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The Role of Business Intelligence in Shaping Management Practices

School of Management
Master's thesis in Strategic
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Purpose: The aim of this study is to elaborate how business intelligence shapes concrete managerial practices in a case company context.

Theory: The theory of this research consists of three key frameworks which are business intelligence (BI), strategy-as-practice (SAP), and sociomateriality. As a combination these will provide a valid framework to observe changes in managerial practices in relation to business intelligence. The synthesis also provides a theoretical lens, through which is it is possible to easily view the empirical results in theoretical context.

Methodology: The empirical part of this thesis includes a case study, for an unnamed large-scale production company. The material was gathered by conducting semi-structured interviews with managers from the case company. The data is analysed by using content analysis.

Findings and contribution: Changes in managerial practices were identified in relation to business intelligence. First of key findings were that managers are analysing the data in more depth, due to the fact that business intelligence provides the initial analysis. Second change was that managers are looking the operations of the company through more comprehensive view and they examine the cross-department causations in more detail. Third identified change in managerial practises was that operative optimization has become more apparent, as business intelligence enables it with more level of detail than before.

KEYWORDS: business intelligence, strategy-as-practice, sociomateriality, managerial practices, knowledge management

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Tavoite: Tutkimuksessa tarkastellaan, miten business intelligence muovaa johtamisen käytänteitä.

Teoria: Tutkimuksen teoria koostuu kolmesta pääkehyksestä, joita ovat business intelligence (BI), strategia käytäntönä (SAP) ja sosiomateriaalisuus. Näiden yhdistelmä tarjoaa validin synteesin, jonka avulla voidaan tarkastella johtamisen käytänteissä tapahtuvia muutoksia suhteessa business intelligencen hyödyntämiseen. Synteesi tarjoaa myös teoreettisen linssin, jonka läpi on mahdollista tarkastella empiirisen tutkimuksen tuloksia teoreettisessa kontekstissa.

Metodologia: Tutkimus toteutettiin tapaustutkimuksena, jonka kohteena oli suuri tuotantoyritys. Tutkimuksen aineisto kerättiin semistrukturoitujen haastattelujen avulla ja aineiston analyysimenetelmänä käytettiin sisällönanalyysia.

Löydökset ja kontribuutio: Tutkimuksessa havaittiin business intelligencen aiheuttavan joitakin muutoksia johtamisen käytäntöihin. Ensimmäinen löydös oli se, että johtajat analysoivat dataa syvällisemmin, sillä business intelligencellä on kyky tarjota ensianalyysi pohjaten raakadataan. Toinen havaittu muutos oli se, että johtajat tarkastelevat yrityksen toimintaa sekä osastojen välisiä vuorovaikutussuhteita syvällisemmin. Kolmas tunnistettu muutos johtamiskäytännöissä oli se, että operatiivinen optimointi on lisääntynyt, kun business intelligence mahdollistaa datan tarkkailun tarkemmalla tasolla kuin aikaisemmin.

Avainsanat: business intelligence, strategia käytäntönä, sosiomateriaalisuus, johtamiskäytännöt, tiedolla johtaminen

1 INTRODUCTION

Business development today includes variety of elements which are outside of the direct scope of what is commonly considered as business. Developing businesses model canvas or expanding operations to abroad are straight forward considered as developing business operations, whereas organizational structures, practices within those structures, and technologies that facilitate change are more dependent on the viewing point of an individual (Vaara & Whittington, 2012). As organizations scale up and aim to respond to the market challenges information systems become increasingly important part of the day to day operations. Ultimately these systems are responsible for carrying massive amounts of information across operations and based on this information people make decisions that in the end are responsible for organizational outcomes (Vaara & Whittington, 2012).

Business intelligence (BI) has been created to maximize the potential of the gathered data that organizations have collected to different locations (Akter, Wamba, Gunasekaran, Dubey & Childe, 2016; Alnoukari & Hanano, 2017). BI's purpose is to analyse and visualise data tailored to the organizations and user's needs, offering companies versatile options to explore the potential that lies in their stored information. In relation to using BI there is also a process of developing the organizational business intelligence, as well as, using it on regular basis. People who are involved in development the BI are responsible for developing it to match the organizational need and more specifically the individual needs inside the organization (Orlikowski, 2000). These systems are often developed for different types of daily organizational needs and are in a key position to affect the work of the individuals. Employees and managers of the organization interact with it and discover insights, software bugs and things to be developed, which are then addressed, and the systems are adjusted accordingly. This cyclical development of business intelligence and many other information systems is business development that happens in the background as people adjust systems, which guide their practices and vice versa. (Akter et al., 2016; Alnoukari & Hanano, 2017).

