Business Intelligence through a sociomaterial lens

The imbrication of people and technology in a sales process

Tobias Christian Fischer
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Abstract

Digitalization and digital devices are on the rise, and as a result, many new products and services have been developed, which has led to greater interaction between people and technology. This thesis explores the interaction between people and technology by looking at the daily use of a business intelligence (BI) system in an automotive company’s sales process, where sellers use the system to analyze, report, and measure sales performance. The thesis is based on a single case study, and the data sources are in-depth interviews, observations, and archival data.

The theoretical perspective is grounded in the concept of sociomateriality and its notion of the imbrication of people and technology. Specifically, this work explores the research question ‘How does imbrication between people and technology develop during daily use of BI systems?’ The main theoretical finding is that three phases of imbrication can describe these interactions, and these phases coincide with three situations in which people and technology must interact: automation of transactional work (Imbrication Phase 1), ‘informating’ of analytical work (Imbrication Phase 2), and transformation of work (Imbrication Phase 3). These three Imbrication Phases demonstrate the social dynamics at play when people interact with technology (specifically with BI). This contribution therefore extends the concept of imbrication within the field of sociomateriality. The primary empirical contribution is to illustrate the daily use and practice of BI within a sales process.

Keywords: big data, business intelligence, business intelligence systems, data analytics, digital transformation, imbrication, sales process, sociomateriality, sociomaterial imbrication model, work shadowing

Tobias Christian Fischer, Department of Business Studies, Box 513, Uppsala University, SE-75120 Uppsala, Sweden.

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"Stilles bescheidenes Leben gibt mehr Glück als erfolgreiches Streben, verbunden mit beständiger Unruhe."

Albert Einstein (Tokyo, 1922)
I am thankful, relieved and proud that my Ph.D. journey is coming to a successful end. It was a giving experience for me, which helped me to develop myself further. I feel privileged and thankful that Uppsala University gave me the possibility to start this Ph.D. and that my education during the master was excellent throughout the whole program. It prepared me to start the Ph.D. project freely where I had to design, redesign, structure and deliver a complete work, which I call mine. I put my heart, soul and mind into this thesis project. I am thankful that my supervisors, colleagues, close friends, case company, family and beloved ones, and even stranger took the time to read, reflect and discuss my ideas, papers, and kappa. Without you, this work would have not the one it is now. Therefore, I would like to thank you all.

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Truly yours,

Tobias Christian Fischer
This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


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### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BI</td>
<td>business intelligence</td>
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<tr>
<td>BIS</td>
<td>business intelligence system</td>
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<tr>
<td>CEO</td>
<td>chief executive officer</td>
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<td>CMS</td>
<td>content management system</td>
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<tr>
<td>CRM</td>
<td>customer relationship management</td>
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<tr>
<td>DBMS</td>
<td>Database management system</td>
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<tr>
<td>ERP</td>
<td>enterprise resource planning</td>
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<tr>
<td>ETL</td>
<td>extract-transform-load</td>
</tr>
<tr>
<td>FinTech</td>
<td>financial technology</td>
</tr>
<tr>
<td>HCI</td>
<td>human computer interaction</td>
</tr>
<tr>
<td>ICT</td>
<td>information and communication technology</td>
</tr>
<tr>
<td>IS</td>
<td>information systems</td>
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<tr>
<td>IT</td>
<td>information technology</td>
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<tr>
<td>IBM</td>
<td>intelligent business machine</td>
</tr>
<tr>
<td>IoT</td>
<td>internet of things</td>
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<tr>
<td>KPIs</td>
<td>key performance indicators</td>
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<tr>
<td>MNC</td>
<td>multinational corporation</td>
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<tr>
<td>NPS</td>
<td>net promoter score</td>
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<tr>
<td>NGO</td>
<td>non-governmental organization</td>
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<tr>
<td>OLAP</td>
<td>on-line analytical processing</td>
</tr>
<tr>
<td>RDBMS</td>
<td>relational database management system</td>
</tr>
<tr>
<td>REA</td>
<td>resource-event-agency</td>
</tr>
<tr>
<td>ROI</td>
<td>return on investment</td>
</tr>
<tr>
<td>SWS</td>
<td>seller workspace system</td>
</tr>
<tr>
<td>TAM</td>
<td>technology acceptance model</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>VEPA</td>
<td>visibility, editability, persistence, association</td>
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Chapter 1: Introduction

Digitalization is on the rise, and digital devices are increasingly present in all aspects of life. As a result, many new products and services have been developed (McAfee and Brynjolfsson, 2017). These developments have the potential to change both our behavioral patterns and our way of working (Nylén and Holmström, 2015) and have become integral to most business operations, from large automobile manufacturers to small internet start-ups (Orlikowski and Scott (2008:434).

This change has led to a greater interaction of people with technology. In the workplace, for example, there can be an intense interaction between employees and smart devices like wearables (Sultan, 2015) with the goal of facilitating daily work (Orlikowski, 2007). Scholars from many different disciplines\(^1\) have concluded that this interaction between humans and technology will only continue to expand and become increasingly important.

However, the relationship between humans and technology has not been investigated in the business context. The focus of both researchers and practitioners has mainly on the technological side, because there, success is visible and more easily measured. But by considering the social aspects of technology, and specifically by looking how technology is used in a business context, new insights could be found that show how people actually use technology. In the end, this is important because people are the ones deciding if and how a technology is used in a business.

This thesis will explore the relationship between people and technology using sociomateriality, which is a new sociological lens through which to view these interactions. More specifically, the concept of imbrication or overlap (Leonardi, 2012a) will be explored. The primary data for this thesis will come from a case study that investigated the daily use of a business intelligence system in an automotive company.

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\(^1\) Examples include economics (D’Adderio, 2010), engineering (Brenner et al., 2014), information systems (Cecez-Kecmanovic et al., 2014 and Te’eni, 2016), and management (Colbert, 2016; Berthod and Müller-Seitz, 2018).
1.1 Business intelligence: Past, present, and future

At its core, business intelligence (‘BI’ for the remainder of this text) can be a digital tool that analyzes a company’s own data and develops new insights based on those analyses (Kisielnicki and Misiak, 2017). BI can enable structured content analysis (through ETL tools (‘extract-transform-load’), OLAP (‘online analytical processing’), and dashboards (Larson and Chang, 2016)) as well as unstructured content analysis (from web, social media, and social network analytics). For example, the backend of BI uses ETL tools and OLAP to load data in near real-time to the right people when they need it, and can provide ad hoc analyses without disruption. The frontend of BI uses dashboards that visualize certain key performance indicators (KPIs), metrics, or curves in a chart or overview used by experts and management for various analyses. These structured and unstructured analyses can then be used to support business decisions (Chen et al., 2012). For example, an emerging use for BI is analyzing something called a ‘Data Lake’, which is the unused and unstructured data within and around firms and businesses. The Data Lake comes from the company’s own data, and can be thought of as accumulated knowledge that no one had yet a reason to look at (O’Leary, 2014, Phillips-Wren et al., 2015). Within these data sources, real-time insights can be found. BI also has the potential to create a competitive advantage by supporting decisions with consolidated analyses and data (Davenport and Harris, 2007).

BI originated when businesses first started using technology to analyze the behavior of individuals. One of the early pioneers of BI was Hans Peter Luhn, who was a researcher in computer science for IBM. He invented multiple applications in various areas in computer and information science, and started theorizing about these processes as early as the 1950s (Luhn (1958)).

In the past, firms used BI as a kind of automatic system for creating documentation and for distributing information to multiple departments. In the course of these information gathering and distribution processes, profiles of cases and customers were created so that structured information could be used to base further actions on, for instance, to help the decision-making process (Luhn, 1958). Luhn described BI as “an automatic system [which] is being developed to disseminate information to the various sections of any industrial, scientific or government organization. This intelligence system will utilize data-processing machines for auto-abstracting and auto-encoding of documents and for creating interest profiles for each of the ‘action points’” in organizations (Luhn (1958:314).

Today, BI can be thought of and used as a platform (Peters et al., 2016) or as an all-in-one tool (Isik et al., 2011) that offers a wide range of tools for automation, analysis, and predictions. BI is widely used in the core business...
of firms ranging from production to sales to provide real-time analytics. Its ease of use can provide a platform for new methods such as artificial intelligence (AI) or big data, which enable advanced analytics for different business units at all levels by combining data sources. For example, the production of cars uses BI to visualize bolting cases to show experts possible difficulties when bolting together different materials like plastic or metal. A car has multiple bolted joints like airbags, breaks and wheel, which are relevant for the safety of the car and protection of the driver. In the past, engineering experts analyzed thousands of bolting cases manually by looking at curves consisting of torsional moment and rotation angle on a daily basis. This process was so time consuming for the engineering expert that it could happen that a car already was produced and handed over to the customer. Therefore, BI was introduced and is used in combination with AI and big data to support the experts. The BI tool uses a teachable algorithm, which uses the curves to identify and recognize anomalies in any bolting. The tool documents those curves, categorizes them and warns the experts automatically in the right time. In that way, BI can aid the process of bolting.

Chen et al. (2012) identified three phases in BI and analytics (here shortened to BI&A) development, and they argued that each of these stages has specific key characteristics. In BI&A phase 1.0, business units and businesses get insights through the collection of structured data through multiple systems enabling data warehousing, ETL, and OLAP for developing dashboards and scorecards (Golfarelli et al., 2004). In BI&A phase 2.0, unstructured user-generated data (from for example social network analytics and opinion mining) is gathered to enable insights about consumer opinions and customer needs. In BI&A phase 3.0, new forms of data emerge, such as mobile and sensor-based content, which give the potential to analyze large amounts of data (Parks and Thambusamy, 2017).

In this era of Big Data, BI is mainly used for analytics (Frisk and Bannister, 2017), data science (Sun et al., 2018), and strategic management (Calof et al., 2017). Using BI together with Big Data (in Chen et al.’s terminology, phase 3.0) could potentially enable a much wider use of mobile devices and be useful for understanding human-computer interaction (Chen et al., 2012). Furthermore, BI could potentially be integrated into routines or embedded in a way that can create knowledge and guide actions (Shollo and Galliers, 2016). However, getting BI implemented, integrated, and routinized and/or embedded requires conscious effort.

Projects aimed at implementing and integrating BI face challenges similar to any other innovation. The two main obstacles for integrating BI are costs of the systems and the skills and willingness of its intended users. First, implementing BI can be expensive. A BI system (BIS) has several different
cost centers\(^2\) such as hardware, software, labor, and maintenance (Negash, 2004). Unforeseen or unpredictable costs, like administrative costs for data creation (Pape, 2016), maintenance of the system (Negash, 2004), and cost for education and learning the new BI system by the employees (Yeoh and Popović, 2016), are revealed only after the BIS is installed.

Second, even after the BIS is implemented, the people who are going to use the BIS have to be skilled and motivated enough to use it properly. For example, if users are going to support their daily work with BI, they need to be able to perform and communicate complex analyses (Chen et al., 2012), and they need a mix of technical and business expertise (Yeoh and Koronios, 2010), (Robinson et al., 2010), (Rettus and Smith, 1972). If an intended user does not have these skills or qualities, there is a risk they will hesitate to use the BIS.

The combination of high cost and user reluctance can have led to failure of the BI project. In BI in particular, vendors often overestimate the ease of deploying a BIS and underestimate the time it takes for the users to adapt to and accept the new routines (Williams and Williams, 2003). Just like any other innovation, BI projects can fail through inefficient change management (Williams and Williams, 2010).

BI’s role in business and the IT landscape often concerns industries and use. BI is a technology suitable for multiple industries (such as consulting, financial services, education, healthcare, insurance, manufacturing, and telecommunication) on both an operational and strategic level (Stodder, 2014). BI can be used on an operational level by employees on a daily basis (Chaudhuri et al., 2001, Azvine et al., 2005), especially in accounting and finance (Abbasi et al., 2012), marketing (Chau and Xu, 2012) and sales (Liautaud and Hammond, 2000). Operational uses can also increase agility (Krawatzeck and Dinter, 2015) and make analyses and predictions (Schneider et al., 2015).

BI can, under the right circumstances, also be used on the strategic level by executives and managers to support strategies (Olszak, 2016), and develop new processes (Lukman et al., 2011). In a study by Olszak (2016), she

\(^2\) A cost center is defined as a group of resources and outputs for accounting control that are allocated for specific operations performed (Rettus and Smith, 1972). These groups have specific costs connected to departments, business units or individuals. These centers are summed up into budgets (Robinson et al., 2010), which are controlled by performance measurement systems (Rettus and Smith, 1972). A performance measurement system could itself be BI, if it controls the relationship between costs and resource/output. The goal is either to minimize cost for a given resource/output, maximize the resource/output for a given cost, or minimize its average costs (Robinson et al., 2010).
highlights that organizations increasingly align BI and their business strategy with each other. According to Brooks et al. (2015:338), a success factor of this alignment between BI and business strategy requires “…to understand how people think and work with one another.” The case of this thesis showed that BI is used on a strategical level because the aim was to improve sales and increase customer satisfaction. The management of the firm closely worked with the actual user of the BI system together to develop and integrate the tool.

BI is also used by non-business actors like customers. When customers buy, offer, and use products and services online through mobile devices, they inform themselves about those products and services, compare competing products and services, and interact virtually with their favorite brands by giving feedback and use information. Together, that feedback and use information can improve BI. If BI is consistently used in an integrated and embedded way, customers can get the best information and predictions to help decision making. And if BI offers the right products and services, customers will be more satisfied and have a better experience.

The future of BI will require an understanding that goes beyond the technology itself. It will require studying the concept in its own environment by considering factors such as a firm’s organizational context, the strategy of that firm, and how the firm’s people act in their roles. Understanding these factors will allow us to get a holistic view of BI in both a technical and social context. The intent of this thesis is to contribute to that understanding by identifying factors that help managers and researchers understand how people and BI interact in daily use. To that end, an empirical case study will be used to exemplify these factors.

1.1.1 Difficulties encountered in BI research

Campbell et al. (2012), Stonebraker (2012b), and Schumaker (2013) all concluded that it is difficult to study BI. However, they all used terms like “business intelligence” without elaborating on what BI meant, either in theory or by looking the particular technology in its context. Those studies either treated BI concepts like a black box, or provided a technological perspective of BI without considering how people were working with it, which means that BI was presented BI only from a technical point of view.

There are two main reasons why it has been difficult to study BI: (1) lack of definitions (Orlikowski and Iacono, 2001, Agarwal and Lucas Jr, 2005),

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3 A complete list of BI research using the ‘nominal view’ (see Orlikowski and Iacono, 2001) is attached in Paper I (Appendix B).
and (2) omission of its social dynamics (Bailey et al., 2010, Leonardi and Barley, 2010).

Good definitions for BI are hard to find. Agarwal and Lucas Jr (2005:381) saw an “information systems identity crisis” because there are no unified definitions for technological terms routinely used in BI, or even for the term “BI” itself. One group of researchers referred to BI as an enterprise system (Rouhani et al., 2012), while a second group used it as relational database management systems (RDBMS) to make reporting and interactive visualizations (Chen et al., 2012), and a third group considered BI as a sort of information system for making predictions and optimizing processes (Moro et al., 2015). BI has been defined as a strategic or tactical decision-making tool for interpreting data of business tasks (March and Hevner, 2007), and it has also been defined as a process with the primary activities of “getting data in and getting data out” (Watson and Wixom, 2007b:96). All these viewpoints and definitions are different, which of course can confuse the issue.

Furthermore, there have not been many studies about how social dynamics interact with BI in business contexts, or to put it another way, “organizational scholars have yet to develop ways of thinking about technology interdependence or its impact on the social dynamics of work” (Bailey et al. (2010:714). This gap in the research was noted by Ahn et al. (2011), who said that “few approaches or tools sufficiently address the problem of how to analyze the social dynamics” (309).

The reason for this research gap could be connected to the the strong focus on the technological side of BI. Shollo and Kautz (2010:2) found that BI research focuses more on the technological side of BI than the social dynamics connected to people and their roles:

Our findings show that the literature focuses mostly on data and information, and less on knowledge and decision making. Moreover, in relation to the processes there is a substantial amount of literature about gathering and storing data and information, but less about analyzing and using information and knowledge, and almost nothing about acting (making decisions) based on intelligence. The research literature has mainly focused on technologies and neglecting the role of the decision maker.4 (Shollo and Kautz (2010:2)

Davenport (2006) noted that even successful uses of BI were vulnerable to social factors like human error:

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4 Following Shollo and Kautz (2012), the concept of data and information is used throughout together. Others like Hand (2007) divide the concepts of data and information, and view information as resulting from of combining data into a useful way.
“Business intelligence” (the term IT people use for analytics and reporting processes and software) is generally managed by departments; number-crunching functions select their own tools, control their own data warehouses, and train their own people. But that way, chaos lies. (…) research has shown that between 20 and 40% of spreadsheets contain errors; the more spreadsheets floating around a company, therefore, the more fecund the breeding ground for mistakes. (Davenport, 2006:7)

According to Popović et al. (2012:729), the focus on information means that less emphasis has been placed on understanding how BI can actually be used in a firm:

The information systems (IS) literature has long emphasized the positive impact of information provided by business intelligence systems (BIS) on decision-making, particularly when organizations operate in highly competitive environments. Evaluating the effectiveness of BIS is vital to our understanding of the value and efficacy of management actions and investments. Yet, while IS success has been well-researched, our understanding of how BIS dimensions are interrelated and how they affect BIS use is limited. (Popović et al. (2012:729)

The lack of knowledge about interrelations and BI use can be addressed by considering social aspects and dynamics, which will require a shift away from study of the technological side of BI and towards study of the social aspects. To that end, this thesis will present a case study exploring the day-to-day activities of sellers in an automotive company that uses BI.

1.2 Sociomateriality – a new way to study BI

The thesis uses the concept of sociomateriality to study BI. Here, the definition of sociomateriality will follow Leonardi (2013), who said that sociomateriality “represents that enactment of a particular set of activities that meld materiality with institutions, norms, discourses, and all other phenomena we typically define as ‘social’” (Leonardi (2013:73).

Put a little more simply, sociomateriality is the interplay between people (with all their intentions based on norms, discourses, and institutions) and technology (Leonardi, 2013). This interplay between people and technology comes (hopefully) into being when BI is used to control processes (Elbashir et al., 2008, Tobias et al., 2009, Cheng, 2012), increase performance (Chen et al., 2012, Vukšić et al., 2013), support decisions (Turban et al., 2014), and perform other management control activities (Burstein and Holsapple, 2008).

Two concepts that are fundamental to the study of sociomateriality are design and material agency, and BI includes both these aspects. Much of BI
based on data interfaces: that is, it is designed to help visual measurements (Sangari and Razmi, 2015, Elbashir et al., 2008) with the ultimate goal of highlighting performance in (for example) the form of dashboards and scorecards (Chen et al., 2012). The material agency is the architecture of BI, which helps initiators and developers to design systems that support different types of work. The material agency of BI has applications to specific operations like coding, filtering, or aggregating data and information (Chaudhuri et al., 2011).

Sociomateriality has primarily been used to investigate three broad areas of human interaction with technology (Leonardi and Barley, 2010, Cecez-Kecmanovic et al., 2014). One area has been entanglement of people and technology in everyday life. Two recent examples include Wagner et al. (2010), who looked at an empirical case of the implementation process of an IT project of a large established firm doing the central administration of time-based budgeting, and Schultze (2011), who looked at the use of avatars in the 3D world of the game Second Life, and their entanglements with the humans behind them. The second area has focused on the “inherent inseparability of the technical and the social” (Orlikowski and Scott, 2008:434). The third area has looked at how the entanglement of the social and the material manifests in the workplace, and whether the resulting “complex sociomaterial configurations” (Orlikowski, 2010:125) are taken seriously by management.

Sociomateriality denies the idea that technology, work, and organization can be separated (Orlikowski and Scott, 2008:433) and considers that the social and the material are inextricably entangled (Cecez-Kecmanovic et al., 2014). Starting from this perspective, it is possible to apply different models and lenses to describe the imbrication (or overlap) between people and technology (Leonardi, 2012a). (The concept of imbrication will be discussed extensively in later chapters.)

The value of the sociomaterial lens is that it takes the ‘material’ aspects seriously. That is, it emphasizes the things that are actually produced, like insights about the social landscape, and the practices (actions, routines, and the engagement with technology) that produce those things. An advantage of using the lens of sociomateriality specifically in the context of BI is that accounts for the social dynamics within a firm, and it looks at the evolution of the reciprocal relationship between people and technology (Leonardi, 2012a, Leonardi et al., 2012, Leonardi, 2013).

A potential weakness in using sociomateriality is that there are a variety of opinions about some basic concepts such as materiality (Jones, 2014); the concept is still immature and lacks agreed-upon definitions (Jarzabkowski and Pinch, 2013). Also, it can be difficult to identify the manifestations of all
concepts in a real-life setting. Later in this thesis, these issues will be addressed in more detail in relation to the empirical case, where it will be easier explain these problems by giving empirical examples. This case will demonstrate a consistent way of viewing materiality, and will mature the concept by giving an illustration of it.

As mentioned previously, this thesis will rely on the sociomaterial concept of imbrication, which means an ‘overlapping’ formation. In this context, imbrication means that “human [people] and material (artefact) [technology] have agency, which becomes interlocked in a particular sequence” (Mathiasen and Koch, 2015:605). A more elaborate description of imbrication will be presented in Section 2.2.

In conclusion, sociomateriality will be used as a theoretical lens in this thesis, and by doing so, it will extend the concepts of sociomaterial practice and imbrication in particular. Through this lens, the thesis will aim to show how BI is actually used by people in specific situations, and how BI can hold together an enterprise.

1.3 The case study
This thesis draws its empirical material from a qualitative case study of a multinational firm in the car manufacturing industry. Specifically, it follows the digital transformation of a sales process that began when the firm started using BI to try to increase its sales performance. Sellers started using BI to analyze, report, and measure the sales performance, and to see how satisfied customers were throughout the purchase. Information about the sales process was put into digital format, which could then be used by non-sales people like developers. The new digitized sales process was integrated into the overall strategy of the company, and was quickly perceived as necessary for staying competitive.

The BI strategy was initiated from the top-down, though implementation and maintenance involved different actors with different roles such as initiators, developers, and users. The initiators had the goal of increasing sales performance by using the BI system strategically. To achieve this, a collaboration between initiators and key users, who were sellers with high-performing sale scores, was established. The key users explained their needs and requirements for a BI system, which was then realized by developers who designed and implemented the BI for these users.
1.4 Research question and thesis structure

The overall purpose of this thesis research is to study BI and its social dynamics, and to show that they are particular forms of technologically-induced change. The case study looks at how the sales department of a certain firm was transformed through this technological change.

