

MASTER

Value driven decision making using customer analytics a framework proposal for the Dutch financial services sector

van Norden, T.

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Master thesis

Value driven decision making using customer analytics

A framework proposal for the Dutch financial
services sector

by
Tom van Norden

Student Identity number: 0790197

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Supervisors:
Dr. C. Chituc, TU/e, IS

Dr.ir. H. Eshuis, TU/e, IS
M.N. González-Estéfani, EY
R. Gischler, EY

TUE. School of Industrial Engineering.
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Preface & acknowledgements

Never before were people connected and tracked as now, and are devices becoming available that observe and analyze people. By 2020, an entire generation will have grown up in a primarily digital world. This trend leads to an ever more increasing amount of data available in the world, from which useful information can be extracted. In the midst, the financial services sector are adapting to the post-financial crisis environment. In this environment the relationship between customer and their financial service providers has changed. Customers are more confident, and demand more from their financial service providers, and customer analytics has been proposed to use the available customer data to face these customer related challenges. Unfortunately, little is known about how to use customer data in the financial sector to address the above mentioned challenges. For this reason, this research will address these uncertainties by companies in the financial services sector by creating a conceptual artifact that explains how business value is created. In the end this research hopes to contribute to developing customer analytics in the financial sector, and helping financial service providers to better serve their customers.

In this document my master thesis research is described. After extensive preparations this document outlines the actual research performed for my graduate internship at EY ITRA FSO, including the methodology, analysis of the results, and the main findings. I would like to thank EY ITRA for letting me perform my research at their department. Without their expertise, advice, and contacts it would not have been possible to perform my research. Particularly, I would like to thank Marta Nalda González-Estéfani for her supervision, advice, and general support during my internship at EY. I would also like to thank Rudo Gischler for his support with my thesis, and with approaching contacts to take part in the interviews and questionnaire. In addition, I would like to thank Jacco Jacobs for giving me the opportunity to do the internship at EY ITRA. Furthermore, I would like to thank everyone who participated in the interviews and electronic questionnaire. Lastly, I would like to thank Claudia M. Chituc and Rik Eshuis for their supervision of the whole master thesis project from an academic perspective.

Executive Summary

Introduction

Banks are adapting to the post-financial crisis environment, and at the same time the amount of data available in the world is exploding. The increased availability of data offers opportunities for enhanced information extraction and decision making about and for customers.

Companies in the financial services sector are unable to assess how business value is created from adopting customer analytics capabilities, leading to irrational decision making regarding the adoption of customer analytics capabilities. For this reason, this research looked into the value creation from customer analytics and provided a framework that explained how business value is created from adopting customer analytics capabilities in the Dutch financial services sector.

The research was performed at the IT Risk & Assurance (ITRA) FSO department at EY, whom will use the conceptual artifact to start developing customer analytics capabilities at their clients. Since ITRA FSO the Netherlands is almost exclusively focused on the Dutch financial services sector, this research was focused on this sector.

Research design

Because the framework was specifically meant for the Dutch financial services sector, and because of the early stage of development of customer analytics in the Dutch financial sector an inductive approach for the design of the framework was taken. The following research steps were executed: performing a literature review, performing interviews with consultants working at EY ITRA, constructing the framework based on the interview findings and my own interpretation of these, sending out an electronic questionnaire to practitioners in the Dutch financial services sector for validation of the framework, evaluation of the questionnaire results and redesign of the framework based on these results.

Literature findings

The difference between big data analytics and customer analytics is that customer analytics deals with customer data more specifically to extract meaningful insights about customers, while big data deals with all kinds of data. The process of extracting information from customer data is therefore similar to that of big data, and also includes: 1. acquisition and recording, 2. extraction, cleaning and annotation, 3. integration, aggregation and representation, 4. modelling and analysis, and 5. interpretation. For this reason, a view on creating value from customer analytics should not be too narrowly focused on analytics only, but should encompass all steps from the extraction process to extract value from customer data.

The most important expected outcomes from the use of big data are customer centric (49%), operational optimization (18%), risk/financial management (15%), new business model (14%), and employee collaboration (4%), and are focused on three main areas: customer segmentation, predicting customer actions, and understanding customer views.

Business value derived from customer analytics focuses on the link between investments in customer analytics and organizational performance, both at the intermediate process level and organization-wide

level. Too much emphasis is placed on economic value by practitioners in the financial services sector. Other evaluation perspectives exist: existing IT evaluation, organizational culture, strategic match, impact on organization & surroundings, risk & uncertainties, IT specific characteristics, program & project portfolio, benefits, costs, stakeholders, and project organizing, and organizational culture.

Customer analytics specifically leads to information about customers, which can be used to improve organizational performance. There is a time lag between deriving the information from customer analytics and the impact it has on organizational performance. Before that the information derived from customer analytics will mainly manifest itself in enhanced business processes. For these reasons, I define business value as an increase in organizational performance both at the intermediate process level and organization-wide level.

The two most applied theoretical approaches are the economic/accounting and the interpretative analysis. An interpretative approach was taken, because of the intangible nature of the output of customer analytics. The Balanced Scorecard (BSC) framework was used to guide the design of my framework, because it specifically deals with organizational performance, it is most commonly used in business, and it specifically deals with customer value.

Interviews and questionnaire

A total of 10 interviews were performed at EY ITRA. The sample consisted of persons working for the Enterprise Intelligence pillar at the ITRA department at EY Amsterdam. In addition, it consisted of persons from all levels within the department (junior advisor, senior advisor, manager, senior manager), with differing backgrounds (e.g. technical, regulatory, business, etc). To analyze the results of the interviews the data were coded and categorized. Further analysis was performed by identifying specific variables within the relevant categories to be used to construct the framework based on the BSC framework and in line with the posed definition of business value. After identifying the variables per perspective and the correlations between them, the variables were placed in its respective place in the BSC framework according to the perspective they belonged to based on my own interpretation. After constructing the initial framework, it was modified based on the insights from literature, and my own interpretations.

To validate the framework an electronic questionnaire was sent out to practitioners in the Dutch financial services sector. Each correlation in the framework was tested by means of a statement about the correlation, and asking the extent to which respondents agreed with the statement. Based on the results unsupported correlations in the framework were modified.

Conclusion

Investments (Learning & Growth perspective) should be made in the IT infrastructure, storage and processing solutions, training current employees, hiring new employees, and hiring consultants. This can enhance the following business processes (Internal Process perspective): gather and assess the necessary data, adhering to regulatory requirements, creating and maintaining a 360 view of individual customers, and data management. Enhanced business processes enable the following customer value propositions (Customer perspective): complaint mitigation, informing customers, and personalized offerings. Offering these customer value propositions enable the following business objectives to be

achieved (values to be determined for companies specifically) related to customers (Customer perspective): trust, customer satisfaction, retaining customers, and success rates of marketing/sales initiatives. Achieving these objectives can lead to efficiency gains/ cost savings and/or increased sales (Financial perspective), which can lead to increased revenue (Financial perspective).

This research aimed to develop a conceptual artifact that explains how business value is created from adopting customer analytics capabilities in the Dutch financial services sector. The framework designed in the research, explains companies in the financial sector how business value is created and what capabilities should be in place to derive this value. In addition, it provides insights in how to measure business value other than by using economic measures, and from which perspectives to measure business value. This way, companies in the financial services sector are able to assess how business value is created from adopting customer analytics capabilities, and make rational decisions regarding the adoption of customer analytics capabilities.

Compared to the ROI value the designed framework offers several advantages: it is more specific about how adopting customer analytics capabilities lead to business value, making it more convenient to track benefits back to the original investments. In addition, benefits from customer analytics capabilities are difficult to quantify directly by means of estimating the ROI. The framework can be used to create measures of performance in steps (per perspective), per business process important to extract value from customer analytics. Lastly, compared to the ROI measure, the framework offers starting points for taking next steps to actually start developing customer analytics capabilities.

Managerial implications

Managers at clients of EY could use the framework for the financial services sector to guide the development of specific business cases. In line with this, managers at clients of EY can also use the framework to start developing objectives per perspective in the framework, define KPI's to measure these objectives, and set targets to manage the development of customer analytics capabilities. Also, the framework offers insights in how EY should develop its own customer analytics capabilities to help their clients. That is, on what kind of topics to focus, to determine what kind of capabilities and resources they need in order to help their clients, and to develop their organizational model to deliver their customer analytics capabilities to their clients. Lastly, the framework could be used for marketing purposes by EY.

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1. Introduction

Banks are adapting to the post-financial crisis environment, and at the same time the amount of data available in the world is exploding. The increased availability of data offers opportunities for enhanced information extraction and decision making about and for customers. Customer analytics concerns itself with extracting meaningful information from customer data.

It is unclear how customer analytics can create value for a company in the Dutch financial services sector. For this reason this research will look into the value creation from customer analytics and will provide a conceptual artifact that explains how business value is created from adopting customer analytics capabilities in the Dutch financial services sector.

The research is performed at the IT Risk & Assurance department at EY, whom will be introduced in the next section. EY will guide this research and provide input including knowledge and contacts. The conceptual artifact will be used by them to start developing customer analytics capabilities at their clients.

The first chapter encompasses an introduction into the topic, including the research background and research goal. After that the research design is discussed in chapter two, followed by the literature findings on customer analytics and business value in chapter three. Chapter four explains the approach to create a conceptual artifact. Then, in chapter five and chapter six a design proposal is done and validated with data from practitioners from the Dutch financial sector. Finally, chapter seven concludes this document with the conclusion, discussion, the managerial implications, and some suggestions for future research.

1.1 Company Profile

The roots of EY date back to 1849 with the founding of Harding & Pullein, but the present company was formed in 1989 by a merger of Ernst & Whinney and Arthur Young & Co. Until 2013 the company was known as Ernst & Young, but after 2013, Ernst & Young underwent a rebranding to the current name EY. Globally EY is divided into four areas EMEA (Europe, Middle East, India, and Africa), Americas, Asia-Pacific, and Japan. EY has four main service lines: Assurance, Tax, Advisory, and Transaction Advisory Services (TAS).

Current research was performed at the advisory group IT Risk & Assurance FSO (ITRA FSO) in Amsterdam, which is part of EY Financial Services Advisory (EMEA area). More specifically, the research was performed for the Enterprise Intelligence group within ITRA FSO. The focus areas of ITRA FSO are banking & capital markets, insurance, asset management, and pension funds, which is referred to as the financial services sector (FS). The current services/solutions ITRA FSO offers are related to: IT risk assurance (FAIT), IT risk assurance (extended assurance & SOCR), IT internal audit, cyber security, IT risk transformation (including applications risk), and enterprise intelligence/data risk.

1.2 Research background

1.2.1 Problem statement

EY identified four global “mega” trends that will affect the banking industry: a global marketplace, digital business, demographic shifts, and a changing workforce (EY, 2015). In addition, banks face pressure from different stakeholders. Government and regulators are becoming increasingly assertive, customers are becoming increasingly demanding, investors demand increased performance, and the best and brightest graduates are looking for a career beyond financial services (EY, 2015). Banks will increasingly focus on profitability rather than revenues, while dealing with a low-growth environment across the developed world and slowing growth in the emerging world (EY, 2015). Three key drivers for business model transformation within the banking industry were identified: 1. changing regulatory and risk management requirements, which is getting increasingly more strict and extensive; 2. technology and process innovation, where the main challenge lies in the improvement of information flows for informing management and adapting to regulatory requirements (real time), and the alignment of technology initiatives with business priorities (improving customer experience, enabling growth, improving productivity/efficiency, and reducing risk); and 3. variations in customer behavior and preferences, which requires enhanced cooperation and communication to adjust the product and service portfolio to the needs of the customers, to re-build trust and improve customer relationships (Hellmich et al., 2014). For these reasons, banks will need to reinvent themselves and transform to respond to the pressures faced nowadays, and be flexible enough to be able to adapt to the world of in the future (EY, 2015).

A first imperative for a bank’s transformation is to define the new core of a bank. A product-centric approach has not benefited banks, instead banks need to be customer-centric, and to be truly customer-centric products need to be customer-driven (EY, 2015). Banks must earn a high level of trust in order to retain customers, win more business, and create genuine loyalty. There is significant business opportunity associated with customers who are true “advocates”, and key to realizing this growth is an improved customer experience (EY, 2014). Banks that are customer-driven will be able to win an increased share of wallet, reduce the costs of operations, and be able to better satisfy regulators (EY, 2014). To achieve this it will require a reform of banks’ internal systems, processes, operations, and culture. In addition, banks will need to develop a clearer understanding of the value of a product across its life cycle to ensure that these customer-driven, dynamic products are priced appropriately (EY, 2015). A second imperative for a banks’ transformation is strategic investment in technology to reshape banking, and changing customer expectations will force banks to invest in their core systems and processes (EY, 2015).

At the same time the amount of data available in the world is exploding. Never before were people connected and tracked as now, are devices becoming available that observe and analyze people, and is commerce conducted as it is now (Dhar et al., 2014). The increased availability of data offers opportunities for enhanced information extraction and decision making regarding customers. Customer analytics is a potential solution to face the challenges of improving the customer experience and improving the understanding of a customer along its value life cycle (EY, 2014).

Although the potential benefits of customer analytics are evident, it is very difficult to assess the concrete value from adopting customer analytics capabilities. Also, what needs to be in place and how to derive that value is unclear. A very common way to assess the business value from analytics is by determining its return on investment (ROI), but measuring the financial output of business intelligence is very difficult (Lonnqvist & Pittimaki, 2006). Big data analytics suffers from the same issue (see comment below by a general manager at EY), because data analytics has no value of its own, and is created from the information delivered to the organization (Brown, 2005).

General Manager at EY ITRA FSO:

“ROI is a common method. The difficulty lies in quantifying the benefits. For example, how do you quantify the access to measurement information? Or access to cleaner data? You will then have to think about its applications: can you do more than before by using analytics? If so, what is the value of that? How much extra business will it generate, or which extra customers do you attain? It is a lot of speculation and difficult to concretize. In addition, it is difficult to determine what an acceptable ROI is. Often data related projects are therefore initiated on the basis of regulatory requirements (compliance), and less on the basis of operational excellence”

Before adopting big data & analytics capabilities, large banks evaluate their options through several lenses: “value creation” (how much, what areas, etc), “design and operating model” (goals and objectives, roadmap, and operating model), and “implementation” (IT/data infrastructure, available data, etc) (Sabadell, 2015). Since, customer analytics is a new development and companies lack experience with customer analytics, it is very difficult to conceive how business value is created from adopting customer analytics capabilities keeping these three lenses in mind. Also, how and what kind of value can and needs to be derived can differ per sector and geographical region, which makes a general explanation of the value from analytics less relevant. Without understanding how business value can be created from adopting customer analytics capabilities it is more difficult to actually start developing these capabilities. For this reason the following problem statement is prepared:

Companies in the financial services sector are unable to assess how business value is created from adopting customer analytics capabilities, leading to irrational decision making regarding the adoption of customer analytics capabilities.

Since ITRA FSO the Netherlands is almost exclusively focused on the Dutch financial services sector, this research focused on this sector.

1.2.2 Customer analytics journey by EY

The above described problem statement is part of a larger scope to introduce customer analytics in the Dutch financial services sector, which is referred to as the “customer analytic journey”. EY is searching for a way to start developing customer analytics related services for its clients in the Netherlands, and also how to be strong in this market.

Understanding how value can be created, how to derive this value, and the resources that need to be in place to derive this value from adopting customer analytics capabilities in the Dutch financial services

sector can help EY to take a first step in the customer analytics domain, and help them to start approaching their clients to help them realize their business objectives related to consumers in the Dutch financial sector and add value to their companies. In addition, understanding how business value can be created from adopting customer analytics capabilities can help EY with internal decision making regarding their customer analytics capabilities. For example, on what kind of topics to focus, to determine what kind of capabilities and resources they need to help their clients, and to develop their organizational model to deliver their customer analytics capabilities to their clients. Lastly, it can provide EY with insights into stage of development of the Dutch financial services sector regarding customer analytics.

On behalf of EY ITRA FSO Amsterdam, the following people were closely involved in supervising my master thesis research: Marta Nalda González-Estéfani, Senior Advisor at EY financial services advisory, who was my direct contact and supervisor on behalf of EY. In addition, Jacco Jacobs, Executive Director Enterprise Intelligence at EY financial services, and Rudo Gischler, Senior Manager Enterprise Intelligence at EY financial services, were involved in the process.

1.2.3 Financial services sector

The financial services sector (FS) comprises companies that for the largest part manage money, including credit unions, banks, credit-card companies, insurance companies, accountancy companies, consumer-finance companies, stock brokerages, investment funds and some government-sponsored enterprises. The FS is just recovering from the financial crisis and is still suffering from its consequences. It is characterized by the following characteristics: low trust by consumers (especially in banking), changing consumer demands, fierce competition from inside and outside the financial sector, stricter requirements regarding transparency, and stricter regulatory requirements. To comply with the stricter requirements, and to face the challenges posed by the characteristics above, the FS is a big player when it comes to developing analytics capabilities, and thus provides a good opportunity to perform my research.

The Dutch financial sector specifically is generally considered to be a low risk market for companies, and saturated. The size of the economic value is big compared to the economic output of the Netherlands. In addition it is subject to strict national and European regulations (DNB, 2009). For this reason, companies should either grow by attracting customers from competitors and/or by focusing on obtaining more revenue from their current customers. Although there are slight differences between banks and other kind of companies in the financial sector, it is assumed that this research is suitable for the most typical kinds of companies in the financial sector. For this reason, the outcomes of this research will be generalized to the Dutch financial sector as a whole, which are ITRA FSO's focus areas described above.

1.3 Goal and research questions

Value creation from customer analytics has not been researched extensively in scientific literature so far. Although literature findings suggest that a positive correlation exists between adopting customer analytics capabilities and increased business value (McKinsey&Company, 2014) (Herschel & Chandler, 2014). Companies that have already adopted customer analytics report, among others, the following benefits: a better understanding of their customers, the possibility to offer enhanced personalized

offerings to their potential and current customers, and an enhanced prediction of shifts in demand (Simo, 2015). Though the business value of adopting customer analytics capabilities is evident, it remains elusive how business value is created from it. For proper decision making regarding the adoption of customer analytics capabilities it is essential to understand how business value is created from adopting customer analytics capabilities. For this reason, the goal of this research was to develop a conceptual artifact that explains how business value is created from adopting customer analytics capabilities in the Dutch FS.

1.3.1 Research Questions

The following research questions were used to guide the research:

1. What is customer analytics?
 - a. How does customer analytics differ from big data analytics?
 - b. What are advantages of developing customer analytics capabilities?

2. How can the business value from customer analytics be measured?
 - a. What is IT business value?
 - b. How is IT business value evaluated?
 - c. How is business value from analytics measured?

3. How can adopting customer analytics capabilities create business value for an organization in the financial services sector?
 - a. What approaches exist to assess business value?
 - b. What requirements should an assessment approach adhere to, to measure the business value from customer analytics in the Dutch FS?
 - c. What approach is most suitable for explaining value from adopting customer analytics capabilities in the Dutch FS?

1.3.2 Scientific relevance

For companies in the FS it is still unclear how customer analytics can add value to their organizations, and how to measure this value. In scientific research some theoretical approaches and considerations of business value assessment from big data analytics and business intelligence are present, but few conceptual artifacts that explain how business value is created from adopting analytics capabilities exist yet. There exist no conceptual artifact for customer analytics specifically. Therefore, this research made a first attempt to design a conceptual artifact that explains how business value can be created from adopting customer analytics capabilities to fill this gap. In addition, this research used existing theoretical approaches and considerations of business value assessment to design a conceptual artifact for a problem for which these approaches and considerations hadn't been used before, and thus possibly came up with new starting points for future research regarding business value assessment of customer analytics.

2. Research Design

To guide the research a set of proven guidelines and processes for doing proper research were used. In this section the research design is discussed.

2.1 Research Design explained

The research design had to facilitate a design approach and adhere to the requirements for proper scientific research. That is, the research should lead to a solution that is relevant (useful in business practice), and scientifically rigorous (based on methodologies & guidelines accepted and proven in science). In addition, the research design should incorporate multiple perspectives, because IS technologies inherently involves people, managing these people, different stakeholders, and the organizational environment (March & Smith, 1995).

A research design that meets the above posed requirements is proposed by (Hevner, 2004). Hevner (2004) argues that two paradigms characterize the Information Systems discipline, that is behavioral science and design science. Truth (behavioral science) and utility (design science) are considered by pragmatists to be part of the same thing, Hevner (2004) argues therefore that the two paradigms are inseparable in IS research. As a result, scientific research should be evaluated in light of its practical implications (Hevner, 2004). Behavioral researchers are able to understand organizational phenomena in context, and design-science researchers are able to understand the problem addressed by the artifact to be developed, and the feasibility of the approach to its solution (Nunamaker et al., 1991).

To understand, execute and evaluate IS research, combining the behavioral science and design-science paradigms, Hevner (2004) established seven guidelines to assist readers to understand the requirements for effective design-science research: 1. design as an artifact; 2. problem relevance; 3. design evaluation; 4. research contributions; 5. research rigor; 6. design as a search; and 7. communication of research. From these guidelines the following research steps were derived: performing a literature review, performing interviews to create the conceptual artifact, sending out an electronic questionnaire for validation of the proposed conceptual artifact, analysis of the electronic questionnaire, and evaluation and redesign of the conceptual artifact based on the results of the electronic questionnaire analysis. A reference to Table 1 is made to explain the rationale for choosing the research steps based on the guidelines provided by Hevner (2004).

| Guidelines | Rationale |
|--|---|
| Design as an artifact: design science research must produce a viable artifact. | The research aimed to design a conceptual artifact from scientific literature (i.e. by performing scientific literature review) and by using scientific research methods. |
| Problem relevance: the objective of design science research is to develop solutions to relevant business problems. | The result of this research clearly helps to solve a business problem by helping EY to take a first step in the customer analytics domain (see section 1.2.2). |

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| Design evaluation: The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well executed evaluation methods. | An electronic questionnaire was sent out to validate and evaluate the conceptual design. |
| Research contributions: effective design science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies. | A conceptual artifact that explains the value from customer analytics did not exist yet. Existing theoretical approaches and considerations of business value assessment were used to design the conceptual artifact for a problem for which it hadn't been used for before. |
| Research rigor: design science research relies on the applications of rigorous methods in both the construction and evaluation of the design artifact. | Interviews and an electronic questionnaire were used to construct and evaluate the conceptual artifact. |
| Design as a search process: the search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment. | Evaluation and redesign of the conceptual artifact were performed based on the results of the electronic questionnaire analysis. Which was based on insights from the research population. |
| Communication of research: design science research must be presented effectively both to technology oriented as well as management oriented audiences. | The end results are focused on management and academic oriented audiences in the master thesis document and the final presentation. |

Table 1 - Rationale design science research guidelines for master thesis research (Hevner, 2004)

Because the conceptual artifact is specifically meant for the Dutch financial services sector (see section 1.2.3), and the early stage of development of customer analytics an inductive approach for the design of the conceptual artifact was taken. That is, data was collected from the literature review and the interviews, to design the conceptual artifact based on my own interpretation of this data. The data that needed to be collected is reflected in the research questions.