1.1 Motivation for the study

As the role of data comes increasingly important functions like forecasting market demand, optimising production and inventory, analysing customer data to better direct R&D, and many other aspects rely on data (Akter et al., 2016; Alnoukari & Hanano, 2017). Therefore, how the data is being interpreted by those who need to fully utilize it, is at least equally important so that employees and managers can make informed decisions in agile business environment. The role of BI increases in the routines of individuals in an organizational setting and the decisions that are made are guided to some extent by the business intelligence (Akter et al., 2016; Alnoukari & Hanano, 2017). Considering then the highlighted effects of utilizing BI it is interesting to reflect how the decisions were actually made before, and how business intelligence has contributed to the decision making. Ultimately these information systems shape the everyday routines and practices of individuals and therefore affecting the concrete actions in their work, but how have these systems shaped the practices of an individual.

1.2 Research gap

Business intelligence is designed around the concept of creating value out of data and that has been researched by many scholars. Alnoukari and Hanano (2017) studied how business intelligence can be integrated to organizational strategic management. Bordeleau, Mosconi, and Santa-Eulalia (2020) researched the topic of value creation of business intelligence to medium size manufacturing enterprises. Arnott, Lizama, and Song (2017) in contrast have looked into patterns of business intelligence systems usage in organizations. These authors have studied the implementation of business intelligence among other writers, many of whom are mentioned later in this paper, and they have contributed immensely in the process of discovering the outlaying value of BI. Then for example Constantiou, Shollo and Vendelø (2019) have noted other important ways to analyse the variety of decision making that happens outside of the system, providing great insight to the shortcomings of business intelligence considering organizational decision making. However, many of these studies take only very little focus to the user practices of the systems as well as the routines surrounding the BI usage.

Frameworks of strategy-as-practice and sociomateriality provide great insight into the importance of practices in relation to business decision making process as well as to the contribution of information systems to the mentioned practices (Feldman & Orlikowski, 2011; Vaara & Whittington, 2012). Their relation to business intelligence is however left for less attention as they are more tied into the premise of organizational practices. Strategy-as-practice is focused around the strategic business practices and sociomateriality is more concentrated around the concept of information systems role in the organizational practices (Feldman & Orlikowski, 2011; Vaara & Whittington, 2012). These two practical orientations provide the background for analysing managerial practices and business intelligence research provides the literature to further analyse the development and contribution of BI to organizations (Akter et al., 2016; Alnoukari & Hanano, 2017). These three frameworks provide a premise to this research that has been less present in the related research.