The overall research question is ‘How does imbrication between people and technology develop in the daily use of BI systems?’ That question will be addressed through an exploratory case study, the aim of which is to identify and define the imbrication between people and technology.

Chapter 2 of this kappa sets the theoretical background, in which the concepts of business intelligence, and sociomateriality are further explored. This chapter also explains the theoretical model of sociomaterial practice with human agency and material agency. The thesis develops a synthesis of this model by relating it to the case study, which is the pivotal point of the thesis. Chapter 3 presents the methodology which consists of research design, case study background, data collection and data analysis. Chapter 4 uses the concept of imbrication and relates it to Papers I–IV by asking three main questions: ‘Who is studying imbrication of people and BI?’; ‘How does the sociomateriality between people and BI work?’; and ‘What supports the imbrication of people and BI?’ Chapter 5 presents the results in which BI and people are explained and connected to sociomateriality. Chapter 6 discusses the answers to the research question by discussing three imbrication phases. Chapter 7 concludes with limitations, theoretical contributions, and managerial implications.

The research contributions that this thesis is based on, Papers I–IV, are presented after this kappa.
Chapter 2: Theoretical background

In this chapter, the theoretical background of the research is described. The first section gives a general description of BI, and then looks at it through the theoretical lens of Zuboff (1988) and her concepts of ‘automate’ (automation), ‘informate’ (information), and transformation. The second section explains and explores sociomateriality’s key concept of imbrication.

2.1 Business intelligence

2.1.1 What is business intelligence?

Business intelligence (BI) can include a suite of technologies, tools, and processes for businesses and organizations that helps them make decisions (Chaudhuri et al., 2011) on both an operational and strategic level (Watson and Wixom, 2007a). BI (hopefully) enables the accessing, analyzing, gathering, and storing of data (Wixom and Watson, 2012).

At its simplest, BI can be visualized as pyramid with four main technological levels: (1) raw data sources, both internal and external; (2) data gathering and processing tools; (3) servers with formatted data (for example, in relational databases) and mid-tier applications (for example, searching and data mining tool); and (4) high-level applications and results like dashboards, spreadsheets, and queries (Figure 1).
Figure 1. The pyramid of architecture of BI redrawn after Chaudhuri et al. (2011) and Azvine et al. (2005)
Level 1. The pyramid’s foundational level comprises the raw data and stored data that have yet to be processed (Zorrilla and Garcia-Saiz, 2013). External data (a) come from vendors and operational databases (see (c) below) used across the departments in the company (Chaudhuri et al., 2011) for data virtualizations (Krawatzeck and Dinter, 2015) and other insights. Internal data (b) (Laney, 2015) originate from data streams coming from different internal departments and units such as marketing, sales, and production. Operational databases (c) connect theses lowest levels of data to the higher levels in order to enable multidimensional models of data to make analyses and visualizations (Chaudhuri and Dayal, 1997a). These can of course be updated frequently (March and Hevner, 2007), which is important for higher-up real-time applications.

Level 2. The second section of the pyramid is data gathering and processing. Here, the raw data are modified or converted so that they can be used by higher functions, which generally happens through Extract Transform Load (ETL) tools (d) and Complex Event Processing (CEP) engines (e). ETL tools convert and integrate enterprise-specific data for operational and tactical management (Olszak, 2016), while CEP engines enable real-time data processing, pattern detection for further analyses and monitoring, and data available for “computation across queries when possible” (Chaudhuri et al., 2011). An example is the restocking in a warehouse. In modern warehouses, machines automatically move goods from different locations. The position of the machine as well as the item is tracked and traced, and translated into key performance indicators (KPIs). These are then presented to experts that analyze various factors, like for example the capacity of and shifts within the warehouse. The real-time data is enabled through ETL and CEP engines that transform the data into a pattern.

Level 3. In the second highest section of the pyramid are two kinds of servers, namely data warehouse servers and mid-tier servers (Chaudhuri et al., 2011). The data warehouse is a repository where data and information are loaded (Chaudhuri et al., 2011). The data warehouse server consists of relational servers like relational database management systems (RDBMS) and are used to store the data sources in one digital place (Chen et al., 2012).

Level 3.1 One data handling technique at this level is exemplified by MapReduce (f), which is a programming technique used to distribute data and files and make advanced analyses (Krawatzeck and Dinter, 2015). MapReduce is an emerging research field for establishing frameworks and models (Chen et al., 2012), where researcher combine this technique with cloud computing and big data (Larson and Chang, 2016, Chang and Wills, 2016). MapReduce is commonly used in functional programming as a strategy for real-time data analysis of big data sets and has the goal to make data
scalable and more fault-tolerant. MapReduce is a single application that loads data quickly and enables specific mechanisms for “ad hoc and on-time extraction, parsing, processing, indexing and analytics in a scalable and distributed environment” (Olszak, 2016:111).

Another technique for data handling at this level is relational database management (DMBS, g), which can have a high degree of automation (Paredes-Moreno et al., 2010) to enable data acquisition, storage, and accessibility in almost real-time (Obitko et al., 2013). Relational database management can require high performance and scalability if mobile and web-generated content is used, because the volume of data can increase quite quickly when those are used (Stonebraker, 2012a).

Level 3.2 The second kind of server is the mid-tier server. These complement the data warehouse servers by providing specific functions for BI scenarios (Chaudhuri et al., 2011). The mid-tier servers have four functions including online analytical processing, reporting servers, search engines, and data mining (Chaudhuri et al., 2011).

First, online analytical processing (OLAP, h)) is used for data mining and other analytics (Chen et al., 2012, Işık et al., 2013, Olszak, 2016). OLAP is used to consolidate mined data (Turban, 2014).5 The ‘OLAP cube’ (a widely used metaphor describing the analytical capability of OLAP) includes product, time, and location. A possible cube is a ‘sales cube’, which would use the ‘product’ dimension for different car models, the ‘time’ dimension for when the cars are sold, and the ‘location’ dimension for the different sale areas. Combining these dimensions through analysis and dashboards can answer complex questions (e.g., How do the sold cars differ between car models and sale area?). OLAP enables slice and dice operations (van der Aalst, 2013), which allow one to look at specific elements in the data in a detailed way. The example of the sales cube can describe the slice and dice operation in a better way. Slice operations could look at a specific sales area and consider the car models sold over a period of time. Dice operations could compare specific sale areas with car models during the financial crisis. Other operations include pivot (Kueng et al., 2001), drill down/up to have data ranging from summaries (up) to details (down) (Kocbek and Juric, 2010), and roll-ups, which could be the computing of totals that gives a summary along a particular dimension of the data (Mansmann et al., 2014).

5 In previous studies, OLAP was connected to decision support and data warehouses that are used by ‘knowledge workers’ (e.g., analysts, managers) who make different kinds of analyses with OLAP, and includes, for example, an early study by Chaudhuri, S. & Dayal, U. 1997b. An Overview of Data Warehousing and Olap Technology. ACM Sigmod record, 26, 65-74.
Second, reporting servers (i) are responsible for making data available to other users, so that data can then be combined, shared or released (Howson, 2016). For example, the sales performance for specific regions can be compared to previous years (Chaudhuri et al., 2011), which requires access to different levels.

Third, search engine servers (j) belong to search-based applications (Olszak, 2016) and are the foundational technologies of text and web analytics (Chen et al., 2012). Text and web analytics are used to analyze and process unstructured content (Olszak, 2016). For example, unstructured data in a warehouse is searched through for email messages, purchases or particular customers (Chaudhuri et al., 2011).

Fourth, data mining platforms and tools (k) provide engine-independent and customized solutions (Chaudhuri et al., 2011) and make in-depth data analysis possible by provide predictive models to answer complex and predictive questions, like the likelihood that brand and other products and services have been considered after purchase (and might therefore influence re-purchase).

Level 4. At the top of the pyramid are applications, which are various tasks that BI can perform based on all the data and data processing that has taken place at levels 1–3. These tasks include searches (l), spreadsheet making (m), dashboards (n), and ad hoc queries (o). Searches enable the categorization and sorting of information through mid-tier servers (Chaudhuri et al., 2011). Spreadsheets deliver a “limited interactive interfacing with object and attribute” (Peters et al., 2016:3), and are needed for data integration (Popović et al., 2012). Dashboards in the context of a firm can be described as user experience or management cockpits so relevant information is always accessible (Ivan, 2014), and these can also be used to track the performance for decision makers (Chaudhuri et al., 2011). Ad hoc queries enable users to individualize reports, which are usually automized and require less skill (Howson, 2016), and enable visualization in real-time in BI (Chaudhuri et al., 2011).

As can be seen in Figure 1, features can be either integrated into the back-end of a BI system, or they can be an ad-hoc front-end tool used by experts. An example of back-end BI is an extract-transformation-load tool (ETL), which is a feature of data gathering and processing (Chaudhuri et al., 2011). An example of front-end BI are reporting tools (Lukman et al., 2011) and top-level applications (Chaudhuri et al., 2011) that make BI content more agile (Krawatzeck and Dinter, 2015).
2.1.2 How have information and automation transformed BI?

Transformation

Anthony (2016:2) defines transformation as a “marked change in form, nature, or appearance or to change (something) completely and usually in a good way.” In the management literature, transformation refers to processes connected to development (Bider and Jalali, 2016), value (Robertson and Novek, 2014), and human engagement (Bider and Jalali, 2016).

Transformation is often enabled through the use of “IT as a strategic weapon” (Venkatraman, 1994:73). The BI literature connects transformation with customer satisfaction (Tribuzio, 2016) and the information that is useful in businesses (Smith and Lindsay, 2012). For example, manufacturing firms are leveraging customer involvement and innovation by increasing their IT capability (Saldanha et al., 2017).

Technology can transform processes and shape the way people work (Zuboff, 1988, Kochan and Useem, 1992, Venkatraman, 1994, Doolin, 2016), and a BI system is a manifestation of such transformative technology. To give a ‘primitive’ example, in the past, BI systems were used for auto-abstracting and auto-encoding documents used by people (Luhn, 1958:319). That change certainly transformed the way people worked in an organization. But in way, that particular BI system can be considered ‘primitive’ because was being used for a single purpose and in isolation.

These days, BI systems can be much less isolate and much more integrated with all aspects of a firm’s activities. An example of a much more advanced use of BI is in healthcare, where remote sensors can directly gather patient data (Waetlar, 2011). New patterns in the data can be seen by combining different data sources and different technologies. Through these advanced capabilities, the BI system has transformed healthcare “from reactive and hospital-centered to preventive, proactive, evidence-based, person-centered, and focused on wellbeing rather than disease control” (Chen et al. (2012:1171). BI has the potential to similarly transform many aspects of entire organizations or even whole industries.

The word ‘transformation’ is now often connected specifically to digital transformation, and digital transformation can cause a firm to reconsider its position in its own ecosystem (Carcary et al., 2015:47).
Information and automation

Transformation can be enabled by information and automation. Information is generated through data (which are increasingly digitized, (Hand, 2007) which is then (hopefully) mediated and translated into knowledge through social interaction. Information plays a leading role in transforming things like transportation and mobility. For example, GPS data can be used to compile fleets for bicycles and cars as new services. These bicycles and cars are traced and tracked on a map to offer them in bigger cities to potential customers exploring the city (Brenner et al., 2014). Automation supports technologies that simplify and standardize the way people work. BI research connects automation to standardization of business processes which can help build better BI practices (Olszak, 2016).

Zuboff used the terms ‘automate’ and ‘informate’ (Zuboff, 1985, Zuboff, 1988) in the following way. The ‘automate’ process is a type of automation that specifically aims to replace the work of humans by machines, and the term and idea are connected to the efficiency of activities, productivity, and rationalization of work used by other researchers (Kaiserlidis and Lindvall, 2004). Second, ‘informate’ is defined as the process that translates descriptions and measurements of activities, events, and objectives into information, which is mediated and translated through communicating knowledge and intelligence to people (Zuboff, 1985, Zuboff, 1988, McKinney Jr and Yoos Ii, 2010). In other words, information is gathered through ‘informating’ (Zuboff, 1988). (To avoid confusion, hereafter ‘automate’ will be referred to by the more standard automation and ‘informate’ by the more standard as information.)

In the early days of the field, Luhn saw BI in terms of both automation and information. To him, BI was an automatic system that could “accept information in its original form, disseminate the data promptly to the proper places and furnish information on demand” (Luhn, 1958:314). Of course, today’s automated data processes can gather and process much larger amounts of relevant information (Williams and Williams, 2003, Azvine et al., 2005), (Azvine et al., 2005)2005, (Quagini and Tonchia, 2010). In fact, the volume of data made available through automation requires BI if the information is to be understood and used effectively (Chau and Xu (2012:1190).

Information provides guidance for taking actions (Power, 2002), but “[a] wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it” (Simon (1971), (Manyika et al., 2011:18). Although BI can help bring attention to the right data, and bring the right data and information to the right people (Chen et al., 2012), it is still the people who will be required
to take actions and make decisions based on that information. Intelligent technologies require an understanding of the people who are intended to use these digital tools (Majchrzak et al., 2016).

**Positive and negative factors**

Automation and information can simultaneously improve and weaken BI systems by shifting focus away from data gathering and documentation and towards data analysis, data insights, and reporting.

A benefit of automation and information is that they can allow the BI system to have real-time insights (Kane et al., 2015), which can increase speed (Wixom et al., 2013) and can help standardization (Bhimani and Willcocks, 2014). Real-time insights can affect the process of information retrieval and dissemination (Luhn, 1958:314), can connect data more closely to process (Kane et al., 2015), and can reduce costs by reducing labor (Loebbecke and Picot, 2015).

However, automation and information applied through a BI system can also have detrimental effects, like the creation of information islands. An information island can be created when BI systems are used by management on a department-wide scale but in isolation from other units (Dinter, 2012). One important requirement of BI is that it can get “the right information to the right people at the right time” (Cheung and Li, 2012:5279), which is very difficult if a BI analysis has happened in isolation.

Two other pitfalls of automation and information are errors in comparing wrong data and information (Obitko et al., 2013), and loss of human contact through the use of robots (Frick, 2015).

Three things are necessary if the right people are to get the right data at the right time. First, the information has to be easy to access, especially in real-time applications (Olszak, 2016). Second, data filtering should be conducted to eliminate “irrelevant and outdated information … that won’t improve or inform your analysis” (Sumastre, 2016:2). Finally, there needs to be a ‘techno focus’, which is a general acceptance that “once the data provision is in place then decision makers will make better decisions with the information from the BI system” (Arnott et al. (2017:67).

To sum up, information and automation can transform BI. Information gives the opportunity to support operational and strategic decisions by providing timely and relevant insights, and is transformative by helping the technology develop and be better aligned to its purpose (e.g. integration to sales process to increase sales and customer satisfaction). Automation helps
to transform BI because it allows people to shift their work away from data gathering towards data analytics. However, transformation requires the readiness of technology and, more importantly, the willingness of people using it. The people must be willing to change, learn, and understand a new technology and its use.

2.2 Sociomateriality and imbrication

Sociomateriality focuses on the agencies of people and technology (Orlikowski and Scott, 2008). It can be defined as an interplay between people and technology used in practice (Leonardi, 2013), and it challenges the conventional presumption that there is a separation between technology, work, and an organization (Parmiggiani and Mikalsen, 2013). Cecez-Kecmanovic et al. (2014:809) propose that “sociomateriality stands out as a symbol for the interest in the social and the technical, and in particular, the subtleties of their contingent intertwining.”

This section presents a theoretical model of sociomateriality and imbrication, resting on the work of Leonardi (2012a) which describes human and material agency, and the imbrication of people and technology. The upcoming section is divided into four parts. First, human agency and its components are presented as the willingness of people to interact with technology. Second, material agency and its components are presented as the materiality of technology. Third, the concept of imbrication is presented in more detail. Finally, a model of BI is given, seen through the lens of sociomateriality with a focus on the imbrication of people and technology.

2.2.1 Human agency

Human agency is defined as the ability to formulize and realize the goal of individuals (Giddens, 1984, Leonardi, 2012a). In human agency, the work of people is not dependent on a technology (Leonardi, 2012a). Human agency creates a social reality, and develops conditions for a technology to support goals (Leonardi et al., 2012), suggesting that people have specific goals, and the capacity to fulfill them (Leonardi, 2011). Human agency includes roles such as users or producer, which each have specific goals (Kim et al. (2012). For example, sellers have the goal to sell products or services and track the success in a IT system, and technology supports their way of working. To fulfill specific goals, people have to change their routines of using technology, and human agency can either enables or hinders the technology, because people can decide if they perceive the technology as useful, and they can accept or reject it (Leonardi, 2011). Technology is a boundary object (Doolin
Voluntarism in a sociomateriality context is the intrinsic willingness of people to interact with artefacts and technologies. In the example of Nolan (2000), people would interact with computers based on their own intentions. According to Leonardi and Barley (2010:34), materialism and voluntarism shape and form sociomateriality because they both have impacts on the social and material, which is “constitutively entangled in everyday life.”

2.2.2 Material agency

Material agency is defined as the capacity of nonhuman entities such as any technology to act without the intervention or full control of people (Leonardi, 2011, Leonardi, 2013). A concrete example is for instance when OLAP in a BI system (Ivan, 2014) or other unsupervised machine learning (Breiman, 2001) translates text from a source computer language into another language, and visualizes or animates the analysis without further human intervention (Leonardi, 2011).

Materiality is the arrangement of materials relevant to people in a specific time and place, which results in artefacts or technologies; materialism is the physical shape and form of these artefacts and technologies which make them usable and touchable (Leonardi (2011). The materialism of a computer is connected to functionalities like analyses, calculations, and reports (Nolan (2000). Materialism can lead to avoidance and resistance if people perceive an artefact or technology as useless, or if they simply do not understand it (Leonardi and Barley, 2010).

2.2.3 Imbrication: A model combining human and material agency

Sociomateriality has been criticized for lacking depth. For example, Mutch (2013:23) argues in his review of the concept that “two key problems are isolated: a failure to be specific about technology and a neglect of broader social structures.”

One way to address this problem is through the idea of imbrication, which is often used in the Information Systems (IS) literature as a metaphor to describe sociomateriality. “Imbrication” refers to the overlapping pattern of roof tiles (imbrices) used in ancient Greek and Roman architecture (de Vaujany and Vaast, 2013). The basic concept of sociomateriality builds on the interconnectedness and interdependency of people and technology (Leonardi,
2012a), and imbrication is a metaphor specifying that people and technology do not have clear-cut boundaries between them, but rather that they interlock and overlap to some degree, just like those roof tiles. As McMaster and Wastell (2005:179) put it, “technology cannot act without people any more than people can act without technology. Agency cannot be reduced to either pure humans or pure machines.”

This interlock in a particular sequence distinguishes imbrication from interplay. Interplay is when two or more things have an effect on each other. Imbrication goes one step further because it looks at the overlap, overlay and interweave between these two or more things, while interplay focuses on its interaction, interchange or cooperation. The point of departure differs, and therefore, the outcome of investigation can also differ. Furthermore, the concept of interplay lacks social dynamics and social factors like actions and impact of actions, which are highlighted by Leonardi (2012)’s framework of imbrication (Figure 2).

*Figure 2. Model describing the imbrication between people and technology in a process free after Leonardi et al. (2012).*

The model includes a social context (I) and sociomaterial practice (II). The social context is the setting with its boundaries and aspects combing the social dynamics such as a process (C). The social context gives a social structure through “mechanism[s] of socialization.” (Parsons, 2010:8). The socialization is given by the structure of a firm as such because it provides a structure for both people and technology. The structure enables a communication network between share- and stakeholders, hierarchies employees, and others (Leonardi et al., 2012). The structure develops boundaries and dynamics impacting the
sociomaterial practice (II) (Kallinikos, 2011). For example, a process (C) has standardized routines and specific steps (Davenport, 2013, Glykas, 2013) that have to be fulfilled to reach a specific goal.

At the same time, sociomaterial practice (II) “refer[s] to a space in which work is made possible through the imbrication of social [human] and material agencies” (Leonardi et al., 2012:34). Sociomaterial practice contains people (A) with their human agency (1), and technology (B) with its material agency (2). People (A) are usually employees, knowledge workers, and managers, who have an intent when working with technology. Employees are for example analysts, while knowledge workers are experts who have a deep understanding of the technology. Managers control the numbers and are responsible for the system working.

The imbrication (3) between human agency (1) and material agency (2) is triggered by people and technology being intertwined, or as Mathiasen and Koch (2015:605) put it, “humans [people] and materials [artefacts/technology] have agency, which become interlocked in a particular sequence.”

Material intrusions onto human agency can reduce willingness to perform actions (Blackler and Regan, 2009), and can therefore hinder company-linked goals and purposes. Material intrusions can include things like the “unanticipated enactments of new IT initiatives” (Robey et al., 2013:384). For example, a study by Chu and Robey (2008) focused on a new learning system for nurses that was not being used by them, which was perceived as a problem. The reason for the underuse was that traditional learning practices were valued more highly than new online learning systems. As the study showed, systems like a technology (with its own material agency) can have an effect on human agency.

However, human agency can also interact well with material agency, through for example working routines using technology (Leonardi, 2011). People simply work in their daily business with technology. The challenge for the technology is to trigger a specific interaction or way of working. For example, embedded technology can be integrated in ways to help trigger interaction (Robey et al., 2013).

An example of a positive, routinized interaction of human and material agency was provided by Carlile et al. (2013), again involving nurses. In this study, nurses used patient databases to help facilitate their work. These databases were based on the nurses’ routines and their actual requirements. Data were provided automatically to nurses, which decreased the risk of errors when transcribing information, and increased the density of the data available.
The data had a certain quality fulfilled by the materiality of the system. Here, materiality mattered because the patient database matched the needs of nurses. This effect could in theory be felt at any and all levels, in any organization (Leonardi and Barley, 2008, Marler and Liang, 2012).

In conclusion, imbrication is the interdependent intertwining between people and technology (Leonardi, 2011), and it has been demonstrated in a sociomateriality framework (Leonardi et al. (2012) to allow studying the human and material agency of people and technology in a better way. Imbrication takes an in-depth, conceptual look at both people and technology by focusing on people’s use of technology.

2.3 Synthesis: A model of BI seen through the lens of sociomateriality

When considering the model from the beginning, the sociomaterial practice becomes more concrete, and the applicability and advantage of using a sociomaterial lens to study BI is becomes clearer.