Research question 1 was posed to gain an understanding of the differences between customer analytics and big data analytics and business intelligence, of the characteristics of analytics that have to be taken into account when designing the conceptual artifact, and on what topics customer analytics can create value. Research question 2 was posed to assess what kind of theoretical approaches to measure business value from analytics already exist, and what considerations existed in scientific literature and needed to be taken into account for the design of the conceptual artifact. Research questions 1 and 2 are answered in chapter 3 by performing a literature review. Research question 3 was posed to come up

with the best approach for designing the conceptual artifact, what requirements needed to be adhered to design the conceptual artifact for the Dutch FS, and to do the design of the conceptual artifact based on data gathered from the Dutch FS. Research question 3 used the results from research questions 2 and applied them to the specific situation of the Dutch FS. Research question 3 is answered in chapter 4, 5, and 6 by performing a literature study, interviews and sending out an electronic questionnaire. To validate and evaluate the practical relevance of the proposed conceptual artifact in its specific business environment, extra data was gathered by sending out an electronic questionnaire and analyzed afterwards. Based on the analysis results of the questionnaire, adaptations were made to the conceptual artifact to make it fit better with the views of practitioners in the Dutch FS, thus contributing to the relevance of the designed conceptual artifact. In the end, the research results were presented in the master thesis document. An overview of the complete process, including the thesis chapters and research question, is provided in Figure 1 below. The detailed methodologies for each research step in the process is detailed in its respective chapters.

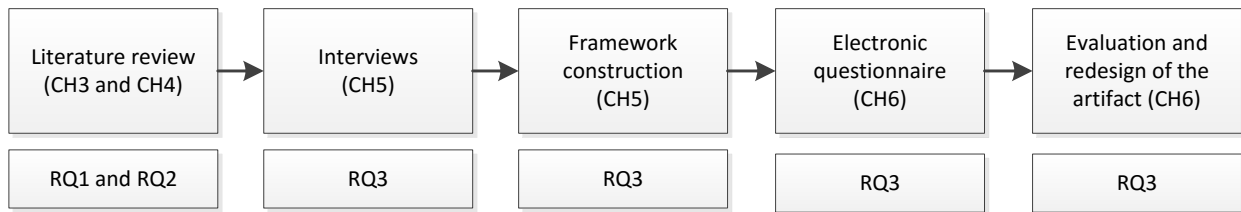


Figure 1 - Overview of research process

3. Literature review findings

In this chapter the most important literature findings on customer analytics and creating business value in the FS are discussed.

3.1 Literature review methodology

To perform the systematic review of the literature the article: A Guide to Writing the Dissertation Literature Review by Justus J. Randolph was used (Randolph 2009). This article proposes that performing a proper literature review consists of the following stages: problem formation, data collection, data evaluation, analysis & interpretation, and public presentation. Any incompleteness in the process of Randolph has been complemented with the process proposed by Reymen in the Design Science Methodology course. In addition, suggestions made by the thesis supervisor were also included in the process. An overview of the final process is added to Appendix 1 - Systematic Literature Review Process. This process was used to align the literature review with the research requirements, and any practical issues concerning my master thesis project. In this manner the best possible fit between the literature review and the master thesis research was achieved. For further details a reference is made to the systematic literature study, which is available as a separate document. This document is available on request (the inquiry information is available in Appendix 6 - Contact Information).

3.2 Summary of the main literature findings

3.2.1 What is customer analytics?

3.2.1.1 Big data analytics

Big data is usually defined in terms of 3V's, which stand for 'volume', 'velocity', and 'variety'. Often three more V's are added: 'veracity', 'variability', and 'value' (Amudhavel et al., 2015) (Gandomi & Haider, 2015). Volume refers to the magnitude of data, variety refers to the structural heterogeneity and/or architectural diversity in a dataset, velocity refers to the rate at which data are generated and the pace at which it should be evaluated, veracity refers to the unreliability of in some sources of data, variability refers to the variation in the data flow rates, and value refers to the 'low value density' of big data (Amudhavel et al., 2015). In addition, the 6V's are dependent on each other. A change in one dimension is likely to lead to change in another dimension (Gandomi & Haider, 2015).

To make a distinction between big data and (big) data analytics a closer look at the process of extracting information from big data needs to be done. Generally the process is broken down into five stages: 1. acquisition and recording, 2. extraction, cleaning and annotation, 3. integration, aggregation and representation, 4. Modelling and analysis, and 5. Interpretation. These five stage form the two main sub processes: data management, and data analytics. Data Management refers to the first three stages, while analytics refers to the fourth- and fifth stage (Gandomi & Haider, 2015). So, data analytics refers to the method used to analyze, derive, and interpret insights from big data (Amudhavel et al., 2015).

3.2.1.2 Big data and business intelligence

Isik et al., (2013) define BI as *"a system comprised of both technical and organizational elements that presents its users with historical information for analysis to enable effective decision making and management support, with the overall purpose of increasing organizational performance"*. Although big

data and BI are different terms specifying different concepts, they are related. Chen et al. (2012) explained that the term “business analytics” was introduced to refer to the key analytical component in BI. Big data and big data analytics are used to describe larger, more complex data sets that require advanced and unique data storage, management, and visualization technologies (Chen et al., 2012). Big data can thus be seen as being a component of the BI concept (Payandeh, 2013).

3.2.1.3 Customer analytics

Customer analytics usually involves analyzing available customer data for customer related decision making. A definition is provided by Sathyanarayanan (2012): “*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 customers*” (Sathyanarayanan, 2014). The goal of customer analytics is “*to create a deeper understanding of customers and their behavior to maximize their behavior to maximize their lifetime value to the company*” (Sun et al., 2014).

According to Nauck (2006), customer analytics can be divided into three main areas: customer segmentation, predicting customer actions, and understanding customer views (Nauck et al., 2006).

3.2.1.4 Advantages and disadvantages of (big) data analytics

Research performed by McKinsey surveying 418 senior executives of major companies across Europe, the Americas, and Asia showed that using customer analytics has a large impact on corporate performance (profit, sales, sales growth, and ROI). Successful companies outperform their competitors across the complete customer lifecycle (McKinsey&Company, 2014). The most important expected outcomes from the use of big data are customer centric (49%), operational optimization (18%), risk/financial management (15%), new business model (14%), and employee collaboration (4%) (Schroeck et al., 2012).

By cross linking heterogeneous and large datasets, business analysts may be able to optimize their marketing and advertising strategies, gain real-time insights into their customers’ needs, usage, and buying patterns, and possibly identify emerging (product/market) trends early on (Simo, 2015). Companies that are already applying big data technologies for analysis of their customer data derive the following usages/benefits: a better understanding of their customers, personalized offerings to their potential and current customers, and can predict shifts in demand (Simo, 2015). Other benefits from using customer analytics are: identifying segments based on profitability, assess the life time value of customers, measure campaign response rates better, predicting the risk propensity of customers, targeted marketing and campaigning, improved customer relationship management, improved customer retention and satisfaction, better utilization of marketing resources (improved ROI), and prediction of future behavior of consumers (Sathyanarayanan, 2012).

Yin explains the challenges of big data in respect of 5V’s, which are also explained above. The volume and variety of big data creates challenges in the hardware and software requirements to deal with data. The veracity and velocity of big data create the challenge to timely detect new data measured before any corruption, manipulation, or obsolescence to ensure the trustworthiness of data. Lastly, the value of big data creates the challenge of the necessity of interdisciplinary cooperation (Yin & Kaynak, 2015). In addition to challenges related to the ability to use big data, Simo (2015) mentions challenges related to

legal and ethical issues, where underlying analytical models and infrastructures negatively affect privacy from a legal and ethical perspective (Simo, 2015). Security and privacy challenges include: increased possibility of large-scale theft or breach of sensitive data, loss of individual control over personal data, long term availability of sensitive datasets, data quality/integrity and provenance issues, unwanted data correlation and inferences, lack of transparency and consent management, and algorithmic accountability (Simo, 2015). Ethical and social challenges include: information asymmetry and the issue of power; surveillance; and filter bubble, social sorting and social control (Simo, 2015). Sathyanarayanan (2014) mentions more challenges related to using big data: establishing a clear vision, investment in IT infrastructure, acquiring right talent to manage data and generate insights, destroying organizational silos, creating a face driven decision making culture, overcoming resistance to change, data governance, organizing the company around customers, prepare CMO's for social media, and establishing clear metrics to measure the outcome of analytics (Sathyanarayanan, 2012).

Companies are not fully aware of the costs that are inherent to big data (Bantleman, 2012). Due to the enormous growth of available data the costs of storing data has also increased along with it (Bantleman, 2012). In addition, even more costs are associated with the operation and overall management or integration of Big Data within the existing ecosystem (Bantleman, 2012). For example, enterprise banks must adhere to standard-based security, disaster recovery and availability, but a less costly technology like Hadoop, makes data management even more complex (Bantleman, 2012). In addition, companies need to invest in human capital, and leverage big data technologies (e.g. Hadoop) to existing data warehouse and the business intelligence infrastructure (Bantleman, 2012). (Winter, 2013) identified the following major cost components for estimating the total cost of data: acquiring, maintaining, supporting and upgrading the hardware and system software (for both data warehouse technology and Hadoop), hiring and maintaining expert staff to administer the system and the data, acquiring an extract, transform and load (ETL) or a similar solution to prepare data for analytic use, writing queries that can be expressed in SQL, creating procedural programs that perform data analyses too complex to express in SQL, and develop substantial application programs that use the data to support repeatable processes (Winter, 2013).

3.2.1.5 Concluding remarks

Big data is defined as 6V's (as discussed above). This is not different for (big) customer data. The difference between big data analytics and customer analytics is that customer analytics deals with customer data more specifically to extract meaningful insights about and for customers, while big data deals with all kinds of data. The process of extracting information from customer data is therefor similar to that of big data. The process is as follows: 1. acquisition and recording, 2. extraction, cleaning and annotation, 3. integration, aggregation and representation, 4. modelling and analysis, and 5. interpretation. Deriving value from data analytics partly depends how well this process is executed. So in addition to investing in data analytics capabilities (step 1-2), to make use of CA, data management (step 3-5) also affects the value creation from customer analytics. Therefor a view on creating value from customer analytics should not be too narrowly focused on analytics only, but should encompass a broader view on extracting value from data representing the whole information extraction process

described above. An important aspect that has been raised in the literature is that to do analytics the necessary data (if available at all) should be joined together, and made available for analysis.

Customer analytics can be used in three main areas: customer segmentation (e.g. targeted marketing and campaigning), predicting customer actions (e.g. predicting the risk propensity of customers), and understanding customer views (e.g. gaining real time insight into customer needs, usage, and buying patterns). These benefits can ultimately lead to improved customer retention & satisfaction, and better utilization of marketing resources, thus increasing the organizational performance (including ROI, profit, sales, and sales growth).

Along with benefits identified from customer analytics, several investments need to be made to create value from adopting customer analytics capabilities. Areas of investments found in literature are technological (e.g. IT infrastructure to be able to collect data from different touch points within the organization), human capital (e.g. acquiring the necessary talent to manage data), and organizational (e.g. creating a fact based decision making culture (change management)). One very important point to keep in mind is that companies are not fully aware of the costs that are inherent to big data, though it diminishes the potential value of customer analytics.

3.2.2 Measuring the business value of customer analytics

3.2.2.1 Business value of IT

IT (IS) business value research focuses on the link between IT investment and organizational performance (Masli et al., 2011). Cronk & Fitzgerald (1999) propose the following definition of IS business value: “ ‘IS business value’ is the sustainable value added to the business by IS, either collectively or by individual systems, considered from an organizational perspective, relative to the resource expenditure required”. Differing perspectives on value make it difficult to define value, and consequentially value for money, and organizational performance. “Value” is defined as “the importance, worth, or usefulness of something” (Oxforddictionaries, 2015), but what constitutes importance, worth, and usefulness to an individual is determined by many factors. For this reason, it is important to understand the evaluator’s value perspective in order to interpret her evaluation (Cronk & Fitzgerald, 1999). When considering IS business value, two concepts are relevant: the business contribution of IS business value, and how it relates to the resource expenditure required. Together this is known as “value for money” (Cronk & Fitzgerald, 1999). The added value must exceed the ongoing expenditures of the IS, hence the need to define IS business value using the word “sustainable” in the definition above. Value for money also is subject to the related issue above of the evaluator’s perspective on value for money (Cronk & Fitzgerald, 1999). Lastly, organizational efficiency and related performance are also a question of values, differing depending on perspective (Cronk & Fitzgerald, 1999). Melville et al. (2004) state that research literature studies that examine the relation between IT and organizational performance do not agree on the conceptualization of key constructs and their interrelationships. They define “IT business value” as “the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts” (Melville et al., 2004).

3.2.2.2 IT investment evaluation

IT investments often fail in delivering value to an organization, and a suggested reason is the difficulty of evaluating IT investments (Frisk, 2007). Often, the evaluation perspectives are narrow and conveyed from an economic view, which is mostly focused on costs and benefits rather than more holistic measures (Frisk, 2007). The last ten years of IT evaluation has not resulted in much progress in resolving the situation. Despite more proposed interpretative evaluation approaches, these have received little attention among practitioners (Frisk, 2007). There are several possible reasons for this: 1. efficiency is of great interest due to an economic short-term view by companies, 2. a difficulty in understanding how to apply interpretative approaches. Since the field is still far from generally accepted concepts, it needs to create an understanding of important concepts. For this reason, (Frisk, 2007) outlines an overview of different evaluation perspectives put forward by prior research.

To develop a better understanding of the different IT investment evaluation perspectives, their criteria, and rationale, (Frisk, 2007) performed a literature review. This was done from an organizational and management point of view. The following evaluation perspectives were identified: existing evaluation tools, organizational culture, program and project portfolio, strategic match, impact on organization & surroundings, risk & surroundings, IT specific characteristics, benefits, costs, stakeholders, and project organizing.

3.2.2.3 Assessing the value of business intelligence

Business intelligence (BI) has no value of its own, instead value is created from the information delivered to the organization (Brown, 2005). The perceived value of intelligence is likely to vary depending on the subjective appreciation and needs from the person for whom the extracted information is intended for (Lonnqvist & Pittimaki, 2006). Lonnqvist & Pittimaki (2006) identified two main purposes for measuring BI: determining the value of BI, and managing the BI process. Keeping in mind for or by whom value is being measured and that BI itself has no value of its own, the assessment of the value of BI requires two main questions to be answered: how much does it cost to apply BI, and what are the benefits of applying BI? Calculating the costs of BI requires calculating the expenses related to the BI activities (including e.g. labor costs, and information purchases). A method for identifying all relevant costs related to an activity is called total cost of ownership (TCO) (Lonnqvist & Pittimaki, 2006). Measuring the benefits of BI is less straightforward and difficult, due to the nonfinancial and intangible nature of it. Eventually, non-financial benefits will lead to financial benefits, but a time lag may be in between them (Lonnqvist & Pittimaki, 2006). In practice the measurement systems should be tailored to the specific needs and situation of an organization (Lonnqvist & Pittimaki, 2006).

3.2.2.4 Concluding remarks section

IT business value focuses on the link between IT investments and organizational performance. It is related to the organizational performance impacts of IT at both the intermediate process level and organization-wide level. If I make an analogy then business value derived from customer analytics focuses on the link between investments in customer analytics and organizational performance, both at the intermediate process level and organization-wide level. Also, for customer analytics holds that what constitutes importance, worth, and usefulness to an individual is determined by many factors. For this reason, also for customer analytics it is important to understand the evaluator's value perspective. In

addition, too much emphasis is placed on economic value without taking into account a more broad view, encompassing non-economic measures, which eventually lead to business value. As has been shown, a wide range of evaluation perspectives exist: existing IT evaluation, organizational culture, strategic match, impact on organization & surroundings, risk & uncertainties, IT specific characteristics, program & project portfolio, benefits, costs, stakeholders, and project organizing, and organizational culture.

BI analytics, big data analytics, and customer analytics all lead to information. Customer analytics specifically leads to information about customers, which can be used to improve organizational performance. So, in line with BI, customer intelligence also has no value of its own. Also, the perceived value is likely to vary depending on the subjective appreciation by different persons. If we make a further analogy, it can be deduced that for customer analytics the value added is its benefits minus its costs. Measuring the benefits of customer analytics is also difficult due to the intangible nature of the information derived, and its use in business processes. Enhanced business processes will lead to an enhanced customer value proposition, which in turn can lead to increased organizational performance. So, also for customer analytics holds that it will lead to financial benefits with a delay in time. Measuring value should be tailored to the specific needs and situation of an organization.

4. Business management frameworks

4.1 Rationale for a framework

The two most applied theoretical approaches are the economic/accounting and the interpretative analysis (Frisk, 2007). The economic approach sees IS as technical systems, is described as rational, because it claims that acting and behavior is predictable (Frisk, 2007). Interpretative IT evaluation approaches sees evaluation as a social process (Frisk, 2007). (Frisk, 2011) recognizes the multidimensionality of business value of IT investments, which typically resides in both tangible and intangible aspects (Frisk, 2011). Taking an economic / accounting approach to explain how value is created from customer analytics is considered unsuitable, because of the intangible nature of the output of customer analytics. An interpretative approach was therefore taken. Two main interpretative conceptual artifacts for explaining value are common in the FS: benchmarks and frameworks.

Customer analytics is still at an early stage of development. Also, the potential value created, and the kind of value conceived important, from adopting customer analytics capabilities in the Dutch FS differs from other sectors. For these reasons, benchmarking is not a suitable method for explaining how value is created from customer analytics, because these are created ex post. Frameworks allow a more flexible manner of explaining predictively how value can be created from customer analytics a priori, and is thus considered to be the better method for this research.

Customer analytics, just like Business Intelligence and analytics in general, in the end has the purpose of increasing organizational performance. For this reason, I define business value as an increase in organizational performance both at the intermediate process level and organization-wide level. Business performance management specifically deals with organizational performance, and is described as “the methodologies, metrics, processes, and systems used to monitor and manage the business performance of an enterprise” (Gartner, 2015). For this reason, a BPM framework was used to guide the design of my framework. In addition, BPM frameworks are commonly used in business, so using a BPM framework to design my own framework might add to the acceptability and comprehensibility of it to business people. Lastly, it offers clear guidelines on how to develop a solid framework.

In the next section three performance management frameworks are discussed. These frameworks are: the Balanced Scorecard Approach by (Kaplan & Norton, 2004), the Performance Prism by (Neely et al., 2002), and the SMART pyramid (also called performance pyramid) by (Lynch & Cross, 1991). The frameworks have been selected based on the following characteristics by (Neely et al., 2002):

- Provides a balanced picture of the business. From literature and from the problem statement (paragraph 1.2), it is concluded that financial measures alone are not sufficient to measure value from IS/IT systems (Frisk, 2007).
- Multidimensionality. In line with the argument for a balanced picture of the business (see above), it is important to measure multiple areas of performance. (Frisk, 2007).
- Performance should be integrated across the organization’s functions and through its hierarchy to encourage congruence of goals and actions. It is argued that the impacts of customer analytics should be measured at the intermediate process level as well as at the organization wide level. The

lenses, explained in paragraph 1.2, which companies in the FS use to evaluate their options regarding big data & analytics capabilities are reflected in this requirement.

- Provides a succinct overview of the organization's performance. This research attaches a lot of value to the practical application of the solution. A succinct overview is more practical, cheaper, and easier to use. For these reasons, an organization will be more inclined to use a framework to measure performance.

4.2 Performance Management Frameworks explained

In this section the Balanced Scorecard approach, the Performance Prism, and the SMART pyramid are explained briefly.

Balanced Scorecard Approach (BSC). The "Balanced Scorecard" developed by Kaplan and Norton (2004) is the most widely used performance management framework by practitioners (Neely et al., 2002). (Rigby & Bilodeau, 2015) found that around 40% of companies worldwide use the balanced scorecard. The balanced scorecard (BSC) approach, first introduced in 1992, by Robert S. Kaplan and David P. Norton has evolved considerably throughout the years (1st to 3rd generation). The initial design of the BSC had at least the following characteristics: financial and non-financial measures, a limited number of measures (15 – 25), four clusters of measures called perspectives (financial, customer, internal business process, and learning & growth), measures chosen related to specific strategic goals, chosen measures that gain the active endorsement by top management, and attempts to introduce causality (Lawrie & Cobbold, 2002). The 2nd generation BSC introduced a direct mapping between each of the strategic objectives attached to each perspective and one or more performance measures. In addition, causal linkages between strategic objectives were introduced. These two characteristics now define the second generation BSC (Lawrie & Cobbold, 2002). 3rd generation BSC's deals with issues related to the validation of strategic objective selection and target setting. These issues were addressed by introducing a "Destination statement" (description of what the organization is likely to look at an agreed future date), and a simplified strategic linkage model with "Activity" (learning & growth plus internal business process perspectives) and "Outcome" (financial plus customer perspective) perspectives (Lawrie & Cobbold, 2002).

Performance Prism (PP). Neely et al. (2002) developed the Performance Prism. The PP takes a stakeholder centric view of performance measurement to satisfy the growing importance of stakeholder requirements. Companies must assume a broader role than simply delivering shareholder value. Companies need to address multiple stakeholders to upkeep their corporate reputation and market capitalization at the least (Neely et al., 2002). The PP is a holistic thinking aid to illustrate the complexity of performance measurement and management within an organization through five perspectives. These perspectives are (Ken, 2002):

- Stakeholder satisfaction. Identification of the key stakeholders and their needs
- Strategies. The strategies to be put in place to satisfy the needs of the key stakeholders.
- Processes. Identification of the processes to be put in place to satisfy the needs of the key stakeholders.