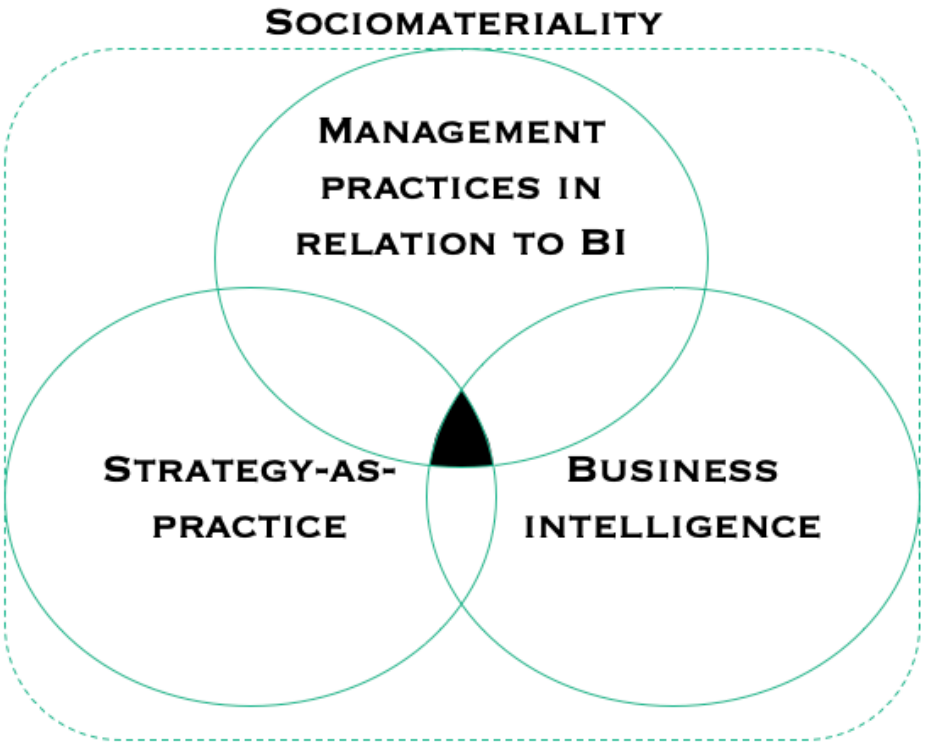

Figure 1 Research gap

1.3 Research question and objectives

As utilizing business intelligence in organizational development is becoming increasingly more widespread and contributing the decision making that ultimately affects the organizational practices and development, this thesis aims to find out how business intelligence shapes management practices.

The research questions are as follows:

1. How business intelligence shapes management practices?
2. What similarities can be identified between managerial practices before and after implementing business intelligence solution?

Answering to these two questions is manged through set of research objectives, which aid the cause of clearly defining an accurate area of research.

The research objectives are:

- To describe business intelligence role in organizational development
- To construe connections between strategy-as-practice and business intelligence
- To find commonalities in management practices that might occur before sor after business intelligence is implemented

By achieving the research objectives and answering the set research questions this thesis can contribute and add into the existing literature through empirical and theoretical means. Widening the theoretical frameworks of BI to consider the practice theory through SAP and sociomateriality and providing deeper insight into the practical effects of utilizing such information system. In terms of empirical study, this thesis provides practical implementation cases of BI to support the research narrative to identify how business intelligence shape the management practice.

1.4 Thesis structure

This thesis introduces three key theoretical frameworks from which a theoretical lens is formed which can be used to interpret the research findings in contrast. The literature review begins by introduction to the frameworks of business intelligence, then moving to explain the frameworks of strategy-as-practice and lastly the concept of sociomateriality in relation to the research agenda. Figures and tables will be provided throughout this research to provide clarity and structure between these frameworks and parts of the study. After these three frameworks, a synthesis is provided concluding to theoretical lens which is compressed from the used theories in order to effectively analyse the empirical data in relation to theory.

In the third chapter, methodology of this research will be discussed in relation to the set research agenda. The chapter will introduce the methods of data collection and the structure of the empirical section of this study. The case study will be further elaborated to provide clarity of the empirical contribution to this study and how it is related to the premise of this research. Fourth chapter will discuss the findings of the research and draws analysis from them by utilizing the theoretical lens. This chapter aims to clarify the relation between the theory and empirical parts of this study and how well they contribute to each other. Lastly the conclusions provide the outcomes of this research and provide more compressed analysis of the research results. All of the chapters throughout will have supporting figures and tables to further elaborate the explanations in the text.