BI is a technology and people are its users. Leonardi (2012a) considers technology, with its materiality, to be like a rune stone or compass, with a specific meaning for its users. The meaning for users of BI is that it is a digital tool that helps their decision making. The digital tool consists of interfaces, making the capabilities and characteristics of the BI system accessible so that users are able to support their decisions. A BI’s architecture defines its materiality, which is its characteristics, form, and functionalities (Leonardi, 2011). BI’s architecture is described by its data source, data gathering and processing, servers and applications.

People have certain goals, such as increasing sales or satisfying customers. If people have specific goal-oriented intentions with their BI, then their human agency is responding to a concrete material use. People will interact with BI (that is, with material agency) if they perceive the provided information as useful. For example, sales goals are connected to the BI system’s analyses and reports (material agency), which supports the intention of sellers (human agency). Human and material agencies have become imbricated.

This imbrication in turn influences the social context. When people communicate with colleagues, they improve and innovate the both process and social context. For example, BI allows sellers to have visible results based on (non-financial) data, which in turn influences other people and/or the technology. The human and the material are inextricably linked.
Chapter 3: Methods

3.1 Research design and case selection

This thesis applies a single case study design (Ragin and Becker, 1992, Berg, 2004, Creswell, 2013) and analyses a leading car manufacturer located in Germany. According to Creswell (2013:43), a case gives “an in-depth analysis of a case, often a program, event, activity, process or one or more individuals.” This case gives insights about a BI system (a program), about events concerning sales and purchases, and specifically about the BI and the sales process.

The relevant explorative research question is ‘How does the imbrication between people and technology develop in the daily use of BI systems?’ The hypothesis is that “management research outlets do not take into account the role of technology in organizational life” (Orlikowski and Scott, 2008:433).

As Yin (2013) reminds us, contemporary phenomena are best studied through a case study set in in a qualitative research design. The contemporary phenomenon studied in this thesis was the digitalization of a sales process through a BI system. The BI system introduced new affordances and motivated people to use these technologies, and provided the opportunity to explore the imbrication between technology and people.

The selected case is a division of a multinational car manufacturer which introduced a BI system for sales process analysis to its more than 450 sellers. The BI system was developed as a high-priority initiative of top management, with the intention to increase both customer satisfaction and sales.

This case was selected for four reasons: (1) the relevancy for investigating imbrication, (2) the revelatory nature of the newly-available information, (3) the gap in the literature on these issues, and (4) trust.

First, the case was highly relevant for investigating sociomateriality, because it gave the possibility for studying people and technology, both separately and in combination. The empirical sources were widely spread across the organization. For example, respondents at different hierarchical levels (from call center agents to directors) were willing to contribute, and BI,
as a technology in a daily use, could be studied with its features and functionalities according to specific measures (e.g. KPIs). This gives a unique possibility to study BI as a technology with its social dynamics and overlap with different people (e.g. users, initiators, and developers).

Second, this particular case involved digitalization of a process that had not previously been easily visible. The insights afforded by the digitalization were new, and therefore revelatory. The process studied was the sales process, which was now being described in a standardized way. Through the BI’s digitalization, specific KPIs could be measured, which made the process comparable among sellers, showed patterns of how people worked, and showed where sellers were performing well or needed improvement.

Third, there was a gap in the literature about the use of BI on a day-to-day basis, especially in the context of social dynamics. Here, daily use was observed and investigated by looking at different situations in terms of both the technological side of the BI and the social dynamics around the BI (Arnott et al., 2017, Kohtamäki and Farmer, 2017). Furthermore, the phenomenon studies the use of BI at a large organization, as other researchers have called for (Lian, 2017, Pratama, 2018, Yeoh, 2018).

Last, trust between myself and the case company was established through a personal contact, who helped to connect me with different individuals at the case company who were using BI and working with the sales process. This trust and my transparency helped to establish an open attitude. For example, I explained in every interview who I was and how the contact was established, in order to gain trust. The access helped to develop the research freely and with the support of the case company. By the end, it was possible to ask the case company additional questions about BI or any other situation, and get answers.

The trust also helped me to get unlimited access to the BI system. BI provided a stronger connection to the company because critical cases were discussed with the sales department (see interviews 15, 17, and 23 in Appendix 1) and analytical questions were explained by the developers and analysts (see interview 8, 11, 19, and 22 in Appendix 1). This in-depth access was built on a three-year relationship between myself and the case company.

In conclusion, the case study enabled the study of contemporary BI and its social dynamics in day-to-day use in different situations. The study provided a rich illustration of users, processes, and specific factors connected to BI. The case study enabled multiple angles and a holistic view, which put the phenomenon in an organizational context (Eisenhardt, 1989).
3.2 Case study background

3.2.1 History and trends towards digitalization

The case company is a car manufacturer that had decided to use a BI system to increase its customer focus and improve its sales process. The history of the case company is characterized by major events like bankruptcy (1920), market expansion (1967), and the recent financial crisis (2009).

In 1920, the company made cork substitute produced from native plants, which got shipped on a global scale. The global demands were quickly satisfied elsewhere, leading the company to leave its core business (Frey, 2017). The company had to be saved from bankruptcy by banks and private people (Hoshi, 2004). Production shifted toward car manufacturing, and focused a three-wheel truck (1931), commercial vehicles (1950), and city-coupé (1960) (Kuch, 2008).

In 1967, a newly developed engine was introduced (Kogai, 2017a:8) followed by expansion to the Germany market. The car manufacturer was perceived by the German media “with a certain skepticism” (Eicker, 1972:126), because of the different engine power and the fact the company was new (Eicker, 1976). The company expanded to other markets including Australia (1967), Canada (1968), and the US (1970) (Kogai, 2017a). Expansion on a global scale led to new production factories in strategically located countries such as the US (1987), Japan (1992), and Mexico (2014) (Kogai, 2017b).

In 2009, the financial crisis hit the car manufacturing industry and the company had losses. The company’s struggles during the financial crisis included delays in car delivery because of missing supplies and a weak home currency, which got stabilized through increased prices (Springer, 2009a, Springer, 2009c, Springer, 2009d). During the time, one problem was that some employees and parts of the seller network minded their own business instead of stabilizing the overall economy: “some employees were more focused on their own careers in Europe instead of engaging in the Germany market” (Springer, 2009b). Management quickly engaged and reformed the seller network by decreasing the number of sellers, educating the sellers better, and by digitizing major processes in sales through integrated systems such as BI (Springer, 2010a, Springer, 2010b).

The reform led to a steady reduction of the number of sellers and successively increased sales beginning in 2012 (Figure 3). At the same time, the reduction of number of sellers required new tools to handle the increasing
number of sales per year. A BI tool was used that measured customer feedback in the sales process.


This section describes a part of the social context that is a central part of the model used.

Sales and salespersons (hereafter referred as sellers) bridge the gap between customer needs and the products and services that can fill those needs (Porter, 1996, Reynolds and Arnold, 2000, Winer, 2001). The sellers purchase products and offer services, and are challenged by an increasing number of technologies involved in these sales (Jones et al., 2005). Technologies aim to make the work of sellers easier through automation and information.

6 Figure 3 is only an illustration showing how the development between sold units and sellers. For a better visualization, the BI system is also included. This figure is not intentionally presented to build any clear, causal or analytical connection to the findings of this thesis. Instead, the purpose is to provide a broader contextual background to the case study.
At the case company, the sales process was digitalized for standardization of work, structuration of the sales process to anticipate steps for sellers (cf. Osowski (2013) and Hall and Johnson (2009)\(^7\)), and transparency to control the work of sellers and make it comparable to the needs of customers. Standardization led to a situation where every seller had to do the same job and had to follow the same steps over and over again. This structuration was enabled through a BI system that measured the performance at various steps in the sales process, which increased transparency.

Digitalization helped to anticipate the needs of customers in the sales process. However, the transparency concerned the sellers, whose work was,

<table>
<thead>
<tr>
<th>Process</th>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Appointment</td>
<td>Date setting between buyers and sellers to meet-up which is previously set by a phone call, online form or other communication option</td>
</tr>
<tr>
<td></td>
<td>2. Arrival</td>
<td>Describes usually the appearance of buyers at the sellers’ location. It includes a preset procedure of welcoming and introducing between buyers and sellers</td>
</tr>
<tr>
<td></td>
<td>3. Test drive &amp; Consulting</td>
<td>Buyer tests the car &amp; get some consulting during the drive to understand the handling of the car</td>
</tr>
<tr>
<td></td>
<td>4. Purchase: Negotiation &amp; Deal</td>
<td>The financing, arrangement, and conditions for the purchase are discussed and legally signed by buyers and sellers</td>
</tr>
<tr>
<td></td>
<td>5. Car- and accessories ordering</td>
<td>The features and equipment of the car are ordered and are discussed and double-checked with buyers</td>
</tr>
<tr>
<td></td>
<td>6. Car delivery</td>
<td>The moment when the purchased car is arriving at the sellers’ location</td>
</tr>
<tr>
<td></td>
<td>7. Car handing over</td>
<td>A check-list for the car is getting filled-out by buyers and sellers and the buyer gets the car physically</td>
</tr>
<tr>
<td></td>
<td>8. Payment</td>
<td>The process when money is withdrawn from the account of the buyer &amp; handed over to the seller</td>
</tr>
<tr>
<td></td>
<td>9. Repurchase</td>
<td>The moment when a buyer considers repurchasing at the seller, which depends on customer satisfaction</td>
</tr>
</tbody>
</table>

Table 1. Repetitive sales process with steps and description.

\(^7\) In this respect, this thesis makes a small contribution to Oswoski (2013), where structuration and standardization are key elements that provide flexibility in sales. He explains that "standardization of sales work supported by IT" (p.191) could create affordances leading to flexibility in firms. These affordances could lead to “well-grounded, well-related, and well-informed decisions and actions” (p.191) in sales, which relates to the findings of this thesis.
The sales process was broken into nine steps, which follow buyers and sellers through the whole process of getting a car, from appointment to repurchase (Table 1).

The sales process started with an appointment, which is a scheduled meeting between a buyer and a seller. The appointment initiated a dialogue about buying a car. The meeting was set by communication via phone, an online form, or any other device such as email or WhatsApp, and has the intention to sell a car from a seller.

Next, the arrival was the actual meeting between a buyer and a seller, which included a registration of the buyer at the information desk, where the first contact details of the buyer were noted. After this, sellers welcomed the buyer and determined their needs by arranging a test drive and consulting.

Third, test drive and consulting were services offered by the seller in preparation for purchase, which included an explanation of the car, guidance through the contract, and listing the equipment needed for the buyer.

Fourth, the purchase was the settling of the contract by negotiating the deal. (Here, a distinction was made between private and commercial buyers, which is according to a sales expert “60:40”, see interview 14 in Appendix 1.) The contract is a legal document between buyers and sellers, which settles financing options such as leasing, loan, and trade-in, and gives a detailed description of buyers, cars, and sellers.

Fifth, car and accessories ordering was an internal process by the disposition of the seller.

Sixth, car delivery was the moment of arrival of the purchased car at the seller. The step included the preparation of the car for handover to the buyer with cleaning from the outside, removing of security covers, and various checks.

Seventh and eighth, car handover was when the buyer got the car, and payment was when the seller got the money for the car. These two steps involved multiple documents such as handover confirmation to ensure the accuracy of the purchase, a digital check-book to ensure the warranty and customer relationship of the buyer, and a description of the car in all its detail.

Last, repurchase was the moment when the same buyer, who had already purchased a car and was satisfied, went through the sales process with the seller again.
The incentive to use BI along the sales process was to increase sales efficiency and avoid obsolescence. BI was used to digitize each step in the sales process of each and every seller. The aim of the BI was to give the sellers a tool that would offer them alternative ways to respond to customer needs. The customer journey was measured through factors such as *customer experience*, to get a feeling how a customer perceived the sales (Norton and Pine, 2013), and *customer satisfaction*, to see how pleased a customer was throughout the process (Hyvönen, 2007).

### 3.2.3 BI architecture, input, and output

The company’s BI system was a cloud-based digital tool used to support decisions in the sales process. The BI system was integrated into the digital strategy and aimed to gather a larger amount of data to make the sales process more transparent. The stated aim of the BI was to support sellers “to improve their customer service and sales performance thus increasing loyalty and decreasing defection/rejection” (text on the landing page of the BI system).

The old system, called ‘Focus Customer’, was a customer relationship management tool. It did not measure customer satisfaction, and had not lead to increased car sales. The system was perceived by the sellers as complicated with a mismatch of functionalities and features.

The people who used the new BI system were employees working at headquarters and subsidiaries, who are users, initiators and developers. These people had two major intentions based on the business strategy: increasing sales and increasing customer satisfaction.

The architecture of the BI system was divided into back-end and front-end (Figure 4):
The map of the BI system was drawn based on the empirical case. A clear categorization of OLAP and ETL tool into the BI architecture was limited because these parts were taken for granted by the company. The ‘map’ of the BI system architecture comes from Kemper et al. (2010), which is adjusted and represents an edited version fit to the case studied. The full reference is as follows: Kemper, H.-G., Baars, H. & Mehanna, W. 2010. Business Intelligence–Begriffssabgrenzung Und Ordnungsrahmen. Business Intelligence–Grundlagen Und Praktische Anwendungen. Springer.
The section will explain the BI system and more specifically the operative system (1), data source (2), information generation and distribution (3), and information access (4). The parts were driven by the input (A) and output (B).

The input (A) to the BI system was data about customers, sellers and cars. The output (B) of the BI system was analysis and reports for decision support in the sales process. The back-end (a) consisting of the operative system, data source, and information generation and distribution and connected the input and output with each other.

The operative system (1) gathers and compiles data through specific systems along the sales process. The specific systems collect data and information about customers through three subsystems: a customer relationship management system (CRM), a seller workspace system (SWS), and a content management system (CMS). First, the CRM system gathers data from online forms and phone calls about customers. Second, the SWS system compiles and documents data from sales cases, and contact details about sellers. Last, the CMS provides from phone calls unstructured data about cars, customers, and sellers. For example, sellers can gather unstructured data customers’ preferences concerning the preferred color of the car or the previously driven car. Therefore, the operative system gathers unstructured and structured data of CRM, SWS, and CMS through an extract, transform load (ETL) tool. The ETL tool takes data from cars, customers, and sellers and uses a specific template, in which the data is stored. The ETL tool belongs to the data management system (DMS), which is a first harbor to pile the data into one common database. At the case company, the DMS is an interface for sellers for connecting them to the headquarter, customers, and tighten them to themselves. Furthermore, the DMS is an operating system to compile data and information about for cars, customers, and their cases sellers. The DMS is part of the data warehouse, and has an important role for the BI architecture because it provides all data and information needed to satisfy customers and improve sales.

Data source (2) stores the data in a data warehouse and manages content and document. The data warehouse (2A) is based on an Oracle solution, which is the data source: Siebel (Gilbert, 2002, Kawamoto, 2006). Siebel stores the data and information of the DMS into a common database. The database of Siebel is, according to a respondent in his role as senior manager National Sales Company and Dealer Information System (see Appendix 1, Interview 9), responsible to store and document data for different departments such as marketing for customer relation, after sales for warranty, and sales. The sales department uses the data to track sales, and improve sales through customer satisfaction. Therefore, the data warehouse (2A), Siebel, is connected to a ETL tool, which extracts seller-specific data, transforms them
into the BI template form (see Appendix 8), and make it possible to load it as content and document for sellers. The ETL tool is a form of converter that transforms data into useful data and information for the content and document management (2B) with a specific semantics. For example, Paper II describes the ‘semantic orientation’ of BI in a more detailed way. A common template is used that compiles data and information into a database in a common way, and distributes these data and information to its specific sellers.

Information generation and distribution (3) analyses the data and distributes information about sales and customer satisfaction to specific users: sellers and subsidiary (see 3.3.4). Analytical systems (3A) use data analytics to make individual reports and cumulative reports about satisfaction, and data mining to structure the data logically into themes, and prepare it for text analysis. These reports and analytics is enabled through OLAP, which is at the case company a technological application to make analytical calculations, reports and trend analysis based on ‘what if’ scenarios. OLAP is used in the back-end and has a time since 2013 and category dimensions that stores information about cars, customers, and sellers.9 These information is piled into specific cases, which are used to take actions and decisions of sellers. Information distribution (3B) is, as well, done through the back-end and every seller gets their dataset, which consists of cases with their purchase to customers. The case company gets also only the datasets of their sellers in connection with the datasets of customers connected to the seller.

In the front-end, people actually use the BI system. In there, the information access (4) is granted through the BI portal (4A). The front-end architecture of the BI portal. The BI portal shows for examples features and functionalities such as KPIs, dashboards or monthly reports, which lead to analysis and reports as an output. The BI portal uses the corporate identity of the case company (see Appendix 7). Its landing page consists of seven tabs to get an overview of all important KPIs; my profile to change the password; individual reports to filter single cases and critical cases; aggregated reports to compare dashboards, trend analysis, and text analysis; downloads to get monthly reports, mystery shopping, and follow-up reports; information page to have a handbook for the BI system itself; and logout to simply shut-down the BI system. The landing page shows the performance of actors (Figure 4, Section 3.2.3) such as sellers (the ‘person’ symbol in Appendix 6) in comparison to its seller network (the ‘world’ symbol in Appendix 6). Those features and functionalities help decision support (4a). For example, Paper II highlights that sellers need support in their decisions when making compensations to

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9 The materiality of BI is formed by ETL and OLAP, which support the transactional work and analytical work of people.
their buyers. This effort of BI has two strategic goals: customer satisfaction and sales.

3.2.4 People: their roles and use of BI
The BI system at the case company (Figure 4, Section 3.2.3) is used by different people, which have different roles. The use and roles respond to the research ‘How does imbrication between people and technology develop in the daily use of BI systems?’ – People have aims when working with the technology and peoples’ goal differ depending on their roles. In other words, in order to understand the forthcoming answer to the research question manager and researcher must first understand the people that are using the BI and their respective roles they have when they do so.

At the case company, the researcher identifies three main roles based on the empirical data (mainly the interviews): initiators, users, and developers. Figure 5 describes the roles and relationship with the BI system (marked with the arrows):
The three roles are briefly described as follows. The *initiator* is the actor that introduced BI. The *user* is the actor that operates BI. The *developer* is the actor that grows and matures BI. The different actors in their roles were interviewed and afterward clustered into the three main groups (see fourth row in Appendix 1).

The identification of these specific roles is important due to three reasons explained in the following: description of actors (1), relationship towards BI (2), and identification of aims with BI (3). First, the roles give a *description of actors* related to the case company. They give actors an understandable personality and make their activity and task clearly. For example, sellers are users, who actually operate with the BI system. Second, the roles highlight the *relationship towards BI*. Users such as sellers are acting in a specific way with BI. They are providing reports and get analysis. In contrast, initiators improve BI based on analyses she or he gets through BI. The relationship towards BI of actors differs, which is highlighted by the roles. Last, the *identification of goals* actors gets more visualized through roles. For example, an initiator’s aim with BI is to get users to work with it, while users’ aim with BI is to use it, and developers want to improve BI.

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10 Figure 5 is based on the case company and is developed based on the empirical sources (mainly observation, interviews and documents).
Initiators: Distributors and controllers of BI

As seen in Figure 5, the initiators of the BI system are the European headquarter and Directors of the subsidiary ‘Germany’. They have the aim to structure the system in line with their digital strategy and business strategy (see focus group meeting setting in Appendix 5).

The aim of the digital strategy is to get more data in the sales process by interconnecting technologies and increase the use and process with technology (see interviews 18, 25 and 32 in Appendix 1). The aim of the overall business strategy was to increase sales and focus on customer satisfaction.

In the beginning, the European headquarter distributed the BI system to their countries and its sellers. The reaction towards the BI system was positive and sellers began to use the BI system. Users had different difficulties such as logging into the system (see group interview 1 in Appendix 1), the number of systems led to a system overload (see interview 1 in Appendix 1). As a response to those difficulties, the European headquarter improved the system with its subsidiaries, sellers and developers to make BI more integrated into the daily work of user (see interviews 25, 30, and 31 in Appendix 1).

The European headquarter becomes in the end also a user because the system gathered increasingly data from multiple countries such as Germany, Italy, and the UK. They use the data for analysis to compare and control the performance and get an overview how the sales process works in the different European countries.

Users: Providers of reports and consumers of analyses

The users of the BI system are the German subsidiary and sellers. Both provide reports and use analysis for improving the sales process.

The German subsidiary belongs to the European network and is controlled by the initiators. The subsidiary is the case company, which uses the BI system for decision support. The support comes from analysis and reports about sellers in Germany.

Sellers belong to the seller network of around 450 dealerships, which are distributed in Germany. They belong by legal contract to the subsidiary in Germany. Sellers are users of the BI system, which use their own specific data consisting of their sales and customers.

The sellers get information and gave data. They receive information in form of reports and feedback of how their sales process works on an individual level. The individual level shows in detail the seller-buyer-relationship in the
purchase of a car with all the previously described steps of the sales process. The respond of sellers are reports of how they took action.\textsuperscript{11}

The users use the BI system voluntarily to improve the sales process by using analysis and reports. The BI system has the goals to improve factors such as buyer-seller relationship through increased automation and information of different steps in the sales process, sales through increased customer satisfaction and experience and an increased transparency through more KPIs and a social identity profile. The voluntary use (voluntarism) is achieved because users see the goal of BI system strongly connected to their own.

The output of users of the BI system are analyses used to improve the steps along the sales process. The input to the BI system of sellers are reports used of themselves and others to get new insights and make the sales process more transparent. The new insights are received through two ways: reports (1) and analyses (2).

First, users are the provider of reports. The aim of users to provide reports is to receive decision support through BI, which improves their work. The reports support decisions based on monthly reports to give a comparison of the performance on a monthly basis; mystery shopping measurements to test and evaluate the customer experience at a seller, and follow-up impact reports to see the improvement when actually following up on a customer.

For example, monthly reports give sellers the possibility to look at specific cases and compare their results based on factors such as satisfaction. The customer satisfaction makes clear how customer perceived their purchase. The results are presented on an individual level presenting each customer with their perception of different steps (see Appendix 8). In Appendix 8, customer 1-98LNLU2 is presented with his purchase. His feedback with the purchase was satisfying with following feedback:

"Competent consulting. Professionally, the whole team is up to date, everything has been explained clearly. Test drive feasible after short-term appointment. Pros and cons of gasoline and diesel honestly explained. For all questions open. The whole team is very customer friendly. Fair price negotiation."

The response in the overall customer report shows that the customer was satisfied, which responses with “completely satisfied” KPIs in the BI system.