- Capabilities. The capabilities (people, practices, technology, and infrastructure) to be put in place to allow the processes to operate more effectively and efficiently.
- Stakeholder contribution. Identification of what contributions are required from the stakeholders to maintain and develop capabilities.

Strategies, processes, and capabilities need to be aligned to understand how they fit together towards satisfying stakeholder needs. Measures developed through the PP need to be questioned about their necessity constantly (Do we need it? Why do we need it?), and be removed if they are not needed. Lastly, the priorities of the organization need to be communicated consistently, and regularly. Measure need to be reinforced, so that people are encouraged to take action to improve performance against them (Neely et al., 2002).

SMART pyramid. The SMART (Strategic Measurement and Reporting Technique) pyramid (also called the Performance Pyramid) was developed by Wang Laboratories and presented by R.L. Lynch and K.F. Cross in 1991. The SMART pyramid is a hierarchical structured framework for measuring business performance. It identifies five levels from top to bottom: vision, business units, business processes, departments, and individuals. In addition, two stakeholder dimensions are added: external efficiency, and internal efficiency. Every level is associated with at least one goal and measure, which has to be in line with the measures and goals on the level below it. In addition, the measures derived from the posed goals should exhibit a causal relationship between the different hierarchical levels. Lastly, Lynch and Cross added four performance loops which can be adapted to the changing environment. These loops are present at each level of the performance pyramid. The higher the level of a performance loop, the lower the frequency of it. The ultimate goal of the performance loops is to connect the different hierarchical levels to the vision and strategy of a company.

I chose the Balanced Scorecard Approach as base to design my framework. The BSC is the most well-known performance management framework available. It is also the most accepted framework in business, and accumulated the most empirical evidence. In addition, it is the most developed framework (see the description of the BSC in the previous section). The fact that the BSC has already proven itself and is used extensively, makes the designed framework likelier to be accepted and understood in business. This has been raised in literature as a critical issue for assessing parameters of value beyond economic ones. In addition, more documentation on the BSC is available, which makes the BSC the most practical framework to serve as a base for framework development. Another important reason to have chosen the BSC is that customer value is a central element in the framework (Kaplan & Norton, 2004). This makes sense considering the definition and goal of customer analytics: *“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 customers”* (Sathyanarayanan, 2014). The goal of customer analytics is *“to create deeper understanding of customers and their behavior to maximize their behavior to maximize their lifetime value to the company”* (Sun et al., 2014). In the next section the BSC is elaborated upon.

4.3 Balanced Scorecard Approach

A BSC can help an organization to create value for its shareholders, customers, and citizens (Kaplan & Norton, 2004). Key to design a BSC is to focus on the critical few parameters that represent a strategy for long-term value creation (Kaplan & Norton, 2004). A solid methodology to design a 2nd generation BSC is provided in (Kaplan & Norton, 2004), after which a destination statement can be added, and any simplifications be made.

As is noted above, the BSC incorporates four different perspectives: financial, customer, internal business process, and learning & growth). Financial performance is a lag indicator, its strategy explains how a company intends to create sustainable growth in shareholder value (Kaplan & Norton, 2004). The financial perspective remains the most important objective for profit maximizing companies. Financial performance measures, usually related to profitability, indicate whether a company's strategy contributes to bottom line improvement (Kaplan & Norton, 2004). Companies increase shareholder value if a program (e.g. customer intimacy) leads to selling more, or spending less. Thus, financial performance improves through revenue growth and productivity (Kaplan & Norton, 2004). Companies can create profitable revenue by deepening its customer relationships with existing customers, and by selling new products (Kaplan & Norton, 2004). A company can increase productivity by lowering direct and indirect expenses, by reducing their working and fixed capital by using their financial and physical assets more efficiently (Kaplan & Norton, 2004). The financial component of the strategy must incorporate the existing tension between long-term (growth), and short-term (productivity) dimensions, to sustain sustainable growth in shareholder value (Kaplan & Norton, 2004).

A revenue growth requires a specific value proposition that describes how the organization will create differentiated, sustainable value to targeted segments (Kaplan & Norton, 2004). In the customer perspective business unit managers identify specific customer segments to be targeted, and the business unit's performance measures for customers in the identified customer segments (Kaplan & Norton, 2004). These customer measures themselves can be seen as causal (Kaplan & Norton, 2004). Performance measures for customers should be in line with the value proposition it intends to offer the customers. The customer value proposition defines the company's customer strategy by describing the unique mix of product, price, service, relationship, and image that a company its customers (Kaplan & Norton, 2004). Example of value propositions are: lowest total cost, product innovation and leadership, complete customer solutions, and lock-in (Kaplan & Norton, 2004). In short, by developing objectives and measures specific to the value proposition, the strategy is translated into tangible measures for all employees to understand and work toward improving (Kaplan & Norton, 2004).

Once an organization has a clear picture of financial and customer objectives, it can develop objectives in the internal and learning & growth perspectives. These objectives describe how the strategy will be achieved (Kaplan & Norton, 2004). Internal processes achieve two components of the strategy: deliver the value proposition for customers, and improve business processes (reducing costs) (Kaplan & Norton, 2004). Kaplan & Norton (2004) group internal processes in four clusters: operations management (basic daily processes by which companies produce their existing products and services, and deliver them to customers), customer management (processes to expand and deepen customer relationships), innovation (processes to develop new products, services, and business processes), and regulatory &

social (processes to earn the right to operate in the communities and countries in the company produces and sells) (Kaplan & Norton, 2004). To balance value creation between the long- and short term, thus achieving sustained shareholder value, a few critical processes need to be identified. These critical processes need to receive special attention and focus, and should be drawn from the four process clusters described above (Kaplan & Norton, 2004). Kaplan & Norton (2004) explain the learning & growth perspective as the strategic alignment of intangible assets. They offer three categories for intangible assets: human capital, information capital, and organization capital. An overview of a generic balanced scorecard strategy map is displayed in Figure 2 - Generic Balanced Scorecard Strategy Map. Adapted from (Kaplan and Norton, 2004) and (Masli et al., 2011).

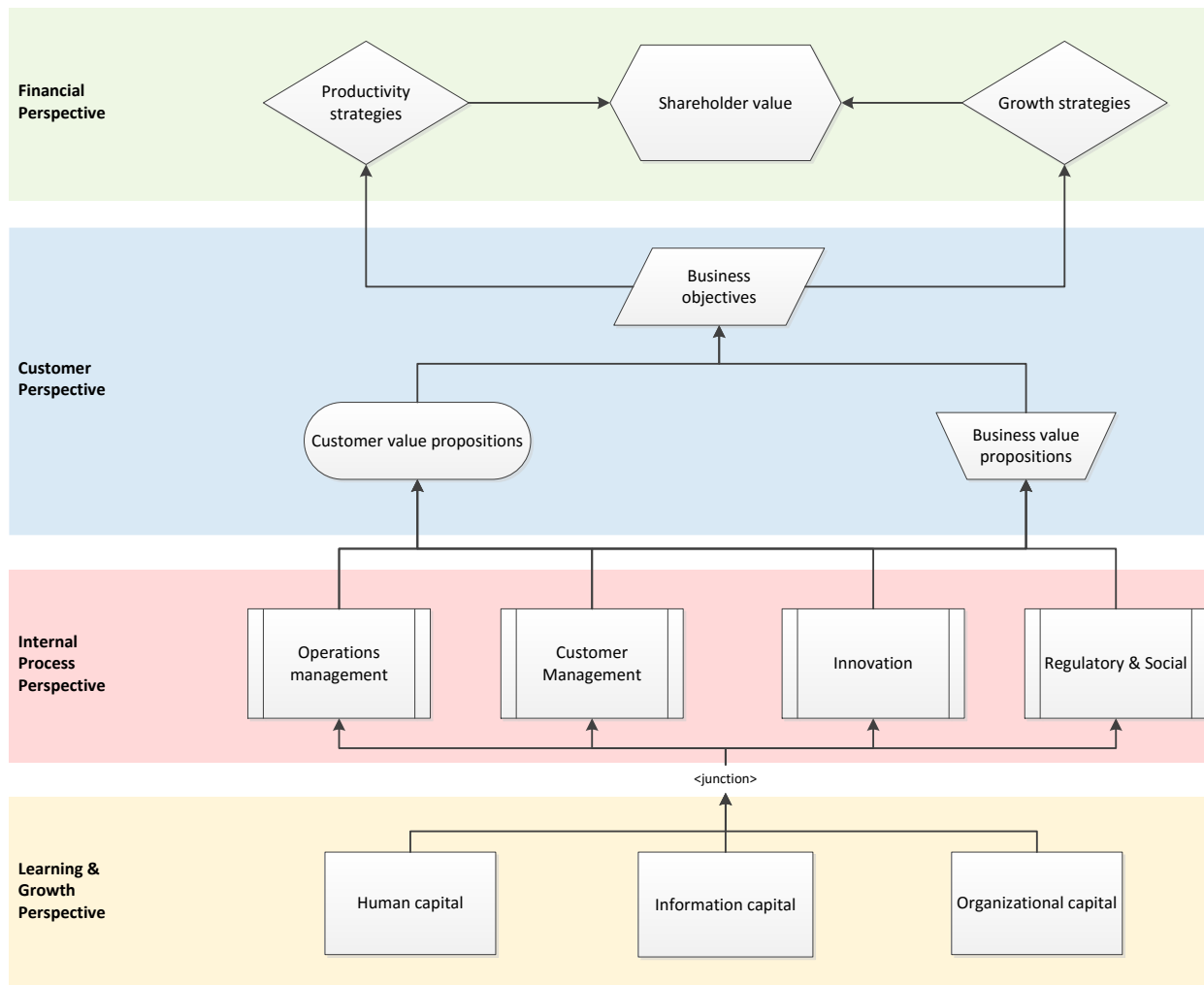


Figure 2 - Generic Balanced Scorecard Strategy Map. Adapted from (Kaplan and Norton, 2004) and (Masli et al., 2011)

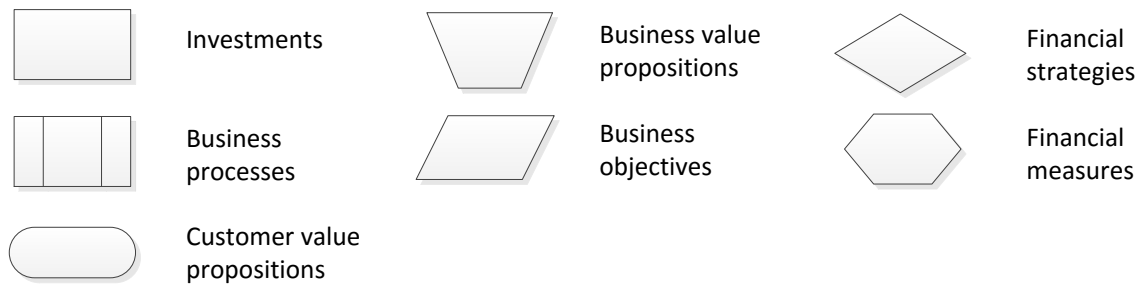


Figure 3 - Legend for generic balanced scorecard strategy map

Despite the widespread use of the BSC a number shortcomings have been identified in scientific literature. The first criticism is the dislike in the scientific community about the empirical nature of the BSC framework, and the lacking scientific foundation of the framework (Norreklit, 2000) (Schneiderman, 1999). The second criticism puts forward that the BSC is just a list of metrics, and does not provide a bottom line score or a unified view with clear recommendations (Jensen, 2001). The third criticism stresses that there is too much focus on financial stakeholders, and it has been suggested that other perspectives might better reflect the priorities of organizations not focused on economic value only (e.g. public and Non-Governmental sectors) (Andersen & Lawrie, 2002). Fourth criticism, several dimension/perspectives are missing in the BSC: competitiveness, human resources/employee satisfaction, supplier performance, product/service quality, and environmental/community perspective. (Ken, 2002). Failure to include these dimensions limits the comprehensiveness of the BSC (Ken, 2002). Lastly, it is argued that the BSC does not fully reflect the different dimensions of organizational performance: generic strategic objectives of quality, cost, delivery (speed and reliability), and flexibility (Ken, 2002).

Some criticisms do not apply to the situation of this research and the FS. The empirical nature of the BSC is considered to be a strong point of the BSC (see arguments in section “5.4 Design requirements”). Secondly, this research aims to explain how business value is added by adopting customer analytics capabilities, and not a bottom line score or unified view with clear recommendations. Lastly, the focus on shareholders as being the most important stakeholders with customers being a central element in increasing shareholder value, fits with the focus in the FS on growth of revenue, profit, and the customer base (EY, 2014). For this reason, the dimensions of the BSC are also considered to sufficiently reflect organizational performance for the Dutch FS. A last point to mention is that though there are many examples of BSC’s to be found on the web, adapting another organization’s BSC to fit your own organization is not advised. It is believed that much of the benefits of using the BSC comes from the design process (Epstein & Manzoni, 1997).

For these reasons, I have made the decision to use the balanced scorecard only as base for the design of my framework. In the next section a framework proposal is provided as a solution for the problem described in section 1.2, along with the rationale for the elements/dimensions included in the framework (both from the BSC and the literature review).

To conclude, the balanced scorecard framework will serve as a basis for developing my framework. The different perspectives provided me with insights and structure on how adopting customer analytics capabilities leads to business value. It also provides guidance for analyzing data gained from the interviews. A more thorough explanation is provided in the next chapter.

5. Framework proposal – business value of customer analytics

5.1 Performing the interviews

I chose to do interviews to gather data for the development of the framework, because it allowed me to go into detail about the topic, it allowed me to explore new ideas in a way that would not have been possible in a group, and because the duration of the research did not allow observational approaches. Lastly, due to the limited time available to conduct my master thesis research, and the limited availability of EY colleagues, conducting interviews provided the most flexible approach to gather data for constructing the framework. In the next sections the sample selection, and the design of the interview script are discussed.

5.1.1 Selection: sampling

The researched populations consisted of people working in the FS in the Netherlands working on or facing customer related business issues, and who might consider investing in customer analytics capabilities to solve their business issues (e.g. Head of CRM, Head of Marketing, Vice President Customer Experience, Market Intelligence Specialist, Manager Retail, or similar). Unfortunately, it was not possible to perform interviews with the researched population, because of practical considerations. Firstly, members of the researched population were difficult to identify, because these persons are outside of EY ITRA's regular client base. In addition, members of the researched population have limited time available for activities outside of their core activities related to their job function. For this reason and also to not intervene with other EY business activities at their clients, it was not feasible to schedule interviews at EY's clients. Also, personal resources were limited for performing interviews. Performing interviews at clients of EY would have taken more time, and (own) financial resources than available. Instead, I chose to send electronic questionnaires to individual members of the researched population to validate the constructed framework.

To construct the framework I chose to perform interviews with colleagues at the ITRA department in the Netherlands. Obviously, due to the practical considerations explained above, the chosen interview sample is a non-probability and convenience sample. Non-probability samples are useful when the researcher has limited budget and time available. These considerations also guide my sample choice. Convenience sampling is a sampling technique where subjects are selected based on their convenient accessibility and proximity to the researcher (Explorable.com, 2015). For these reasons, it has some drawbacks: 1. Results obtained through convenience sampling are difficult to replicate, 2. Convenience samples do not represent the entire population, and thus have a sampling bias, and 3. Convenience sampling has its limitations regarding making generalizations and inferences about the entire population (external validity). Despite these drawbacks, I argue that these drawbacks are mitigated for several reasons. Although my chosen sample is not a representative sample for the researched population, EY has a lot of market knowledge due to their ongoing activities performed for clients across the whole Dutch financial sector. For this reason, they have substantial knowledge about current developments and challenges faced by actors in the Dutch financial sector. In addition, the framework was validated by sending out electronic questionnaires to a sample of the actual population researched. Also, the framework is meant to help EY make a first step in developing their own customer analytics capabilities, so developing the framework should also fit within their capabilities. That is, it should fit their specific

business context including: clients, human resources, current capabilities, and strategy. For this reason, it made sense to choose an interview sample composed of EY colleagues. For these reasons, I consider the interview sample chosen, i.e. colleagues from the ITRA department at EY Netherlands, sufficiently suitable for constructing the framework.

5.1.2 Design of the interview script

An interview script was used to carry out the interviews with my EY colleagues. The interview script can be found in Appendix 7. I chose to use a semi-structured design of the interview script. Using a semi-structured approach allowed me to discover undiscovered variables, relationships and/or issues that have not identified during the literature review, while at the same time ask more specific questions by probing the interviewees based on preconceived topics, and my own knowledge. Also, a semi-structured approach allowed me to perform the interviews consistently and in a more structured manner, which made it more convenient to analyze the results afterwards and draw more meaningful conclusions considering the limited sample size.

The interview questions were designed by using the BSC framework as guideline. The interview script starts out with personal questions to make interviewees feel at ease, and to collect the necessary administrative information. After that, content related questions were posed. First, their definition of customer analytics and business value were asked to gain an understanding of how interviewees perceive the two concepts, to let them think about and verify their knowledge about the topic. After that, key enablers and requirements for customer analytics were asked to uncover variables and relationships in the context of the four perspectives of the BSC framework. If an interviewee mentioned a key enabler or requirement in light of a certain perspective, more information was asked by referring to other perspectives. For example, if an interview mentioned a certain business process as requirement, it was asked what investments are necessary to meet this requirement, or what are the customer value propositions that can be made by meeting this requirement, and so on. These questions were related to the BSC framework in general. More probing questions were then asked to make interviewees explain variables and the relationships between them more specifically. For example by asking interviewees for examples they worked on, and by simply asking them to elaborate. Keywords of the literature findings classified per perspective from the BSC framework, were added to the interview script for general support.

The structured approach of the interview is reflected in the questions, which are based on the BSC framework, and the probing questions based on the keywords. The unstructured approach is reflected the very open questions that were asked, and not providing definitions of customer analytics and business value. Before the actual start of the interview an introduction on the topic and some administrative issues was provided to the interviewees. Lastly, a closing was provided thanking the interviewees for their participation.

5.2 Interview analysis

5.2.1 Description interviewee sample

A total of 10 interviews have been performed. The transcripts of the interviews along with its associated audio files are available on request separate from this document due to the large size of the files (see

Appendix 6 for contact information). The sample consisted of persons working for the Enterprise Intelligence pillar at the ITRA department at EY Amsterdam. In addition, it consisted of persons from all levels within the department (junior advisor, senior advisor, manager, senior manager), with differing background (e.g. technical, regulatory, business, etc). In Table 2 - Summary interviewee sample characteristics you can find a summary of the interviewee sample, and their characteristics.

| Interview nr | Gender | Nationality | Company/ department | Job title | Job function (background) | Sector |
|---------------------|---------------|--------------------|----------------------------|------------------|---|---------------|
| 1 | Male | Dutch | EY ITRA/RISK | Junior Advisor | Data analytics (technical) | Financial |
| 2 | Female | Spanish | EY ITRA | Senior Advisor | Data analytics (business) | Financial |
| 3 | Female | Danish | EY ITRA | Senior advisor | Data analytics (business/ technical) | Financial |
| 4 | Male | Dutch | EY ITRA | Junior advisor | Data analytics (Regulatory/ technical) | Financial |
| 5 | Male | Dutch | EY ITRA | Manager | Data analytics/ business intelligence (business/ technical) | Financial |
| 6 | Male | Rumanian | EY ITRA | Senior Advisor | Data analytics (technical/ business) | Financial |
| 7 | Male | Dutch | EY ITRA | Manager | Data analytics/ IT auditing (business) | Financial |
| 8 | Male | Dutch | EY ITRA | Junior Advisor | Data analytics (Regulatory/ technical) | Financial |
| 9 | Male | Dutch | EY ITRA | Senior Manager | Business Intelligence/ data analytics (business) | Financial |
| 10 | Male | Dutch | EY ITRA | Manager | Data analytics (business/ regulatory) | Financial |

Table 2 - Summary interviewee sample characteristics

5.3 Framework construction

5.3.1 Analyzing the interview results

To analyze the results of the interviews the data were coded and categorized. Codes were used for phrases, sentences and sections. Codes could reflect applications, concepts, relationships, opinions, definitions, variables, and topics relevant to customer analytics. Codes were created based on the researcher's interpretation, that is, my knowledge gained through conducting the literature review. This resulted in a total of 96 codes. To make the analysis process more convenient the codes were grouped and categorized based on their topic. This resulted in 20 categories.

Appendix 8 was used as a general guideline for coding and categorizing the gathered interview data. Not every category was used in the framework, because some categories referred to supporting information not directly relevant for the framework (e.g. categories containing the definitions of customer analytics and business value). An overview of the codes and transcripts are available on request separate from this document due to the large size of the files (see Appendix 6 for contact information). No pre-established set of codes was used. This affected the replicability of the analysis, but it is argued that the issue is mitigated by the structured approach offered by the BSC framework. Unfortunately, some loss of replicability is inevitable due to this choice.

Further analysis was performed by identifying specific variables within the relevant categories to be used to construct my framework based on the BSC framework and in line with my definition of business value (I define business value as an increase in organizational performance both at the intermediate process level and organization-wide level). The following questions were used to accomplish this:

- What indicators for financial value were mentioned during the interviews?
- What customer value propositions were mentioned to create financial value during the interviews?
- What internal business processes were mentioned to deliver the mentioned customer value propositions?
- What resources need to be in place to actualize or enhance the mentioned business processes?

In addition to the variables, correlations between the different variables mentioned by the interviewees, implicitly and/or explicitly, were sought after in the categories. For example, when a remark like *"I think customer analytics is an effort to try to integrate that data, process it in a more efficient way, and analyze it to create a very customer centric picture to a client to make better decisions in the end."* was made, it was identified as a correlation between data integration, and a 360 view of the customer. An overview of all found variables and correlations is added to Appendix 9 - Identified variables and correlations from interviews.

After identifying the variables per perspective and the correlations between them, the variables were placed in its respective place in the framework according to the perspective they belonged to. In line with the BSC framework, subsequently, from bottom to top these are Learning & Growth, Internal, Customer, and Financial. The found correlations between the different variables were added afterwards. The variables in the Learning & Growth perspective indirectly affect the variables in the Financial perspective, through affecting the variables in the Internal and Customer perspective. This resulted in the framework presented in Figure 4.