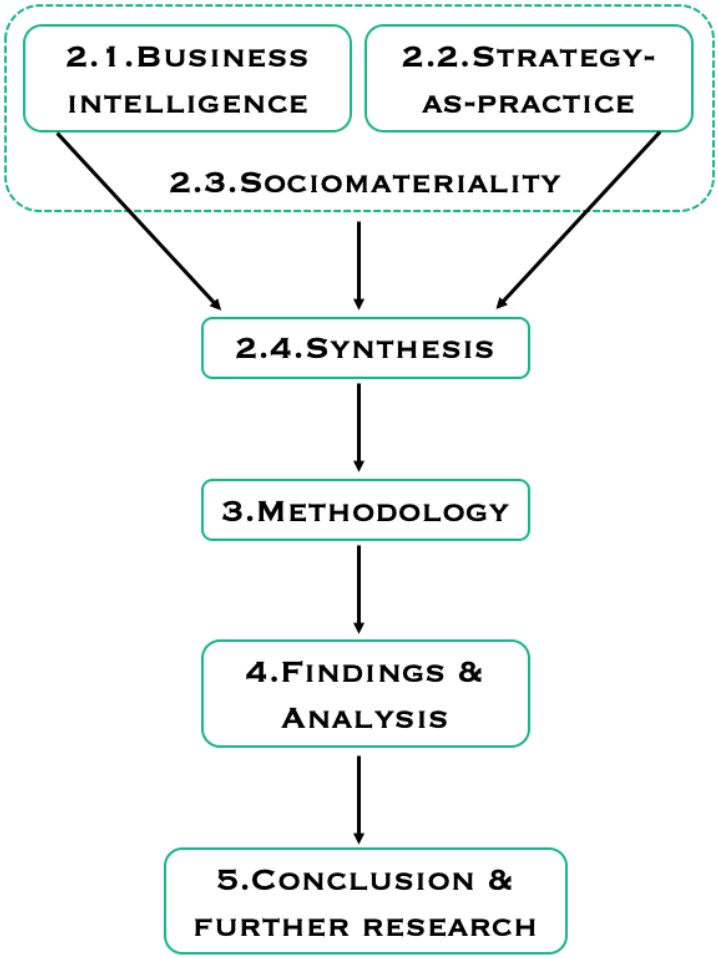

Figure 2 Thesis structure

2 LITERATURE REVIEW

The literature review will introduce three key frameworks of research to better understand the research agenda and the premise of this thesis. These three frameworks represent the cornerstones of this study as they aim is to more deeply explain the theoretical approach to practices and provide a comprehensive understanding on how these frameworks are connected to one another, further creating the lens through which the results of the study can be analysed. First the topic of business intelligence is discussed on broader perspective and how it impacts the decision making in organizations. Then diving deeper into the six research clusters of BI to further explain the roots and future of business intelligence. Second topic is strategy-as-practice which provides an outlook into the concept of strategizing and organizational development. In the context the constructs and deconstructs of SAP are also discussed. Thirdly introducing a deeply theoretical and complex subject of sociomateriality, by synthesizing the key concepts into a compact package to provide the means to understand one of the key binding factors between organizational development and information systems.

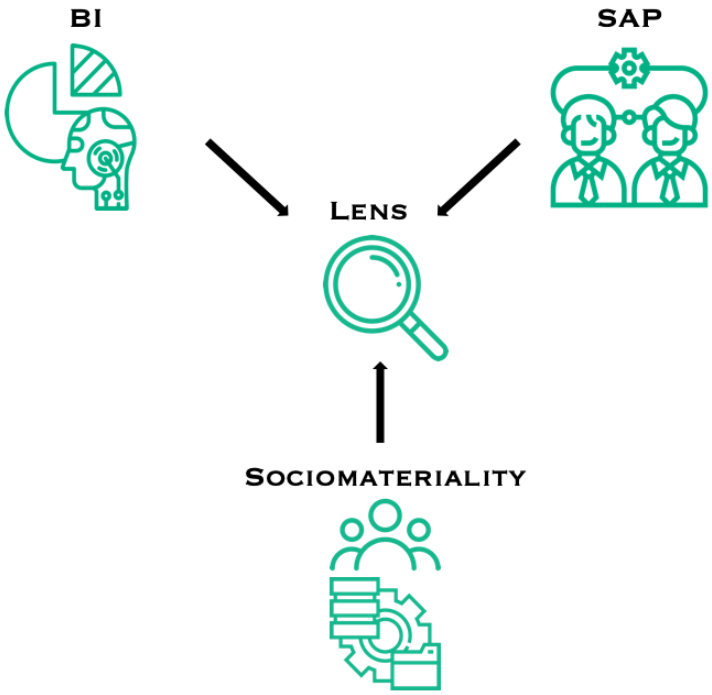

Figure 3 Construct of the theoretical lens

2.1 Business Intelligence

As a term business intelligence, commonly known as BI, has been used as an overarching term to describe different types of data tools which contribute to a business use (Fink, Yogev, & Even, 2016). There exists various types of different BI platforms, which operate differently from one another. In order to identify these differences and system developments Gartner Inc. analyses BI and analytical platforms annually to distinct each other on a matrix, as illustrated on figure 4 (Richardson, Sallam, Schlegel, Kronz, & Sun, 2020). Gartner is specifically open up how they evaluate business intelligence and analytics platforms, and that is why their research is considered as a fair instance to draw comparisons from (Richardson et al., 2020).