\textsuperscript{11} The in- and outflows are an essential part of \textit{Paper II}, which looks at the streams of data and information between BI, events, and actors (especially buyer and seller).
Second, users are consumers of analyses. The aim of users is to consider analyses of the BI system in their work is based on actions. The actions concern decision making to satisfy customers and increase sales (see Figure 8). Analyses itself provide an overview about performance in the sales process, and gave decision support for actions towards buyers. The users made analyses to keep track of different KPIs, dealer dashboard, league table, and trend and text analyses.

For example, analyses are overviews of individual and compiled cases in the sales process, which give insights into the overall sales process performance of all sellers. A respondent in its role as a ‘research executive BI systems’ describes that sellers perform better based on the data provided in the BI system. Car delivery and repurchase are in the analysis perceived as more successful than arrival, test drive and consulting and the purchase (see interview 30 in Appendix 1). An explanation might be given by the sales expert that connects emotions to sales: “The delivery of a car is a special moment, which perceives a customer higher than other events.” (see interview 3 in Appendix 1)

Developers: Architects and embedders of BI

The developers of the BI system are belonging to an external firm with an own research and development department. They are the architects of the BI system, which got enrolled in the European market.

The developers design the back and front end of the BI system. The start of the BI system was in 2013 and they used a modified BI architecture used at another car manufacturer (see interview 31 in Appendix 1). The BI is a described by the respondent as follows:

“This [The BI system] is a tool for (...) [the case company] to measure the performance of the sellers (...). That is a function of it as well as data gathering of KPIs. Another function is the classical market research and we make the reports. (...) …they give the seller a tool at his hands where he can identify dissatisfied customer and follow-up on them for ‘loyalization.’”

The role of developers is to design and integrate BI in line with the sales process, initiators, and users. Those three factors are explained in the following paragraphs.

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12 The key performance indicators are analyzed in a more detailed way in situations in Paper II.
First, the sales process gives the frame to design and implement BI. The developer integrates BI along the sales process and the sales process defined key performance indicators (KPIs) that are measured through BI. The KPIs are connected to performance measurements that look at the satisfaction and experience of customers.\(^{13}\)

Second, initiators have the intention to implement BI according to corporate digital and business strategy (Section 3.2.1). To achieve this, developers initiate and execute the project. Strategical meetings are used to meet initiators, developers, and users to discuss the development of BI, recent issues and updates to serve the user better, gather higher quality of the information, and enable better analysis (see interviews 11, 30, and 31 in Appendix 1).

Last, users have the aim when using BI that it responds to their needs (human agency). To fulfill this aim, developers modify certain criteria to make BI more usable.

For example, KPIs were adjusted based on the needs of sellers to have a better status of the past of customer (see interview 7 in Appendix 1). The new features and functionalities of BI are after that to “develop richer data by connect[ing] information.” (see interview 3 in Appendix 1) The connection or linkage of data is done by implementing more details about the customer in form of a social identity. The social identity combines general information such as profile with car preferences and personal interest to enrich the data gathered.

The result of this described effort is an extension of the existing front-end solution, which presents the buyer and their satisfaction (Appendix 8).

In conclusion, the four actors have three roles aiming to analyze, report and improve the BI system. The BI system is embedded along the sales process, aims to provide decision support, and is integrated along the business strategy. As the case shows, people and technology in form of BI interplay with each other.

\(^{13}\) An elaboration of the KPIs and their connection is given in Paper II. There are 12 KPIs presented, which respond to the sales process.
3.3 Data collection

The empirical data were collected between 2013 and 2016 and consisted of five different sources: interviews, observations, internal documents, the BI system, and external documents and publications (Table 2).

Table 2. Overview of empirical data sources in order of importance.

<table>
<thead>
<tr>
<th>Types of data collection</th>
<th>Unit</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>1. Interviews</td>
<td>Total: 34 interviews with 21 respondents (e.g. advisors, sellers, director of car manufacturer)</td>
<td></td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>#</td>
<td>-</td>
</tr>
<tr>
<td>Group interviews</td>
<td>#</td>
<td>-</td>
</tr>
<tr>
<td>2. Observations</td>
<td>Total: 98 hours of observations at headquarters, office of the external provider of the BI system, &amp; office of two sellers</td>
<td></td>
</tr>
<tr>
<td>Empirical observations</td>
<td>Hrs.</td>
<td>-</td>
</tr>
<tr>
<td>Work shadowing</td>
<td>Hrs.</td>
<td>-</td>
</tr>
<tr>
<td>Meeting</td>
<td>Hrs.</td>
<td></td>
</tr>
<tr>
<td>3. Internal documents</td>
<td>Total: 1,139 pages of strategic and operational documents.</td>
<td></td>
</tr>
<tr>
<td>Strategic documents</td>
<td>Pgs.</td>
<td>63</td>
</tr>
<tr>
<td>Operational documents</td>
<td>Pgs.</td>
<td>209</td>
</tr>
<tr>
<td>4. BI system</td>
<td>Total: 25,721 voice files that documented the feedback of customers for their purchase and 33,532 complete datasets of customer feedback answering how they perceived the nine steps of the sales process</td>
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<td>Voice Files</td>
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<tr>
<td>Customer feedbacks for sales process</td>
<td>Set</td>
<td>580</td>
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<tr>
<td>5. External documents and publications</td>
<td>Pgs.</td>
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<tr>
<td></td>
<td>Books, newsletters, magazine article, press releases, and automotive studies (1969 – 2016)</td>
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First, 32 interviews were performed with 21 respondents (32 semi-structured interviews and two group interviews). The interviews lasted from 2 – 4 hours, resulting in more than 33 hours of recorded material which were collected between 2015 and 2016. Second, 98 hours of observation were performed at headquarters in Germany, at the office of the external provider of the BI system, and at the office of two sellers. Third, 813 pages of internal documents (consisted mainly of operational documents such as monthly reports, and strategic documents like digital strategy documents of the case company) were analyzed. Fourth, the BI system itself provided empirical
material, namely digital voice files containing 25,721 files, and sales files covering 33,532 data sets of purchases. Fifth, external documents and publications published between 1969 and 2016 were collected, comprising primarily publication connected to the case company and public reports about the automotive industry.

Altogether, these multiple sources of data enabled method triangulation within and across the different sources of data. For example, when analyzing the car handing over to the customer, three types of data were triangulated. The datasets of the BI system were used to evaluate the incident; the incident was noted in an interview of one respondent saying that this incident was an ‘emotional moment’; and this incident was also directly observed, where it was obvious what a special event it was for the customer.

3.3.1 Interviews
For the interviews, the choice and order of the respondents was based on expertise interviews with directors such as the Director of Human Resource and General Administration, and the Director of Service. The focus of these first interviews was to get an overview of the case company and the people managing BI as initiators. After speaking with directors at the top-management level, relevant people were identified (that is, the ones actually using the BI). A key respondent was the Team Lead Dealer Analysis and Systems, because he was involved in the development of BI and did analyses with BI. He discussed the sales process, the BI system, and sellers involved.

These interviews were a key moment for conducting future group-interviews, work shadowing, and for getting full access to the BI system. The interviews were divided into semi-structured interviews and group interviews.

Semi-structured interviews
Semi-structured interviews included respondents at the top-management level, such as directors, and operative workers, such as analysts. The semi-structured interviews followed an interview guide, which compiled key questions asked in different categories (Laudel and Gläser, 2007, Saunders, 2012, Ritchie et al., 2013). The interview guide can be found in Appendix 2. The semi-structured interviews were useful because they explored the emerging issue (Saunders, 2012) and put the technology in an organizational context (Orlikowski and Scott, 2008:433).

There were three types of semi-structured interviews: first-contact interviews, follow-up interviews, and problem-specific interviews. The purpose of the first-contact interview was to gain an understanding of the sales process and/or the BI system through conversations. The follow-up interviews
aimed to get a deeper understanding of less well understood situations (e.g. purchases). The problem-specific interviews deepened the understanding of specific issues, such as digitalization. Each interview followed the same five-step procedure: 1. a greeting and an overview of the aim of the interview and research project as a whole; 2. information about anonymity and confidentiality; 3. discussion of roles to understand the affiliation with the sales process; 4. BI system and questions to get to know more about an event, interaction or situation; 5. closure about future contact with the respondent.

An interview guide was used to structure the three types of interviews into an introduction, main part and, wrap-up. The interviews were prepared and the interview guide was used throughout the different interviews. Furthermore, the structure helped to stay focused throughout the interviews.

**Group interviews**

Group interviews were face-to-face conversations between interviewer and respondents. Two group interviews were conducted with five respondents in a semi-structured way. The group interviews were conducted at the location of the respective seller and took 1.5 hours each. Seller 1 was a company located in the center of a capital city in Germany. Seller 2 was a company located in a village near the same capital city.

The two sellers presented two best-practice cases because they were high-performing users of the BI system, with high sales rates and above-average customer satisfaction evaluations. The group interviews approached the topics of the sales process, the BI system, and the use of the system for Seller 1 and Seller 2.

In the first group interview with Seller 1, the respondents were an owner of Seller 1, a person responsible for human resources, and the Team Lead Dealer Analysis and Systems of the case company. The part-owner of Seller 1 had taken over the business from his mother-in-law and could be described as a ‘businessman’. He used the BI system to analyze voice files of their other sellers.

In the second group interview, the respondents were ‘Seller 2’, which consisted of two team-leading sellers managing the business as a brother and sister team, and the responsible human resources person with the Team Lead Dealer Analysis and Systems of the case company. The two team-leading sellers of ‘Seller 2’ grew up in the automotive industry, helped out at ‘Seller 2’ when they were children and are now high-performing sellers. They had a dedicated person hired to take care of the BI system and analyze critical cases with the use of BI on a daily basis.
In sum, the group interviews helped to understand the user-side of the BI system and to see the relationship between seller and case company by looking at their interaction with each other.

3.3.2 Observations

Ninety-eight hours of empirical observations were made through work shadowing and meeting attendance at various sites, which gave a holistic picture of factors such as the BI, processes, and actual work done at the company.

Empirical observations

The empirical observations happened over 10 work days at the sales department and BI department, where the researcher participated in lunches and some meetings. A limitation of contemporary observation is the increased digitalization and virtualization of work through computer, which makes it hard to see what’s going on (Overby, 2008). Therefore, I took field notes to visualize the work with BI.

The sales department was observed with a focus on the work of sellers and the sales process. A sales team involved from six to eight employees with one team leader and the Director of Sales sitting in a shared-office environment. The company offered me a fixed desk to be integrated into the team, and guest access for logging into the company’s intranet. I asked throughout the shadowing informal question to understand the work the employees were doing, and I had also the chance to listen to phone calls between the company and sellers. For example, a seller had a problem with handling a case with a customer, and the whole process was shown and explained and the phone conversation listened to.

Empirical observation helped to get a clearer picture of situations where the BI system was used for critical situations. A study about these critical situations was done in Paper II, in which observations were used to see how BI is used by sellers in a critical situation such as a purchase. The result of these observations showed that BI is used for analyses and reports for making decisions and compensations. For example, observations with an analyst involved critical cases discussed with the help of case-specific sources (e.g. mailing and voice files) to explain in detail what happened, and how the BI supported the critical situation.

The BI department was observed with a focus on the BI system. The team involved two external persons who were loosely connected to the sales department. The company offered full access to the BI system to understand and use it, and documentation to have an overview of programs connected to
BI and the system itself. The BI system was shown and it was explained step-by-step how different actors use the BI system.

In sum, the empirical observation helped to see how BI and users overlapped with each other by showing what the sales process looks like and how people actually work in such process and use BI.

**Work shadowing at a call center**

Work shadowing was done with three call center agents to understand the process of data gathering with the BI system. Work shadowing is a qualitative research method in which the researcher follows people to observe different factors such as roles, the way people actually work, and actual use of a system (McDonald, 2005, Czarniawska, 2007). The documentation and notes from the work shadowing include sitting order to see how the people were grouped in relation to each other (Appendix 3), and field notes made by the researcher.

During work shadowing, the researcher followed the call center agents for two hours each (see Appendix 4 for an overview). The call center agents handled customers who had recently purchased a car, and interviewed them about their experience with the purchase. These interviews were conducted via phone and took approximately 19 min each. In total there were 18 interviews with different customers.

The task of the call center agents was ‘data gathering’ with the use of the BI system. The data gathering had to be done in preparation for taking actions and supporting decisions of sellers and managers in the sales process. The BI system automated each interview by presenting questions on a black screen, which were required to answered. The BI system required that the information be put in a specific form (e.g. answers had to be ‘yes’, ‘no’, numbers or free text). After filling that form, the call center agents were guided through the next block of questions by clicking or filling in an answer. The result of their data gathering was a case of the purchase of a customer, which showed in an overview the satisfaction with the purchases.

Behavior of the call center agents was observed specifically regarding how they used the BI. For example, call center agent 3 was observed to use only a keyboard; when asked about this, she said “this goes quicker” than using the mouse with the BI system. Observations from work shadowing were combined with internal documents (e.g. documentation of the data gathering) and the BI system (e.g. typed in data of the call center agents) to further visualize the overlap between BI and users.

In sum, work shadowing helped explore the overlap between user and BI by understanding how people used the BI in particular situations.
Meeting observations

One meeting was observed in which 12 participants gathered to discuss the operative and strategic dimension of the BI system. The documentation and notes consisted of the agenda for the meeting, formal meeting minutes, and the observed sitting order to see how the people were grouped to each other (Appendix 5) and other field notes made by the researcher.

The meeting involved four parties, which consisted of the company to present how they used the BI system, European headquarters to represent the mother company, BI experts to discuss new features and functionalities of the BI system, and call center agents to explain how interviews were conducted. The meeting consisted of of three presentations and accompanying discussion performed by the case company, IT expert, and call center agents.

The case company presented its work by showing products to give to the call center agents, which gave the potential to experience the cars in real-life, positioning of the brand to show to the employees where the case company stood, and positive and negative examples of the BI system to show to the call center agents how the company actually analyzed the data gathered.

The BI expert gave an overview of the current features and functionalities of the BI system, and showed an outlook for upcoming features and functionalities. For example, it was suggested that data mining procedures should be introduced, and that clearer questions could lead to higher data quality. The presentation showed the strategic direction of the BI system and was concluded by real-time examples, which were the discussed. The European headquarter discussed the strategy, because they were the initiators of the BI system. Their role throughout the meeting was more passive and focused on reporting information to the headquarter in the end via mail.

The call center agents presented their work with the BI system by explaining their experiences. The experience of the call center agents is based on a professional work experience in sales, which varied between four to ten years, coaching to work especially with customers in the car manufacturing industry, and their personal interest in working with cars. For example, call center agent 2 explained that “Germans talk about cars and love their cars” and call center agent 1 continued that “mobility is the key in Germany.”

The information of the meeting observation showed which people were involved with the BI system. The results of this information were used to define roles of the people involved with the BI system according to roles presented in Figure 4. This information showed the overlap between BI and
people, which highlights how the different roles presented themselves in the different Imbrication Phases and interacted with BI.

In sum, meeting observations showed the integration of BI system in its environment and the social dynamics at play during its use.

3.3.3 Internal documents
The internal documents consisted of 1,139 pages of documents collected between 2013 and 2016. These were strategic and operational documents, which gave a picture of the company’s historical background and future development.

**Strategic documents**
The strategic documents consisted of 406 pages of annual reports from 2013 to 2016, including a strategic presentation that provided a thorough explanation about how the digital strategy was executed, and a document with guidelines about people’s social behavior towards customer during the sales process.

The strategic presentation gave an initial comprehension of the case company itself, its products and services, overall strategy and sales over the years (see e.g. Figure 3). This information provided basic understanding that was discussed and questioned during the interviews. Parts of the information from the strategic documents served as a base for descriptive information provided in Section 3.2.

**Operational documents**
The operational documents comprised 733 pages of mainly digital material from the BI system and were collected from 2013 to 2016. The documents were of four different kinds: the monthly newsletter about the company’s products and development from August 2015 to December 2016; monthly performance reports of sales and service between April to December 2016; formal operational descriptions of the BI system; and ‘mystery shopping’ reports that reported how testers perceived the sales process.

The operational documents gave insights on both the macro- and micro level. For example, on the macro level, the monthly newsletter provided information about how the company evolved over time and how they formally presented themselves. At the micro level, the ‘mystery shopping’ reports gave insights about problems in the sales process.
3.3.4 The BI system
I was able to get full-access to the BI system, which measured the customer satisfaction of sellers and provided analysis and reports. The information comprised 25,721 voice files that documented the feedback of customers for their purchase, and 33,532 customer feedback forms about how they perceived the nine steps of the sales process.

The BI system developed a profile of customer and sellers based on KPIs in the sales process. The information was used to fully understand the sales process (Table 1, Section 3.2.2) and the linkage of BI to it. The link was based on KPIs such as the performance of the test drive and consulting or car handing over, which were connected to every step of the sales process. The KPIs measured how and whether the buyer’s needs were fulfilled during the purchase, offers to see if the seller showed them options, and likelihood of buyers considering repurchase. The result is presented in a customer profile showing general information of the customer (e.g. address and contact details) and the actual feedback for their sales process (Appendix 8).

3.3.5 External documents and publications
The external documents and publications played a minor role compared to the main empirical sources. But these did provide an overview and understanding of the company across time. The external documents were published books, magazines articles dating back to 1969 that showed how the brand was portrayed, reports and studies about the brand, press releases and newsletters that gave insights into how the company communicated with the public, website and social media where short biographies about individual sellers were presented, and finally, a number of public documents and reports about the automotive industry.

3.4 Data analysis
Data were analyzed in three phases, consisting of 1) open coding to get the first categorization and develop a feeling for data relevance (e.g. which data were descriptive) in an inductive approach, 2) studying theory to help pattern identification, and 3) re-coding of the data to get a picture of the sales process, BI system and people using BI.

First, open-coding was done during data collection. The coding was partially done manually with paper and pen, and partly with the applications NVivo and Endnote. The codes were divided into parent node and child node. Generally, nodes are a collection of references about specific themes and area
of interests (Bazeley and Jackson, 2013). In this thesis, ‘BI system’ was considered a parent node (a superior theme), and a child node was a subordinate theme such as ‘features’. The code ‘BI system’ (parent node) was identified in the empirical material. This was then divided into codes such as ‘description of BI system’ (child node 1), ‘use of BI system’ (child node 2), and ‘customer satisfaction’ (child node 3). One of the outcomes of this last-mentioned coding was that it was revealed that ‘customer satisfaction’ was problematic, since users had different roles.

For example, one respondent (the Director of Sales) described the problem as follows: “[as a] the car dealer [sellers] who acts aggressively with prices on the web does she or he [does] not care about customer satisfaction.” This meant that sellers had different roles based on their strategy (being price aggressive, being customer-oriented etc.). The consequence of those different strategies was roles that either treat customers well or focused on sales.

Second, after the first-round of interviews, the literature was reviewed in the context of the emerging codes. Different themes such as ‘BI architecture’ were investigated to see how the BI system was structured into different features and functionalities (Figure 4, Section 3.2.3), and the roles of actors were looked into to see who the different actors were and how they used the BI system (Figure 5, Section 3.2.4), and ‘decision making’ was studied to better be able to look at the output side of a BI system.

Third, data were re-coded based on understandings gained from the open coding, concurrent data collection, and theory insights. In general, this re-coding followed a more deductive approach compared to the earlier open coding, and four new codes were identified: ‘the impact of sales process on sellers’, ‘the impact of sellers on sales process’, ‘the impact of sales process on BI’, and ‘actions in the sales process’. For example, the new code ‘the impact of sales process on sellers’ (new parent node) connected to ‘sales process’ (old parent node) because it showed information about the ‘development of standard situation’ (child node 1), and ‘influence of sales conversation’ (child node 2). This re-coding highlighted, for example, that customers were valued more highly than processes or sellers with following information in child node 1: “Let’s put the customer first. (…) Processes, concepts, and solutions come at the end and they are in place to support the delivery of the greatest possible customer experience” (Internal document 13).

Overall, the three phases of open-coding, studying the literature, and re-coding followed an abductive approach, as both inductive logic and deductive logic were applied in the data analysis. The aim of this strategy was to “create fruitful cross-fertilization where new combinations [were] developed through a mixture of established theoretical models and new concepts derived from
the confrontation with reality [i.e. the case study]” (Dubois and Gadde, 2002:559).

A final finding of combining empirical data sources such as interviews, observation, and BI system were the three Imbrication Phases. The inductive theory behind the development of these three phases consisted of two frameworks: first, the model describing the imbrication between people and technology as part of the sociomateriality by Leonardi (2012a), and second, the differentiation of work into automation, ‘informating’, and transformation as part of the smart machine according to Zuboff (1988). With the help of the model describing the imbrication between people and technology framework, different phases of overlap between BI and user could be identified. In these phases, either BI guided people (Imbrication Phase 1), BI and user were in balance (Imbrication Phase 2), or people rejected the BI and the technology was subsequently changed (Imbrication Phase 3). These different phases formed a pattern that told a story when the framework automation, information, and transformation of technology was applied to the nature of work. The pattern showed that easier tasks, like transactional work, were more automated, and more complicated tasks lead to ‘informating’ in a BI system.
Chapter 4: Papers I–IV

This chapter reviews the focus, purpose, and individual contributions of Papers I–IV and relates them to the three questions of the imbrication. In the previous chapter, I showed that imbrication is the metaphorical fitting and overlap between people and technology (de Vaujany and Vaast, 2013), the aim of which is to better understand the relationship between human and material agency (Leonardi, 2012b, Leonardi et al., 2012, Marler and Liang, 2012, Robey et al., 2013, Ranerup and Norén, 2015).

Papers I–IV demonstrate the imbrication of people and BI and address the following issues:

A. *How* have sociomateriality and imbrication been studied and used in earlier BI-related research (Paper I);
B. *How* does the sociomateriality between people and BI work (Papers I & II);
C. *What* supports the imbrication of people and BI (Paper III & IV).

4.1 Paper I: How have sociomateriality and imbrication been studied and used in earlier BI-related research?

Paper I reviewed the technological side of BI from two frameworks used to explore the macro- and the micro-level of a BI. The framework of Orlikowski and Iacono (2001) was used to help conceptualize macro-level uses of BI. This framework highlighted the different views that have been applied within the BI literature. The framework of Malmi and Brown (2008) was used to help characterize the micro level of BI. This framework described the different control mechanisms used by people in relation to BI, and highlighted the imbrication between people and BI through showing the features and functionalities of BI (Paper I, Figure 1). Looking at both the micro- and macro-level of BI allowed us to get a more complete idea of how current research conceptualizes BI.
Paper I found that most research describes BI mainly as a tool supporting the activities of humans. These activities included administration (to influence the organizational structure (Lin et al., 2009, Cheung and Li, 2012)), planning (to offer data to users to enable real-time analytics (Chaudhuri et al., 2011)), and cybernetics (to quantify hybrid measures such as “motivation to use, frequency of use, intensity of use and the number of features” (Popović et al., 2012:732)). The implication was that imbrication between people and BI happened because people wanted to use BI as a digital tool – that is, they wanted support and control in their daily work activities.