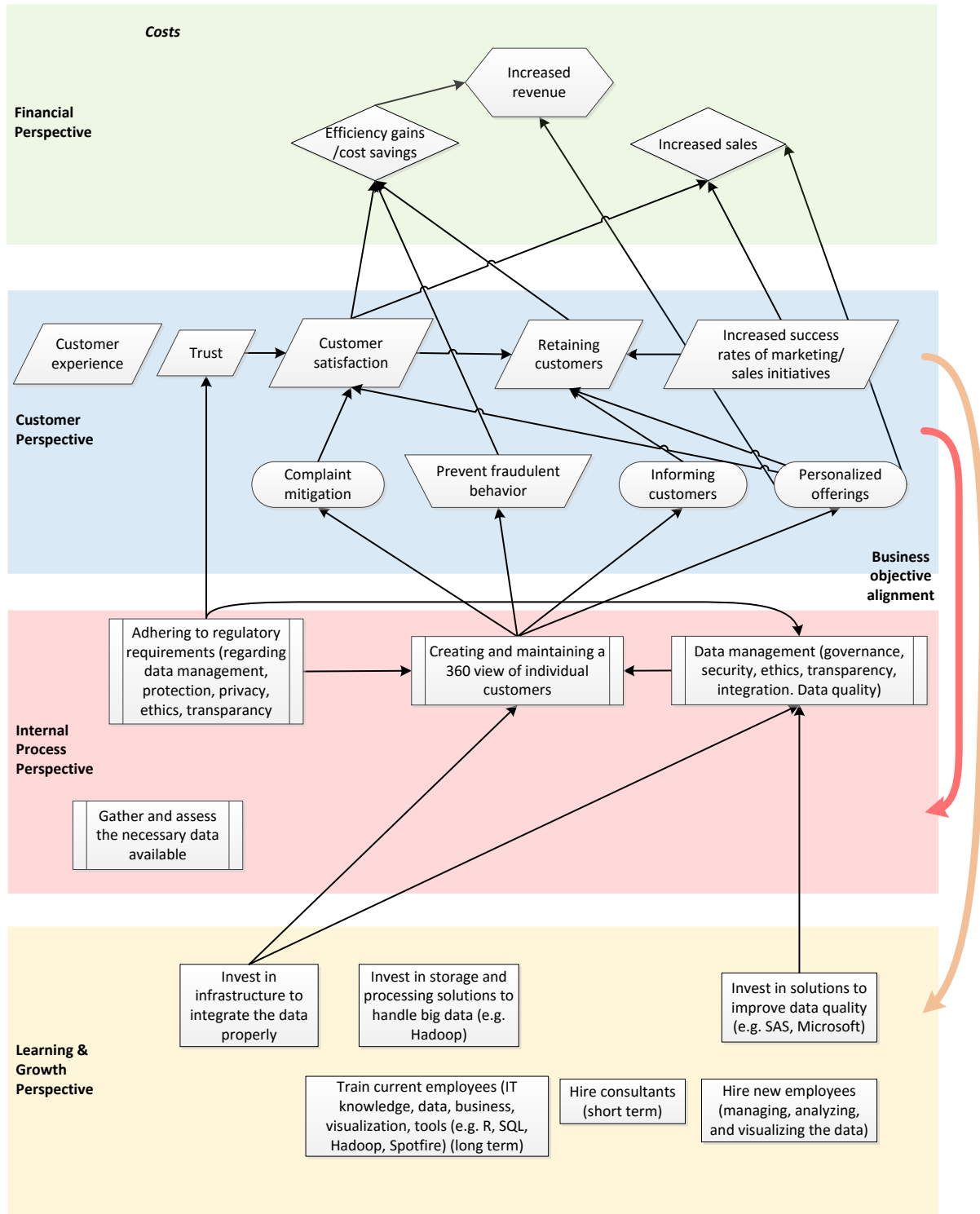


Figure 4 - Framework: How business value is created from adopting customer analytics capabilities

After constructing the initial framework, it was modified based on the insights from literature, and my own interpretations. I made the following decisions regarding the framework and its contents. I have deleted the variable "customer experience". The reason for this is that customer experience is defined

as the overall experience a customer has had with a company through different interactions (e.g. complaint handling) and relationships with actors in the company (e.g. the relationship with the local retail banking agent). It can thus refer to the whole customer perspective, and is therefore considered to be defined too vaguely in order to incorporate it in the framework. I have put the variable “Gather and assess the necessary data available” as mediator between “Invest in infrastructure to integrate the data properly” and “Creating and maintaining a 360 view of individual customers”. Investing in a proper infrastructure is a prerequisite for being able to gather all the data on a customer, which itself is a prerequisite for constructing a 360 view of a customer. I have chosen to add a connection (correlation) between the variables “Invest in storage and processing solutions to handle big data (e.g. Hadoop)” and “Creating and maintaining a 360 view of individual customers”, because in order to handle the massive amounts of customer data, which come from different sources and contain different kinds of data, new ways of storing and processing of all this data is required. Existing data warehouses are simply not suitable anymore. In this manner, the gathered data can be used effectively to create and maintain a 360 view of customers. I chose to add connections (correlations) between the learning & growth variables “Train existing employees (IT knowledge, data, business, visualization, tools (e.g. R, SQL, Hadoop, Spotfire) (long term)”, “Hire consultants (short term)”, “Hire new employees (managing, analyzing, and visualizing the data)” and the internal business processes variables “Adhering to regulatory requirements (regarding data management, protection, privacy, ethics, transparency)”, “Creating and maintaining a 360 view of individual customers”, “Data management (governance, security, ethics, transparency, integration. Data quality)”, because having the right people or training existing employees to perform a specific business process will likely result in that business process being performed better. I deleted the connection (correlation) between the variables “Personalized offerings” and “Revenue”, because this relationship is mediated by the variable “Sales”. I chose to remove the connection (correlation) between the variables “Personalized offerings” and “Sales” and instead let this connection be mediated by the variable “Success rates of marketing initiatives”. I chose to remove the connection (correlation) between the variables “Personalized offerings” and “Customer satisfaction”, and instead let it be mediated by the variable “Success rates of marketing/sales initiatives”. Personalized offerings do not necessarily have to lead to a higher customer satisfaction. It depends on how suitable the offering is to an individual customer, which is represented by the variable “Success rates of marketing/sales initiatives”. The same applies to the relationship between “Personalized offerings” and “Retaining customers”. It depends on how suitable the offering is to an individual customer whether a customer decides to stay at the company. For this reason, this relationship is also mediated by “Success rates of marketing/sales initiatives”. I have added a connection (correlation) between the variables “Sales” and “Revenue”, because sales and revenue (income) are logically linked to each other.

This resulted in the framework presented in Figure 5. This framework is the result of my inductive approach. That is, it is based on the interview results, and my interpretation of these. Other variables and correlations could have been argued for, but are not in line with the interviews. Variables and correlations that have been removed are green with a dotted line, and the added variables and correlations have a blue line. Please refer to the legend in Figure 3 for the meaning of the different shapes used in the framework.

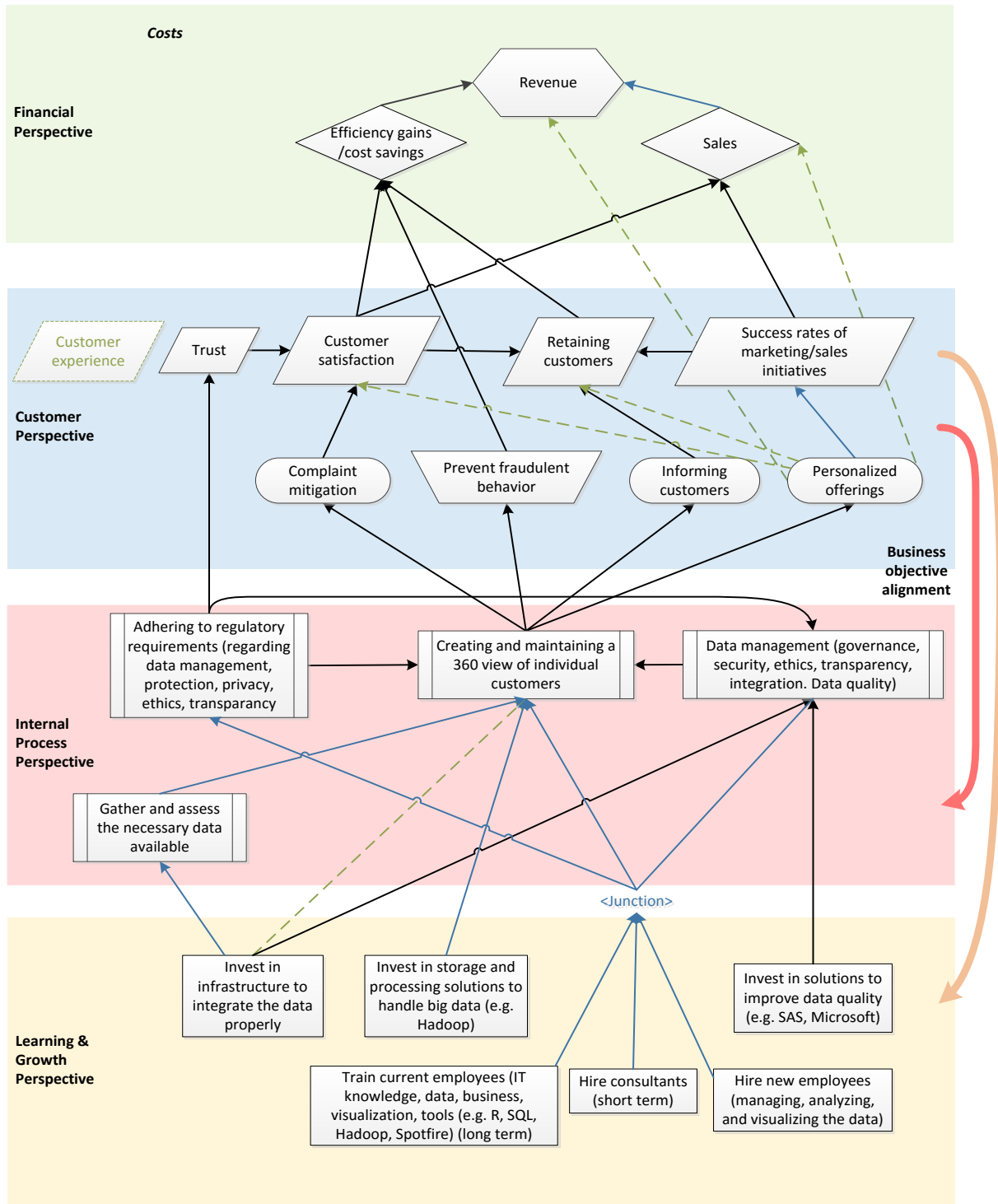


Figure 5 - Adapted framework (1): How business value is created from adopting customer analytics capabilities

In order to create business value from customer analytics investments need to be made: the IT infrastructure to integrate the data; storage and processing solutions to handle the large volumes of customer data; training current employees in all facets required for customer analytics; hiring

consultants in the short term if necessary, due to a time lag in training and hiring people and actually starting with to perform customer analytics; and solutions to improve data quality.

Investing in the infrastructure makes it possible to acquire all customer data - structured and unstructured, internal and external - from different touch points to actually perform analytics on it. In addition, storage and processing solutions are required to handle the big volumes of customer data. These investments will make it possible to handle and process the huge amount of customer data efficiently, for creating and maintaining a 360 view that is regularly updated. In order to make use of the big data analytics technologies and methodologies that are offered nowadays, employees need to be trained, and/or new employees with the required capabilities need to be hired. If companies would like to make use of customer analytics in a shorter term they can also opt to hire consultants to accelerate customer analytics developments within the company. It was apparent during the interviews that most companies in the Dutch financial sector have a lot of data available on their customers, but that the quality of it is dubious. For this reason investments in solutions for improving data quality are also required. What specific capabilities (human and or technological) need to be acquired and in which proportions depends on the capabilities already present, and the business goal of the company. Having the right knowledge and skills will enable companies to adhere to the regulatory requirements posed by national and European governments. In addition, having the right knowledge, capabilities, a proper infrastructure, including proper data quality, will make it possible to manage your data more efficiently, and create a 360 view of the customer.

Adhering to the regulatory requirements in itself will enhance data management by forcing the companies to do so. Ultimately it will increase the trust customers have in the company, because customers know you are not misusing their data and are acting with the consent of the government. Increased trust will likely lead to a higher customer satisfaction.

During the interviews it was emphasized that adhering to regulations impedes the creation of a 360 view of customers, because companies are simply not allowed to use all of the data they have available or combine them in a way to make every possible customer value proposition that might be beneficial. Managing the data properly naturally leads to being better able to create a 360 view of the customer. During the interviews it was emphasized that a lot of companies desire to have a 360 view of the customer. That is, creating one single view of a customer from all of the customer data available to a company. Companies in the financial sector still struggle with that amongst others due to huge amount of legacy systems present.

Having a 360 view of customers will enable companies to mitigate complaints, especially the ones that are likely to escalate, by linking for example, the statements made by a customer on social media with the physical complaints coming through customer service. Being better able to recognize complaints will result in a company being able to actively work on these complaints which will increase the overall customer satisfaction and reduce the costs of a complaint going viral and affecting the brand value of a company, or losing customers directly (hence the correlation between customer satisfaction and retaining customers). Having a 360 view of customers will also allow a company to make predictions about fraudulent behavior. That is, by cross linking data from different sources (e.g. historical, social media, information obtained from customer services, and/or other touch points) predictions can be

made which customers are likely to misuse products and/or services provided by the company, which will immediately result in cost savings (e.g. the costs of fraud in the United Kingdom is 90 billion on an annual basis as was mentioned during the interviews). Another benefit of having a 360 view of customers is understanding customers better, and based on their specific current and future situation informing them on their products and services they have with their financial services provider. For example, during the interviews it was mentioned that banks can advise a customer how to manage her financial situation when she is in a divorce and has less resources to spend the coming years. In this way, companies can build up relationships with customers which makes it more likely that a customer will at their current financial services provider. This ultimately will save companies resources, because the costs of attracting new customer compared to retaining current customers to maintain the same size of the customer base is much higher. Lastly, having a 360 view of customers will enable companies to make more personalized product and/or services offerings to existing and potential new customers. More personalized offerings are more likely to be valued by customers, and are thus more likely to have a higher success rate. This will result in an increase in sales (through attracting new customers), and by retaining customers (selling more to current clients and/or selling products and services at a higher price). Both efficiency gains/ cost savings, and sales, acquired by whatever means (i.e. from all variables showing a correlation with the efficiency gains/ cost), can result in revenues by companies in the financial sector.

It was emphasized during the interviews that customer analytics should be driven by business objectives, in line with company strategy. Based on a company's portfolio and strategy, specific business objectives can be prepared. After that, a company should start assessing whether they have the right data, bringing that data together, and which business processes will be affected by the business objective. Without alignment, companies will not be able to reap the full benefits from using customer analytics, amongst other due to the difficulty to get management support. Business objective/ strategic alignment is not a variable that has a direct correlation with any other variables in the framework. Rather, it is a prerequisite that has to be met. Alignment must be achieved between the business objectives, and the business processes and investments.

It was remarkable that the costs of creating business value from developing customer analytics capabilities was not mentioned during the interviews, although it is considered an essential aspect of business value creation. This lack of awareness about costs corresponds with the literature findings stating that companies are not fully aware of the costs that are inherent to big data. Although not explicitly asked for costs, one of the *requirements* (which were explicitly asked for during the interviews) identified in literature is that benefits derived need to outweigh the direct, indirect, and recurring costs that need to be made to keep deriving these benefits. Costs are being made across the whole framework, that is, in every perspective, including: direct investments, ongoing expenses to maintain and monitor the identified processes and customer value propositions. Unfortunately, none of the BPM frameworks researched above explicitly takes into account the cost perspective, so neither does the BSC framework. I have decided to not include the costs in my framework, because of the inductive research approach, and the fact that it has not been mentioned during the interviews. Instead, I'll discuss this issue in later sections of the thesis document.

6. Framework validation

To validate and evaluate the practical relevance of the proposed framework in its specific business environment, a questionnaire was sent out. The main goal of the questionnaire was to check the fit of the framework within the Dutch FS sector by assessing the consistency of the interview findings in relation to the views of practitioners. Based on the analysis results of the questionnaire, adaptations were made to the framework to make it fit better with the views of practitioners in the Dutch FS. A questionnaire makes it possible to evaluate the framework in its business context using real life data. In addition, it is practically feasible considering the resource limitations. Other evaluation methods are considered inadequate because of practical matters, because they do not apply (it is very difficult to measure business value from customer analytics as has been pointed out), or because it is not possible to evaluate the framework in its business context.

6.1 Design of the questionnaire

6.1.1 Sampling

The researched population consists of people working in an organization in the FS in the Netherlands working on or facing customer related business issues, and who might consider investing in customer analytics capabilities to solve their business issues (e.g. Head of CRM, Head of Marketing, Vice President Customer Experience, Market Intelligence Specialist, Manager Retail, or similar).

Unfortunately, it was not possible to select a sample a priori adequately representing the researched population. Due to the large size of the FS it was difficult to find or come to a complete and up to date list of the entire population and its characteristics. Instead, I chose to approach practitioners in the FS by asking my colleagues at EY for their contacts obtained through their work at clients, and by putting a request to fill in the questionnaire on LinkedIn in relevant groups related to analytics, marketing, and financial services. In addition, I asked different colleagues at EY, who didn't participate in the interviews, for the same reasons as are described in chapter 5. The drawbacks of including my colleagues in the sample are discussed in chapter 5, but it is argued that including them is fine because of the extensive market knowledge that EY has, and that the framework should be in line with the specific business context of EY ITRA. In addition, a random element has been included in the sample selection by using contacts in the FS sector from EY colleagues, and by requesting people to fill in the questionnaire posted on LinkedIn. There was no way for me to assess whether the LinkedIn respondents are representative of the population, because the population details are largely unknown. For this reason, and for including my colleagues in the sample my chosen sample is a convenience sample, making it difficult to make any statistical inferences to the entire research population. Despite this, it was still possible to draw certain conclusions, and make certain claims based on proper argumentation and the data available that can benefit EY in furthering the development of customer analytics in the Dutch FS.

6.1.2 Design of the questionnaire

I chose to send out an electronic questionnaire, because it is a quick and flexible way to reach out to people with a questionnaire. My design includes: an introduction (duration, topic, definitions, contact information), 35 statements each representing a correlation (an arrow) in the framework, including a

comment box to include other remarks, questions related to personal details, and a short ending thanking the participants. The questionnaire was deliberately kept brief, so that as many respondents as possible would be inclined to participate and finish the questionnaire. Ideally, multiple statements would be used to measure one correlation, but this would have made the questionnaire too lengthy to send out.

I chose to ask for the correlations between variables, because I was specifically interested in the cohesion of the framework. Specific variables were not asked for, but it is assumed that if any variable is not confirmed then this is reflected in the strength of a specific correlation. The statements were all described in a positive sense (arbitrarily chosen) to keep the manner of asking consistent (e.g. “if X is invested in, then Y will increase as a result”, or “in order to do Y, X is required”). I chose to use closed type of questions, to keep it simple and brief for participants, and for making it more convenient to analyze the results afterwards. Since, I am measuring latent structures, that is, their opinion about the correlation between certain variables that I identified during the interviews, I used a Likert scale as an answering scale.

6.2 Results of the electronic questionnaire

6.2.1 Methodology for analysis

The goal of the analysis is to test and validate the identified correlations within the framework. Unfortunately, I cannot assume that the sample chosen is representative of the population researched due to the limited sample size and having chosen a non-probability sample. As a consequence, it can also not be assumed that the sample is normally distributed, so normality tests were executed. For small sample sizes, normality tests have little power to reject the null hypothesis and therefore small samples most often pass normality tests (Oztuna et al. 2006). For this reason, I have decided to not perform any statistical normality tests. Instead, the visual normality tests, due to the small sample size, are considered to be sufficient to test for normality in this case. In Appendix 10 – Histograms of questionnaire data a selection of histograms are displayed of 6 identified correlations. In each histogram the mean of the answers provided by respondents is visible as a dotted red line. It is clearly visible that the data is not normally distributed around the mean. This conclusion is backed up by examining the boxplots of the same correlations displayed in Appendix 11 - Boxplots of questionnaire data. It is clear that the boxes are far from symmetrical. After doing the same analysis for all found correlations, it was concluded that the data gathered through the electronic questionnaire is not normally distributed.

Having non normally distributed data obstructed from making any kind of inferences about the population, and preventing me from using multivariate methods like SEM, which would have been the best statistical methodology to test my conceptual framework containing multiple relationships of dependent and independent variables (Joseph F. Hair et al. 2009). Instead of using inferential statistics, I had to resort to descriptive statistics to examine the validity of the found correlations and variables. Although, descriptive statistics did allow me to make any inferences or definite conclusions about the population, it did allow me to examine the strength and validity of the found correlations, and to some extent the validity of the found variables.

To examine the strength of correlations between variables, the central tendency statistics mean and mode are examined. The higher the value of the mean the stronger the correlation between two particular variables is considered. Since, I used a Likert scale, I also examined the mode. The mode is used to take into account outliers that might affect the mean, which can be very influential in a small sample. A lower mean or mode might also indicate that the respondents did not agree with the variables chosen or did not know about them. To further examine the strength of the correlations, and the validity of the variables the dispersion of the answers was examined. If the dispersion is very little, then the correlation is likelier to be more valid. If the dispersion is very high then there seems to be a disagreement about whether the correlation is valid. To measure the dispersion the difference in value between the mean and mode, and the standard deviation were examined. Lastly, I used a correlation matrix to check whether variables in a particular perspective correlated highly with each other, which might indicate that some variables need to be joined together into a single variable.

6.2.2 Results

In the end 14 people filled in the electronic questionnaire. The number of respondents is very few, but considering the short of amount of time the questionnaire was open it is considered to be acceptable. Fortunately, there were no incomplete questionnaires, so no analysis about the missing data had to be performed, and every questionnaire could be used in the analysis. The completed questionnaires are available on request (see Appendix 6 for contact information).

