dynamics characteristics of a SME finance banks, measuring maturity at different departments is crucial for obtaining a complete view of the bank. Interpretation should be done by the professionals

from the SME finance bank itself. Due to a lack of time, this was not possible.

The lack of adoption regarding the use of customer analytics by SMEs finance banks could be explained by using the maturity assessment framework. Identifying and indicating the weaknesses and strengths of the SME finance bank regarding the key domain areas may explain the lack of adoption, however there are still some excluded elements in the framework, like costs. When certain key domain areas are considered as immature, the banks should improve these key domain areas to enhance their business to adopt customer analytics. The designed maturity assessment framework explores the missing link between customer analytics implementation and SME finance banks. An academic foundation is given on the design process of the maturity assessment framework. The missing elements of the framework, like costs, constraint the framework. The model helps SME finance banks to adopt customer analytics, but costs are excluded from the research. Meaning that the actual implementation may still be too expensive.

This research is of an explorative character, since the research field has not been explored before. Empirical data is used in this research to design the maturity assessment framework and to gather insights on the research field. Insights on customer analytics implementation at SME finance banks are gathered in this research: what the requirements are and how the organizational structure is related to customer analytics implementation. The main scientific contribution of the research is the design of a maturity assessment framework what is able to assess the maturity level of certain domains at SME finance banks for customer analytics, which is new in the research field. It differs from existing frameworks in the sense that it considers customer analytics as a multi-criteria phenomenon, focusing on regulation, organization, governance and technology rather than focusing on one single element. Also, the framework aims at assessing the maturity of these domains, instead of implementing customer analytics or creating organizational value. The practical contribution of the research is the framework that could be used by SME finance banks and IT consultants for assessing maturity. A combination of certain topics, customer analytics, maturity assessment models and SME finance provides IT consultants and financial institutions new insights on the research field.

9.2 Further research

The missing link between customer analytics implementation and SME finance is explored in this research. Since this research field has not been explored before, this research should be seen as a start for future research. The framework that is proposed in Chapter 5 consist of requirements for customer analytics implementation. Still, some important elements are excluded from the maturity assessment framework, like compliancy regarding new regulations, current regulations, recruiting of knowledge, quantitative elements, data checks and costs. Some requirements, the key domain areas,

are static. These key domain areas should be rethought in the future. For further research there should be elaborated on the elements of the framework. More research is required on certain topics. Extending the framework is the main recommendations for further research.

Due to a lack of time, it was not possible to reflect the assessments results by the professionals from bank A and bank B. The interpretation of the assessment dashboards and the framework are important for further research. Also the desired maturity of bank A and bank B is not measured, this should be included when expending the framework. For coping with the complexities of measuring maturity more interviews should be taken at bank A and bank B. It was only able to take one interview at each department, for further research more interviews has to be taken at the departments. This should be done to get a more complete view of the department itself. Another recommendation for further research is to conduct interviews are more departments, besides the marketing, data warehouse, data science and finance/risk departments. A SME finance bank consist of many departments, therefore more interviews should be conducted at more departments.

This research in based on a literature review, interviews and two case studies. To enhance the generalizability of the framework more interviews has to be taken with experts to gather more data on the requirements for customer analytics. Experts could always be influenced by specific elements. To mitigate this, the recommendation is to interview more experts from different sectors: consultants, financial sector, insurance, pension funds and asset managers. Therefore for further research the recommendation is to gather more data on the requirements for conducting customer analytics. Two case studies are conducted, the suggestion is made to conduct more case studies at Dutch SME finance banks in the Netherlands.

This research could be seen as the starting point for further research on maturity assessments for customer analytics implementation at the Dutch financial sector.

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Appendix A. Interview questions on lack of adoption

1. Why is there such a big difference between the Netherlands and the rest of the world regarding the implementation of Customer analytics?

2. What are the problems for banks regarding regulation?

3. How do banks deal with their customer data outside the Netherlands?

4. What are the cultural differences between the Netherlands and other countries regarding customer data sharing?

Appendix B. Interview list expert knowledge on customer analytics

The interview

The interview consists of 12 propositions, which were asked in English and six open questions, which were asked in Dutch. All the interviews were taken anonymously. At the end I got response of 10 interviewees (one from the financial sector and nine from EY). More interviews were planned with experts form the financial sector, but due to a lack of response and time planning problems only 1 expert from the financial sector was interviewed. All the interviews were taken live, two interviews were taken via the telephone. The interviews were taken in the period of 29 February 2016 till 10 March 2016.

The interviewees were asked to score (on a 7 point scale) the propositions by 1= Totally disagree/Totally false and 7= Totally agree/ Totally true (or not applicable). In the table below the proposition list is shown.