Here, imbrication was found in the moments when people actually use BI to perform specific functions, like detecting financial fraud (Ngai et al., 2011), supporting mergers and acquisitions (Lau et al., 2012), or predicting the stock exchange (Rubin and Rubin, 2013). BI is engineered technology that has been designed and controlled by people, so it is not surprising that it deals with “technical matters (separate, definable, unchanging and over which humans have control)” (Orlikowski and Iacono, 2001:123 - emphasis added).

4.2 Paper II: How does the sociomateriality between people and BI work?

Paper II presented a case study looking at the imbrication of BI and people in a specific sales process at a specific company (see also Table 1, Section 3.2.2). The purpose of the study was to make BI applicable to accountants and non-accountants by building a theoretical relationship between BI and the Resource-Event-Agency (REA), which is an accounting model (McCarthy, 1982). This accounting model was used to show how people and BI worked during the critical sales moments of purchase and follow-up.

During purchase, the sellers wanted more information to make analyses and decisions in order to have a successful sale. That information was provided by the buyers, who gave feedback and described their experience during the purchase via BI. During follow-up, sellers used BI to make compensation and reports when buyers were dissatisfied. The task of the sellers was to improve customer satisfaction by making suitable compensation. To do that, sellers used key performance indicators (KPIs) provided by BI to estimate and propose the proper compensation to the buyer.

Here, imbrication was found in the match between sellers who wanted to sell cars and improve customer satisfaction, and the BI’s capability to provide the right KPIs and measurements for that purpose (see also Figure 2 in Paper II). People were users who acted (sellers) and gave feedback (buyers), and BI
was a resource based on database, semantics, and structure (Dunn and McCarthy, 1997).

4.3 Paper III: What supports the imbrication of people and BI?

Paper III looked at the technological side of BI by investigating how affordances led to gamification in a BI system. Previously described cases had showed that game design elements such as leaderboards (Cheong et al., 2014), goals (Morford et al., 2014), and challenges (Deterding et al., 2011) develop affordances.

Affordances were defined as potential behaviors and specific outcomes that arose from the relationship between objects and goal-oriented users (Pozzi et al., 2014). Affordances consider the actual use of objects (Treem and Leonardi, 2013, Faraj and Azad, 2012), which in this case meant the actual use of BI. Four affordances (visibility, editability, persistence, and association, or VEPA for short) were considered in relation to how the BI system was used by sellers. The aim was to motivate these sellers to use the BI. The four affordances responded to elements familiar to game design, like game interface design pattern and game models, in specific ways.

Sellers at the case company had been using BI to break habits and to solve problems (Kapp, 2012) like critical cases with customers. The aim with VEPA was to show that the BI was using game design elements to encourage people to take actions. Paper III developed a VEPA affordance model to categorize BI to show that game design elements did indeed motivate sellers (Paper III, Table 2).

Here, imbrication was found in the BI system’s implementation of game design elements, which afforded sellers to take actions. Those actions were directly related to the affordances. The visibility of the BI allowed the sellers to look at their critical situations in the purchase (Section 5.1.4); the editability of BI enabled them to make analyses and reports to make decisions; the persistence of BI let the sellers log in to the system at any time and place; and the association of BI developed a common appearance that responded to the sellers by looking at the actual important KPIs of the business. These affordances helped sellers to more easily engage with the BI.
4.4 Paper IV: What supports the imbrication of people and BI?

Paper IV presented another case study, this time investigating the imbrication of BI and people in managerial processes at a specific company (the same car company that Paper II was based on). The purpose was to consider the social side of BI by looking at how managerial actions could be integrated into BI in order to enhance its use, and the goal was to efficiently characterize imbrication between people and BI.

The investigation gathered data about the sales processes and managerial actions during those the sales processes by conducting interviews, making observations, and analyzing documents. The case showed that people got support and a chance to mature in their BI use. As a result, a model was proposed that identified three phases of BI use, representing three levels of maturity. The first phase was ‘Introduce BI’, in which users were unaware of or skeptical towards the technology; they simply did not know how to handle or use the BI. The second phase was ‘Process BI’, in which BI was used as a focused tactical tool to standardize processes and support documentation and data gathering by the user/worker. In this phase, users handled BI in a decentralized way and shared data and information only internally within their unit or department. The third phase was ‘Integrate BI’, in which users made strategic and frequent use of BI to support their decisions. BI was used to make analyses and reports that were then used to make predictions and visualizations. BI was integrated into the business strategy, and users knew how to make sense of the analysis and reports.

Managerial actions helped advance BI use to a more mature level. For example, in the Introduce BI phase, sellers were educated about the BI’s main features and functionalities, and trainers explained the BI’s benefits for the individual situation of individual sellers. In the Process phase, sellers and analysts received further and more individualized mentoring, and in the Integrate phase, sellers were encouraged to partner with team leaders, developers, and managers in order to innovate and help strategize.

Here, it was shown that the social side of BI (managerial actions) was a key component for supporting this imbrication of people and BI. The imbrication was initially enabled because the BI offered decision support to sellers. Subsequently, both BI and sellers matured through managerial actions that helped BI and sellers to integrate more completely with each other.
Chapter 5: Synthesis of results

The findings of the thesis are divided into sections explaining the three main concepts stated in the main research question: How does imbrication between people and technology develop in the daily use of BI systems?

The main concepts are ‘people’, ‘technology’, and ‘imbrication.’ This research question relates to Leonardi’s (2012a) framework of the model describing the imbrication between people and technology (Figure 2, Section 2.2.3), which divides a company or business into social context and sociomaterial practice.

First, the social context is described through the sales process at the case company (Table 1, Section 3.2.2). The sales process gives the social setting for people and technology. At the case company, the sales process is a (market-)place were sellers and buyers meet to go through nine repetitive steps with the aim to purchase cars. The sales process has an impact on the sociomaterial practice because people and technology are embedded in this social structure.

Second, the sociomaterial practice is described through the imbrication of people and technology. People are described as the ‘social component’ (Section 2.2.2) and these people have different roles when working with BI (Figure 5, Section 3.2.4). The most prominent role of people is as users, since they are represented at the case company by 450 sellers acting with BI. Sellers are driven by their goal to sell cars and satisfy customers, which is supported by BI and makes them use BI (‘human agency’). The second concept is technology, which is the BI system at the case company, and it describes the ‘material component’ (Section 2.2.1). At the case company, BI was a digital tool used for decision support in the sales process. It had a specific architecture consisting of a front- and back-end for users. The architecture of BI aimed to provide users with analyses and reports through its front-end (Figure 4, Section 3.2.3) developing affordances to use BI (‘material agency’).

The following section combines social context and sociomaterial practice with a specific focus on imbrication. The findings that are disclosed here serves as a base for three different Imbrication Phases that will be presented in the last chapter and that constitutes the main conclusion of the thesis.
5.1 Sociomateriality: Imbrication between people and BI works?

5.1.1 The model describing the imbrication between people and technology

The model describing the imbrication between people and technology gives “social constructs and a technical infrastructure,” (Leonardi, 2012a:42) which is applied as lens to the empirical case. At the case company, the model describes the imbrication between people and technology in the sales process as a social context. On a macro level, the firm is selling cars through sellers and the firm implemented BI to support this goal in the sales process. On a micro level, the model highlights agencies consisting of sellers that have a choice to act and use BI (human agency) and BI that develops affordances for sellers (material agency). At the case company, the picture of the model describing the imbrication between people and technology looks as follows:
Figure 6. Model describing the imbrication between people and technology in a process free after Leonardi et al. (2012).

Figure 6 shows the imbrication between people and technology with the main focus on following components: sales process (C), sellers (A) and BI (B). The model divides the case company into social context (I) and sociomaterial practice (II). As the model shows, the sales process (C) impacts (a, c) sellers (A) and BI (B), as well as sellers (A) impact (b) the sales process (C). The imbrication between sellers (A) and BI (B) is giving opportunities for action (d) in the sales process (C). In the following subsection, the social context (I) and sociomaterial practice (II) of the case company is described highlighting dependencies and drivers of imbrication.

Social context - Sales process
The sales process (C) shapes the social context (I). The sales process gives the social context, and following three factors give the boundaries for the sales process at the case company: strategy, actors, and communication. Together, they created a part of the social context, which gets elaborated in the following paragraphs.

First, the sales process follows a strategy, which got implemented by the case company. The strategy has the goal to increase both sales and customer satisfaction. The CEO of the case company describes the aim of the strategy in the annual report of 2016 as to “pursue sales frontline innovation with an emphasis on customer care and improving customers’ brand experience with the aim of becoming a brand that creates special bonds with customers.” (see external document) The strategy of the case company is translated into two strategic goals: 1.) formulation of a digital strategy and 2.) use of the sales process in practice. The first strategic goal is the formulation of a digital
strategy in the sales process. The formulation of a digital strategy contains a plan to share additional data and information between sellers and case company, which is condensed into an agreement. The agreement of the digital strategy should answer following key questions: Where is data stored? What can be done with the data? and; Why do we exchange data (see interview 18 and 25 in Appendix 1)? The second strategic goal is to use of the sales process in practice by sellers with the specific purpose to sell cars and increase customer satisfaction. The purpose for the use of a sales process is to fulfill the strategy by the seller by giving a standardized and comparable way of doing sales. To fulfill the purpose, the sellers use the steps of the sales process as guidance (Table 1, Section 3.2.2), which measures specific KPIs through BI.

Second, the thesis highlights two key actors in the sales process, which are seller and buyer. At the case company, sellers are salespersons, who offer a trade. The trade is offering a car for cash. In this trade, sellers manage the purchase, which involves ordering of car and its accessories for the buyer. In the observed trade, buyers are mainly private consumers that have an interest in getting a car and consider the seller as an actor that fulfills this interest in the sales process. The buyer experiences specific seller’s action, which are perceived as satisfying or dissatisfying by buyers.

Last, the sales process involves the communication between sellers and buyers. The communication between seller and buyer involves face-to-face meetings, telephone, email or digital communication depending on the preferences of both actors. In the sales process, the communication is mainly focused on steps in the sales process such as scheduling an appointment, test-driving and consulting on mechanics as well as negotiating price, product and delivery (Table 1, Section 3.2.2).

In summary, the sales process is part of the social context, which sets the boundaries (that were defined) for sellers and BI. These boundaries of the sales process have an impact how sellers act with customers and how BI is used to fulfill the strategy of sellers. The next sections define sociomaterial practice, sellers, and BI and explain how sellers and BI act with each other in sociomaterial practice.

**Sociomaterial practice - Sellers and BI**
The sociomaterial practice describes a “place” at the case company where the main activities of sellers take place. A respondent in his role as a senior manager for National Sales Company and Dealer Information Services said that sellers have a physical workplace and where they use a computer, laptop or any other mobile device to complete their job (see interview 32 in Appendix 1). A respondent in his role as a digital strategy expert adds to the physical
workplace situation of sellers that currently BI is optimized only for workstations and laptops but not mobile devices. This is a disadvantage for sellers since they have to be physically at their desks and cannot walk with customers and simultaneously take notes in their BI (see interview 18 and 25 in Appendix 1). The “place” where the imbrication between sellers and BI happens is the physical desk in the sales area.

The sociomaterial practice consists of the main concepts ‘people’ focusing on sellers (A), ‘technology’ considering BI (B). The first concept is sellers (A), which are described as users of BI (Section 3.2.4, Users). The goal of the sellers’ work is to sell cars and satisfy customers. The goal is connected to the above-mentioned strategy that translates different sales goals into practice. To reach that goal, they interact with potential buyers in the sales process. The second concept is BI (B), which is a digital tool used for decision support. For decision support at the case company, sellers mainly consider data and information about customer satisfaction in the BI system. The decision support is the material components of BI, which are at the case company analysis and reports. These analysis and reports are the output of BI, which is the result of gathering data about car, customer, and seller (Figure 4, Section 3.2.3). The analysis and reports provide information of the sales process concerning customer satisfaction and sales.

Dependencies and drivers of imbrication
Seller and BI work together and the imbrication between seller and BI depends on two factors:

1) choice to act and use BI (1), and
2) BI offers affordances for sellers (2).

First, sellers have the choice to act and use BI (1) with its analysis and reports. The factors depend on sellers and their intention at the case company, which respond to the human agency (Section 2.2.1). At the case company, the human agency of sellers is driven by the willingness to interact with BI and other duties they are obligated to fulfill. For example, a seller with a strong price focus has a lower intention to use BI compared to a customer-oriented seller who is more interested in attaining high customer satisfaction.14

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14 This is highlighting specific strategies of sellers when using BI. A respondent in his role as Director of Sales explained that sellers range from customer-oriented strategies to price-aggressive strategies. The Director explains it by saying that sellers either “…take it serious. They base their employee feedback on it and say ‘Ok, here is your potential.’ They also identify teaching potential based on it.” or act “…aggressively with prices on the web… [so they do] not care about customer satisfaction.” (see interview 15 in Appendix 1)
Second, BI offers affordances for sellers (2), which makes BI tangible for sellers. These affordances can be considered being a stimulus for sellers to interact and use the BI ('human agency'). In Paper III, it is highlighted that the BI at the case company has four affordances connected to sellers: visibility, editability, persistence, and association (Table 1 in Paper III), which respond to the material agency (Section 2.2.2). For example, the data warehouse of BI at the case company (Figure 4, part 2A, Section 3.2.3) has no visibility and editability to sellers. The consequences of missing those two affordances are that the case company controls the data input and its distribution. The data gets distributed to the corresponding seller and is applicable at any time, which develops a high persistence and association to the data. Another example presents the front-end of BI, which is the BI portal (see Figure 4, part 4A, Section 3.2.3). In the front-end of BI, sellers can see all four affordances, visibility, editability, persistence, and association, described as follows. Sellers see their information in different formats\(^\text{15}\) (visibility); edit and document their information individually (editability); see all information of any time in the BI database because they remain in the BI portal (persistence) and; have access to their own data (association). Therefore, sellers have a high imbrication with BI because they have multiple ways to use BI in their daily work.

The two factors - seller’s choice to act and use BI (1), and BI offering affordances for sellers (2) – can be discussed on an agency level because initiators and developers are only responsible for the development of dependencies and affordances. On the one hand, sellers have the choice to act and use BI (1), which is the human agency. The sellers can make the BI system useless because they actually decide if they are using BI, only a legal agreement can force them to use BI. On the other hand, BI offers affordances for sellers (2) that translate into a material agency. The material agency is build up from the architecture of BI at the case company (Figure 4, Section 3.2.3). This BI system could either match, mislead or guide to their goal: sales and customer satisfaction.

The imbrication (3) of seller and BI describes how the drivers work together in a workplace. The imbrication is driven by sellers that want to sell cars and satisfy customers, and BI offers decision support for that goal of the case company: sales and customer satisfaction. The daily business and goal of sellers is to sell cars, which is connected to their salary because bonus payments depend on them. A factor, which is increasingly important for the case company, is customer satisfaction, which could lead to repurchases of customers (see interview 3 in Appendix 1). The customer satisfaction depends

\(^{15}\) Paper II highlights the semantic orientation of BI, which enables to see data in form of simple Excel templates up to trend analysis in BI.
on offers, experiences and current satisfaction of buyers. This is connected to the strategy but is an individual choice of sellers if and how sellers fulfill their goals. BI offers measurements of this customer satisfaction in the form of KPIs for decision support. Decision support is provided by BI via analysis and reports, which are provided for sellers. For example, the case company shows that sellers are users, which are the providers of reports but also consumers of analyses (Section 3.2.4, *Users*). This shows that BI is used differently by users. According to the metaphorical description of the Director of Service, the BI system is used as follows:

“I can use [the BI system] on a low flame and I can apply the whole keyboard.”

The metaphorical description of sellers shows the wide range of BI users. An example showing that the imbrication between sellers and BI works gives seller ‘Meyer’. They are having, according to the respondent in his role as team lead dealer analysis and systems, a sub-urban location and managed to be one of the top-sellers in the sales area (see interview 23 in Appendix 1). Seller ‘Meyer’ used a salesperson, who was engaged with the BI, its KPIs and the critical cases occurring in the sales process. The salesperson checked on a daily basis the customer satisfaction of its clients. At the end of the year, the seller was the leader in customer satisfaction of the case company (see group interview 2 in Appendix 1). The metaphorical description shows the key-point, which shows that users are the driver of imbrication because they have the choice to act and use BI and BI offers affordances in return.

In conclusion, sellers and BI are working in the sales process together. The sales process gives the social setting, in which sellers work and BI provides decision support. The imbrication between sellers and BI works because sellers have the goal to sell cars and satisfy customers, and BI supports the goal by providing the matching analysis and reports. (As the arrows of Figure 6 will indicate, the social context does somehow impact the sociomaterial practice, and the sociomaterial practice somehow develops actions, which are influencing the social context.) The impact and action between social context and sociomaterial practice are investigated in the following section.

5.1.2 Impacts and actions between social context and sociomaterial practice

**Context and practice**

The impact (arrow a in figure 6) of the sales process on the sellers is based on two reasons that help to guide sellers and give a structure by contributing to the role of sellers. The two reasons are:
1) development of standard situations, and
2) influence of sales conversation.

First, development of ‘standard situations’ is based on the defined steps in the sales process (Table 1, Section 3.2.2). For example, a test drive of a car proceeds in a standardized way. The steps of the sales process give an order and support sellers how to behave. The sales process follows the strategy to focus on sales and customer satisfaction, which gives support how to handle customer. In the strategy of the case company, the sales process is seen as a ‘support’ for sellers with a clear ‘customer first’ mentality as following example strategic documents shows: “Let’s put the customer first. (…) Processes, concepts, and solutions come at the end and they are in place to support the delivery of the greatest possible customer experience.” This was further supported and a re-current theme in the interviews with respondents (see interviews 1, 3, and 22 in Appendix 1). This described attitudes in combination with standard situations influence the sales conversation as such, which is explained in the following.

Second, the influence on sales conversation focuses on the buyer-seller-relationship at the specific steps in the sales process. Sellers communicate with buyers because of their intention to generate sales and satisfy customers. The communication between seller and buyer in the sales process is pre-defined in following steps (Table 1, Section 3.2.2): appointment, test drive and consulting, or purchase. For example, the date for the appointment between seller and buyer is set in a face-to-face and/or digital communication. The communication discusses the specific data and time for the meet-up to introduce the sales. In the step of the appointment, the information in the BI system recommend sellers to communicate with the buyer (see internal document). In the appointment, sellers develop their own routine based on previous experience, which develops standardized ways of communicating with their potential buyers.

The impact (arrow b in figure 6) of sellers on the sales process is described by a respondent with the job title district manager (see interview 4 in Appendix 1) of the case company as follows:

“Sales has an impact on the sales process. That [sales] is one thing the seller does.”

In this interview, the manager implies that sales are essential goals in the sales process, which is done by sellers in their usual work. In the following, the manager mentions that sellers developed a sales process due to the goal to generate sales. For example, a seller has an individual strategy of interacting with customers in the purchase. The conversation between seller and customer
decides what steps in the sales process are next and the seller can change the steps how they fit the conversation. This implies that sellers crafted the sales process based on their intention. For example, seller ‘Müller’ told that “nothing would change” if BI were gone because they have their working routine. The routine was established of the parents of seller ‘Müller’, who were the previous owner. They taught seller ‘Müller’ how to do sales and service. According to the case company, seller ‘Müller’ is “simply doing a good job” (see interview 23 in Appendix 1), which is honored in selling awards and being recognized as top-seller.

The impact (arrow d in figure 6) of the sales process on BI and its decision support (6) at the case company is based on two factors:

1) performance measured in the form of KPIs, and
2) implications for satisfaction measurements.

The two factors respond to the strategy, which focuses on customer satisfaction and sales. Both are explained in the following two paragraphs.

First, performance measured in the form of KPIs of BI is designed along the steps of the sales process. BI measures six steps of the sales process based on 12 KPIs, which are based on structured and unstructured data translated into information. Three steps use unstructured data, which are analyzed through text mining. The 12 KPIs of BI are explained in detail in Paper II were the sales process is explained. The actual performance of sellers in the responding steps of the sales process looks as follows:

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16 The appointment, arrival, and payment were measured in with unstructured data (Table 1, Section 3.2.2). Opinions about the three steps were gathered when the customer said something about the “arrival”, which can be analyzed through a text mining analysis of BI.
As Figure 7 indicates, the performances of sellers differ in the steps of the sales process. Therefore, the steps of the sales process can be divided into high performance (a) and places for improvement (b), which is a result of the interviews conducted and is explained in the following in a more detailed way.

In Figure 7, the high performance (a) areas are test drive and consulting (3), car handing over (7), and repurchase (9). These areas had eight and nine out of ten satisfied customers. The places for improvement (b) are steps, in which every third customer was dissatisfied. The respondent in his role as Team Lead Dealer Analysis and Systems describes that the aim of the case company with BI is to transfer dissatisfied customer into satisfied customer (see interview 3 in Appendix 1). The places for improvement and critical situations\(^{\text{18}}\) are highlighted through BI in the area of purchase (4), car and accessories ordering (5), and car delivery (6). For example, car delivery (6) is described as an emotional moment with “higher impact for a customer” because the new car is seen for the first time (see interview 5 in Appendix 1). The car delivery is described as an ”emotional moment” in the sales process that is (hopefully) remembered positively by the customer and the BI aides in collecting data about this (Figure 4, Section 3.2.3).

\(^{17}\) The performance was taken from the values of the BI system, and I divided it into two groups based on the interviews.

\(^{18}\) In Paper II, critical situations are described as unexpected events or breakdowns in an economic event that impact the sales process as such (see 2.1 in Paper II).
Second, the sales process provides an insight into implications for satisfaction measurements in BI. One respondent working as a District Manager sees BI as follows (see interview 27 in Appendix 1):

“BI maps the sales process. It captures at least the sales.”

The sales process is the basis for the measurement of satisfaction and gives implications in the form of satisfaction measurements. In BI, satisfaction measurement happens through calculation of KPIs into a so-called ‘Net Promoter Score’ (NPS) in the sales process. The aim with this score is “to transform customer into raving fans” with a subsequent “KPI calculation logic” (see calculation in Appendix 7):

“All markets follow the same KPI calculation logic. Reporting uses top box scoring methodology. The top box scoring methodology helps us accomplish our goal of providing customers with excellent experiences and of increasing customer loyalty.”