6.2.2.1 Description of respondents

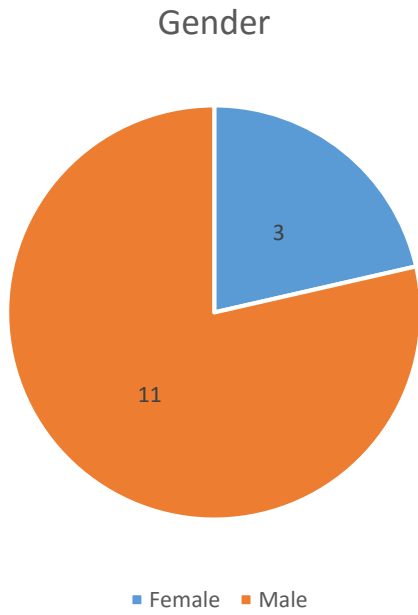


Figure 6 - Description of respondents - Gender

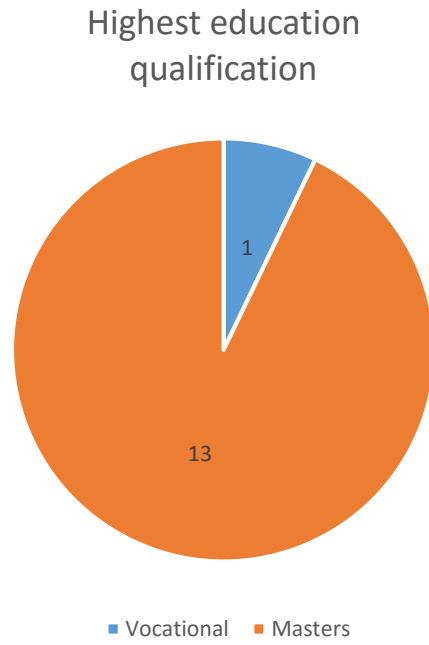


Figure 7 - Description of respondents - Highest education qualification

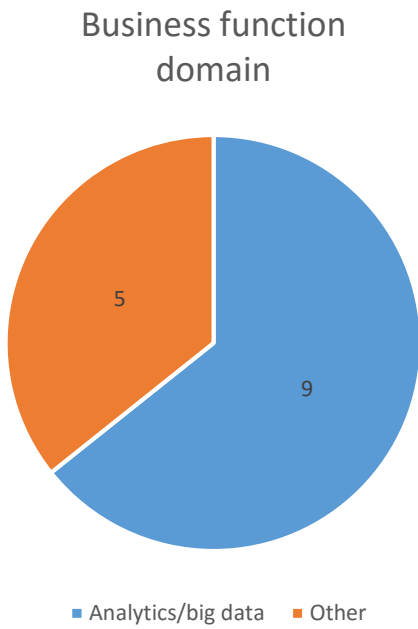


Figure 8 - Description of respondents - Business function domain

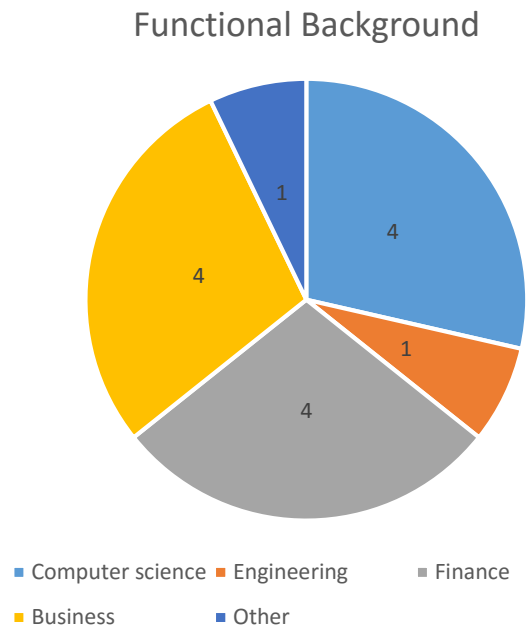


Figure 9 - Description of respondents - Functional Background

Years working at current company

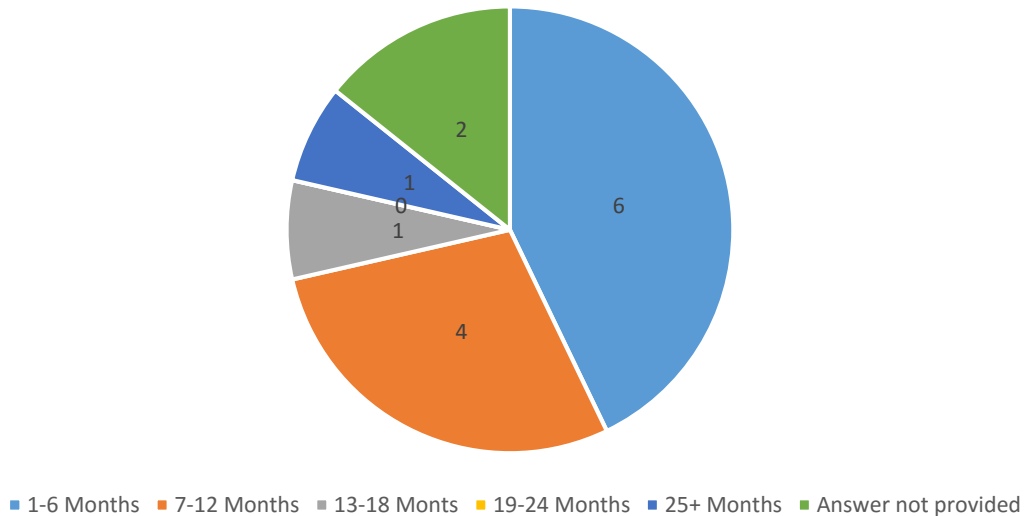
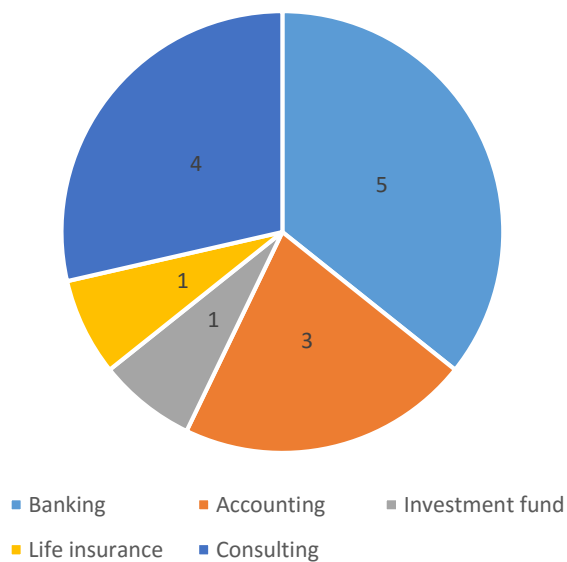


Figure 10 - Description of respondents - Years working at current company

Kind of organization



Size of the company

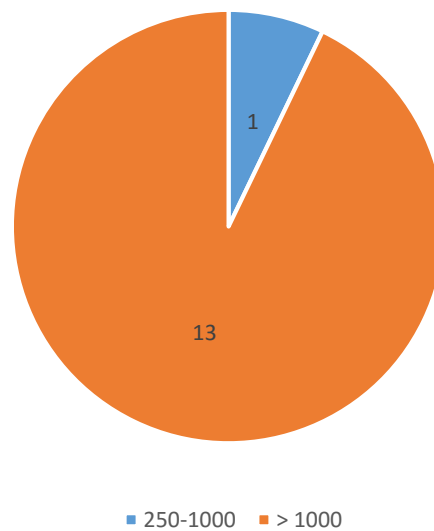


Figure 11 - Description of respondents - Kind of organization

Figure 12 - Description of respondents - Size of the company

What is noticeable is that there were no respondents with a marketing or customer relationship management function domain. Five respondents filled in “other”, and have various business function domains (including IT, product development and IT audit). This might be an indication that most companies do not really have a clearly defined business role for customer analytics professionals, which makes sense due to the early stage of development of the market. This is backed up by the numerous

categories of functional backgrounds that were filled in, despite the small sample. Another indication of the early stage of development of the market is the amount of years respondents have been working at their current company. 10 out of 14 respondents have been working at their current company for less than one year, indicating that they have been hired specifically to fill in their current role related to analytics.

13 out of 14 respondents filled in as highest education qualification to have obtained a master degree, and only one respondent filled in another category. This is a sign that the sample chosen is not representative of the population, because most employees in the working population do not have a master degree. This is further apparent in the size of the company. Most respondents work at a very large organization, while the FS also consists of a lot of smaller companies. These indications further strengthen my conclusion to not make any inferences to the researched population using this sample.

In short, the sample consists of respondents with different backgrounds, working at different companies. This makes the sample more interesting for comparison with the interview sample. From the sample description it is also further concluded that the sample is not representative of the population, and no inferences should be made to the researched population.

6.2.2.2 Reliability and Validity

Reliability and validity are considered to be the core of scientific proof, and minimum requirements for both have to be met. Reliability refers to the repeatability of the research, and validity refers to the conformity between the results and the scientific research method used. Different types of reliability and validity are distinguished, but not all can be used in this research due to resource constraints, the research design, or being not applicable.

Only one type of reliability is applicable in this research: internal consistency. It measures whether several items that propose to measure the same general construct produce similar scores. The construct I am trying to measure is business value from customer analytics, so Cronbach's alpha provides an indication whether the statements used in my questionnaire consistently measure this. Below you can see the formula used to calculate Cronbach's alpha (Figure 13) and the results of the calculations (Table 3). Cronbach's Alpha is calculated to be 0,997, which is well above the minimum of 0,7. For this reason, this research meets the reliability requirement.

$$\alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^K \sigma_{Y_i}^2}{\sigma_X^2} \right)$$

K "=" number of items (that measure one construct)
 σ_X^2 "=" variance of the observed total test scores
 $\sigma_{Y_i}^2$ "=" variance of component i for the current sample of persons

Figure 13 - Formula Cronbach's alpha

| | |
|--------------------------|-------|
| Sum item variance | 27,5 |
| Cronbach's alpha | 0,997 |
| K | 35 |

Table 3 - Results Cronbach's alpha

Validity was hard to test, since most types of require multiple tests through time or randomized tests or require a larger sample, both of which were not possible/available in this research. Also, the design of the research does not allow construct validity to be tested, because the opinion on variables specifically

was not asked for in the questionnaire, making it not possible to examine whether a specific variable is addressed properly by a specific measure (statement). For this reason, I only examined the face validity of my questionnaire.

Face validity measures whether or not the survey has the right questions in order to answer the research questions that it aims to answer. To test this I've asked a senior manager at EY to provide feedback on the first version of the designed questionnaire, and adapted the design and contents of the questionnaire based on it. Based on his expert opinion I conclude that the requirement for face validity is being met, which also provides some support for construct validity.

6.2.2.3 Strength of the correlations between the derived variables

The most important aspect to test are the correlations between the variables identified from the interviews. The strength of the correlations indicates how well the framework explains the value created from adopting customer analytics capabilities, as perceived by practitioners operating in the Dutch FS (so by the research population). The stronger the correlations, the more the FS practitioners agreed with specific actions on how to create value by adopting customer analytics capabilities in the Dutch FS.

To indicate the strength of a correlation between two variables the mean, the standardized mean, and mode were examined. The higher the mean of answers provided for a specific correlation, the stronger the correlation is considered to be. The standardized mean is also provided, because it provides a more intuitive indicator for the correlation strength than the mean (which is on a scale from 1 to 5). The standardized means is calculated by subtracting 1 from the mean and dividing the outcome by 4. Lastly, the mode is examined in order to take into account possible outliers, which can have a big impact on the mean because of the small sample size. An overview of the mean, standardized mean, and mode can be found in Table 4, which is sorted by descending value of the mean.

| Correlation name | Mean | Mode | Δ Mean / mode | Standardized mean |
|---|-------------|-------------|------------------------|--------------------------|
| <i>Data_360view</i> | 4.64 | 5.00 | 0.36 | 0.91 |
| <i>360view_ Informing customers</i> | 4.43 | 5.00 | 0.57 | 0.86 |
| <i>Informing customers_ Retaining customers</i> | 4.43 | 5.00 | 0.57 | 0.86 |
| <i>Trust_ Customer satisfaction</i> | 4.36 | 4.00 | 0.36 | 0.84 |
| <i>Customer analytics initiatives_ Clear business objectives.</i> | 4.36 | 5.00 | 0.64 | 0.84 |
| <i>Customer satisfaction_ Retaining customers</i> | 4.29 | 4.00 | 0.29 | 0.82 |
| <i>Complaint mitigation_ customer satisfaction</i> | 4.21 | 4.00 | 0.21 | 0.80 |
| <i>Customer satisfaction_ Sales</i> | 4.21 | 4.00 | 0.21 | 0.80 |
| <i>Regulatory requirements_ Trust</i> | 4.21 | 5.00 | 0.79 | 0.80 |
| <i>360view_ Personalized offerings</i> | 4.21 | 5.00 | 0.79 | 0.80 |
| <i>Business objectives_ Strategic alignment</i> | 4.14 | 4.00 | 0.14 | 0.79 |
| <i>Personalized offerings_ Marketing/sales initiatives</i> | 4.07 | 5.00 | 0.93 | 0.77 |
| <i>Train current employees_ Regulatory requirements</i> | 4.00 | 4.00 | 0.00 | 0.75 |

| | | | | |
|---|------|------|------|------|
| <i>Train current employees_Data management</i> | 4.00 | 4.00 | 0.00 | 0.75 |
| <i>Train current employees_360view</i> | 4.00 | 4.00 | 0.00 | 0.75 |
| <i>Hire consultants_Data management</i> | 4.00 | 4.00 | 0.00 | 0.75 |
| <i>Storage and processing_360view</i> | 3.93 | 4.00 | 0.07 | 0.73 |
| <i>360view_Complaint mitigation</i> | 3.93 | 5.00 | 1.07 | 0.73 |
| <i>Data management_360view</i> | 3.86 | 4.00 | 0.14 | 0.71 |
| <i>Marketing/sales initiatives_Sales</i> | 3.86 | 3.00 | 0.86 | 0.71 |
| <i>Hire consultants_360 view</i> | 3.79 | 4.00 | 0.21 | 0.70 |
| <i>Marketing/sales initiatives_Retaining customers</i> | 3.79 | 4.00 | 0.21 | 0.70 |
| <i>Hire consultants_Regulatory requirements</i> | 3.79 | 3.00 | 0.79 | 0.70 |
| <i>360view_Prevent fraudulent behavior</i> | 3.71 | 3.00 | 0.71 | 0.68 |
| <i>IT infrastructure_Data</i> | 3.64 | 4.00 | 0.36 | 0.66 |
| <i>IT infrastructure_Data management</i> | 3.64 | 4.00 | 0.36 | 0.66 |
| <i>New employees_Regulatory requirements</i> | 3.64 | 4.00 | 0.36 | 0.66 |
| <i>Data quality solutions_Data management</i> | 3.64 | 4.00 | 0.36 | 0.66 |
| <i>Regulatory requirements_Data management</i> | 3.57 | 3.00 | 0.57 | 0.64 |
| <i>New employees_360view</i> | 3.50 | 4.00 | 0.50 | 0.63 |
| <i>Retaining customers_Efficiency gains/cost savings</i> | 3.50 | 4.00 | 0.50 | 0.63 |
| <i>Prevent fraudulent behavior_Efficiency gains/sales initiatives</i> | 3.43 | 4.00 | 0.57 | 0.61 |
| <i>Regulatory requirements_360view</i> | 3.36 | 4.00 | 0.64 | 0.59 |
| <i>Customer satisfaction_Efficiency gains/costs savings</i> | 3.29 | 4.00 | 0.71 | 0.57 |
| <i>New employees_Data management</i> | 3.29 | 2.00 | 1.29 | 0.57 |

Table 4 - Central tendency statistics - Correlations

In scientific research a correlation strength is measured in values ranging between -1 and 1. Unfortunately, no distinction can be made between negative and positive correlations, so I used the absolute values of the standardized means to indicate the correlation strength. Generally in scientific research a correlation strength between 0 - 0,30 is considered to be nonexistent, +0,30 – 0,50 is considered to be weak, +0,50 – 0,70 is considered to be moderate, +0,70 – 1,00 is considered to be strong, and 1 is considered to be perfect. In the absence of an existing scale, the above specified scale is being used. Moderate correlations have been highlighted in Table 4 - Central tendency statistics - Correlations with the color orange, and strong correlations with the color light orange. If we then sort the table by the descending value of mode, it is remarkable to see that *Marketing/sales initiatives_Sales* was among the moderate correlations.

I then sorted the table by the ascending order of $\Delta \text{Mean}/ \text{mode}$. The difference between the mean and the mode is an indicator for possible outliers, and the dispersion of the answers provided on a single statement. Having a higher mean than mode means that there probably is an outlier upwards, which means that the correlation strength appears to be stronger than it really is. Conversely, having a higher mode than mean means that there probably is an outlier downwards, which means that the correlation strength appears to be weaker than it really is. Above 0,60 the value of $|\Delta \text{Mean}/ \text{mode}|$ is

perceived to be high. Interesting to see is that *New employees_Data management* has a moderate standardized mean and a high value for Δ Mean/ mode. It is thus doubtful that this correlation is supported by respondents. Other correlations that are questionable are: *360view_Complaint mitigation* (Δ Mean/ mode value > 1), *Hire consultants_Regulatory requirements* (moderate standardized mean, high value of Δ Mean/ mode, higher mean than mode), *Marketing/sales initiatives_Sales* (high value of Δ Mean/ mode, higher mean than mode), *360view_Prevent fraudulent behavior* (moderate standardized mean, high value of Δ Mean/ mode, higher mean than mode), *Customer satisfaction_Efficiency gains/costs savings* (very low standardized mean, high value of Δ Mean/ mode) , *Regulatory requirements_360view* (very low standardized mean, high value of Δ Mean/ mode).

Further examinations of the correlations identified above were done by examining their standard deviation. A high standard deviation might imply that the respondents did not agree about the importance of a specific correlation. In Table 5 an overview of the above identified correlations and their standard deviations is provided. All but the standard deviation of *Marketing/sales initiatives_Sales* are well above the average standard deviation of all correlations, which is 0,90.

| Correlation | Standard deviation |
|---|--------------------|
| <i>New employees_Data management</i> | 1.33 |
| <i>Customer satisfaction_Efficiency gains/costs savings</i> | 1.20 |
| <i>360view_Prevent fraudulent behavior</i> | 1.14 |
| <i>360view_Complaint mitigation</i> | 1.00 |
| <i>Hire consultants_Regulatory requirements</i> | 0.97 |
| <i>Marketing/sales initiatives_Sales</i> | 0.86 |

Table 5 - Standard deviations of identified weak correlations

To further examine all of the correlations identified during the interviews a correlation matrix was created. Per perspective of the BSC framework it was examined whether correlations correlated highly with each other. Variables from different perspectives are not checked for high correlation, because this cannot be backed up with the literature findings. High values for correlations might indicate that some variables need to be joined together into a single variable. The entire correlation matrix is available on request (see Appendix 6 for contact information).

It is noticeable that correlations regarding *Train current employees*, *New employees*, and *Hire consultants* correlate very high with each other, except for the correlations: *Hire consultants_360 view* and *Hire consultants_Data management*. This might imply that the three former mentioned correlations could be joined together, and that the two latter correlations should be kept separate.

6.2.2.4 Summary results and adapted framework

Based on the correlation matrix, and the examination of the mean, mode, and Δ Mean/ mode I've decided to join the correlations regarding *Train current employees*, *New employees*, and *Hire consultants*, because they correlate very high with each other, except for the correlations: *Hire consultants_360 view* and *Hire consultants_Data management*. An extract of the correlation matrix only including the above mentioned variables has been added to the appendix (see Appendix 12). The

decision to join the former correlations is also backed up by comments made by the respondents: “Training should be enough, new employees seems quite rigid”, “External consultants or new employees with the right skills will be needed, not necessary both”. The decision to leave the latter two correlations separated is backed up by the following comment from a respondent: “Regulatory wise I'm not concerned, internal training would be enough. IT infrastructure and skill wise there is a VERY large gap”. Hiring consultants to adhere to the regulatory requirements specifically is thus not deemed necessary, which is also backed up by its high standard deviation (see Table 5). *Customer satisfaction_Efficiency gains/costs savings* is left out of the framework, because of its relatively low mean, and high standard deviation. *360view_Prevent fraudulent behavior* is left out of the framework, including the variable “*Prevent fraudulent behavior*”, because of its high standard deviation, and its relatively low mean. There seems to be doubts whether customer analytics can be used in the same way for preventing fraudulent behavior in the same way as for marketing and customer relationship management related applications. This is backed up by the following comment by a respondent: “Understanding the customer especially has a high impact on advising customers on current products and on new product needs. Frauds are a different breed, however I think that it is definitely possible. What needs to be noted is that very different data needs to be collected for the purpose of business and fraud”, “In terms of fraud: dealing with false positives and false negatives can become even more expensive when not understanding them sufficiently”. For *Marketing/sales initiatives_Sales* no evidence to reject the hypothesis has been found.

Based on the changes proposed above the framework was adapted (see Figure 14 - Adapted framework (2): How business values is created from adopting customer analytics capabilities below). Variables and correlations that have been removed are green with a dotted line, and the added variables and correlations have a blue line. Please refer to the legend in Figure 3 for the meaning of the different shapes used in the framework.