Propositions list:

Questions
1. Customer analytics is well developed and deployed worldwide by SMEs finance banks
2. Customer analytics is well developed and deployed in the Netherlands by SMEs finance banks
3. The current internal data sharing between departments is well organized by SMEs finance banks in the Netherlands
4. The current internal data sharing between departments is well organized by SMEs finance banks in the worldwide
5. Rank the potential value of customer analytics in the Netherlands
6. Dutch SMEs finance banks are innovative with respect to data science (data-analytics)
7. The current data privacy regulation has a negative effect on deploying customer analytics in the Netherlands
8. When the new data privacy regulation directive will be launched, SMEs finance banks will invest more in customer analytics
9. SMEs finance banks are willing to embrace customer analytics
10. Without data sharing, customer analytics deployment is impossible for a SMEs finance bank in the Netherlands
11. In the nearby future (1-5 years) customer analytics will be broadly used by SMEs finance banks in the Netherlands
12. In the far future (5-10 years) customer analytics will be broadly used by SMEs finance banks in the Netherlands
comments

After the propositions, the experts were asked to answer the open questions. The experts were asked to explain their answer. The open questions are formulated in Dutch and asked in Dutch, since all the interviewees were Dutch experts. In the table below the list of questions is shown.

Open questions (Dutch)

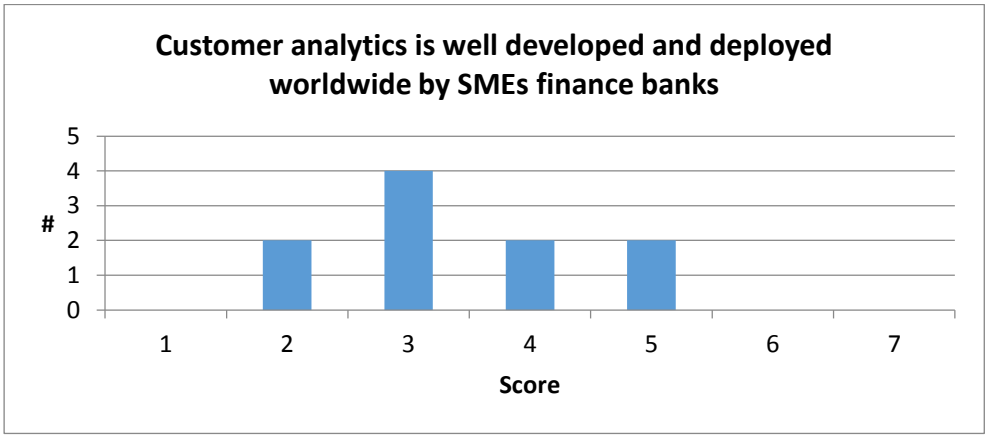
Q1	Op welk niveau bevindt data-analytics zich in de Nederlands financiële sector?
Q2	Op welk niveau bevindt customer analytics zich in de Nederlandse financiële sector, en op wel niveau wereldwijd?
Q3	In welke departementen wordt customer analytics toegepast en in welke departementen ligt de meeste potentie?
Q4	Welke vormen van customer anlaytics worden het meest toegepast door MKB-banken en welke vormen hebben de meeste potentie?
Q5	Wat zijn de technische benodigdheden om customer analytics uit te kunnen voeren door MKB-banken in Nederland?
Q6	Wat zijn de institutionele benodigdheden om customer analytics uit te kunnen voeren door MKB-banken in Nederland?

Table X: Open questions

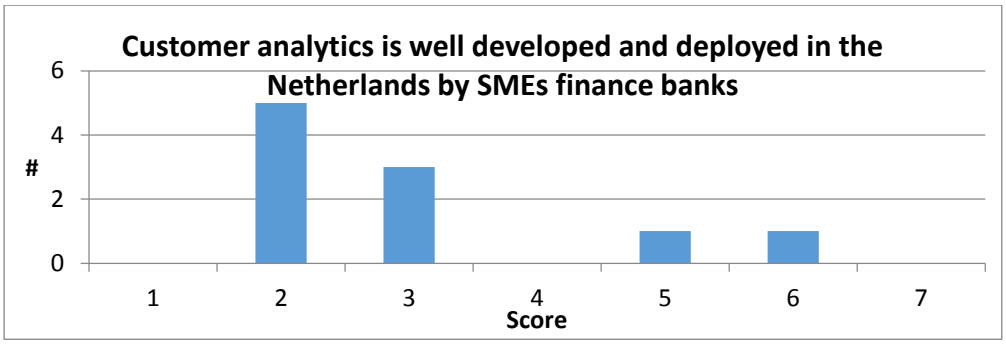
Results

The results of the propositions are shown in the figures below:

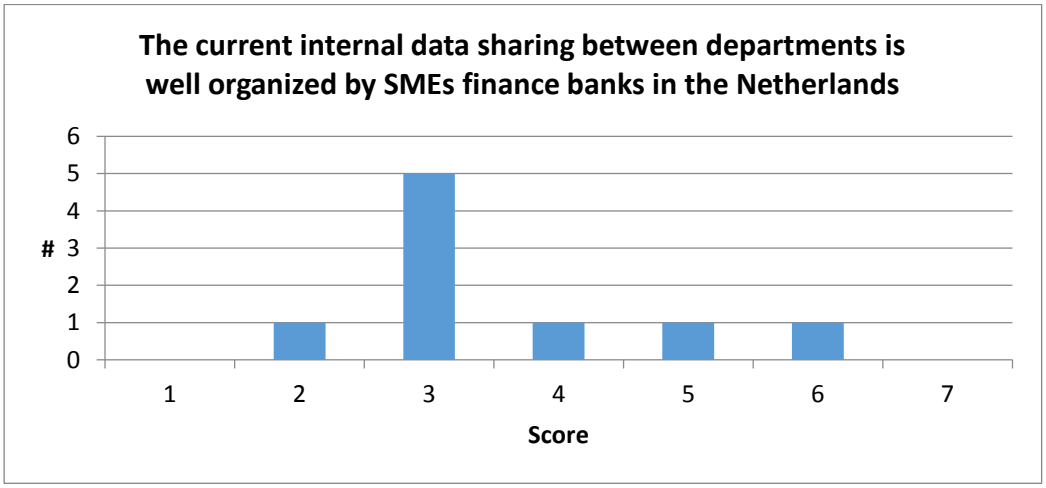
Proposition 1



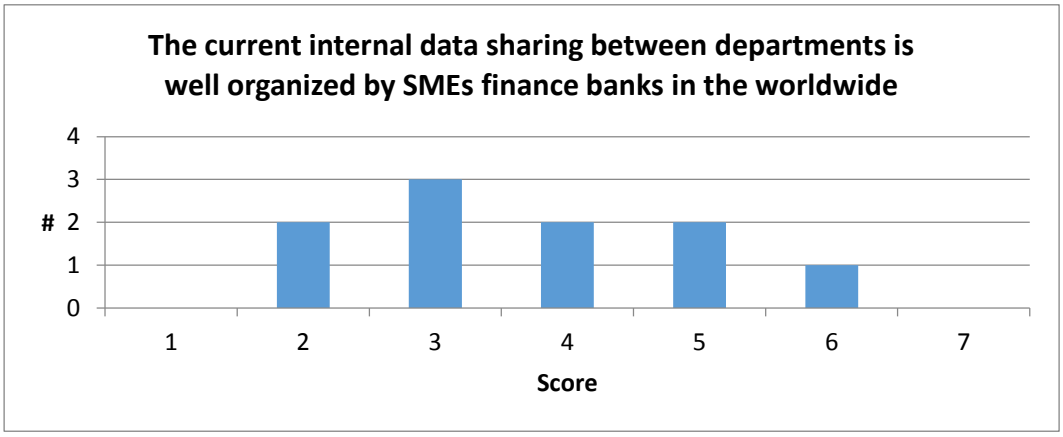
Proposition 2



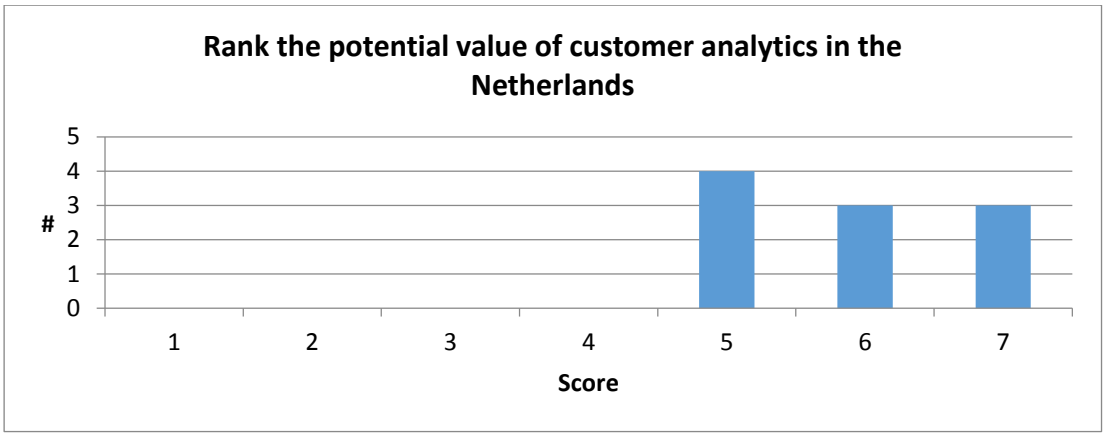
Proposition 3



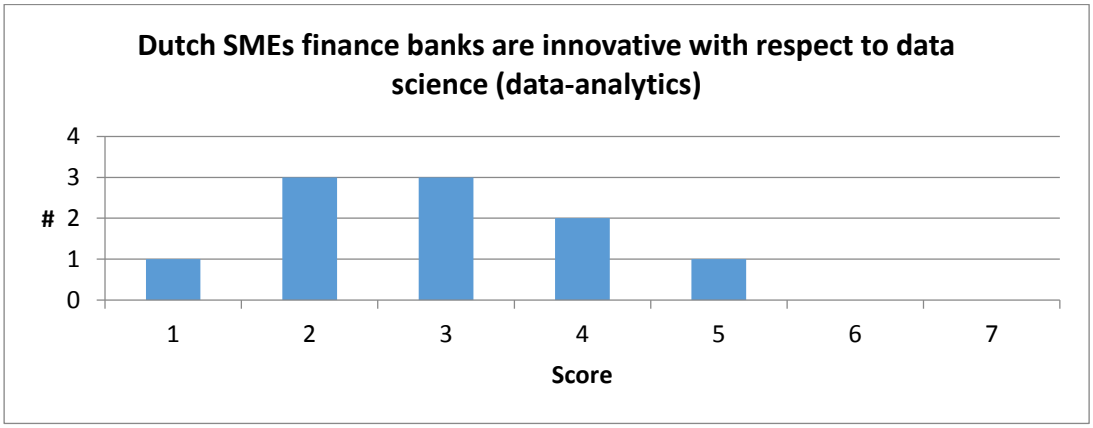
Proposition 4



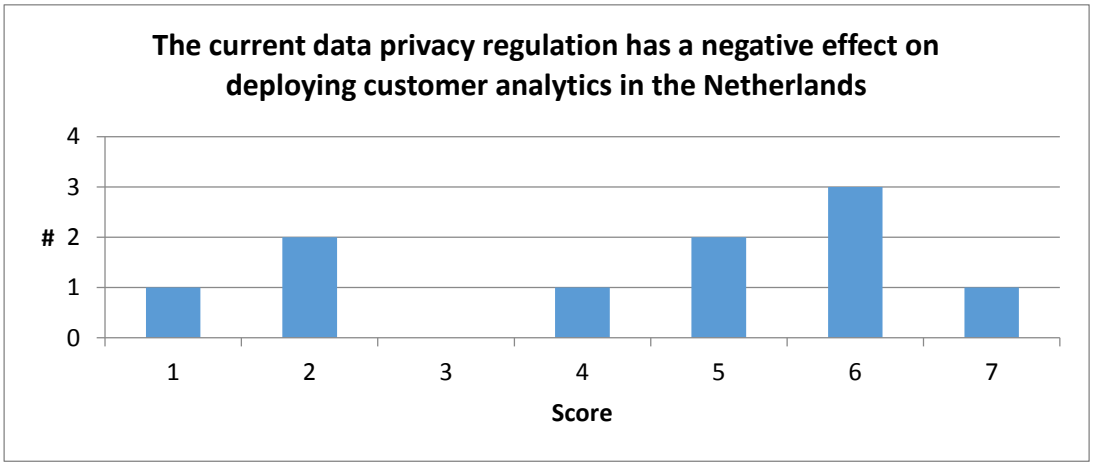
Proposition 5



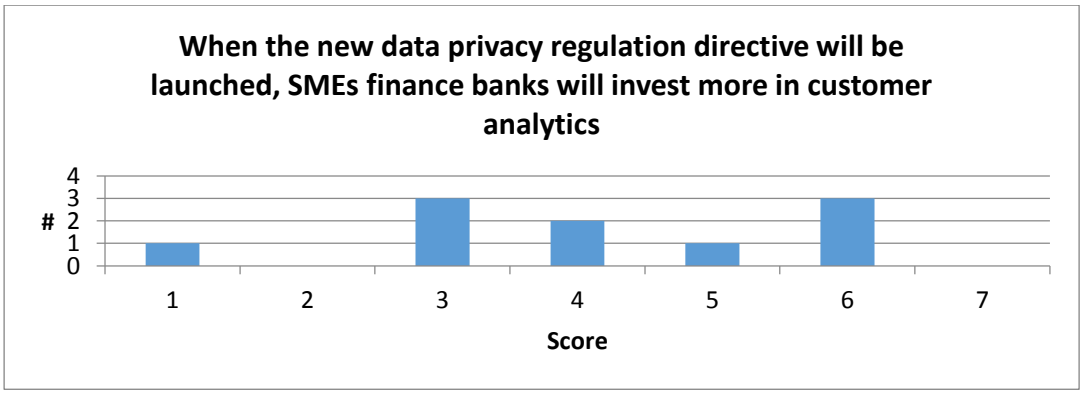
Proposition 6



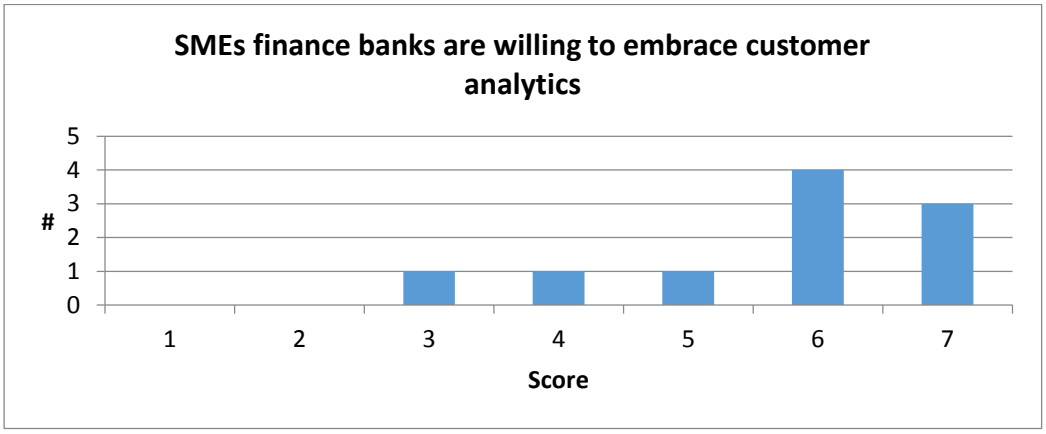