The calculation is used comparably on the European market on a monthly basis. It gives the same satisfaction measurements in the sales process for its sellers (see interview 1 in Appendix 1). The calculation uses satisfied customer and extracts the dissatisfied customers of it with the result of a top-1 box score in the sales process (see Appendix 7). The results of the implication for satisfaction measurement show that almost three out of four buyers are satisfied with their purchase. This result gets challenged if the sales process is changed (see interview 33 in Appendix 1):

“If you make fundamental changes [in the sales process] – quantitative changes – it should also change the satisfaction of customers. Otherwise, you did not win anything.”

According to this interview, potential changes of the sales process would have an impact on customers, which could be seen in BI’s implication for satisfaction measurement (at the case company: NPS). The changes require actions of sellers, which are explained in the following section.

**Action from technical subsystem to social subsystems**

At the case company, seller and BI are taking the actions (c) in the sales process (C). The actions are based on the imbrication (3) between sellers and BI. Sellers perceive BI as a useful tool because it offers the right decision support in the sales process. Two factors that influence the action and that are re-current in the empirical data are:

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19 The number is based on a base count of 33,532 datasets of the BI.
1) Improvement of the sales process, and
2) reaction to customer needs.

The first factor that influences the action is the improvement of the sales process, which is enabled by the information that the BI provides to the seller. Sellers use the information to either improve the whole process or single steps of the sales process. For example, Figure 7 (Section 5.1.2) shows that the purchase is in the area of ‘for improvement’. A respondent in his role of Director of Sales said that it is, for example, good to contact the customer immediately when some changes happen such as delays in the purchase. The seller could even contact the customer when everything is good after the purchase and tell them ‘Thank you for your purchase.’ (see interview 24 in Appendix 1)

A possibility for the improvement of the sales process is the actual use of BI. Currently, “almost 90 percent of the sellers use it [BI]…”, said the respondent working as a Team Lead Dealer Analysis and Systems (see interview 3 in Appendix 1). Based on that number, seller and BI have a high imbrication. The respondent in the role of Director of Sales (see interview 24 in Appendix 1) explained that usage of BI differs:

“With 450 retail characters are many people not using it [BI]. That is the topic ‘usage’ and how systems are used goes from 0 to 100 percent and is definitely not linearly distributed – it is more listing to the left, which means ‘bad use’.”

The usage of BI differs between sparing to intense use. This is supported by both interviews and log-in data from the empirical sources. In the earlier mentioned example of seller ‘Müller’, a salesperson was responsible for the usage of BI. He logged into BI on a daily basis, and responded just-in-time to the requests of customers. This meant that he informed the responsible seller about a satisfied or dissatisfied customer, and discussed how to react in team meetings or with colleagues (see group interview 1 in Appendix 1). A second seller ‘Weise’ claims that he also uses the BI often. However, the log-in data shows that he only did this when there were critical situations, which was when a customer was unhappy (see group interview 2 in Appendix 1). The comparison between those two sellers shows: the usage of BI is different as well as how sellers evaluate their usage. The same applies to the action sellers take with BI.

The actions that sellers aim for is the improvement of the sales process because they want to generate sales and satisfy customers. According to one respond (see interview 16 in Appendix 1), the starting point for action is data from the BI system that then serves as a base for his or her improvement of the sales process.
According to the respondent in his role as a After Sales Manager, starting from this result in BI, sellers improve his or her sales process. The seller “can with the results from BI improve his sales process depending on his results.” (see interview 32 in Appendix 1) The result itself depends on the customer and its experience as the following example shows:

A female customer purchased a car from a well-known seller. The customer was dissatisfied because she was not happy with the seller who forgot to clean the car and integrate the features wanted in the car. The seller read the case in BI and decided to contact the customer by offering a discount for its next inspection. The customer was satisfied and the customer satisfaction was improved after the second feedback (‘follow-up’).  

The customer satisfaction data indicated that the sales process is considered as “good”. It furthermore increases the chances for sellers to get an immaterial awareness, which is similar to getting a bonus but has no monetary benefit for sellers (i.e. money or discount for cars). The immaterial awareness is a recognition in the form of a physical award, which can be used to improve the reputation of the seller concerning its customer satisfaction for buyers. This result also shows that the improvement of the sales process depends on another related factor: the reaction to customer needs, which is explained in the following paragraph.

The second factor that influences the action is the reaction to customer needs, which is evaluated by the case company as an essential point. A respondent in his role as Digital Strategy Expert explains that it is an essential point because “the customer says that certain things are not working,” (see interview 25 in Appendix 1) which has to be recognized and worked with. The work with BI requires certain actions in the sales process. The actions mainly concern communication in the buyer-seller relationship. The most common action taken by sellers concerns critical situations when a customer is dissatisfied. However, according to some respondents (see interview 24 in Appendix 1), the focus of sellers should also consider buyers that “were happy with their purchase.”

The main reasons for satisfaction and dissatisfaction are presented in BI. The recognized place of improvement (Figure 7, Section 5.1.2) is the earlier mentioned car delivery. The main reason for the dissatisfaction of customers with the car delivery was connected to the time it took to deliver. In total 151

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20 Extracted from BI and changed into a flowing text freely based on the input of customer and seller. The customer was coded as follows: 1-101RY8

21 In Paper III, the physical award is described in a detailed way and connected to game design elements that develop affordances for sellers.
out of 552 customers (27.3%) mentioned this as the main reason for their dissatisfaction with the car delivery. They connected it either to the process as such were 28 rated the “waiting time too long” or linked it to the delivery. In the delivery, 28 complained that the “delivery was not on time”, and 45 said that there were “long-delivery times.”

According to the case company, the reason for these delays are long production times at the factory and its shipping to the seller (see interview 3 in Appendix 1). Knowing this, sellers could improve their information transparency and inform their customers about it. A seller, for example, could mention that the order takes longer than expected and give them up-to-date information of the delay in advance (see interview 15 in Appendix 1). This information is (hopefully) gathered through BI and could be used for improvement of customer needs. The cases of the car delivery show that timing and communication could be a key for sellers to satisfy customers. According to the BI system, if sellers react to the needs of customers, customer satisfaction increases on average by 1.25 points. The result indicates that if sellers want to improve their sales process, this should involve changes to strategy and communication.

In some critical situations, sellers react in an inappropriate way. In fact, there might not even exist a solution for the customers. For example, the respondent that is the Director of Sales (see interview 15 in Appendix 1) described a case where a customer brought his own oil to the seller and the seller refused to use it:

Yes, of course, there is the feedback you [the seller] will not be able to solve. There are always special cases. Let us take a specific example: The customer has brought his own oil and the seller refused to use it because the oil bottle was already open. He [the seller] does not know whether the oil is polluted or not. And the result was that the customer gave a bad feedback. I understand the seller, of course, but there are cases were everybody has to fight.”

As the example shows, some cases are not even solvable with the state-of-the-art technology. Beside those exceptional cases, a respondent of the department of ‘After Sales’ (see interview 12 in Appendix 1) explains following “The reaction to customer needs can change the sales process – or even improve it”

In conclusion, the impact and action of the sales process (C), sellers (A) and BI (B) are influencing the case company as such. The sales process brings BI to ‘life’, and gives sellers a social structure, in which sellers interact with each other and BI. If we take a look back again at Figure 6, the previously described situation can be translated into the following summary: the social
subsystem impacts the technical subsystem, and the technical subsystem consisting of sellers and BI take action in the social subsystem. Sellers and BI are overlapping in the technical subsystem, which represents the imbrication. The imbrication of sellers and BI is the actual use of BI. The use of BI by sellers leads to certain actions and decision. BI supports these actions and decisions of sellers with data and information. Therefore, the imbrication between sellers and BI develops a relationship between both parties, which is the heart of this study. The relationship between sellers and BI is in an imbrication. This imbrication develops three situations:

- sellers are guided by BI
- sellers and BI are balanced
- sellers reject BI

These three situations are called *Imbrication Phases* in the next section, and put into a model.

### 5.2 Three phases of imbrication: the imbrication between user and BI

The short summary of the previous sections revealed that the imbrication happens in the technical subsystem between sellers and BI. At the case company, sellers have to sell cars and satisfy customers by using BI (*social agency*), and BI offers decision support (*material agency*), which can be used by sellers.

The imbrication between social and material agency presents three *Imbrication Phases*, in which the overlap between sellers and BI differ. The term *Imbrication Phase* comes from physics and sports and defines the quantity of motion that an object has, which depends on the mass an object has. At the case company, the imbrication between sellers and BI develops three *Imbrication Phases* in the model describing the imbrication between people and technology, which are defined as follows:
Table 3: Imbrication Phases of imbrication between user and BI based on the empirical data from the case studied.

<table>
<thead>
<tr>
<th>Phases of imbrication</th>
<th>Relationship</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imbrication Phase 1</td>
<td>Users &lt; BI</td>
<td>BI’s materiality guide people through the process automatically (Section 6.2.1)</td>
</tr>
<tr>
<td>Imbrication Phase 2</td>
<td>Users = BI</td>
<td>people and technology contribute equally because users get the information needed through BI, which they actually need (Section 6.2.2)</td>
</tr>
<tr>
<td>Imbrication Phase 3</td>
<td>Users &gt; BI</td>
<td>Peoples’ intentions compensate BI’s materiality and people transform a BI that supports their needs (Section 6.2.3)</td>
</tr>
</tbody>
</table>

The three Imbrication Phases belong to the sociomaterial practice and take a closer look at the relationship between sellers and BI.

Within the sociomaterial practice (Figure 8a, Section 6.1.1), the needs of sellers and materiality of BI decide how the imbrication works in these Imbrication Phases. On the one hand, the needs depend on the human agency, which decides if user perceive BI as useable in a situation. On the other hand, the materiality of BI depends on the material agency, which provides affordances\(^{22}\), and decision support through the features and functionalities of BI to make the technology fit for the goal, which is to sell cars and satisfy customers. The three Imbrication Phases are explained in the following Sections (6.2.1 – 6.2.3) following the same structure: definition, description of the situation(s), a short explanation of the situation(s), nature of work, contextual factors, sociomaterial point of view, and conclusion in these Imbrication Phases. This structure helps to highlight the differences in these Imbrication Phases.

5.2.1 Imbrication Phase 1: Users < BI

Imbrication Phase 1 defines a situation, in which BI has an active role and users a passive one. BI provides a platform for operative tasks such as documentation and data gathering. The platform gives a structure, which guides users through the sales process. The users rely on the structure of BI because they need to fulfill their tasks to take further actions such as improving customer satisfaction based on analysis and reports. Imbrication

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\(^{22}\) Compare to Paper III.
Phase 1 is crucial for the case company because it builds the basis for the quality of data of BI because their data is gathered and documented. The Imbrication Phase 1 supports with these data and information the Imbrication Phase 2, which consist of the analytical work of the case company.

The case company delivers an example of Imbrication Phase 1 when they describe two situations:

1. documentation, and
2. guidance with BI.

In the first situation, sellers have to make documentation (1) of their critical cases to explain what went good or bad with the customer. They describe how they responded to the feedback of customer and how they took actions. All this information is compiled in BI and are accessible for the case company. The seller ‘Weise’ describes this type of work as “time-consuming and unnecessary.” In the second situation, call center agents do phone calls and BI guides them through the call. In the second situation, the call center agents get automatically connected to a buyer via phone by the guidance with BI (2). The call center agents ask the customer questions, which are presented on a black-screen in the BI system. BI requires that people type in certain phrases in a box (e.g. Yes or No) and only after this, the new question pops up.

Based on the examples, the nature of work in this Imbrication Phase 1 is transactional because it is an exchange and interaction between people and BI. The exchange happens when sellers have to document critical cases and call center agents have to gather data of customers. In the first example, sellers exchange their workforce to gather data and documents for information relevant for them to make analyses and reports. In the second example, the workforce is used to get information from customer via phone calls. The information are prepared and provided in BI through the integrated ETL tool (Figure 4, Section 3.2.3) for sellers. Both examples describe a situation of tedious work, which is standardized and give limited room for flexibility. So, the work is simple. People get guided through the process by BI, which is connected to contextual factors.

The contextual factors that influence the Imbrication Phase 1 are involved to following four factors: leadership, roles, process, and technology. First, leadership plays in Imbrication Phase 1 a minimized top-down approach, which concerns the operative-level. At the case company, sellers get reminded by BI. If sellers miss the documentation and ignore BI, the case company interferes and contacts the misbehaving sellers individually. Second, the involved roles are users such as seller and call center agents, because they are
working in transactional situations such as documentation and data gathering with BI. Their aim is to get their work done, which is to document certain steps and gather data to provide information that helps them later to improve sales and customer satisfaction. Third, the process becomes standardized through the usage of BI. Certain steps such as documentation and data gathering become always the same and just make a comparison of information easier but also saves time. According to the call center agent ‘Konrad’, data gathering is minimized to 19 minutes per customer (see work shadowing observation 1 in Appendix 4). Last, the technology is a tool for automation\textsuperscript{23}, which provides guidance for documentation and data gathering.

From a sociomaterial point of view, users are guided in the sales process through the materiality of BI, which provides decision support for users. From a social standpoint, user have the goal to fulfill the basic requirements such as documentation and data gathering because they know that by providing data into BI they receive analysis and reports of BI. Those analyses and reports support the overall goals to improve sales and satisfy customers. Even though the goals exist, some users are not willingness to focus their work on these analyses and reports because they might lack the capacity in people and follow a different strategy. From a material standpoint, BI is a digital tool to execute the intention of people by providing decision support. BI becomes relevant in guiding users in an automized way through these steps. The decision support in \textit{Imbrication Phase 1} is focused on simple operational tasks such as sending out reminders via email. At the case company, BI send out emails to sellers to remind them of their critical cases where customers are dissatisfied (see e-mail template in Appendix 9). In this email, information about the critical case is documented and upcoming steps are provided as guidance for sellers.

In conclusion, \textit{Imbrication Phase 1} describes that BI supports simple tasks of operative users such as sellers or call center agents. The work is standardized and is therefore automized by BI.

5.2.2 \textit{Imbrication Phase 2: Users = BI}

\textit{Imbrication Phase 2} defines a situation in which BI and user have an active role. BI has analytical characteristics, which provide users with analysis and reports for operative and strategic actions. The analytical characteristics give KPIs, which help to improve the sales process. Users work with analyses and reports to make predictions for actions that support customers better. Users adjust BI to their needs because they need fitting KPIs to the sales process. \textit{Imbrication Phase 2} uses analysis and reports to develop predictions and visualizations to take action as a case company.

\textsuperscript{23} The phrase is highlighted because it is the basis for the upcoming discussion.
Three examples from the empirical data will be presented that explains the rationale of *Imbrication Phase 2*:

1. analysis of critical situations,
2. development of new KPIs in BI, and
3. analysis of the performance of sellers.

In the first situation, seller *analysis critical situations* (1) and explains them with other sellers to improve the sales experience. The seller network of ‘Weise’ used the results of customer satisfaction for discussions with their sellers. They discussed positive and negative examples by listening to voice files were customers reporting their customer experience (see group interview 1 in Appendix 1). Those examples were perceived as useful and seller explained that they recognized certain customers and their individual purchase situations. In the second situation, sellers complain that BI does not really show all important values in the sales process. In this situation, the case company steps in. They discuss issues with sellers and advise initiators and develops the *development of new KPIs* (2). This happened recently when sellers wanted to know more about the customers’ background and the case company extended some new KPIs such as ‘previous preferred car’ and ‘favorite color’ in the form of social identity of the customer to BI. In the third situation, the case company compares the *performance of sellers* (3) with each other. They compare the performance of the customer satisfaction with each other, which is presented in a visualized league table.²⁴

Based on those three examples, the nature of work in *Imbrication Phase 2* is described as analytical because users make predictions and visualizations based on analysis and reports. The analytical work is driven by skills of users, who are capable of making use of the analysis and reports. The individual level of depth of analysis in form of visualization of facts, figures, and numbers decides how long the analytical work takes. The analytical work can be time-consuming.

In the first example, the time for setting up a meeting and discussing voice calls is basic, because BI offers the voice files and its documentation, which are a result of *Imbrication Phase 1*. The time-consuming part is the prediction making, which requires skills in ‘sales’ but also ‘analysis’ because the users need to understand the numbers, its meaning, and the customer. In the second example, the time constraints are limited because BI delivers all numbers. The demanding part is when users send out emails to visualize the league table or

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²⁴ In Paper III, the league table is described in a more detailed way. The league table shows the name of the seller with their points in different leagues. The seller is ranked based on the points and compared to the other sellers in the responding league.
award sellers who performed well, which is individual. The work is, therefore, time-consuming and requires skills in using BI, which is connected to contextual factors.

The contextual factors that influence the *Imbrication Phase 2* are following three factors: leadership, process, and technology. First, *leadership* has a top-down approach on a managerial level. Team-leading sellers speak with their sellers to discuss critical cases and solve them. The management of the case company rewarded or sanctioned the best performing sellers and speaks with them to improve single KPIs. The improvement of those KPIs happens when the case company speaks with the initiator of BI and developer to discuss new KPIs relevant to be introduced. Second, the *process* is informative because users receive analysis and reports. The information concern dashboards, overviews and league tables. Last, *technology* is a *tool for information* because it provides analysis and reports for prediction and visualization.

From a sociomaterial point of view, social and material agency complement each other and lead to actions in the sales process. User adjusts single KPIs of BIs’ materiality to make the system fit for its aim. The aim is to improve the technical subsystem. From a social standpoint, users have the intention to use analysis and reports to take actions with them. The actions are based on the developed predictions and visualization. The predictions and visualization give users the opportunity to improve the sales process by providing better sales and improving customer satisfaction. From a material standpoint, BI provides the decision support needed to give information in the form of analysis and reports.

In conclusion, *Imbrication Phase 2* describes that BI supports analytical tasks at the management level. The work is informative and users are individually handling BI.

### 5.2.3 Imbrication Phase 3: Users > BI

*Imbrication Phase 3* defines a situation, in which users have an active role and BI a passive one. BI provides a platform, which offers customer analytics but the users refuse to use it. Therefore, BI does not fulfill its purpose for decision support in the sales process. User call for a system change because BI does not give the right information, analysis or reports and is complicated in its usage in the sales process. Therefore, *Imbrication Phase 3* is a critical and costly situation because user refuse using the old system and initiator and developer have to invest resources to fix a new system. *Imbrication Phase 3*

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25 The phrase is highlighted because it is the basis for the upcoming discussion.
contrasts with *Imbrication Phase 1* because it shows a vice versa situation and *Imbrication Phase 2* because it shows a disharmony between BI and user.

The case company had an example of *Imbrication Phase 3* when they described a critical situation, namely, the change from the old system to a new system.\(^\text{26}\)

In the situation, the old system was a DMS, which was a seller-optimized tool with the purpose to bind old customer and acquire new ones. The DMS tool was embedded in the CRM tool used by mainly all sellers. The old system required the sellers to increase the communication with customers. The aim was to get more data of the customer by receiving more information throughout the sales process. The purpose of the data gathering was to satisfy customer. The reality showed that seller perceived the old system as complicated and time-consuming because they had to invest more time in the sales process. Therefore, the old system was rejected and was replaced by the new system: the current BI of *Imbrication Phase 1* and *Imbrication Phase 2*. The change towards the new system happened through times of restructuring of the sales network. Low performing sellers received no extension of their contracts. The trend led to a decrease of sellers, which dropped from 655 sellers in 2012 to 452 in 2013 (Figure 3, Section 3.2.1). In the same year, the new BI system was implemented by developers and initiator. Developers and initiators worked closely together with users to make the implementation as smoothly as possible. The implementation was done in a pilot study with team-leading sellers and then enrolled with other sellers. Almost all sellers use BI, which transformed the measurement of performance in customer satisfaction and sales.

Based on the example, the nature of work in *Imbrication Phase 3* is two folded into agile work for developer and initiator as well as transformative work for users. First, *agile work* happens because the case company developed BI fitting to the needs of users in collaboration with a self-organized cross-functional team. The team was a task force assembled by the case company consisting of developer, initiator and team-leading sellers as the pilot users of BI. The agile work of this team is required because they shifted between programming of software, developing of KPIs, testing the usefulness with sellers, and crafting of a fitting structure, which is given by the sales process. The agile work was complex, high demanding and strategically because

\(^{26}\) Other situations are also possible in *Imbrication Phase 3*, which could be for example a failure of a BI system, which needs to be improved. In this situation, seller would also reject the BI system until it is improved and the failure or system update is fixed. Other situations are when seller actually have a better knowledge than the BI system can provide. Some sellers know their customers by hard and they do not need to rely on a system to be considered as “good” in customer satisfaction or sales.
developers and initiators have to think of multiple factors such as needs of users, costs and the measurements of performance to bring sales process, user and BI in harmony. Second, **transformative work** happens for users because they change from an old system to a new system. The change requires of sellers to change their routines with the new system because they have to respond to the feedback of customer. This requires also a change of resources such as the workforce as such. For example, the seller ‘Müller’ had hired one person responsible for BI (see group interview 2 in Appendix 1). Through the new system, the behavior in the sales process changed for sellers, because they had to make different documentation and work with BI to support their buyers better. The change from the old to a new system transformed work as such. It led to more transactional work in the form of documentation and data gathering (see *Imbrication Phase 1*) and analytical work in the form of predictions and visualization (see *Imbrication Phase 2*).

The contextual factors that influence the *Imbrication Phase 3* involve three factors: leadership, process, and technology. First, **leadership** plays in Imbrication Phase 3 as important top-down approach concerning managerial- and strategical level. At the case company, initiators and developers are the ones executing the change from the old to the new system. Initiators instruct developers how the change is done and work closely together with the team-leading sellers. Team-leading sellers test the new BI system to optimize its functionality to the need of the sales process. Second, the **process** is changing because users such as sellers have to adapt to a new system. Their tasks change from complex documentation to making predictions and visualization. This leads to the development of the technology because the new system offers new opportunities. Last, **technology** is a tool that transforms because it changes from an old system to a new one. The old system does not fulfill its purpose and needs to be changed. The old system is too difficult to handle because users need to use different systems to make analyses and reports. In contrast, the new system offers analyses and reports for predictions and visualization as described in *Imbrication Phase 2* in one system.

From a sociomaterial standpoint, the technical subsystem is imbalanced because the materiality of the old system does not fit the goal of users. The change from an old to a new system aims to bring the material and social agency in balance again as described in *Imbrication Phase 2*. Users should use BI for the purpose intended, which is to support selling cars and increase customer satisfaction. From a social standpoint, sellers want a change of the old system to fulfill the goals of sales increase and customer satisfaction. Therefore, users reject the old system and want to join the new system. Users take actions by speaking with initiators and developers to transform the system.