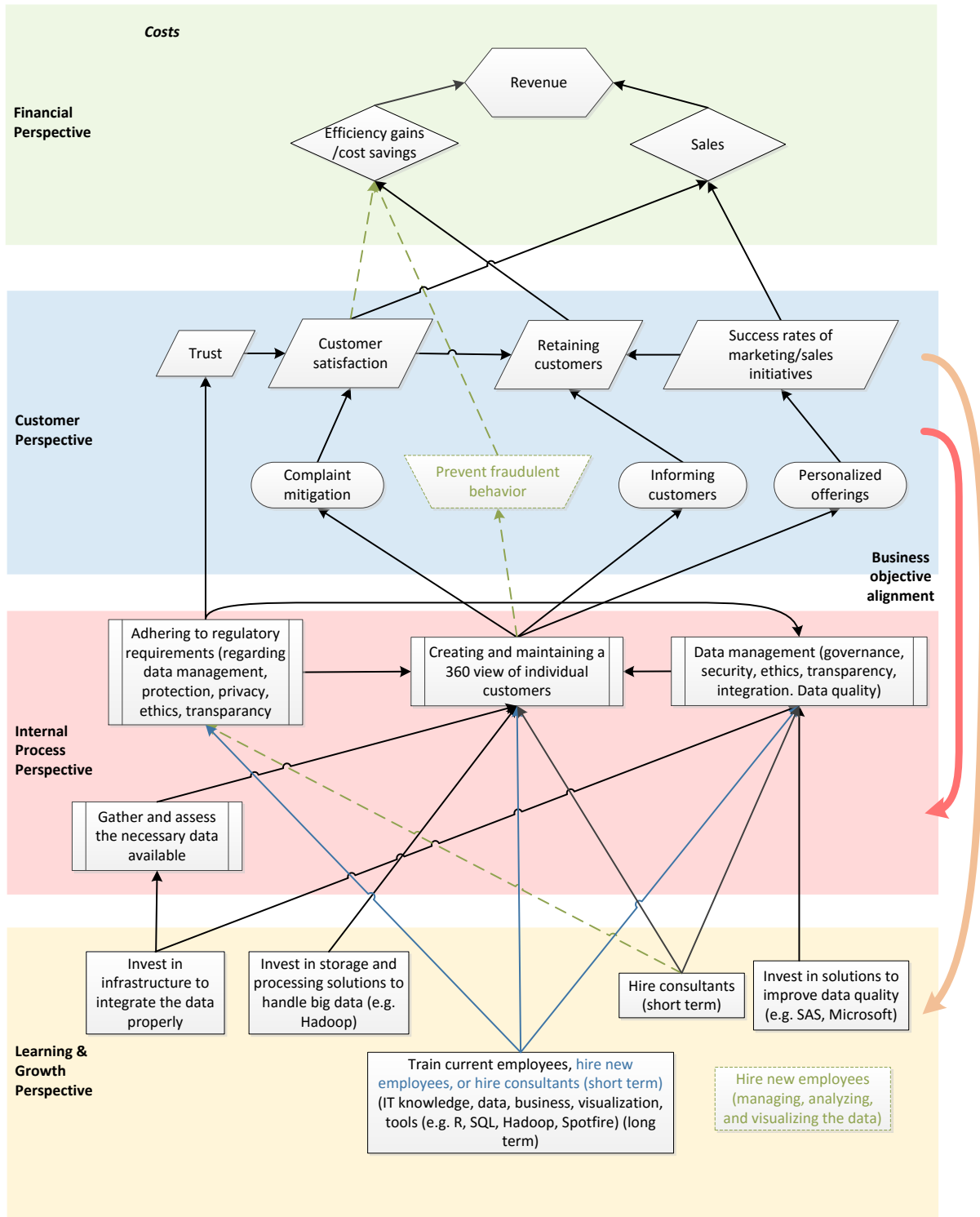


Figure 14 - Adapted framework (2): How business values is created from adopting customer analytics capabilities

6.2.2.5 Comparison of the framework with the ROI measure

As is concluded from the literature findings there currently does not exist a framework that explains how business value is created from customer analytics, especially not one that is focused on the Dutch financial sector in particular. Also, currently there do not seem to be any general frameworks that explains how business value is created from data analytics. A possible explanation for this is are the differences in business applications between sectors and geographical areas that have to be considered. Such a general framework would inherently ignore these difference, which will affect the relevance of such a framework in business. This framework can be seen as a first attempt to create a general framework that explains how business value is created from data analytics, but specified to the Dutch FS for customer analytics specifically. More of these attempts to create frameworks like mine, but then focused on other sectors or other kinds of analytics might lead to the emerging of general characteristics on how business value is created from data analytics in general.

In the 1.2.1 Problem statement it is stated that before adopting big data & analytics capabilities, companies in the FS evaluate value creation by calculating the ROI (return on investment) of an investment. The ROI is calculated by subtracting the cost of an investment from the gain from an investment, and dividing that by the cost of the same investment. Although ROI is not a method to explain how value is created, it is the common method for explaining the value creation from analytics initiatives in the Dutch FS, a comparison of this methodology against my framework is therefore made.

A big disadvantage of using the ROI measure to explain value creation is that it is much too generic. It might be that there will be benefits and costs that are considered in the ROI method that are not attributable to adopting analytics capabilities. That is, it is extremely difficult to assign specific benefits and costs to specific decisions made on the basis of information gained from customer analytics, because of the time lag between making that specific decision and the benefits that materialize as a result of the decision made, so practitioners in the FS can never be absolutely certain that the benefits derived can be attributable to adopting customer analytics capabilities. My framework deals with this by specifically explaining how adopting customer analytic capabilities will lead to economic value in the end. Although the issue with the time lag continues to be a challenge, the framework makes it more convenient to assign specific benefits and costs to specific decisions made, and monitor the implementation of these decision outcomes.

A second shortcoming of calculating the ROI to explain value creation is that it is difficult to quantify the benefits from adopting customer analytics in economic value at all. As has been raised in the 1.2.1 Problem statement it is difficult to quantify, for example, the access to cleaner data. Often these kind of benefits cannot directly be measured in terms of economic value. The advantage of my framework is that it looks at business value from an organizational and an intermediate process view. That is, it explains how business value is created in steps (per perspective), with along with its own associated measures. My framework thus offers more perspectives to look at business value added. This makes it a lot easier to conceive how economic value is created by adopting customer analytics capabilities, and make estimations of measures of business value added in each step eventually leading to economic value added.

A third shortcoming of using the ROI value is that the measure does not offer insights into how customer analytics leads to business value, on which concrete business plans can be designed. It does not offer starting points for taking next steps to actually start developing customer analytics capabilities, which is offered by my framework (see section 7.3 Managerial implications).

An advantage the ROI measure has over my framework is that it explicitly takes into account the costs of developing customer analytics capabilities. A good ROI value logically implies that the benefits derived need to outweigh the direct, indirect, and recurring costs that need to be made to keep deriving these benefits depending over what time period it is calculated for. Unfortunately, as is mentioned above, my framework does not explicitly take into account the costs of adopting customer analytics capabilities, and neither do the other BPM frameworks that have been discussed in section 4.2 Performance Management Frameworks explained. In this research a start has been made to include costs in frameworks that measure business value by raising awareness on the lack of attention of the importance of it for measuring the business value of customer analytics. Unfortunately, it was not possible to explicitly incorporate a cost perspective into my framework due to the research approach used. A possible solution for practitioners at the moment, regarding the exclusion of a costs perspective in the BPM frameworks, might be to use the ROI measure alongside these kinds of frameworks.

The last point to raise is that my framework is very static compared to the ROI measure. That is, it is very sensitive to changes in the market. For example, in a couple of years the focus on creating a 360 view of customers might have shifted to other applications entirely. This will make my designed framework obsolete, while it also takes more effort and resources to update my framework. The ROI is more generic and therefore more durable, and it also offers more flexibility because it is easier to recalculate an ROI value. As more generic characteristics are identified through research, the durability and flexibility of frameworks that explain how business value is created from adopting (customer) analytics capabilities might increase.

7. Discussion and conclusion

7.1 Conclusion

In this section a reflection and summary on the main research results is provided.

What is customer analytics? Big data is defined as 6V's (as discussed above). This is different for (big) customer data. The difference between big data analytics and customer analytics is that customer analytics deals with customer data more specifically to extract meaningful insights about and for customers, while big data deals with all kinds of data. The process of extracting information from customer data is therefore similar to that of big data. The process is as follows: 1. acquisition and recording, 2. extraction, cleaning and annotation, 3. integration, aggregation and representation, 4. modelling and analysis, and 5. interpretation. Deriving value from data analytics partly depends how well this process is executed. So in addition to investing in data analytics capabilities (step 1-2), to make use of CA, data management (step 3-5) also affects the value creation from customer analytics. Therefore a view on creating value from customer analytics should not be too narrowly focused on analytics only, but should encompass a broader view on extracting value from data.

Using customer analytics has a large impact on corporate performance. The most important expected outcomes from the use of big data are customer centric (49%), operational optimization (18%), risk/financial management (15%), new business model (14%), and employee collaboration (4%). Customer analytics can be used in three main areas: customer segmentation (e.g. targeted marketing and campaigning), predicting customer actions (e.g. predicting the risk propensity of customers), and understanding customer views (e.g. gaining real time insight into customer needs, usage, and buying patterns). These benefits can ultimately lead to improved customer retention & satisfaction, and better utilization of marketing resources, thus increasing the organizational performance.

Measuring business value from customer analytics. IT business value focuses on the link between IT investments and organizational performance. It is related to the organizational performance impacts of IT at both the intermediate process level and organization-wide level. If an analogy is made then business value derived from customer analytics focuses on the link between investments in customer analytics and organizational performance, both the intermediate process level and organization-wide level. In addition, too much emphasis is placed on economic value without taking into account more broad view, encompassing non-economic measures, which eventually leads to business value. As is shown, a wide range of evaluation perspectives exist: existing IT evaluation, organizational culture, strategic match, impact on organization & surroundings, risk & uncertainties, IT specific characteristics, program & project portfolio, benefits, costs, stakeholders, and project organizing, and organizational culture.

The output of customer analytics is information. This information can then be used for enhanced decision making regarding customers. There is a time lag between deriving the information from customer analytics and the impact it has on organizational performance. Before that the information derived from customer analytics will mainly manifest itself in enhanced business processes. Customer analytics specifically leads to information about customers, which can be used to improve organizational performance. Customer intelligence has no value of its own. Measuring value should be tailored to the

specific needs and situation of an organization, which also indicates that universal frameworks/benchmarks for explaining the value created from customer analytics should be specific to a sector or organization.

How can adopting customer analytics capabilities create business value for an organization in the financial services sector? The two most applied theoretical approaches are the economic/accounting and the interpretative analysis. An interpretative approach was taken, because of the intangible nature of the output of customer analytics. Because of the flexible manner of explaining predictively how value can be created from customer analytics, a framework is considered to be the better method for explaining how value is created from adopting customer analytics capabilities.

A BPM framework was used to guide the design of my framework, because it specifically deals with organizational performance, it is more commonly used in business, and because a BPM framework offers clear guidelines on how to develop a framework. In addition, it provides a balanced picture of the business, it is multidimensional, it integrates performance across the organization's functions and through its hierarchy to encourage congruence of goals and actions, and it provides a succinct overview of the organization's performance.

I chose the Balanced Scorecard Approach as base to design my framework. The BSC is the most well-known performance management framework available. It is also the most accepted framework in business, and accumulated the most empirical evidence. In addition, it is the most developed BPM framework (see the description of the BSC in the previous section). The fact that the BSC has already proven itself and is used extensively, makes the designed framework likelier to be accepted and understood in business. In addition, more documentation on the BSC is available, which makes the BSC the most practical framework to serve as a base for framework development. Another important reason to choose the BSC is that customer value is a central element in the framework.

I defined business value as an increase in organizational performance both at the intermediate process level and organization-wide level. The BSC framework was used to explain how value is created along four perspectives: Learning & Growth, Internal Process, Customer, and Financial. Investments (Learning & Growth perspective) should be made in the IT infrastructure, storage and processing solutions, training current employees, hiring new employees, and hiring consultants. This can enhance the following business processes (Internal Process perspective): gather and assess the necessary data, adhering to regulatory requirements, creating and maintaining a 360 view of individual customers, and data management. Enhanced business processes enable the following customer value propositions (Customer perspective): complaint mitigation, informing customers, and personalized offerings. Offering these customer value propositions enable the following business objectives (values to be determined for companies specifically) related to customers (Customer perspective) to be achieved: trust, customer satisfaction, retaining customers, and success rates of marketing/sales initiatives. Achieving these objectives can lead to efficiency gains/ cost savings and/or increased sales (Financial perspective), which can lead to increased revenue (Financial perspective).

This research aimed to develop a conceptual artifact that explains how business value is created from adopting customer analytics capabilities in the Dutch FS. The framework designed in the research

explains companies in the financial sector how business value is created and what capabilities should be in place to derive this value. In addition, it provides insight in how to measure business value other than by using economic measures and from which perspectives to measure this. This way, companies in the financial services sector are able to assess how business value is created from adopting customer analytics capabilities, and make rational decisions regarding the adoption of customer analytics capabilities.

Compared to the ROI value the designed framework offers several advantages: it is more specific about how adopting customer analytics capabilities lead to business value, making it more convenient to track benefits back to the original investments. In addition, benefits from customer analytics capabilities are difficult to quantify directly by means of estimating the ROI. The framework can be used to create measures of performance in steps (per perspective), per business process important to extract value from customer analytics. Lastly, compared to the ROI measure, the framework offers starting points for taking next steps to actually start developing customer analytics capabilities.

7.2 Discussion

In the discussion section the limitation of the research is reflected upon. In addition, the managerial implications and suggestions for future research are provided. The main limitation of my master thesis research is that I was not able to make any inferences of my results to the research population. This was due to my sample choice, and not being able to account for the validity of the research.

I chose to use an interview sample that was composed completely of EY colleagues, and argued that this was fine because of the extensive market knowledge by EY, and that the framework should fit their specific business context. ITRA is mainly focused on IT, Risk, and Assurance, so my sample is likely to have been biased towards applications of customer analytics in their field. This could have led to me not taking into account other perspectives of business value creation from customer analytics. This casts doubts on whether the complete construct was accounted for. Another limitation related to the interviews was the small set of questions. Purposefully the interview script was kept short for practical reasons (from my own perspective and the interviewee's perspective), but this limited the number of questions I could pose. This made the interview script possibly non exhaustive in terms of perspectives and topics I could address, whereby I possibly missed certain correlation and/or variables that could have been interesting to include in the framework.

Limitations related to the electronic questionnaire concern the sample size, sample choice, and the questionnaire contents. The questionnaire sample chosen was much too small, which obstructed me from using the results to make any kind of inference to the researched population. This was reinforced by using a convenience sample not representative of the researched population. As a result, the cohesion of the framework could not be tested, because I could not use SEM. In addition, the number questions posed in the electronic questionnaire was limited for practical reasons. Ideally, multiple statements would have been used to measure correlations, and specific variables. This would have made it possible to analyze the results more thoroughly and come with more solid conclusions about the framework.

Validity is only limitedly accounted for, so it is not sure whether the statements used in the questionnaire actually measure the construct they are meant to measure. Also, the difficulty in this research was that the construct to be measured: business value from customer analytics is perceived very broad by participants of this research, and was therefore open to interpretation. This made it extra difficult to adhere to validity requirements.

Another limitation concerned the use of the BSC framework. Although the BSC framework was used as guideline to design my own framework, it also limited us by excluding certain views that might have been important to consider in my framework. For example, a stakeholder perspective was not taken into account, while from the interviews it was apparent that every interviewee had a different view on what business value from customer analytics is. This might have led to me missing certain correlations and variables that should have been included in the framework.

7.3 Managerial implications

Managers at clients of EY could use the general framework for the FS to guide the development of specific business cases. Managers should start with identifying a few critical issues that are in line with company strategy for long-term value creation (e.g. customer experience, trust, etc). Then managers need to decide what kind of value they would like to create in line with the identified critical parameters (e.g. deepening customer relationships), and defined specific customer segments to target. Subsequently, specific customer value propositions need to be created to create differentiated and sustainable value for the targeted segments. Then, to achieve the strategy a few critical business process need to be identified to deliver the defined customer value propositions, and given special attention to. In addition, managers need to think what data is necessary to improve/set up this process, how to manage this data, and which regulations affect these decisions. Lastly, the required resources to be in place to work on the processes identified in the previous step need must be thought about. During the process the inherent direct costs, indirect costs, and ongoing expenses to deliver this value in a sustainable manner should be taken into account in addition to the possible value created. The framework provides an excellent guide on how practitioners in the Dutch FS think about the possible applications of customer analytics.

In line with the managerial implication explained above, managers can also use the framework to start developing objectives per perspective in the framework, define KPI's to measure these objectives, and set targets to manage the development of customer analytics capabilities. In addition, specific action plans per perspective can be made including budgeting.

Also, the framework offers insights in how EY should develop its own customer analytics capabilities to help their clients. That is, on what kind of topics to focus, to determine what kind of capabilities and resources they need to help their clients, and to develop their organizational model to deliver their customer analytics capabilities to their clients.

Lastly, the framework could be used for marketing purposes. For example, EY could use the framework to develop flyers, description on their website on the research they performed research on how the market thinks about using customer analytics to create business value. They could further specify the findings of this research by creating marketing materials around certain topics. They could also use it as

a starting point for a more extensive market research about the state of development of customer analytics in the Dutch FS.

7.4 Future research

In this section, some suggestions for future research are provided. Most importantly, more research should be performed on the cost perspective of creating business value from developing (customer) analytics capabilities, which is not included in current BPM frameworks. Research should be performed to better understand why managers often overlook to take into account the inherent costs of developing (customer) analytics capabilities. Also, the results of this research should lead to BPM frameworks incorporating the cost perspective more explicitly. For this reason, research should be performed on how to incorporate the cost perspective in current BPM frameworks, and how costs then should be measured. Secondly, similar research as the research performed in this document could be performed by including other business value perspectives. This might bring new variables and correlations to light that haven't been identified yet. Thirdly, the research could be made more specific by examining a particular part of the Dutch FS (e.g. insurances), or by focusing on a specific topic, because fraud prevention has been mentioned as "being from a totally different breed" than the other applications in the framework. This might lead to a more specifically defined framework for a particular application or part of the Dutch FS. This will lead to a narrower framework, but a more relevant one.

Fourthly, other samples for both the interview could be used in similar research. Other departments should be involved in the interviews if EY ever plans to perform a similar research. In a similar questionnaire, more people from the sector under study should be included. This will eventually lead to more solid findings, and being able to generalize the findings to the researched population more. Also, future research might try to identify specific indicators based on the framework to devise a method to quantitatively measure the business value from customer analytics prior to making any kind of investments. Lastly, similar research as in this document could be performed, but then making sure validity requirements for the questionnaire are adhered to by using techniques like test groups, randomization, measuring test results through time. This will result in more accurate research findings.

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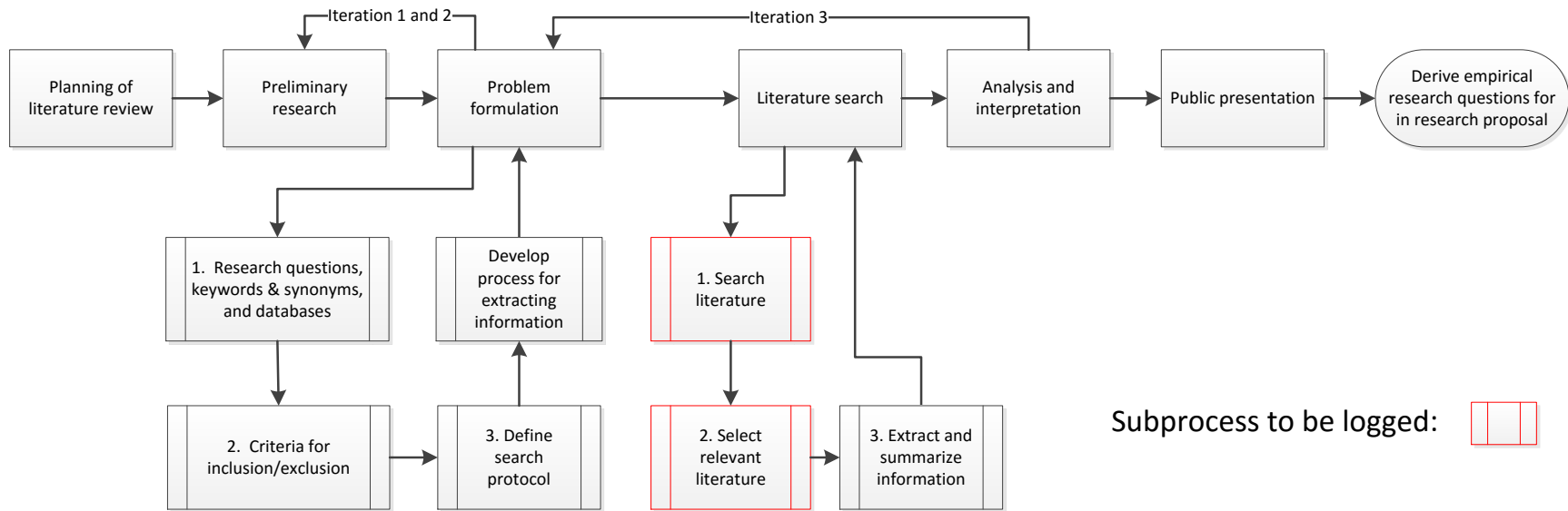
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Appendix 1 - Systematic Literature Review Process



Appendix 1 - Systematic Literature Review Process

Appendix 2 - Systematic literature review methodology and results

Background of methodology

The Master thesis project and preparation will adhere to the “Design-oriented research” principles as has been taught in the Design Science Methodology course (course code: 1ZM50), which is part of the master: Innovation Management (Reymen 2013). This approach fosters the development of design principles for use in practice which are grounded in scientific literature (academic rigor and relevance). Design principles are developed based on a systematic review of the literature (Reymen 2013). To perform a systematic review of the literature the article: A Guide to Writing the Dissertation Literature Review by Justus J. Randolph is used (Randolph 2009). This article proposes that performing a proper literature review consists of the following stages: problem formation, data collection, data evaluation, analysis & interpretation, and public presentation. These stages largely overlap with the systematic literature review process proposed by Reymen in the Design Science Methodology course, but Randolph’s process has been found more comprehensive. Any incompleteness in the process of Randolph has been complemented with the process proposed by Reymen. In addition, suggestions made by the thesis supervisor have also been included in the process. An overview of the final process has been added to Appendix 1 - Systematic Literature Review Process. In addition, if more specifics on how to execute a specific stage were required additional resources have been consulted. These resources have been referred to in its respective section.

Planning

Randolph recommends to consider where a review fits in Cooper’s Taxonomy of Literature Reviews (Cooper 1988) before commencing the actual review. This will increase the understanding of the review process and the goal to achieve, hence, will improve the overall quality of the review process. Cooper suggests that literature reviews can be classified using five characteristics: focus, goal, perspective, coverage, organization, and audience.