Proposition 7



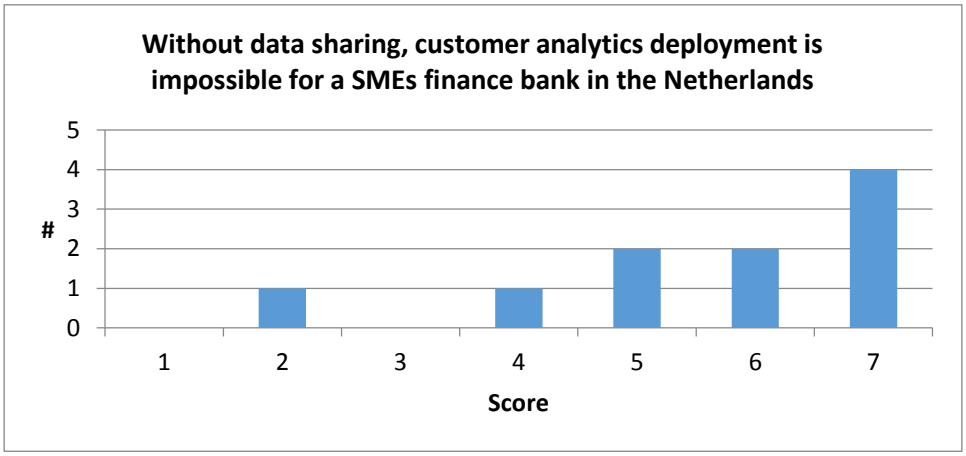
Proposition 8



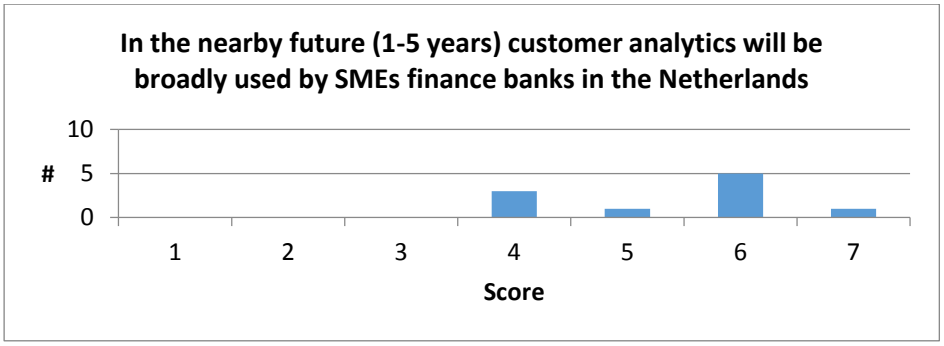
Proposition 9



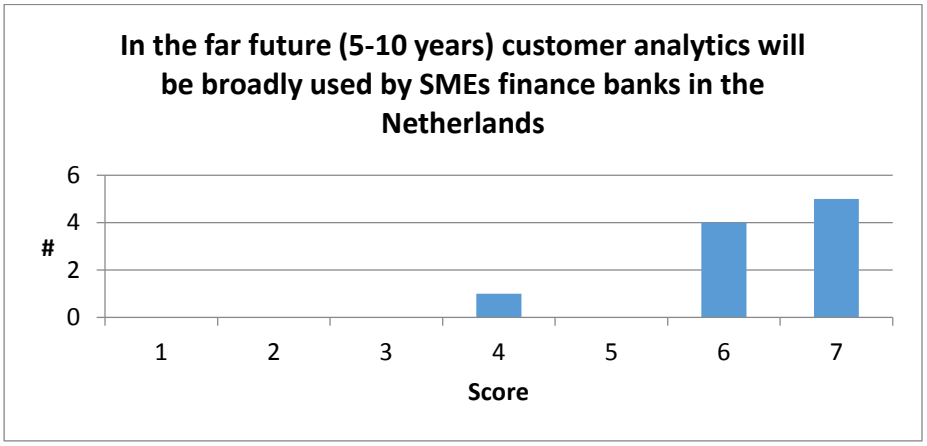
Proposition 10



Proposition 11



Proposition 12



Comments on the propositions

[redacted]

The answers on the open interview questions are presented below. The (#/#) means the range that a certain answer is given

1. Op welk 'level' staat data analytics in de financiële sector op dit moment in Nederland?

[redacted]

2. Op welk 'level' staat customer analytics in de financiële sector op dit moment, zowel wereldwijd als in Nederland?

[redacted]

3. In welke departementen wordt customer analytics het meest toegepast bij MKB banken? En waar waar ligt de meeste potentie.