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27 The phrase is highlighted because it is the basis for the upcoming discussion.
because they are the key roles in making the change possible. From a material standpoint, a technology has to fulfill its purpose: decision support. At the case company, the old system did not fulfill it anymore. The old system got replaced by the new system. The development of the new system required of initiators and developers to replace it adequately. A peer group of sellers was chosen with whom BI was tested and implemented. The result showed that the new BI system is accepted. BI offered all features and functionalities needed to support the transactional and analytical work in one common system. Therefore, BI fulfilled its purpose and the transformation from an old to a new system was successful because it was used and realized higher customer satisfaction and sales.

In conclusion, *Imbrication Phase 3* describes a clash of the old system and the need of users. Therefore, the case company implemented a new system: the current BI. The change requires new types of work such as agility and transformation to implement a system efficiently in the sales process.
6.1 The nature of work and technology

The results revealed situations that highlighted the following three phases of imbrication between users and BI:

- **Imbrication Phase 1**: transactional work such as documentation and data gathering provided by BI;
- **Imbrication Phase 2**: analytical work such as predictions and visualizations made from analysis and reports;
- **Imbrication Phase 3**: agile and changing work, which consists of developing, programming and testing systems to change from an old to a new system.

A factor highlighted in these Imbrication Phases is the nature of work. Moving from phase 1 to phase 3, the nature of work becomes increasingly complex. Phase 1 (automation) describes the replacement of tedious and simple tasks. Phase 2 (information) describes users individually, and decides based on their skills what kind of predictions and visualization they want. Phase 3 (transformation) demands that management implement technology that works and is accepted by users. The concept of the nature of work in combination with technology relates to Zuboff’s (1988) framework of automation, information, and transformation.28

6.1.1 Automation of transactional work – *Imbrication Phase 1*

*Automation* was in the theoretical background defined as a process aiming to replace work of users with machines (Zuboff, 1988). A user is an operational worker such as a seller or call center agent that uses BI. A firm has the intention to increase activity and productivity through support or even replacement of users with machines (Kaiserlidis and Lindvall, 2004).

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28 Section 2.1.2 defines the terms ‘automate’, ‘informating’, and ‘transformate’ by Zuboff (1988). She used the terminology in the previous described way. To make the work more consistent and establish a common way of wording, the thesis refers to these three concepts as automation, information, and transformation.
In the case studied, *Imbrication Phase 1* represents the situation described by Zuboff (1988). In *Imbrication Phase 1*, users get supported by BI in their transactional work. The transactional work consists of sellers making the documentation of critical cases and call center agents gathering data of buyers. These kinds of transactional work are perceived as tedious work. BI automates work through its structure, semantics, and database. For example, templates are established, which are structured in the same way for each and every customer to standardize the process. The imbrication between user and BI is visualized from a sociomaterial point of view in Figure 7a:

*Figure 8a. Automation of transactional work (Imbrication Phase 1).*

Figure 8a shows a close-up of the technical subsystem in *Imbrication Phase 1*. The figure shows users performing documentation and data gathering. BI provides automation through its database, semantics, and structure, which is enabled by the ETL tools. Both automation and structure lead to an imbrication of BI and users performing transactional work. The transactional work leads to actions in the sales process impacting the users and BI. In Figure 8a, the two salient points are social dynamics between BI and user (1) and the imbrication in the form of transactional work (2).

First, the social dynamics between BI and users occur in the imbrication in the case company. In *Imbrication Phase 1*, the imbrication is the transactional work, which is documentation and data gathering of operative users. In the transactional work, the automation of BI compensates the documentation and data gathering, which users have to make. The reason for this is that BI guides users through the transactional work because it delivers an intelligent system, which offers a database semantics, and structure for automation. Users follow this guidance of BI to take actions in the sales process. In the sales process of the case company, users take actions such as asking questions (data gathering), and typing in information in critical situations (documentation). BI supports
the data gathering and documentation through guiding the user through a standardized way of doing things. This leads to a BI-focus imbrication between user and BI.

Second, the *imbrication in the form of transactional work* is supported by BI. The support by BI concerns the documentation and data gathering, which is done through its three features: database, semantics, and structure. First, automation through BI builds on a database, which uses the same data applicable for all users. In the documentation and data gathering, users can input data in a primitive form varying between unstructured and structured data (e.g. numbers, text, and Yes and No answers). The database simplifies the transactional work because users know what to ask, and how to type in data. Second, automation through BI uses the same semantics, which is based on one system used for all situations. The semantics of a system establishes rule-based hierarchies, and categorization of measurements, which consists of data about cars, buyers, service, and sellers in BI. The semantics also supports the transactional work because it creates a clear individual profile for each user. Last, automation through BI uses the same structure, which builds on templates used on an operational level consisting of sellers and call center agents. The template of BI uses an input screen. The input screen affords specific data and information typed into BI, which standardizes the data input. In that way, the structure supports the transactional work because users type data in the same way and it is processed and presented in the same form. An extension of the three factors of database, semantics and structure is described in *Paper II*.

From a sociomaterial point of view, the transactional work leads to actions (1) in the sales process, which have an impact (2) on user and BI. Action and impact in the transactional work are explained in this paragraph. First, *actions* in the transactional work of the sales process are to ask customer questions in the data gathering process and to request input for documentation such as additional information of sellers or customer. The aim with these actions is to give a clear picture of the sales process with data and information through data gathering and documentation. This means in detail, that the performance and experiences of sellers throughout the sales process are visible to the case company.

The picture shows the performance of sellers and the experience sellers made throughout their sales process. Second, the *impact* of the sales process on BI and the user is that it provides them with unstructured and structured data, which has to be harvested by sellers and call center agents. In this scenario, BI acts like a compass in that it guides users in the right direction to get the data needed.
As discussed in the theoretical background, in the transactional work, BI relates to the framework of Luhn (1958).29 According to Luhn (1958), BI is “an automatic system [which] is being developed to disseminate information to the various sections of any industrial, scientific or government organization. This intelligence system will utilize data-processing machines for auto-abstracting and auto-encoding of documents and for creating interest profiles for each of the ‘action points.’” BI acts in the transactional work in *Imbrication Phase 1* as an automatic system. It abstracts and encodes information of documents and gathered data by developing action points for predictions and visualizations. Therefore, BI can be seen as an automatic system, which supports users with positive and negative impact on their work.

The automation of transactional work through BI has positive effects on the actual work based on the following two affordances grounded in the empirics: concentration on what’s important work (1), and accuracy (2). First, the case company highlights that the important work in the sales process is analytical work (Imbrication Phase 2) because based on this, actions and decisions of sellers are made. The action and decisions have an impact on the performance of sales and customer satisfaction. In the automation of work, BI helps to make transactional work more time efficient, which helps sellers to shift from transactional work towards analytical work. The time efficiency is a result of the standardization and guidance of users through BI, which helps them to concentrate on more advanced work such as analyses and reports. Second, the accuracy is supported by the automation of work through BI because BI puts everything in a specific form, sends out reminders, and gives guidance for users.

The automation of transactional work through BI has negatives effects on the actual work based on the work replacement (1). The automation of work through BI leads to a replacement of users. The work of mainly operative users such as sellers and call center agents get replaced with automation of BI. At the case company, an external firm is currently running the call center agents, which previously was done in-house by the case company. This shows that it is only a question of time until call center agents get replaced by online-forms where customers have to fill-out blanks about their customer experience individually.

As the case company shows, BI leads in the first stage towards a standardization of the process. There might be is a standard way of doing the

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29 The use of the reference of Luhn (1958) shows that the thought of automation through BI is known since 60 years. The topic of using BI in all of its forms is still relevant in research. Therefore, Luhn (1958) is a relevant piece contributing to the BI literature and should be used and considered when speaking about BI and its automation.
transactional work, which BI pushes and controls for. The second stage of automation at the case company is that customers would fill-out online forms. Those two stages of standardization (first stage) and automation (second stage) would lead to a replacement of the operational users working with BI. For the case company, the replacement of operational users leads to cost reduction because fewer people are hired with this form of skills. For the operational user, pressure and education would increase because their ambition is (hopefully) to be hired with skills fitting the analytical work, which the case company needs.

In conclusion, automation of transactional work requires an “intelligent system” (Luhn, 1958:314) such as BI. BI supports to automate processes such as data gathering and documentation to transform data into information. The intelligence of BI comes from its database, semantics, and structure, which guides users through the process and prepares information for the analytical work.

6.1.2 Information of analytical work – *Imbrication Phase 2*

Information\(^{30}\) was defined in the theoretical background as a process aiming to translate descriptions and measurements of events into information (Zuboff, 1988). Managerial workers like team-leading sellers and the case company itself are driving the information process and use this information. This information is translated through communication into knowledge and intelligence leading to actions (Zuboff, 1985, Zuboff, 1988, McKinney Jr and Yoons Ii, 2010).

In the case study, *Imbrication Phase 2* represents the information situation described of Zuboff (1988). In *Imbrication Phase 2*, users are supported by BI in their analytical work. The analytical work is done by managerial users such as team-leading sellers that make predictions on how they can service customers better. The management of the case company performs analytical work as well, which consists of preparing visualization of the performance of sellers in a league table. The work of managerial users and the management is perceived as skillful work. BI is finding a way of information this type of work through its analysis and reports. The imbrication between user and BI is visualized from a sociomaterial point of view in Figure 8b:

\(^{30}\) The original reference by Zuboff (1988) refers to informating, which is translated in the thesis to information to build a common ground throughout the thesis.
Figure 8b. Information of analytical work (Imbrication Phase 2).

Imbrication Phase 2

First, the social dynamics between BI and users occur in the imbrication of the case company. In Imbrication Phase 2, the imbrication happens in the analytical work, which consists of predictions and visualization of managerial users. In the analytical work, information of BI as well as the predictions and visualizations of the user are at the end contributing to the imbrication. The reason for this is that BI supports users through the analytical work because it translates the sales process event into analyses and reports, which is useful information to the user. Users follow the information of BI to take actions in the sales process. In the sales process of the case company, users take actions such as improving the seller-buyer-relationship to increase customer satisfaction (predictions) and awarding top-performing sellers in the sales process (visualizations). BI supports the predictions and visualizations of managerial users through translating KPIs into analysis and reports. This leads to an information-focused imbrication because user and BI are in balance and work in harmony.
Second, the imbrication in form of analytical work is supported by BI because it supports prediction and visualization through two factors: analysis and reports. First, information through BI builds on analysis, which presents daily, monthly, and yearly results of cars, customer, and seller in the sales process. The analysis in BI consist of information about trends, reasons for (dis-)satisfaction, and text analysis. Team-leading sellers can look at their individual performance in satisfaction. In the case company, a previously mentioned example was the car delivery, which often takes too much time. Therefore, sellers can precisely analyze the reasoning for their individual case and make predictions on how to avoid it. Second, information through BI builds on reports, which builds on monthly and yearly results of performances of sellers, as well as different steps in the sales process. The reports consist of information about individual critical situations, dealer dashboards, and league tables. The management of the case company uses the league table to provide visualized motivators to their sellers, as best sellers will receive a physical reward at the end of the year. The reward and league table is described in a more detailed way in Paper III.

From a sociomaterial point of view, the analytical work leads to action (1) in the sales process, which has an impact (2) on user and BI. Action and impact in the analytical work are explained in this paragraph. First, actions in the analytical work of the sales process are to improve the seller-buyer-relationship in the analysis and awarding top sellers with the rewards. The aim of those actions is to improve the sales process by providing high customer satisfaction for buyers and top-motivated sellers. The improvement of the sales process has, of course, an overall goal: selling more cars. Second, the impact of the sales process are descriptions and measurements for BI and feedback for users. The descriptions and measurements are presenting the basis for KPIs, which are used to create analysis and reports. The feedback from users is the basis for making predictions and visualizations for performance.

In relation to the theoretical background, BI relates in the analytical work to the framework of Turban (2014) because BI is used as a tool to make decisions through its features and functionalities. According to Turban (2014), BI is a multi-sided tool that analyzes, measures and monitors performance for taking actions and supporting decisions. A more descriptive definition of BI is given in Paper I based on its conceptualization and characteristics. BI acts in the analytical work of Imbrication Phase 2 as a digital tool because it translates descriptions and measurements into analysis and reports. Therefore, BI can be seen as an information system, which supports users with positive and negative impact in their work.
The information of analytical work through BI has positive effects for the actual work performed based on two factors: possibilities of decision support (1) and useful information use (2). First, information of analytical work through BI gives the possibilities of decision support. BI is used as a tool which gives the possibility to make multiple high-quality analysis and reports. For example, the case company does simple analytical work when they analyze the time-spent in the car delivery. When visualizing the car delivery, the case company realizes that customers would be way more satisfied if the seller informs them, that the delivery will take longer. According to the case company, providing this information to customers leads to increased customer satisfaction and is, therefore, an effective support of decisions. Second, information of analytical work through BI enables the useful information use. BI offers multiple information about different steps of the sales process such as the car accessories ordering. As highlighted earlier, the satisfaction of car accessories ordering (Figure 6, Section 5.1.1) has room for improvement. Therefore, team-leading sellers looked at the offering of summer- and winter tires in BI and realized that some sellers do not offer them at all. Those accessories are important features for customers because they develop a value for customers (e.g. accessories to install bicycles on the top of a car). The additional accessories increase the value of the purchase, which is in return positive for the performance of sellers. Therefore, with the help of BI, team-leading sellers sensitize their sellers to offer more tires the corresponding months in order to satisfy customers.

The information of work through BI has negative effects on the actual work based on one factors: time-consuming (1). The information of analytical work through BI is time-consuming because of contextual factors such as leadership, process, and skills. First, as the previous example of car delivery time and car accessory offer shows, leadership is top-down oriented at a managerial level. This leadership orientation requires a lot of communication with sellers, who have to understand why they are doing it and how they are doing it. Second, the process used in the analytical work is informative, which requires a lot of time because users have to look into BI and use their workforce to make predictions and visualization. Last, skills are required to develop analysis and perform analytical work. It requires sellers to take part in trainings or seminars to understand BI and make use of it. Based on those contextual factors, information of work through BI takes a lot of time.

As the case company shows in the first stage, BI leads to analysis and reports. Users have to make the analytical work individually because BI only makes an offer to use its feature and functionalities. The second stage of information at the case company is that users make predictions and visualizations through the use of those analysis and reports. Those two stages
of analysis and reports (first stage), and predictions and visualization (second stage) increasingly leads to a focus on managerial users working with BI at the case company. For the case company, focus on managerial users leads to an increased use of BI to support decisions in sales and customer satisfaction. For the managerial user, increasing skills are required to meet the demands of BI to fulfill the analytical work.

In conclusion, information of analytical work requires skills of users, and an information system such as BI (Turban, 2014). BI supports to inform the process by translating analysis and reports into patterns, which are needed for predictions and visualization. The information of BI comes from analysis and reports, which are translated by BI into predictions and visualizations for taking actions in the sales process.

6.1.3 Transformation through agile and changing work – 
*Imbrication Phase 3*

Transformation is defined as a change in the form of appearance, form, and nature to something, which requires development, people engagement and IT (Venkatraman, 1994, Anthony, 2016, Bider and Jalali, 2016). The people are users such as operational workers represented by sellers or call center agents; managerial workers consisting of team-leading sellers; and strategic workers composed of initiator and developer that drive the transformation. Transformation is enabled through automation standardized ways of working and information through the use of technology (Kotter, 2010).

In the case studied, *Imbrication Phase 3* represents the transforming situation described by Anthony (2016). In *Imbrication Phase 3*, users such as operational and managerial workers want to make customers satisfied and sell cars, which is not supported by BI. Therefore, users are changing work by rejecting BI and bypassing the old system completely. Initiators and developers have to react to this changing work. The ambition of initiators and developers is to replace the old system with the new one, which is used by operational and managerial workers. The use is focused on two factors: automation of transactional work (*Imbrication Phase 1*) and information of analytical work (*Imbrication Phase 2*). The *Imbrication Phase 3* is presented from a sociomaterial point of view in Figure 8c:
Figure 8c. Transformation of work (old system) through agile work (new system) in Imbrication Phase 3.

Figure 8c shows a close-up of the technical subsystem in Imbrication Phase 3. The figure divides Imbrication Phase 3 into two situations: old system (situation 1), and new system (situation 2). The example shows the “big” transformation between the old and the new system. The Imbrication Phase 3 can also encompass smaller transformation and this example has an illustrative purpose, which is supported by the empirical data of this third phase of imbrication.

In situation 1 of Imbrication Phase 3, users (B1) such as operational workers want to make customer satisfied and sell cars (1). The old system has a mismatch of functionalities and features (2) for these operational workers. The imbrication between users and old system leads to changing work (3) because users bypass the system and the action is the implementation of a new system. In situation 2 of Imbrication Phase 3, initiator and developer realize that the old system does not work, and want to implement a new system fitting what user want to make (4). The old system undergoes a process of transformation to a new system to respond to user’s needs (5). The imbrication between initiator and developer (D) and the new system BI (E) results in agile work (6) because the new systems is designed and immediately used while the old system is still used as backup. The old system is furthermore a source of
knowledge for designing the new system because it offers valuable information which sites were used and how features could be improved. In the construct of the two situations, the two salient points are social dynamics between BI and user (1) and the imbrication in the form of changing work through agile work (2).

First, the social dynamics between BI and user occur in the imbrication of the case company. In Imbrication Phase 3, the imbrication in situation 1 happens in the changing work, which consists of a mismatch between functionalities and features of the old system for the need of the user. In the changing work, customer satisfaction and selling cars of users (social agency) compensates the mismatch of functionalities and features of BI (material agency). Therefore, users reject the old system. The reason for this is that the old system does not fulfill the needs of users. At the case company, the old system was called ‘Focus Customer’, which was complicated and offered limited analysis and reports. Therefore, users were bypassing the old system and changing their way of working. The need for a new system got bigger and bigger and therefore, situation 2 happens. In situation 2, the imbrication between initiator, developer and the new system is agile work because user’s needs to have a working system has to be fulfilled. The aim of the agile work is to develop and design a new system while the regular business with the old system is happening. The new system has the aim to provide a balance between the imbrication of user’s needs and the materiality of BI. Therefore, initiator and developer use the old system as a basis to design the new one. The aim is to learn from the failures and design a system, which fulfills criteria of the transactional- (Imbrication Phase 1) and analytical work (Imbrication Phase 2).

Second, the imbrication in form of changing work through agile work is supported by initiators, developers, and users because they transform the old system from a mismatch of functionalities and features to a new system (BI) that responds to user’s needs. The basis for the transformation at the case company is action and impact from the old system. The following paragraph elaborates the action and impact of the old system from a sociomaterial point of view.

From a sociomaterial point of view, the changing work in situation 1 leads to action (1) in the sales process, which have an impact (2) on initiators, developers and the new system. Action and impact in the changing work, which lead to agile work, are explained in this paragraph. First, the action in the changing work is the implementation of a new system (a) for the sales process because the old system ‘Focus customer’ (C) does not fulfill the need of users. The old system is the reason for the transformation towards the new
system, which uses the mistakes of situation 1 in combination with the sales process to develop the new system. Second, the impact of the old system from situation 1 and the sales process is two-folded on situation 2: programming and crafting (b) and design, functionalities, and features (c). First, the *programming and crafting* are done by developers, who look at the sales process and look what user actually need. The user has an overall goal, which is to make customers satisfied and sell cars. To achieve this, *Imbrication Phase 1* and 2 is needed because they support the goal with their transactional and analytical work by proving information. Developers use this information to make programming and crafting accordingly to implement a new system fitting what users want to make. Second, designs, functionalities, and features of BI are done by all actors: users (B) initiators and developers (D). Users (B) are the ones working with BI (E) and initiators and developers (D) are the ones crafting BI. BI is implemented along the nine steps of the sales process. The functionalities and features of BI (E) aim to be a mirror of the steps of the sales process. For example, initiators and developers implement fitting KPIs in BI that measure the performance of the car delivery, purchase and accessories ordering. A detailed description of how the KPIs and BI match, is done in *Paper II*. In conclusion, the old system of situation 1 and the sales process have an impact on the new system, which is going to be implemented.

In relation to the theoretical background, users, initiators, and developers relate to their agile and changing work practice to the BI implementation (Section 1.1.1) were “the stakes are high for organizations to develop successful BI implementation.” (Jourdan et al., 2008:121) The goal of transforming from the old to a new system is to “reduce the latency between when operational data is acquired and when analysis of that data is possible.” The aim is to develop a real-time BI, which is developed through a maturity model that considers user, BI and the sales process, which was recommended by research (Lukman et al., 2011, Popovič et al., 2012, Brooks et al., 2015, Olszak, 2016). *Paper IV* highlights the maturity of BI, which looks into the same entities: users, BI, and process.

The transformation of work through BI has positive effects for the actual work based on two factors: potential ways of imbrication between users and BI (1), and focus on the needs of users (2). First, the case company sees with the transformation a potential way of imbrication between user and BI because the materiality of BI matches more the needs of users in the sales process. The potential lays in finding a way to integrating or even embedding a system, which fulfills the needs of users. Through imbrication, the system could support transactional and analytical work of operational, managerial- and strategical workers, which would be not only an advance in the development of the system but also could transform towards the transparency in the sales
process and develop a strategic competitive advantage. Second, the focus on the needs of users gives at the case company the possibility to analyze the status quo of the old system, find its failures and develop something new, which is fitting the needs of users. The positive factor with this is that a focus on users is given, which helps to look at the environment in which the user works. At the case company, the environment consists of the sales process, which is analyzed and initiator and developer looked at factors such as ‘what data comes in?’, ‘what data gets out?’, and ‘what data do we need?’ – The conceptualization of BI is manifested through the focus on the needs of users, which strengthen the focus to develop BI, which is embedded and integrated with users and along the sales process.

The transformation of work through BI has negative effects for the actual work based on the costs for the technology and the risks from users and processes. The costs for the BI were completely unknown. The development of the technology, which was integrated not only at the case company but also at all other European headquarters, was cost-intensive. This made BI a high investment because developers had to be paid, the servers had to be bought, and the technology had to be used, which required training. The latter was the riskiest factor, because the BI or system could have been rejected by users. The risks from users and process was that something changed because the needs, processes and behaviors changed. Change is not necessarily bad, but it is risky for BI to survive, and iterations are required to make the BI and its functionalities and features useful. If users wished for something new, or the sales process had changed, BI would not have functioned and would have had to be changed.