The main focus of this review is on practices/applications (identifying a practical need currently not being met). The goal of this review, in line with the preface, to integrate scientific literature and to critically analyze it to identify central issues, and to identify a gap in the literature to arrive at relevant research questions for the master thesis. Since the goal of the review is to integrate current literature, this review (attempts) to take a neutral perspective and presents the review findings as fact, though it will be discussed how eventual biases could have affected the literature review. For coverage of this review a representative sample of publications is considered and inferences about the entire population of publications are made. The reason for considering a representable sample is because of the time constraints for executing the master thesis project. To make sure that the sample actually represents the entire population, the sample is validated by having regular feedback sessions with supervisors of the master thesis project from academia (TU/e) and business (EY). The literature review is organized methodologically with clear sections (introduction, methodology, etc) for clarity reasons, but chapter 4 will be organized around the theoretical concepts to present the search findings more clearly. The audience of the review are the 1st and 2nd supervisors and any other possible reviewers (also in academia).

Problem formulation

To ensure that the design and content of the literature review methodology logically follow from scientific literature (i.e. that the proper research questions are posed, the proper key words determined, and the proper criteria for inclusion/exclusion are determined), preliminary research has been performed using scientific and management literature. This preliminary research was guided by knowledge from the author gained by an initial search and analysis of scientific literature, as well as by conversations with supervisors from TU/e and EY. An initial introduction into the topic had been drafted based on the preliminary research, after which an initial design of the literature review methodology was drafted (see “iteration 1” in Appendix 1 - Systematic Literature Review Process. Based on feedback from both supervisors and a further search for relevant literature a revised introduction into the topic and a revised literature review were drafted (see “iteration 2” in Appendix 1 - Systematic Literature Review Process). Based on the preliminary research, initial research questions, keywords and criteria for inclusion/exclusion were drafted, and databases were selected. Also, a method for evaluating and extracting information from the found literature was devised. After this, an initial literature search was performed, relevant literature was selected, information was extracted, and summarized. Findings from the preliminary research were added to the summary of the literature findings. Lastly, the literature findings were analyzed. The summary of the literature findings can be found in chapter 4, and the analysis in chapter 4 and 5. After the analysis and more feedback from both supervisors a third iteration took place (see “iteration 3” in Appendix 1 - Systematic Literature Review Process) to complement any literature missing deemed important. In this chapter the research questions, the keywords, databases, and criteria for inclusion/exclusion used for the literature are discussed. Finally, the search protocol are explained.

Research Questions

Based on the focus, the goal of the research, and the research of scientific literature, the following research questions and sub questions are proposed to guide and delimit the literature review:

1. What is customer analytics?

- How are customer-, social data, and marketing analytics related to each other?
- What are advantages of developing customer analytics capabilities
- What are disadvantages of developing customer analytics capabilities?
- Which technologies preceded customer analytics?

2. What are characteristics of the changing marketing landscape in the FSS?

- What trends in marketing in the FSS can be identified?
- How have consumer attitudes and expectations in the FSS changed over recent years?
- How are competitors from outside the FSS competing with the FSS?

3. What approaches exist to assess the business value of analytics?

- What is business value?
- What approaches exist to assess business value?

- What are the strengths and weaknesses of these approaches?
- What requirements should an assessment approach abide to measure the business value of customer analytics?

Question 1 is posed to gain an understanding of customer analytics and its possible value, question 2 is posed to establish the requirements by the FSS as input for the to be designed framework, and question 3 is posed to research how the business value of customer analytics can be measured.

Keywords, databases, and criteria for inclusion/exclusion

Using the above defined research questions search keywords were developed to provide a representable sample of all topics that are related to the above presented set-up. So in line with the sub research questions posed, the keywords make sure that the guidance of the systematic literature search and the delimitation of the search scope were concretely translated to the actual execution of the literature search in the literature databases. In addition, a list of databases to be used for the literature search was developed. The databases were selected based on the field of study: general/all scientific fields, computing, business, and marketing (related to technology). The derived keywords and selected databases are shown in Table 6 - Keywords and Databases. Due to time constraints it is not possible to explore every keyword combination in the same depth. How to deal with this issue is explained in section 2.3.

| | |
|------------------|---|
| Keywords | Customer Analytics, Marketing Analytics, Social Data Analytics, Data Science, Financial Industry/Sector, Financial Firm/Company/Organization, Europe, Business Intelligence, Data Mining, Drawbacks, Costs, Risks, Challenges, Benefits, Big Data, (Value AND Model), (Value AND Framework) |
| Databases | Google Scholar, Web of Science, Scopus, ABI/INFORM, IEEE – IET Electronic library, ACM Digital Library, Inspec, Elsevier Science Direct, Gartner Research library |

Table 6 - Keywords and Databases

Based on the research questions and prior knowledge the following criteria for inclusion/exclusion were developed. These criteria are used to delimit the selection scope of scientific publications in line with the delimitation enforced by the research question and keywords. In addition the criteria are posed to ensure that the selected publications adhere to a minimum level of scientific quality. The criteria for inclusion/exclusion are displayed in Box 1 - Criteria for Inclusion and Exclusion.

| |
|---|
| <p>Content-related criteria</p> <ul style="list-style-type: none"> • The publication should deal with the field of analytics (may be indirect, but must touch upon the field). • The publication should be applicable to the financial services sector. • Year of publication: at least after 2004, and a focus on publications after 2012. |
|---|

- The publication is written in English
- Only scholarly articles, management publications, books, and conference proceedings and papers are included.
- The article should deal with, be related to, or should be directly applicable to customers/consumers or marketing

Quality-related criteria

The quality of journals was assessed by studying its SCImago Journal Rank (SJR) indicator. The SJR indicator is a measure of the relative importance of a journal within its field. It is developed by SCImago from the widely known algorithm Google PageRank. Journals with a higher SJR indicator value are deemed more important than those with lower impact factors. The SJR indicator values were assessed using the website “<http://www.scimagojr.com/>”. No minimum value for the SJR value is set, but instead all publications are assessed on its perceived quality.

Managerial publications were evaluated by using the checklist by Yasin and Hasnain (2012) which is included in Appendix 5 - Grey Literature Assessment Checklist (*Yasin & Hasnain 2012*). No minimum value for the grey literature assessment checklist value was set, but instead all publications were assessed on its perceived quality.

Box 1 - Criteria for Inclusion and Exclusion

Search Protocol

It is very important for the reliability of the research to define a clear and meticulous search protocol.

Keyword Usage for Search

The data collection process starts with an electronic search in the academic databases and keywords specified in Table 6 - Keywords and Databases

As was already mentioned above it is not possible to explore every keyword combination and database in the same depth, because of time constraints. Due to a lesser relevance of some of the keywords, and the research focus it is also not necessary to explore every keyword combination. The checklist for developing a search strategy by the Cochrane network (Cochrane 2007) is used to methodologically derive useful keyword combinations for literature search. Not the whole checklist is applicable to this research, so the decision was made by cherry-picking the checklist by the Cochrane network and construct a condensed process. This process is displayed in Figure 15 - Development of Keyword Combinations.

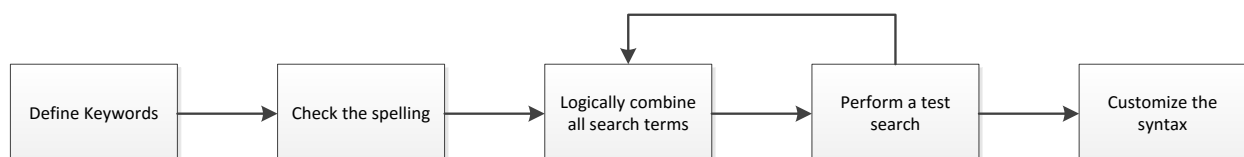


Figure 15 - Development of Keyword Combinations

The first step – define keywords – has already been executed in section 2.2 (see Table 6 - Keywords and Databases for the keyword list). The spelling of each keyword was checked by using the built in Spelling & Grammar check in Microsoft Word, and by simply looking up a particular word in the Google search engine (www.google.com). Then, logical keyword combinations were developed. This was done by first grouping the keywords that would not be used as individual keywords (because of having the same meaning, or because it would not yield more usable results if used separately (e.g. finance* and Europe both refer to the target of study)). Secondly, Wildcards (substitutions of a symbol for one letter of a word) and truncations (a technique that broadens a search to include various word endings) were added to keywords that can have multiple synonyms (e.g. financ* will search for finance, financial, financial sector, etc). Thirdly, all possible keyword group combinations were listed, after which the most useful keyword group combinations were highlighted in green and the useless in red. The decision to highlight particular keyword group combination green or red was done at the author’s discretion, and based on the research questions and the expected overlap in search results. In the end, a set of 14 keyword group combinations was drafted and tested. In the end, this resulted in a final set of 9 keyword group combinations. The final set of keyword groups, keyword group combinations (including the final set), and initial keywords have been added to Appendix 3 - Keyword combinations. Each of the keyword group combinations have been customized to the specific syntax of the database. A complete list of all keyword group combinations and its specific syntax for each database has been added to Appendix 4 - Keyword group combinations syntaxes.

Search Process

The search process starts with selecting a database (step 1). After that a separate search was executed for each keyword group combination in each of the databases (step 2). If a search would yield too many results to process, a refinement of the results was made by further specifying the search by selecting on metadata. A first refinement was made by refining the results based on “year of publication”, because this research strives to use the most recent publications based on the most recent developments (it is acknowledged that for every concept the most recent developments differ regarding their age (e.g. the most recent developments for concept A might be existing for 10 years already, while for concept B this might have been for only 1 year)). If the number of results would still be too much to process, a further refinement was made based on “type of document”. Only scientific publications would be included then (step 3). The sought after number of search results was 100 after this step. After this a further selection of publications was made based on the title and availability (step 4). Then another selection was made based on the abstract of the article (step 5). All publications conceived irrelevant were discarded after step 5. The research questions and content-related criteria were used as a guideline for including or excluding a publication throughout the selection process so far. After that, the found publications were processed (step 6) which meant: adding pre research and other provided documents; removing supporting publications, (e.g. (Randolph 2009)), removing doubles, and performing a quality check. Subsequently, the found publications were summarized (step 7), and relevant publications were selected (a further refinement) and integrated (step 8). After iteration 3 in Appendix 1 - Systematic Literature Review Process, further literature searches have been performed by reference searching and citation searching, (step 9). Step 9 was repeated until the research questions were answered sufficiently, which was decided at the author’s discretion. This resulted in a final set of publications (step 10). An

overview and summary of the literature search process can be found in Figure 16 - Literature Search Process.

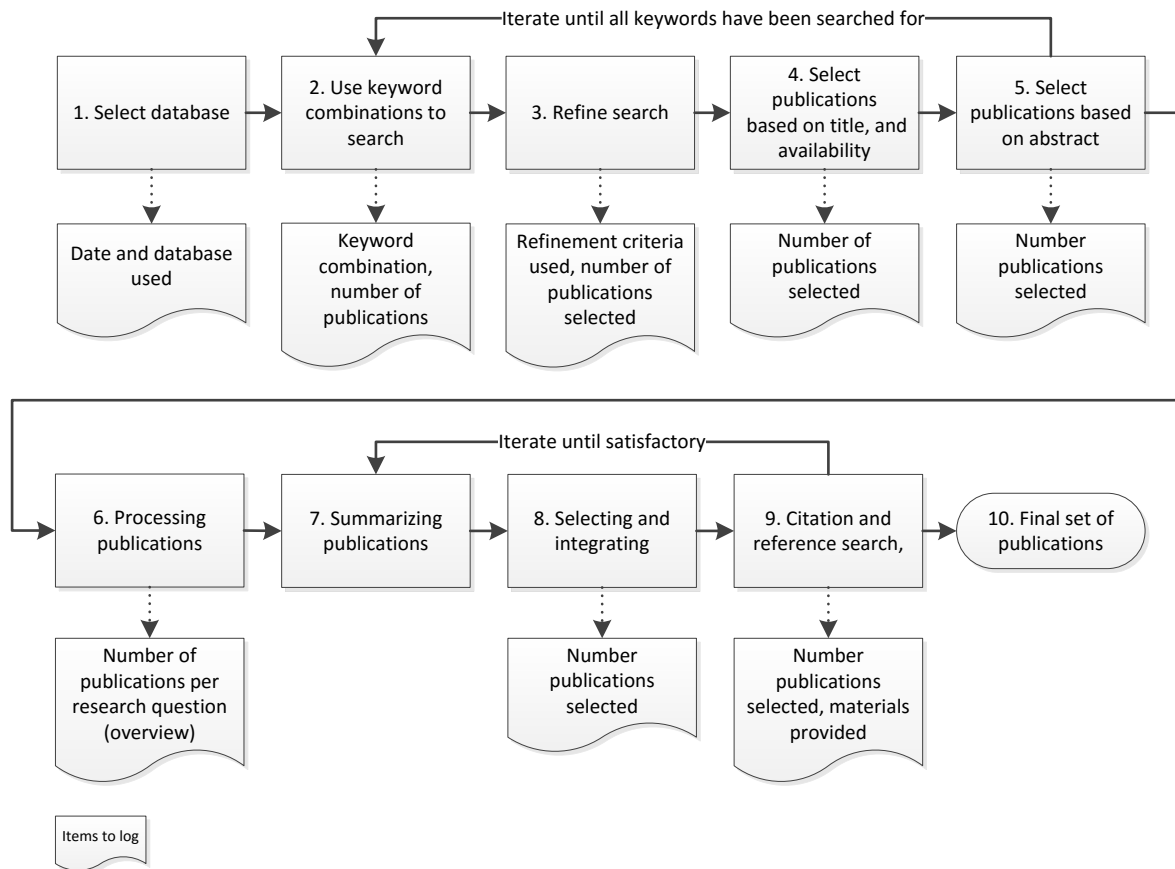


Figure 16 - Literature Search Process

Data extraction

A clear and careful method for data extraction has to be developed, in line with the goal and focus of the literature review (Randolph 2009). As stated in section 1.2, the goal of this literature review is integration and analysis, and the focus is on practical applications. Another requirement of the method is that the level of detail is sufficient, so that a second person could arrive at about the same results by following the procedures in the method (Randolph 2009). Based on the goal and focus this literature review extracts the required data from different sources.

| | |
|-------------------------------|--|
| Practical applications | Results (frameworks, models, etc), managerial implications |
| Integration | Abstract, conclusion |
| Analysis | Research gap, arguments made |

Table 7 - Data Sources

Due to time constraints it was chosen to detect and summarize specific useful information from the found publications in line with the research questions. If a publication did not contain any useful information, it was discarded.

Data Collection

In this chapter an overview of the search results after step 5, and step 10 in Figure 16 - Literature Search Process is provided.

| Topic | | <i>Changing marketing landscape</i> | <i>Current state of development</i> | <i>How to measure value</i> | <i>What is customer analytics</i> | <i>Total</i> |
|--|-----------------------------|-------------------------------------|-------------------------------------|-----------------------------|-----------------------------------|--------------|
| Database | ABI_INFORM | 2 | 0 | 8 | 5 | 15 |
| | ACM Digital Library | 0 | 0 | 1 | 1 | 2 |
| | Elsevier Science Direct | 4 | 1 | 3 | 2 | 10 |
| | Gartner Research Library | 6 | 9 | 13 | 9 | 37 |
| | Google Scholar | 6 | 0 | 2 | 12 | 20 |
| | IEEE-IET Electronic library | 0 | 1 | 8 | 2 | 11 |
| | Inspec | 0 | 2 | 4 | 3 | 9 |
| | Scopus | 4 | 0 | 4 | 2 | 10 |
| | Web of Science | 1 | 1 | 7 | 7 | 16 |
| Total number of publications (after step 5) | | 23 | 14 | 50 | 43 | 130 |
| % | | 18% | 11% | 38% | 33% | 100% |
| Scientific Literature | | | | | | |
| | | <i>Scientific Literature</i> | <i>Grey Literature</i> | <i>Total</i> | | |
| Total number of publications (step 10) | | 66 | 31 | 97 | | |
| % | | 68% | 32% | 100% | | |

Table 8 - Overview of the Search Results

Appendix 2 - Systematic literature review methodology and results

Appendix 3 – Keyword combinations

| | |
|---|---|
| <ol style="list-style-type: none"> 1. Customer analytics 2. Marketing analytics 3. Social data analytics 4. Data science 5. Financial industry/sector 6. Financial firm/company/organization 7. Europe 8. Business intelligence 9. Data mining | <ol style="list-style-type: none"> 10. Drawbacks 11. Costs 12. Risks 13. Challenges 14. Benefits 15. Big data 16. (Value AND Model) 17. (Value AND Framework) |
|---|---|

Box 2 – Keywords

| Group # | Group of keywords |
|---------|--|
| 1 | “customer analytics” OR “marketing analytics” OR “social data analytics” |
| 2 | “data science” OR “big data” OR “business intelligence” OR “data mining” |
| 3 | financ* OR Europe |
| 4 | (value AND framework) OR (value AND model) |
| 5 | “challenges” OR “drawbacks” OR “costs” OR “risks” OR “benefits” |

*Table 9 - Keyword groups **

* Keyword combinations like “(customer analytics)” instead of “customer analytics”) were not used, because some keywords lose their meaning when using brackets instead of quotation marks. There would be too many useless results (e.g. using (marketing analytics) would also result in publications like: “Web 2.0: Conceptual foundations and marketing issues”). In addition, the keywords used are judged as being an established concept. Any useful article related to these keywords would therefore also contain the exact keyword in it.

| | n = 4, r = 1 | n = 4, r = 2 | n = 4, r = 3 | n = 4, r = 4 |
|-------------------------------------|--------------|--------------|--------------|--------------|
| Possible keyword group combinations | 1 | 1, 2 | 1, 2, 3 | 1, 2, 3, 4 |
| | 2 | 2, 3 | 2, 3, 4 | |
| | 3 | 3, 4 | 3, 4, 1 | |
| | 4 | 4, 1 | 4, 1, 2 | |
| 2, 4 | | | | |
| 3, 1 | | | | |
| Other combinations | 1, 5 | 1, 4, 5 | 4, 5 | |

Table 10 - Keyword group combinations

n = number of keyword groups possible

r = number of keyword groups used

Final set of keyword group combinations

Appendix 4 – Keyword group combinations syntaxes

Web of Science, Scopus, ABI/INFORM, IEEE – IET Electronic library, Elsevier Science Direct, Inspec

| # | Combination |
|---|---|
| 1 | “customer analytics” OR “marketing analytics” OR “social data analytics” |
| 2 | (“customer analytics” OR “marketing analytics” OR “social data analytics”) AND (drawbacks OR costs OR risks OR benefits) |
| 3 | (“customer analytics” OR “marketing analytics” OR “social data analytics”) AND (“data science” OR “big data” OR “business intelligence” OR “data mining”) |
| 4 | (“data science” OR “big data” OR “business intelligence” OR “data mining”) AND (financ* OR Europe) |
| 5 | ((value AND framework) OR (value AND model)) AND (“customer analytics” OR “marketing analytics” OR “social data analytics”) |
| 6 | (“customer analytics” OR “marketing analytics” OR “social data analytics”) AND (financ* OR Europe) |
| 7 | (“customer analytics” OR “marketing analytics” OR “social data analytics”) AND ((value AND framework) OR (value AND model)) AND (drawbacks OR costs OR risks OR benefits) |
| 8 | (“data science” OR “big data” OR “business intelligence” OR “data mining”) AND (financ* OR “Europe”) AND ((value AND framework) OR (value AND model)) |
| 9 | (financ* OR “Europe”) AND ((value AND framework) OR (value AND model)) AND (“customer analytics” OR “marketing analytics” OR “social data analytics”) |

Table 11 - Keyword group combinations syntaxes (1)

Google Scholar, Gartner Research library

| # | Combination |
|---|---|
| 1 | "customer analytics" OR "marketing analytics" OR "social data analytics" |
| 2 | ("customer analytics" OR "marketing analytics" OR "social data analytics") AND (drawbacks OR costs OR risks OR benefits) |
| 3 | ("customer analytics" OR "marketing analytics" OR "social data analytics") AND ("data science" OR "big data" OR "business intelligence" OR "data mining") |
| 4 | ("data science" OR "big data" OR "business intelligence" OR "data mining") AND ("financial industry" OR "financial sector" OR "financial firm" OR "financial company" OR "financial organization" OR "financial service provider" * OR Europe) |
| 5 | ((value AND framework) OR (value AND model)) AND ("customer analytics" OR "marketing analytics" OR "social data analytics") |
| 6 | ("customer analytics" OR "marketing analytics" OR "social data analytics") AND ("financial industry" OR "financial sector" OR "financial firm" OR "financial company" OR "financial organization" OR "financial service provider" OR Europe) |
| 7 | ("customer analytics" OR "marketing analytics" OR "social data analytics") AND ((value AND framework) OR (value AND model)) AND (drawbacks OR costs OR risks OR benefits) |
| 8 | ("data science" OR "big data" OR "business intelligence" OR "data mining") AND ("financial industry" OR "financial sector" OR "financial firm" OR "financial company" OR "financial organization" OR "financial service provider" OR "Europe") AND ((value AND framework) OR (value AND model)) |
| 9 | ("financial industry" OR "financial sector" OR "financial firm" OR "financial company" OR "financial organization" OR "financial service provider" OR "Europe") AND ((value AND framework) OR (value AND model)) AND ("customer analytics" OR "marketing analytics" OR "social data analytics") |

Table 12 - Keyword group combinations syntaxes (2)

ACM Digital Library*

| | |
|---|---------------------------------------|
| 1 | "customer analytics" AND financ* |
| 2 | "customer analytics" AND Europe |
| 3 | "marketing analytics" AND financ* |
| 4 | "marketing analytics" AND Europe |
| 5 | "customer analytics" AND "framework" |
| 6 | "marketing analytics" AND "framework" |
| 7 | "customer analytics" |

Box 3 - Keyword combinations syntax ACM Digital Library

* It was decided to make a custom keyword combination list, because of the limited search functionalities of the ACM Digital Library. In addition, the available literature in the database is also limited compared to the other databases used. The keyword combinations in Box 3 - Keyword combinations syntax ACM Digital Library – were used for the ACM Digital Library. These keyword combinations are found most important in light of the research goal.