4. Wat zijn de meest gebruikte en relevante vormen van customer analytics?

5. Wat zijn de (technische) benodigdheden om customer analytics uit te kunnen voeren door MKB financiërs ?

6. Wat zijn de (institutionële) benodigdheden om customer analytics uit te kunnen voeren door MKB financiërs?

[redacted]

Appendix C. Annual figures top four banks in the Netherlands

Dutch SME finance bank	Annual revenue 2015
ING	€ 16,554 billion (ING, 2016)
ABN AMRO	€ 8,455 billion (ABN, 2016)
Rabobank	€ 13,041 billion (Rabobank, 2016)
SNS Bank	€ 1,18 (SNS, 2016)

Appendix D. Description of the KDA capability levels

Critical Variable	Level 1 "Initial"	Level 2 "Developing"	Level 3 "Defined"	Level 4 "Managed"	Level 5 "Optimized"
Knowledge on the content of the GDPR	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Action plan to deal with privacy issues	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Professionals working on privacy related issues	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Knowledge on the contents of the PSD2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Action plan to deal with this new directive	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
People are aware of the usefulness of data analytics	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
People share the same opinions on analytics	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consistency between the department's internal policy regarding the use of customer analytics	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Monitoring and evaluation plan regarding the use of analytics (C-level)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Action plan for using data analytics in the business	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]


Lower level management plan regarding the use of customer analytics
Knowledge on data quality
Arrangements within the department regarding data quality
Data quality structure
Professionals that monitor data quality
Rules regarding the definition of data
Compliance with the rules regarding the definition of data
Consultation within the department on data quality
Consultation regarding the use of customer analytics
There is central distribution for data
Data sharing between the departments
All the departments have access to the data from a warehouse

It is possible to enrich the data	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Alignment in software environment	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
There is an analytics group with access to all the data	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
People know how to use SQL	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Technical conflicts between the business and IT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Appendix E. Case study questions

The caste study list consists of four main open questions, which are presented below, and a check list, which is also presented below.

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

Hoe is data technisch georganiseerd bij de MKB-financier?

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

Checklist questions

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	
Is de data van andere afdelingen centraal beschikbaar?	
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	
Wordt er binnen de afdeling aandacht besteed aan data governance?	
Zijn er professionals berust met data governance binnen deze afdeling?	
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	

Hoe kan customer analytics worden toegepast bij door de MKB-financier bij een MKB?	
Hoe oud zijn de legacy systemen en denkt u dat het mogelijk is om data te kunnen ontsluiten om MKB profielen te kunnen maken?	
Is er veel onwetendheid binnen de organisatie omtrent de technische mogelijkheden van customer analytics?	
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	
Wordt er organisatiebreed gesproken over customer analytics en het gebruik van customer data ?	

Appendix F. Case study results Bank A

Interview 1

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	[redacted]
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	[redacted]

Hoe kan customer analytics worden toegepast bij door de MKB-financier bij een MKB?	Data Science
Denkt u dat het technisch gezien mogelijk is om MKB profielen te maken?	[redacted]
Wordt er organisatie breed gesproken over customer analytics en het gebruik van customer data ?	[redacted]
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wat wordt er nu binnen de organisatie gedaan met customer data?	[redacted]

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

[redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

- [redacted]

Interview 2

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	

Voor welke doeleinden wordt customer data gebruikt?	
Wordt customer analytics toegepast binnen deze afdeling?	[redacted]
Wordt er organisatiebreed gesproken over het gebruik van customer data?	
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wat wordt er nu binnen deze afdeling gedaan met customer data?	[redacted]

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

[redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

Interview 3

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	[redacted]
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	[redacted]

Voor welke doeleinden wordt customer data gebruikt?	
Wordt customer analytics al toegepast binnen deze afdeling?	[redacted]
Wordt er organisatie breed gesproken over het gebruik van customer data?	[redacted]
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wat wordt er nu binnen deze afdeling gedaan met customer data?	[redacted]

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?
[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

Hoe is data technisch georganiseerd bij de MKB-financier?