As the case demonstrated, the old system was in situation 1, which lead to a transformation, because the old system did not fulfill the users’ needs. Situation 1 was critical, because users were changing work by bypassing the system; clearly a new system was needed that fixed the old issues by reacting to the needs of users. Situation 2 was the actual transformation, because it considered everything from situation 1 (such as needs of users, the sales process and the old system) and implemented a new system. The transformation from the old system to a new one lead to increased costs, because the new system had to be implemented and maintained. The primary aim with using BI is to increase sales and customer satisfaction. A secondary aim with using BI is to use the system throughout the whole organization, which requires coaching and education as described in Paper IV.

In conclusion, transformations of agile and changing work required implementing a new system to enable transactional and analytical work for users. The transformation from an old to a new system required considering
people, processes, and the technology itself because the main aim was to change for the better.
Chapter 7: Conclusion

7.1 Summary
This thesis asked and answered the question ‘How does imbrication between people and technology develop in the daily use of BI systems?’ The objects studied were people, technology, and the imbrication between them. People were users, initiators, and developers. The technology was a BI system developed during the digitalization of a sales process. After implementation of the BI and daily use, both people and BI wanted to change the sales process.

The theoretical background and models that this thesis was based upon are threefold: (1) BI, (2) imbrication from a sociomateriality perspective, and (3) a model describing the imbrication between people and technology from a sociomaterial practice perspective.

The first factor, BI, was a digital tool that used data and information\(^{31}\) to produce analyses and reports for the development of new insights. The new insights were predictions and visualization, which support decisions of users. The second factor, imbrication, was the overlap between people and technology. The concept of imbrication comes from the framework of Leonardi (2012a) and can be translated as overlapping formation between people and technology.

To come up with the third factor, that is, an imbrication model from a sociomaterial perspective, this thesis raised the questions How, How, and What is imbrication to understand this specific key objective of the research question. Papers I–IV explored the following three questions:

A. How have sociomateriality and imbrication been studied and used in earlier BI-related research (Paper I);
B. How does the sociomateriality between people and BI work (Papers I & II);
C. What supports the imbrication of people and BI (Paper III & IV).

\(^{31}\) Data and information are two central data sources used at the case company. In the Information Systems literature, data and information are not the the same concepts. See: Hand, D. J. 2007. Information Generation How Data Rule Our World.
The *How*-question was addressed in Paper I, which pointed out that the BI literature mainly focuses on the technological side of BI. The technological side of BI describes BI mainly as a tool used by people. Imbrication between BI and people happens because people see BI as a tool to control administration, cybernetics, and planning in critical situations (e.g. financial fraud, merger and acquisitions, or predictions). The *How*-question was also addressed in Paper II, which highlighted two situations at the case company (purchase and follow-up) in which the BI and the user overlapped. This overlap happened because BI provided information for analysis and reports that were needed by people to make compensation and decisions.

The *What*-question was addressed in Papers III and IV which looked at the technological and social side of BI and its imbrication. Paper III showed that the technological side of BI has game design elements that support the development of new affordances. The new affordances offered a motivation for users to use the BI system in different types of work. Paper IV showed that, from the social side of BI, managerial actions supported BI usage of BI in different phases. Knowledge-workers supported users by being coaches, mentors, and partners to help a user progress to a more mature usage of the BI, a process that optimized the imbrication between user and BI. A theoretical model of sociomateriality was presented which described the imbrication between people and technology. This model was applied to the case company and various functions. The model described the imbrication between people and technology and functioned as a sociomaterial lens, and showed that the imbrication between users and BI triggered actions. In the case study, users wanted to sell cars and satisfy customers with the support of BI and the BI provided decision support for the users.

The findings of the thesis were built on scenarios that were pre-defined in the sales process of the case company. In these scenarios, the imbrication between people and technology was different in each of the three *Imbrication Phases*.

*Imbrication Phases* are the answer to the research question and highlight the following three situations of overlap between people and technology: automation of transactional work (Phase 1), information of analytical work (Phase 2), and transformation of work (Phase 3). In Imbrication Phase 1, technology provided a platform that users used for their operative tasks such as documentation and data gathering. Technology guided users through these processes by providing a database, semantics, and structures for these tasks. The tasks were automated through additional technology, which lead to automation of transactional work. In Imbrication Phase 2, technology and users overlapped because the technology provided analyses and reports for operative and strategic actions. These actions concerned critical situations.
such as purchases, development of new KPIs, and the analysis of users’ performances. Again, the actions were informed through additional technology, which lead to an information of the analytical work. In Imbrication Phase 3, technology that did not offer the right information, analysis, and reports to the users was refused by them. At this point, the technology was replaced by human initiators, developers, and other users who offered a working new system, which enabled a better overlap between people and technology.

Moreover, the three phases demonstrated the social dynamics between people and technology and answered the following three questions: How users use BI?, How does BI support users, and What kind of work is supported by BI? In Phase 1, technology lead to automation because it standardized the process for the user through technology. In Phase 2, technology lead to information because the process for users through technology was informative. In Phase 3, technology lead to a transformation because it did not meet the needs of the users.

The Imbrication Phases described BI as a technology with social dynamics. It was suggested that identifying these phases of imbrication could lead to more purposeful use of technology, and could establish or restore a balance between technology and the social dynamics around it.

7.2 Theoretical contributions

The thesis contributed to the fields BI and sociomateriality. This thesis lead to a conceptualization of BI, which gave a definition of BI and highlighted three phases in which BI supported the work of users. This conceptualized BI into automation, information, and transformation by relating to its users. The categorization of BI showed three phases in which BI usage was highlighted: automation of work, ‘information’ of work, and transformation of work. The usage of BI built a connection to social dynamics, which related to factors such as the nature of the work, and specific roles such as initiators, developers, and users. The conceptualization, categorization, and connection of BI extends the current body of literature.

Second, the thesis addressed the weaknesses of sociomateriality raised in Chapter 1 by showing an empirical case that extended the framework of Leonardi (2012a). The case showed how BI was used throughout the firm to tackle inconsistency, and showed how the social and material were used throughout the company by introducing imbrication by Leonardi (2012a) and followed his call to “begin a movement in the direction of clarity so that scholar can use these terms productively” (p. 2). The thesis used
sociomateriality as a lens by offering two sets of extensions to the sociomaterial practice. The empirical case study showed the imbrication of people and technology in an organizational context. The result of this imbrication gave an example of sociomaterial practice exemplified by sellers and BI working together in a sales process. This example showed that the agency of people has an impact on the social structure, and gives an extension of the framework of sociomateriality by dividing it into three phases of imbrication.

7.3 Managerial implications

The thesis has managerial implications for businesses and companies relying on the design, implementation, and change of BI systems. In the design phase, the imbrication between BI and users can be used to optimize the integration and embeddedness between BI systems, people, and processes. For example, the transactional work in processes imply that the BI system supports data gathering and documentation.

The systems could automate specific steps (e.g. through black screens guiding people). The black screens motivated the call center agents to interact with customers and to stick to the questions asked on the screen, because they were not distracted by difficult-to-use systems, or by a need to switch systems. The black screens were an effective way to make the agents work-compliant. The automation of certain steps shifted the work away from transactional work and towards analytical work. This shift might help developers and initiators to design and integrate BI, which would then be more likely to be accepted by its users. In the implementation phase, managers and experts could evaluate the consequences of the BI system on processes and users by using the conclusions of this thesis. For example, a transparent sales process visualized by BI might be a realistic achievement when the sales process is mapped out, discussed with all involved actors, and integrates specific performance measurements.

This thesis implies that there is a better way of communicating a BI system to its users. Analytical work with BI requires its user to have certain skills, which could be learned by offering specific training and education. This thesis might show how such training should be done with specific user groups. For example, managers and experts might set up specific training plans in specific way for different types of users.

In the changing phase of BI systems, companies and businesses should be able to react in a more routinized and standardized way because certain steps of changes from an old to a new system are discussed in Imbrication Phase 3.
This knowledge might help define a change process by the management, which would help to guide users from the old system to the new one. These phases of design, implementation, and change could be integrated into an overall digital business strategy, which would certainly lead to a better imbrication between technology and people.

7.4 Limitations

The most important limitation of the thesis is its analytical generalizability (Yin, 2013) due to the nature of a single case study. In a case study, the processes, systems and people involved are specifically characterized by the case’s industry, which generates a limitation all in itself. The results are based on an in-depth understanding of the case studied. Nevertheless, the study’s findings could be relevant to similar industries such as healthcare (e.g. where the imbrication is between physician and mobile devices), trade (e.g. where the imbrication is between customer, seller and digital devices) or other companies that work with BI technologies.

Another limitation concerns the data sources used and data interpretation. The study used data sources provided by the case company, which gives a limited picture. Even though the case study was made quite recently, the concepts of big data and digitalization were considered hyperbole. For example, many of the people at the case company mainly ascribed positive attributes to these concepts without any further critical thought.

7.5 Future research

The research for this thesis fills a gap in the literature because it studies a field still quite unexplored (Lian, 2017, Pratama, 2018, Yeoh, 2018). There are many studies discussing business intelligence and sociomateriality, however, research on the combination of these is rather limited. Nevertheless, there are two certain recommendations for the future: first, combination of nature of work, technology and people, and second, the conceptualization of terms such as BI and sociomateriality.

First, the combination of nature of work, technology, and people could be even more conceptualized by combining the frameworks of Leonardi (2012a) and Zuboff (1988) and extending that with Nolan (2000). By doing so, a BI system could be studied by considering its iteration, which would include a temporal dimension. Second, the current conceptualizations of BI and sociomateriality offer a good starting point for studying in-depth the functionalities and features of BI and its impacts on and for people, processes,
and human and material agency. The concept of sociomateriality is relevant for studying people and technology, but it still lacks a depth in the concepts around social agency and material agency. These two concepts in combination with imbrication could be the basis for further empirical research aimed at developing a richer body of literature around the existing theories for the concept of sociomateriality.
References


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Olszak, C. M. 2016. Toward Better Understanding and Use of Business Intelligence in Organizations. Information Systems Management, 33, 105-123.


Williams, S. & Williams, N. 2010. The Profit Impact of Business Intelligence, Morgan Kaufmann.


Appendices

Appendix 1: Overview of semi-structured interviews and group interviews

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Respondent</th>
<th>Role*</th>
<th>Description</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Semi-structured interviews</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>09.05.2015</td>
<td>District manager initiat or</td>
<td>Pilot-interview, Overview of case company and what an after sales manager does</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>17.07.2015</td>
<td>Director of Service initiat or</td>
<td>Expert interview was conducted about the implementation of the BI system, possible actors that work with the BI system</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>28.07.2015</td>
<td>Director Human Resource and General Administration initiat or</td>
<td>An expert interview is conducted, which discusses two different projects: fleet and BI implementation. The respondents were identified and a legal agreement discussed.</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>07.10.2015</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>An overview about the BI system</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>09.10.2015</td>
<td>District manager user</td>
<td>Before starting the thesis project with the case company, a pre-interview about possible topics is conducted</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12.10.2015</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>Overview of BI system and access to the cloud solution platform for the researcher</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>12.10.2015</td>
<td>Director of Service initiat or</td>
<td>Digitalization and how subsidiaries act.</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>12.10.2015</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>Talk about the BI system, how everything is interconnected and who works with it</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>23.10.2015</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>The use of BI, which had additional question based on the previous interview the respondent</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>02.11.2015</td>
<td>District manager user</td>
<td>BI system and talk about the respondents and what to expect</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Time Slot</td>
<td>Name</td>
<td>Role</td>
<td>Topic</td>
<td>Duration</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>9 10.11.2015</td>
<td>10:00-11:00</td>
<td>Senior manager Dealer Information Services</td>
<td>/ * * *</td>
<td>Which tools are sellers using? How do they do their work and how does the BI system support it? Explanation of a seller cockpit</td>
<td>60</td>
</tr>
<tr>
<td>10 11.11.2015</td>
<td>10:00-11:00</td>
<td>After sales manager</td>
<td>user</td>
<td>Sales, sales process and BI in relation to each other</td>
<td>45</td>
</tr>
<tr>
<td>11 12.11.2015</td>
<td>10:00-11:00</td>
<td>Research executive BI system</td>
<td>developer</td>
<td>BI system, how the award show is and how the BI system, award and league table work together. The motivation why sellers use BI</td>
<td>90</td>
</tr>
<tr>
<td>12 13.11.2015</td>
<td>10:00-11:00</td>
<td>After sales manager</td>
<td>user</td>
<td>Explanation of a critical case documented in the BI system.</td>
<td>30</td>
</tr>
<tr>
<td>13 18.11.2015</td>
<td>10:00-11:00</td>
<td>Analyst Aftersales Reporting &amp; Programs After Sales Marketing &amp; After Sales Strategy</td>
<td>user</td>
<td>The sales process and what was before the BI system? A short explanation of a bonus reward system, and how it relates to the BI system</td>
<td>90</td>
</tr>
<tr>
<td>14 19.11.2015</td>
<td>10:00-11:00</td>
<td>Manager Sales Operations</td>
<td>user</td>
<td>Different systems and its landscape for sellers and its connection to the BI system and the sales process.</td>
<td>60</td>
</tr>
<tr>
<td>15 19.11.2015</td>
<td>10:00-11:00</td>
<td>Director of Sales Initiation</td>
<td>user</td>
<td>BI system used in the sales process.</td>
<td>80</td>
</tr>
<tr>
<td>16 25.11.2015</td>
<td>10:00-11:00</td>
<td>Team lead Dealer Analysis &amp; Systems</td>
<td>user</td>
<td>The preparation for the league table and a short explanation of the next steps. Some questions about BI.</td>
<td>20</td>
</tr>
<tr>
<td>17 16.12.2015</td>
<td>10:00-11:00</td>
<td>Analyst Aftersales Reporting &amp; Programs</td>
<td>user</td>
<td>Year-end initiatives, award show and league table.</td>
<td>40</td>
</tr>
<tr>
<td>18 05.01.2016</td>
<td>10:00-11:00</td>
<td>Digital strategy Expert</td>
<td>user</td>
<td>Digital sales strategy, platforms, and how online selling of cars works at the case company</td>
<td>90</td>
</tr>
<tr>
<td>19 28.01.2016</td>
<td>10:00-11:00</td>
<td>Team lead Dealer Analysis &amp; Systems</td>
<td>user</td>
<td>The Use of the BI system and arrangement of group interviews with seller</td>
<td>20</td>
</tr>
<tr>
<td>20 23.02.2016</td>
<td>10:00-11:00</td>
<td>Team lead Dealer Analysis &amp; Systems</td>
<td>user</td>
<td>BI SYSTEM, focus group actors, Hot Alerts &amp;Future of the System</td>
<td>60</td>
</tr>
<tr>
<td>21 24.02.2016</td>
<td>10:00-11:00</td>
<td>Business Intelligence Expert</td>
<td>developer</td>
<td>Business Intelligence, Future, Past of the system, etc.</td>
<td>120</td>
</tr>
<tr>
<td>22 24.02.2016</td>
<td>10:00-11:00</td>
<td>Analyst</td>
<td>user</td>
<td>BI system, Hot Alerts, Fraud, Analysis of BI system of the case company Side</td>
<td>100</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Name</td>
<td>Title</td>
<td>Role</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>---------------------------------</td>
<td>------------------------------------------</td>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>23</td>
<td>25.02.2016</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>A reflection of the group interviews and discussion of some critical cases</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>26.02.2016</td>
<td>Director of Sales initiat or</td>
<td>Digital sales and how the BI system contributes</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>26.02.2016</td>
<td>Digital Strategy Expert initiat or</td>
<td>Follow-up on how data is gathered and used in the future and what steps have to be taken.</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>27.03.2016</td>
<td>Team lead Dealer Analysis &amp; Systems user</td>
<td>What is new in the BI system? What is getting updated?</td>
<td>10</td>
<td></td>
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<tr>
<td>27</td>
<td>25.07.2016</td>
<td>District manager user</td>
<td>Different users and how people mediate the system to sellers.</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>27.07.2016</td>
<td>District manager user</td>
<td>How do people translate the system to others?</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>29.07.2016</td>
<td>District manager user</td>
<td>Definition of roles in the BI system</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>06.10.2016</td>
<td>Research executive BI system developer</td>
<td>Talk about the meeting observation and who is participating and topics</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>11.10.2016</td>
<td>Research executive BI system developer</td>
<td>Pre-interview for the observation meeting</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>13.10.2016</td>
<td>Senior Manager National Sales Company and Dealer Systems /</td>
<td>IT landscape and functionalities of BI system and its interconnectedness</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>24.10.2017</td>
<td>District manager user</td>
<td>Follow-up meeting: BI system, connection between BI, sales process and users</td>
<td>(60)</td>
<td></td>
</tr>
</tbody>
</table>

** Total 1.975 (33 h)**

** Group interviews **

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Name</th>
<th>Title</th>
<th>Role</th>
<th>Description</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25.02.2016</td>
<td>Seller 1, team lead Dealer Analysis &amp; Systems &amp; Human resource specialist user</td>
<td>The use of the BI system, there work, and possible occurring positive and negative happenings with the system</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>25.02.2016</td>
<td>Seller 2, team lead Dealer Analysis &amp; Systems &amp; Human resource specialist user</td>
<td>The use of the BI system, there work, and possible occurring positive and negative happenings with the system</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Total 180 (3 h)**

*) The roles are described in sections 5.2.4.
**) The interview 33 was a follow-up interview to get in touch with the case company. Therefore, the 60 minutes of interview 33 are not counted in Table 2 in section 5.3 or Appendix 1.
***) The senior manager uses different systems in his daily work.
Appendix 2: Interview guide for case company

*The interview guide was used between 2015 and 2016. The interviews were all conducted in German and the guide is freely-translated into English.*

<table>
<thead>
<tr>
<th>General questions</th>
<th>What is your position?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>How long do you work in your position?</td>
</tr>
<tr>
<td></td>
<td>What is your responsibility?</td>
</tr>
<tr>
<td></td>
<td>What is data?</td>
</tr>
<tr>
<td></td>
<td>What is a system?</td>
</tr>
<tr>
<td></td>
<td>What does the digitalization mean to you/case company?</td>
</tr>
<tr>
<td>Data storage</td>
<td>What is the system about?</td>
</tr>
<tr>
<td></td>
<td>How does data come in/goes out?</td>
</tr>
<tr>
<td></td>
<td>Who is involved?</td>
</tr>
<tr>
<td></td>
<td>How is system x, y, z connected to BI?</td>
</tr>
<tr>
<td>Visualization</td>
<td>How does data get visualized?</td>
</tr>
<tr>
<td></td>
<td>Who analyses the data?</td>
</tr>
<tr>
<td></td>
<td>Which decisions are made based on visualization?</td>
</tr>
<tr>
<td>Process</td>
<td>Who works with the data?</td>
</tr>
<tr>
<td></td>
<td>What happened good/bad in the process?</td>
</tr>
<tr>
<td>Environment</td>
<td>What kind of information do you put in/get out?</td>
</tr>
<tr>
<td>Analytical competence</td>
<td>Which kind of education, coaching or teaching exist for BI?</td>
</tr>
<tr>
<td></td>
<td>What kind of competence is needed for BI?</td>
</tr>
</tbody>
</table>
Appendix 3: Group interview in the meeting room – Sellers and case company on opposite sides

Legend:

<table>
<thead>
<tr>
<th>Case company</th>
<th>CEO(s) of seller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewer</td>
<td>Screen(s)</td>
</tr>
<tr>
<td>HR</td>
<td>TL A&amp;S</td>
</tr>
<tr>
<td>HR</td>
<td>TL A&amp;S</td>
</tr>
<tr>
<td>HR</td>
<td>TL A&amp;S</td>
</tr>
</tbody>
</table>

Appendix 4: Work shadowing

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Respondent</th>
<th>Role</th>
<th>Observed Interviews in the data gathering process</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.10.2016</td>
<td>Konrad</td>
<td>Call center agent 1</td>
<td>6</td>
<td>120</td>
</tr>
<tr>
<td>2</td>
<td>12.10.2016</td>
<td>Sonja</td>
<td>Call center agent 2</td>
<td>6</td>
<td>120</td>
</tr>
<tr>
<td>3</td>
<td>12.10.2016</td>
<td>Silvia</td>
<td>Call center agent 3</td>
<td>6</td>
<td>120</td>
</tr>
</tbody>
</table>

Total: 360 (6 h)
Appendix 5: Meeting setting and order of meeting

Legend:
- Case company
- European headquarter
- IT expert managers
- Call center manager
- Call agent supervisor
- Observer
- Screen
- Team lead
- Team expert
- New employee
- Audio

Talk flows situation 1: intro & strategy
TL

Talk flows situation 2: Cases & strategy
TE

NE
New employee
Mg.
Manager
Appendix 6: Screenshot of BI portal

Appendix 7: Calculation of the satisfaction measurement in BI based on sales process

should be to provide as many customers as possible with a highly satisfying customer experience. Below, the calculation of the top box score is illustrated:

NPS Calculation: Top-Box In % (score 5) - Bottom-Box In % (score 1, 2 and 3). NPS Calculation is based on the dealer/brand recommendation question.

PROMOTERS - DETRACTORS = NPS (NET PROMOTER SCORE)
Appendix 8: Picture of customer profile - Example for automation
Appendix 9: E-Mail template for the seller generated by the BI system

The following customer has requested that we notify you regarding their recent [SALES/SERVICE] experience. In case the customer interview was recorded, the actual recording will be available [within] the next 24 hours.

Note: Recorded interviews are available for 4 weeks, after which time they will be archived.

As part of your customer experience commitment, you are required to contact this customer within the next 48 hours.

Customer Name: xxx
Contact ID: xx
Dealership: xx
Primary Phone: xx
Alternative Phone: xx
Email: xx@xx
VIN: xx
Model Yr / Model: xx
Transaction Type: xx
Transaction Date: xx

Background Information
Date of Interview: xx
Satisfaction Response: 1 [completely dissatisfied]
Description: CUSTOMER ALERT
Customer Comments:

xxxx

You are also required to document the actions taken to resolve this customer alert, following these simple steps:

1. Log onto [using your unique user name and password].

2. Click on the Contact ID within the “Hot Alerts” report which will link you to “Hot Alert Details”, where you can manage the Hot Alert.

3. Select the “Action” in the drop down menu that you take to solve the respective Hot Alert.

4. In the “Description” section, input what needs to be done or insert feedback from the customer based on your contact.

5. To complete the action, please click on “Assign action”.

6. Choose the action “Closed” and then click on “Assign action” to close the Hot Alert.

For assistance in completing your feedback in the webportal, please use “Contact us” (in the footer of the webportal) or contact your Mazda Business Manager.


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