Appendix 4 - Keyword group combinations syntaxes

Appendix 5 – Grey Literature Assessment Checklist

(Assign scores. Yes = 1, Partially = 0.5, No = 0)

| No | Question | Answer |
|----|---|--------------------|
| 1 | What is the research methodology defined? | Yes/ No/ Partially |
| 2 | Does the article produce repeatable results? | Yes/ No/ Partially |
| 3 | Does the article have sufficient bibliographical information? (Author, Stakeholders, Date) | Yes/ No/ Partially |
| 4 | Does other reviewed paper cite the document? | Yes/ No |
| 5 | Is the document produced by international organization or research lab? | Yes/ No |
| 6 | Is the article commented online in forums/ discussion boards? | Yes/No |
| 7 | If discussed online, do the comments contribute to the original article findings? | Yes/No |
| 8 | Does the author belong to academic/ research institute? | Yes/No |

Appendix 5 - Grey Literature Assessment Checklist (Yasin & Hasnain 2012)

Appendix 6 - Contact Information

For any inquiries regarding this document please contact:

Tom van Norden

E-mail: t.norden@student.tue.nl or tomvannorden1@gmail.com

Appendix 6 - Contact Information

Appendix 7 – Interview script

Prerequisites for the interview to take place

Requirements for participating in the interview

- Should know what customer analytics is.
- Should have prior experience with analytics (BI or Big Data) and/or data management, or should work on a project related to the topic now, or planning to do so in the future.
- (Optional) Should know (a little) something about customer related issues (from Marketing, CRM, other)

Before the interview <Introductory script>

Proceedings before the interview

1. Explain the research briefly
 - I am researching how customer analytics can add value to an organization in the Dutch financial services sector.
2. Is it OK if I tape the interview for transcription purposes, and analysis?
3. Is it OK with you that the transcripts, and tapes become public material (both on request only)?
4. Answer the question to the best of your knowledge. There is no right or wrong, I am just curious about you opinion. I do want to ask you to be as concrete, and to the point as possible
5. (if the interviewee is Dutch) Are you OK with us doing the interview in English?

Introduction

0. Welcome. Thank you for participating in this interview regarding customer analytics.
1. The goal of this interview with you is to explore your opinion about how customer analytics can create value in the financial services sector in the Netherlands, and what the requirements are for doing so.
2. You can answer the questions to the best of your knowledge, don't worry about your answer being correct or wrong
3. Do you have any questions before we get started?

Format

1. We'll start off with some introductory questions about you and your role within the organization
2. Then we'll ask you some questions about customer analytics, and business value

3. Then we'll go into how customer analytics can create value within the financial sector

Interview questions – Customer analytics framework FSS

- The interview has started, so the everything will be recorded from now on
 - o <You have consented to me taping the interview, could you please confirm?>

Introductory questions

- Welcome... , please tell me what is your name, and current job function?
- Please tell me, what experience with big data and/or business intelligence do you have?
 - o How many years or projects? (approximately)
- Please tell me, what experience do you have in customer related domains (e.g. customer relationship management, marketing, other)?
 - o How many years or projects? (approximately)

Customer Analytics & business value

- What is your definition of customer analytics?
- What is your definition of business value created from customer analytics?
- Tell me what you think are the key enablers for creating value from customer analytics in the financial services sector in the Netherlands?
 - o Data management, human capital acquisition (data scientists, data engineers), change management, data storage, data analysis, destroying organizational silo's,
 - o Internal business processes, marketing, sales, regulatory
 - o Customer value proposition,
 - o External factors: market, government, technological developments, organizational culture & mindset, goal & vision
 - o Current capabilities: BI, data management,

!!! It is very important to probe interviewees during these questions. E.g. if they say "technology is a key enabler", ask them what kind of technology, why, ask for examples, etc?!!!

- Tell me about the requirements there are for creating value from customer analytics you think?

!!! It is very important to probe interviewees during this question.!!!

- Please tell me, what do you think is the added value of big (customer) data analytics compared to current existing BI capabilities?

< stop recording the interview >

After the interview < closing script >

- Thank you for your participation
- Remind them that the tape is public material, and the transcripts and tapes of this interview will be available on request.
- I will send you the final results of my thesis (so the thesis document), but if you have any questions about my research do feel free to contact me.
- **Thanks again!**

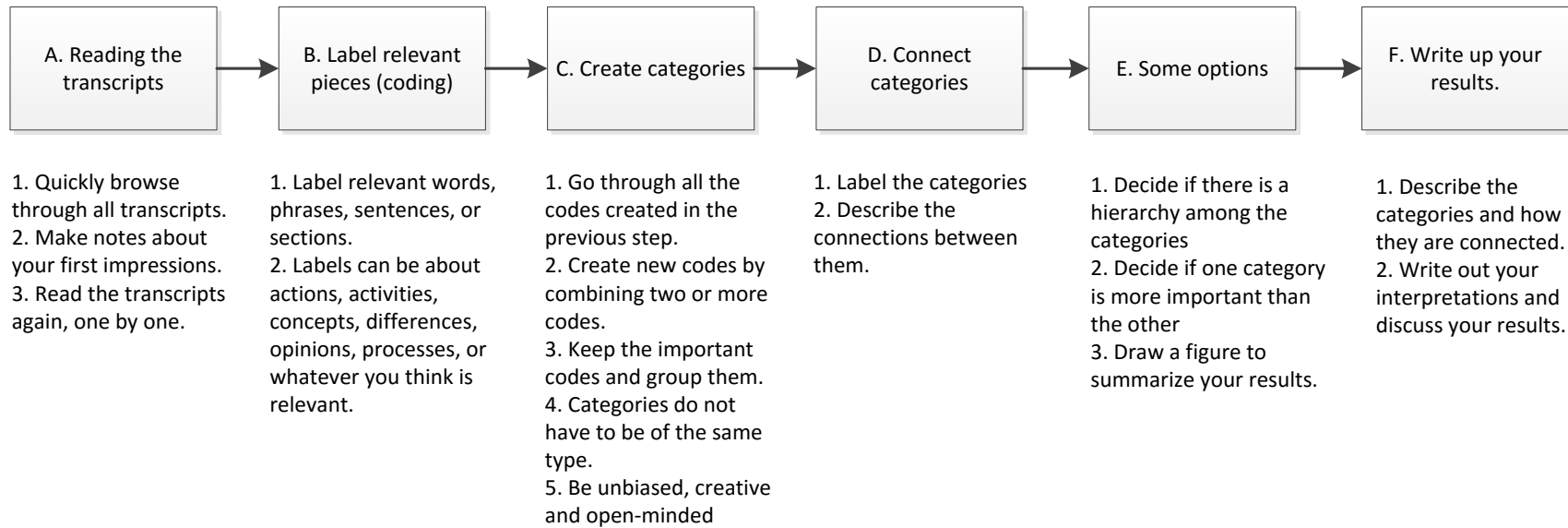
Extra information

< **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 customers” >

< **The goal of customer analytics is** “to create a deeper understanding of customers, and accurately predict their behavior to maximize their lifetime value to the company” >

Appendix 7 - Interview script

Appendix 8 – Interview Analysis Procedure



Appendix 9 – Found variables and correlations

Appendix 9 - Identified variables and correlations from interviews

Variables

| <u>Learning & growth perspective</u> |
|--|
| Identified variable |
| Invest in getting the right people (managing the data, analyzing the data, visualizing the data) |
| Invest in storage and processing solutions to handle big data (e.g. Hadoop) |
| Invest in infrastructure to integrate data properly |
| Train people (IT knowledge, data, business, visualization, tools (R, SQL, Hadoop, Spotfire) (long term). |
| Hire consultants for the necessary knowledge (short term) |
| Invest in solutions to improve data quality (e.g. SAS, Microsoft) |

Table 13 - Identified variables. Learning & growth perspective

| <u>Internal perspective</u> |
|--|
| Identified variables |
| Adhering to regulatory requirements (regarding data management, protection, privacy, ethics, transparency) |
| Creating and maintaining a 360 view of individual customers |
| Timely handle complaints on social media |
| Prevent fraudulent behavior |
| Retaining customers |
| Gather and assess the data available |
| Data management (governance, security, ethics, transparency, integration) |

Table 14 - Identified variables. Internal perspective

| <u>Customer perspective</u> |
|--|
| Identified variable |
| Retaining customers |
| Personalized offerings |
| Increase success rates of marketing/sales initiatives (higher revenue, more efficient, more satisfied customers) |
| Informing customers (provide recommendations, advise) |
| Customer experience |
| Customer satisfaction |

| |
|-------|
| Trust |
|-------|

Table 15 - Identified variables. Customer perspective

| |
|-------------------------------------|
| <i>Financial perspective</i> |
|-------------------------------------|

| |
|----------------------------|
| Identified variable |
|----------------------------|

| |
|---------|
| Revenue |
|---------|

Table 16 - Identified variables. Financial perspective

Correlations

| |
|--|
| <i>Learning & growth perspective → Internal perspective</i> |
|--|

| |
|--------------------|
| <i>Correlation</i> |
|--------------------|

| |
|--|
| Better data integration leads to more efficient business analysis of the data, which leads to a 360 view of a customer |
|--|

| |
|--|
| Investing in data quality monitoring tools improves data quality |
|--|

| |
|--|
| Improved data quality (customer definition) leads to a better 360 view |
|--|

| |
|---|
| Improved data integration leads to a better customer 360 view |
|---|

Table 17 - Identified relationships. Learning & growth perspective --> Internal perspective

| |
|---|
| <i>Internal perspective → Customer perspective</i> |
|---|

| |
|--------------------|
| <i>Correlation</i> |
|--------------------|

| |
|--|
| Having a 360 view of customers leads to better marketing, and higher sales |
|--|

| |
|---|
| Having a 360 view of customers leads to better complaint mitigation, which leads to higher satisfaction of that specific customer, and retaining her. |
|---|

| |
|--|
| Having a 360 view of customers leads to improved product offerings, by understanding your customers better |
|--|

| |
|--|
| Enhanced product/service offerings will lead to a higher customer satisfaction |
|--|

| |
|--|
| A higher customer satisfaction leads to retaining a customer |
|--|

| |
|--|
| Understanding the customer better will lead to more trust from the customer. |
|--|

| |
|--|
| Understanding your customer better makes it easier to assist/advise customers, which leads to customer staying at your company (retaining) |
|--|

| |
|---|
| Predicting customer needs (360 view) makes it possible to offer complementary products/services (cross selling), thus retaining a customer. |
|---|

| |
|--|
| Understanding customers better will result in better segmenting customers, and offering them personalized offerings, which makes it likelier that a customer stays with a company. |
|--|

| |
|--|
| Regulations have a positive effect on integrating data (They are obliged to do so). |
| Having a 360 view of your customer makes it better able to provide personalized offerings (cross selling), thus retaining customers |
| Integrating data makes it possible to construct a 360 view of the customer, and come with personalized offering for the customers. |
| Customer data privacy regulations affect the ability to create a complete 360 view |
| Preventing fraud will lead to cost savings |
| Having a 360 view of customers can help to profile customers, and can help to prevent fraud. |
| Data regulations are impeding the offerings that companies are able to make |
| Having a 360 view of customers helps to better service customers better (so with the current products/services they have). |
| Having a 360 view of customers helps to better service (provide help in the form of advice, information, and help in difficult times) customers. |
| Direct marketing (e.g. more personalized offerings) will lead to more revenue. |

Table 18 - Identified relationships. Internal perspective --> Customer perspective

| |
|---|
| <u>Customer perspective → Financial perspective</u> |
| <i>Correlation</i> |
| Having a better relationship with a customer will lead to a higher likelihood of retaining a customer. |
| Adhering to regulations will lead to more value for the customers in the form of trust (i.e. there are backup plans if a product or service fails, the product is better suited for customers because they had to do research into the added value for customers) |
| Providing personalized offerings will lead to a higher customer satisfaction |
| Providing additional services will lead to a higher revenue |
| Personalized offerings have a higher success rate, leading to less costs of doing marketing, and a higher revenue. |

Table 19 - Identified relationships. Customer perspective --> Financial perspective

Appendix 6 - Histograms of questionnaire data

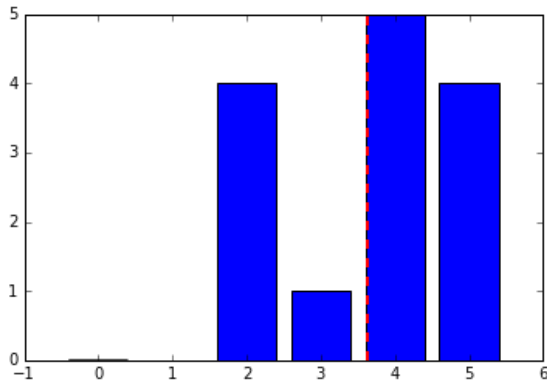


Figure 17 - Histogram IT infrastructure_Data

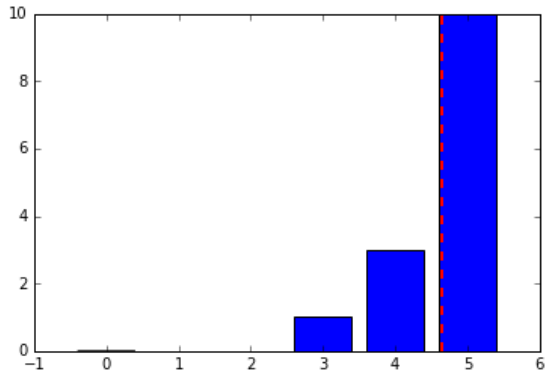


Figure 18 - Histogram Data_360view

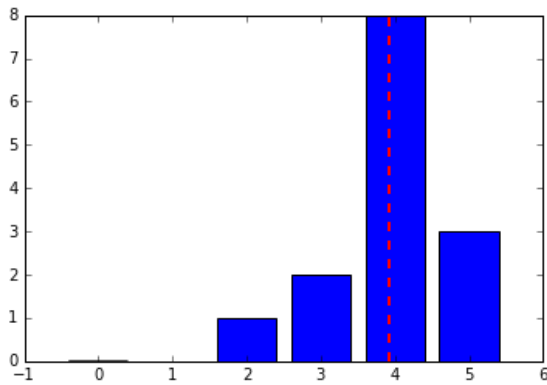


Figure 19 - Histogram Storage and processing

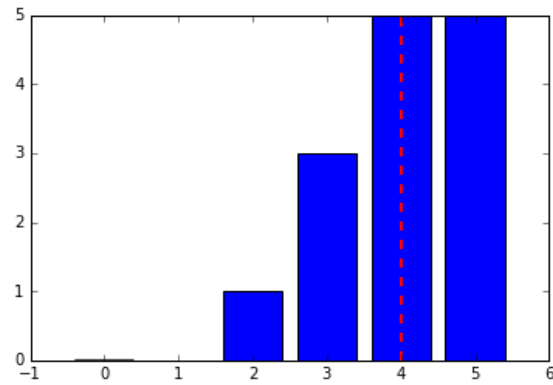


Figure 20 - Histogram Train current employees_Regulatory requirements

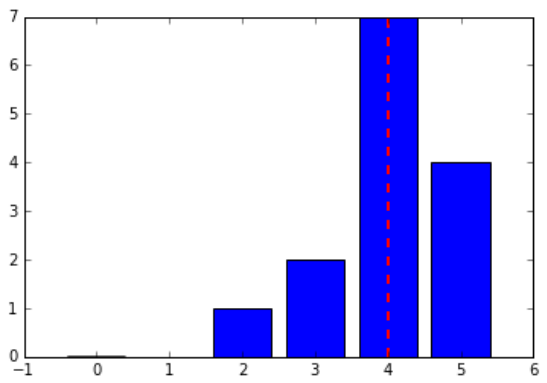


Figure 21 - Histogram Train current employees_Data management

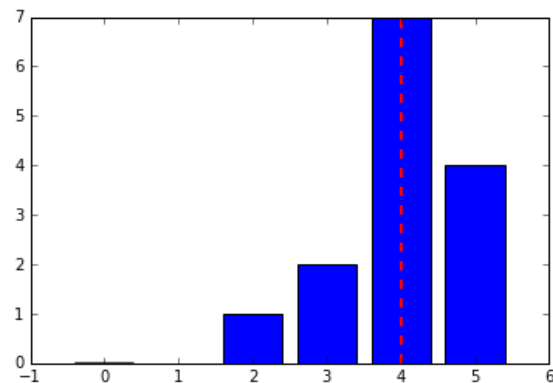


Figure 22 - Histogram Train current employees_360view

Appendix 10 - Histograms of questionnaire data

Appendix 7 – Boxplots of questionnaire data

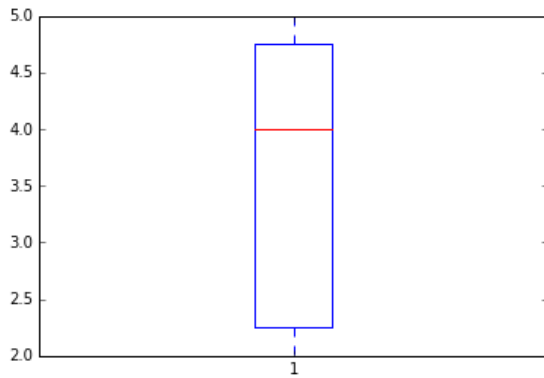


Figure 23 - Boxplot IT infrastructure_Data

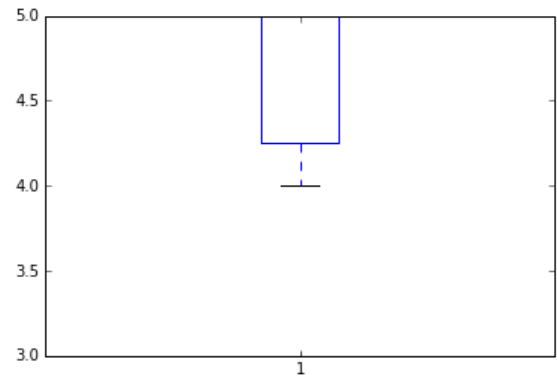


Figure 24 - Boxplot Data_360view

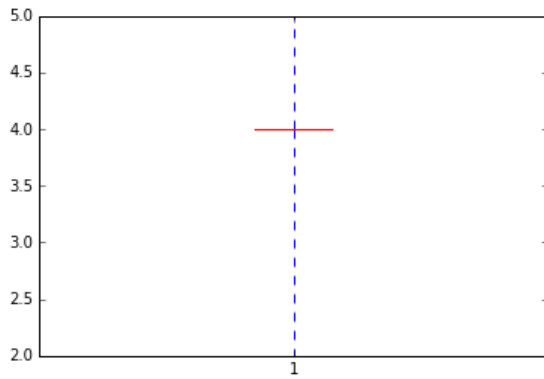


Figure 25 - Boxplot Storage and processing

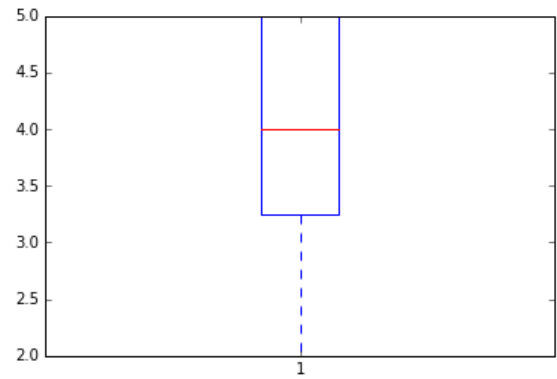


Figure 26 - Boxplot Train current employees_Regulatory requirements

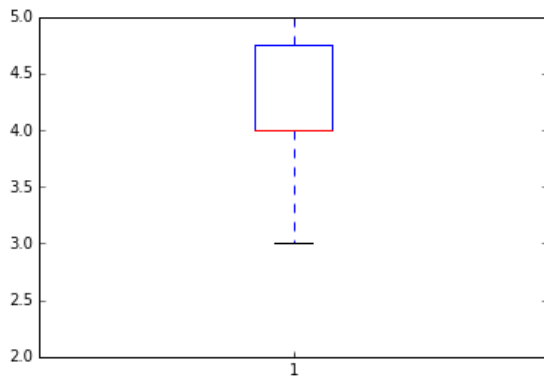


Figure 27 - Boxplot Train current employees_Data management

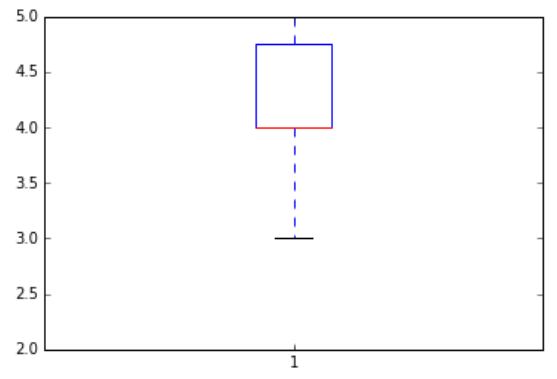


Figure 28 - Boxplot Train current employees_360view

Appendix 11 - Boxplots of questionnaire data

Appendix 12 – Correlation matrix extract

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1. Train current employees_Regulatory requirements | 1.00 | 0.91 | 0.91 | 0.90 | 0.81 | 0.82 | 0.90 | 0.95 | 0.91 |
| 2. Train current employees_Data management | 0.91 | 1.00 | 1.00 | 0.90 | 0.88 | 0.89 | 0.91 | 0.91 | 0.86 |
| 3. Train current employees_360view | 0.91 | 1.00 | 1.00 | 0.90 | 0.88 | 0.89 | 0.91 | 0.91 | 0.86 |
| 4. Hire consultants_Regulatory requirements | 0.90 | 0.90 | 0.90 | 1.00 | 0.74 | 0.80 | 0.95 | 0.97 | 0.94 |
| 5. Hire consultants_360 view | 0.81 | 0.88 | 0.88 | 0.74 | 1.00 | 0.88 | 0.82 | 0.80 | 0.77 |
| 6. Hire consultants_Data management | 0.82 | 0.89 | 0.89 | 0.80 | 0.88 | 1.00 | 0.77 | 0.80 | 0.81 |
| 7. New employees_Regulatory requirements | 0.90 | 0.91 | 0.91 | 0.95 | 0.82 | 0.77 | 1.00 | 0.97 | 0.93 |
| 8. New employees_360view | 0.95 | 0.91 | 0.91 | 0.97 | 0.80 | 0.80 | 0.97 | 1.00 | 0.95 |
| 9. New employees_Data management | 0.91 | 0.86 | 0.86 | 0.94 | 0.77 | 0.81 | 0.93 | 0.95 | 1.00 |
| | 0.90 | 0.92 | 0.92 | 0.90 | 0.84 | 0.85 | 0.91 | 0.92 | 0.89 |

Appendix 12 - Correlation matrix extract

* The extract includes the following variables: “Train current employees”, “Hire consultants”, “New employees”.