[redacted]

- [redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

- [redacted]

Interview 4

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	[redacted]
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	

Hoe kan customer analytics worden toegepast bij door de MKB-financier bij een MKB?	
Hoe oud zijn de legacy systemen en denkt u dat het mogelijk is om data te kunnen ontsluiten om MKB profielen te kunnen maken?	[redacted]
Is er veel onwetendheid binnen de organisatie omtrent de technische mogelijkheden van customer analytics?	J[redacted]
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wordt er organisatiebreed gesproken over customer analytics en het gebruik van customer data ?	[redacted]

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

[redacted]

- [redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

[redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

Appendix G. Data structure bank A

Appendix G have been removed for the public version

Appendix H. Case study result bank B

Interview 1

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	[redacted]
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	[redacted]
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	[redacted]

Hoe kan customer analytics worden toegepast bij door de MKB-financier bij een MKB?	
Hoe oud zijn de legacy systemen en denkt u dat het mogelijk is om data te kunnen ontsluiten om MKB profielen te kunnen maken?	[redacted]
Is er veel onwetendheid binnen de organisatie omtrent de technische mogelijkheden van customer analytics?	
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wordt er organisatiebreed gesproken over customer analytics en het gebruik van customer data ?	[redacted]

[redacted]

[redacted]

[redacted]

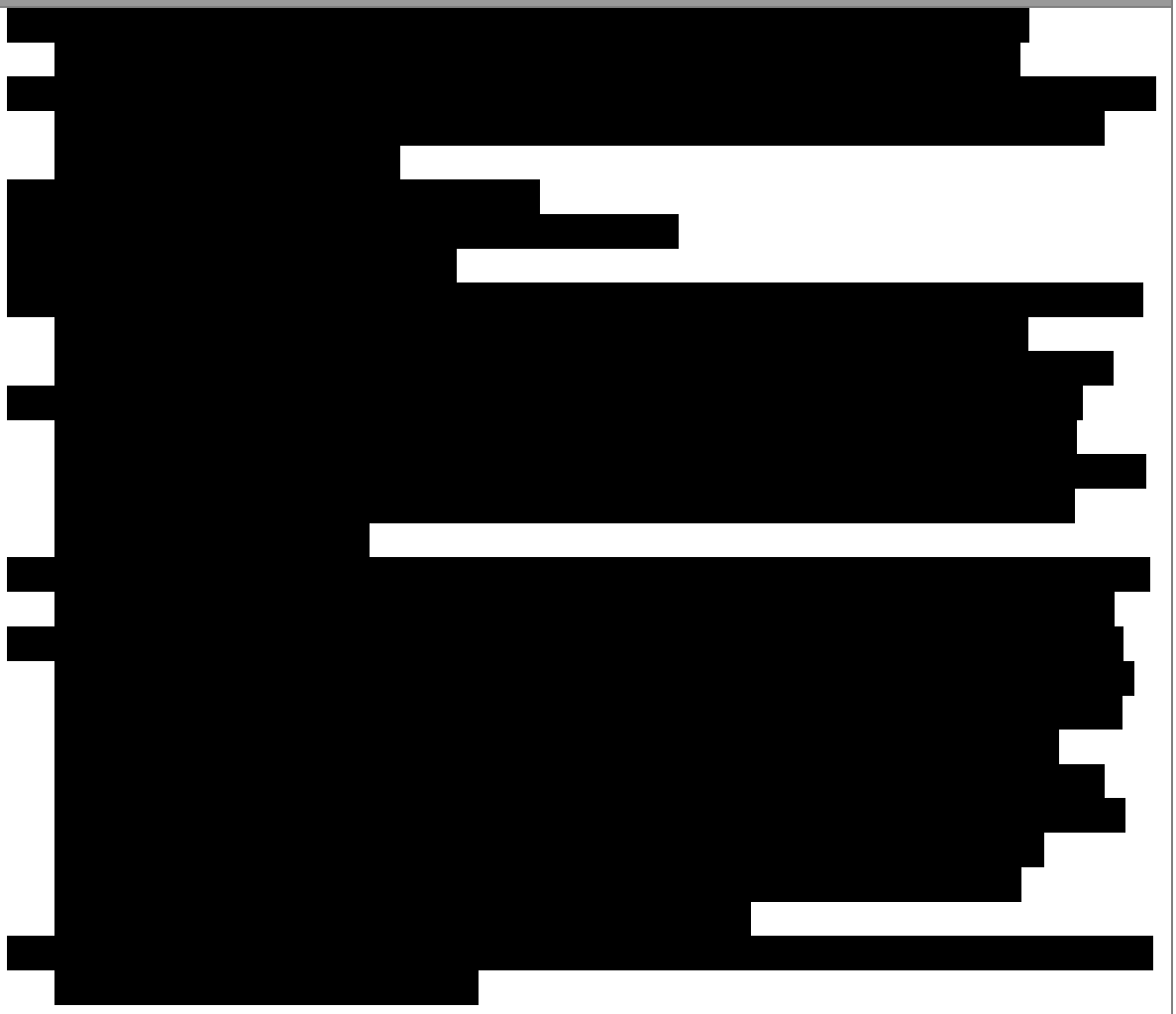
Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?



Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?
[redacted]

Interview 2

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	[redacted]
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	[redacted]
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	[redacted]
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	[redacted]

Voor welke doeleinden wordt customer data gebruikt?	
Wordt customer analytics al toegepast binnen deze afdeling?	[redacted]
Wordt er organisatie breed gesproken over het gebruik van customer data?	[redacted]
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wat wordt er nu binnen deze afdeling gedaan met customer data?	[redacted]

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

- [redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

- [redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

- [redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

Interview 3

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	[redacted]
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	[redacted]
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	[redacted]
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	[redacted]
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	[redacted]
Is de data van andere afdelingen centraal beschikbaar?	[redacted]
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	[redacted]
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	[redacted]
Wordt er binnen de afdeling aandacht besteed aan data governance?	[redacted]
Zijn er professionals berust met data governance binnen deze afdeling?	[redacted]
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	[redacted]
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	[redacted]
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	[redacted]
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	[redacted]
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	[redacted]

Hoe kan customer analytics worden toegepast bij door de MKB-financier bij een MKB?	
Hoe oud zijn de legacy systemen en denkt u dat het mogelijk is om data te kunnen ontsluiten om MKB profielen te kunnen maken?	[redacted]
Is er veel onwetendheid binnen de organisatie omtrent de technische mogelijkheden van customer analytics?	[redacted]
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	[redacted]
Wordt er organisatiebreed gesproken over customer analytics en het gebruik van customer data ?	

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

[redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

[redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

[redacted]

Interview 4

Welke mogelijkheden biedt de nieuwe regulatie voor customer analytics bij MKB ondernemingen?	
Bent u op de hoogte van de nieuwe GDPR regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Bent u op de hoogte van de nieuwe PSD2 regulatie?	[redacted]
Ja. Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Nee. (Regulatie uitleggen) Wat zijn de mogelijkheden of beperkingen om customer analytics uit te kunnen voeren?	
Denkt u dat het juridisch gezien mogelijk is om analytics uit te voeren op SME niveau? *Waarom?*	[redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?	
Hoeveel personen werken op er deze afdeling en hoeveel binnen de gehele organisatie?	
Is er organisatie breed voldoende kennis omtrent data? Wat wordt gedaan (trainingen etc)?	[redacted]
Wordt er binnen deze afdeling voldoende aandacht besteed aan analytics?	
Wordt er binnen de organisatie voldoende aandacht besteed aan analytics?	
Zijn er binnen deze afdeling duidelijke afspraken gemaakt omtrent data kwaliteit en beschikbaarheid?	
Is er een wekelijks/maandelijks overleg met andere afdelingen omtrent data kwaliteit en data beschikbaarheid?	
Is de data van andere afdelingen centraal beschikbaar?	
Wordt er data gerelateerde informatie gedeeld binnen de organisatie?	
Hoe wordt er met data kwaliteit en beschikbaarheid omgegaan ten opzichte van andere organisaties?	

Hoe is data technisch georganiseerd bij de MKB-financier?	
Wat is de meerwaarde van customer analytics, denkt u dat alle afdelingen hetzelfde denken over customer analytics?	
Wordt er binnen de afdeling aandacht besteed aan data governance?	
Zijn er professionals berust met data governance binnen deze afdeling?	
Zijn er professionals berust met data governance binnen in de organisatie? Hoe zijn deze professionals betrokken bij deze afdeling?	
Welke data gerelateerde software wordt er binnen deze afdeling gebruikt?	
Welke (software) tools zijn er nodig om customer analytics op SME niveau uit te kunnen voeren?	
Welke afdelingen moeten kennis hebben van de te gebruiken software om customer analytics op SME niveau uit te kunnen voeren?	
Wordt er op een volwassen manier (technisch gezien) data gedeeld binnen de organisatie?	
Wordt er vaak customer data opgevraagd van andere afdelingen ? Ja, hoe loopt dat proces? Zijn daar vaste protocollen voor?	

Voor welke doeleinden wordt customer data gebruikt?	
Wordt customer analytics toegepast binnen deze afdeling?	
Wordt er organisatiebreed gesproken over het gebruik van customer data?	
Denkt u dat customer analytics binnen nu en 5 jaar veel zal worden toegepast voor MKB-ondernemingen?	
Wat wordt er nu binnen deze afdeling gedaan met customer data?	

Welke mogelijkheden biedt de nieuwe wet en regelgeving voor customer analytics bij MKB ondernemingen door banken?

- [redacted]

Hoe wordt er bij de MKB-financier organisatorisch gezien aandacht besteed aan data?

- [redacted]

Hoe is data technisch georganiseerd bij de MKB-financier?

- [redacted]

Wat is er de afgelopen 5 jaar veranderd bij de bank omtrent data?

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

Appendix I. Data structure bank B

Appendix I have been removed from the public version

Appendix J. Assessment Bank A

Appendix J have been removed from the public version

Appendix K. Assessment Bank B

Appendix K have been removed from the public version