It is also important to distinct analytics and business intelligence platforms from business intelligence tools, which differ from each another to certain extent. For example, as can be seen from the figure 4, Microsoft has the leader role according to Garters evaluation (Richardson et al., 2020). One of the key-reasons for that is that Microsoft ecosystem itself is massive containing a plethora of data storing and processing tools, which can be considered as part of a well-functioning BI infrastructure (Microsoft, Inc.,2020).

Platforms are more extensive collection of tools provided by a company, which could include for example a cloud computing environment, Datawarehouse and a business intelligence tools (Richardson et al., 2020). Whereas business intelligence tool could be an individual software that enables necessary functions to perform analytical operations and model user experience (Richardson et al., 2020). Proceeding forward in regard to the topic, is good to clarify that in this paper the perspective of BI is more focused on the business intelligence tool perspective, as it is the core technical frame that the managers interact with. Analytical platforms could be described as the environment for sufficient business intelligence.

Figure 4 Magic Quadrant: Business Intelligence & Analytics Platforms Compared (Richardson et al., 2020)

One of BI's core purposes today is to bring analysed data visible to everyone inside an organization, not only to the developers or analysts, but to everyone who can benefit from the data visibility (Flink et al. 2016). This acts as an enabler to develop one's own actions inside an organization and point out possibilities that can be interpreted from the data.

BI is claimed to be one of the most substantial tools to bring data to the forefront of business decision-making and development, due to its capability extract and analyse the data in relation to itself and then effectively represent outcomes through visualizations (Arnott et al., 2017; Flink et al., 2016).

2.1.1 BI background, process and value creation

Business intelligence has been described differently by different scholars and researchers, the main dividing factor being that it is described as a product and process or a combination of these two (Trieu, 2007). BI as a term therefore can be understood in many different ways, because of the fairly free use of the term when describing various processes and tools linked to business intelligence (Trieu, 2007). BI systems are often built on two key element groups which are organizational and technical, these two together form a system that generates organization specific information according to the its unique needs (Trieu, 2007). These systems are often first built to provide insight based on historical information and to draw conclusions from it to develop current operations.

Need for business intelligence can emerge from different internal or external sources, which often acts as an ignitor to more wide-spread need for BI inside the organization. For example, marketing department needs to analyse customers behavioural patterns which sparks the first need to implement a BI solution, which could then cause a ripple-effect for sales department to analyse data from customer relationship management systems (CRM) (Trieu, 2017). Many researches have studied how business intelligence creates business value but only few researchers have raised the agenda of how to obtain it (Trieu, 2007).

Trieu (2007) researched the topic of obtaining business and organizational value from business intelligence to better determine its usefulness and how the research on it should be focused in the future. In his research Trieu (2007) studied the empirical research from information systems research field to identify how organizations draw value from business intelligence. He found that there was no direct comprehensive framework to study the empirical findings systematically in relation to organizational value creation, therefore, he created one, which is also being utilized to an extent in this research as well (Trieu, 2007). Trieu's (2007) studies empirically outlined a process so that organizations can draw value from BI if they invest effort in the system and utilize its potential, as otherwise it creates less value in relation. The research outlines heavily the impact of organizational factors affecting value creation of BI (Trieu, 2007).

Business intelligence has been used for various different purposes in order to develop the organizational capacity to adapt to change, as well as, to get ahead of competition. For some organizations it is the need to better oversee production or foresee maintenance issues while to others, it is the need to better comprehend the customer segment's needs (Richardson et al., 2020). Out of different use cases these needs can be categorized into groups according to what type of need they fulfil. The most common approach or first engagement to business intelligence is to use it as decision support system, it provides companies the first glance to BI and its capability to provide useful information that can be validated easily (Trieu, 2017).

The figure 5 is modelled after Trieu's (2007) synthesis from models made by Soh and Markus (1995), Schyren (2013), and Melville, Kraemer and Gurbaxani (2004). The synthesis is compressed from the most prominent three papers which introduce models that offer clarity on how information systems create business value, contributions of the writers to each section of the synthesis are marked on the right side of the figure. The model provides overall clarity on how BI is implemented and how its proper usage leads to impact the competitive processes that contributes to the organization's success (Trieu, 2007). The factors affect the processes specifically in different stages, but they are also affecting overlappingly. This interplay constitutes the most on the BI impacts which makes it difficult to accurately analyse how factors directly contribute to the impacts (Trieu, 2007).

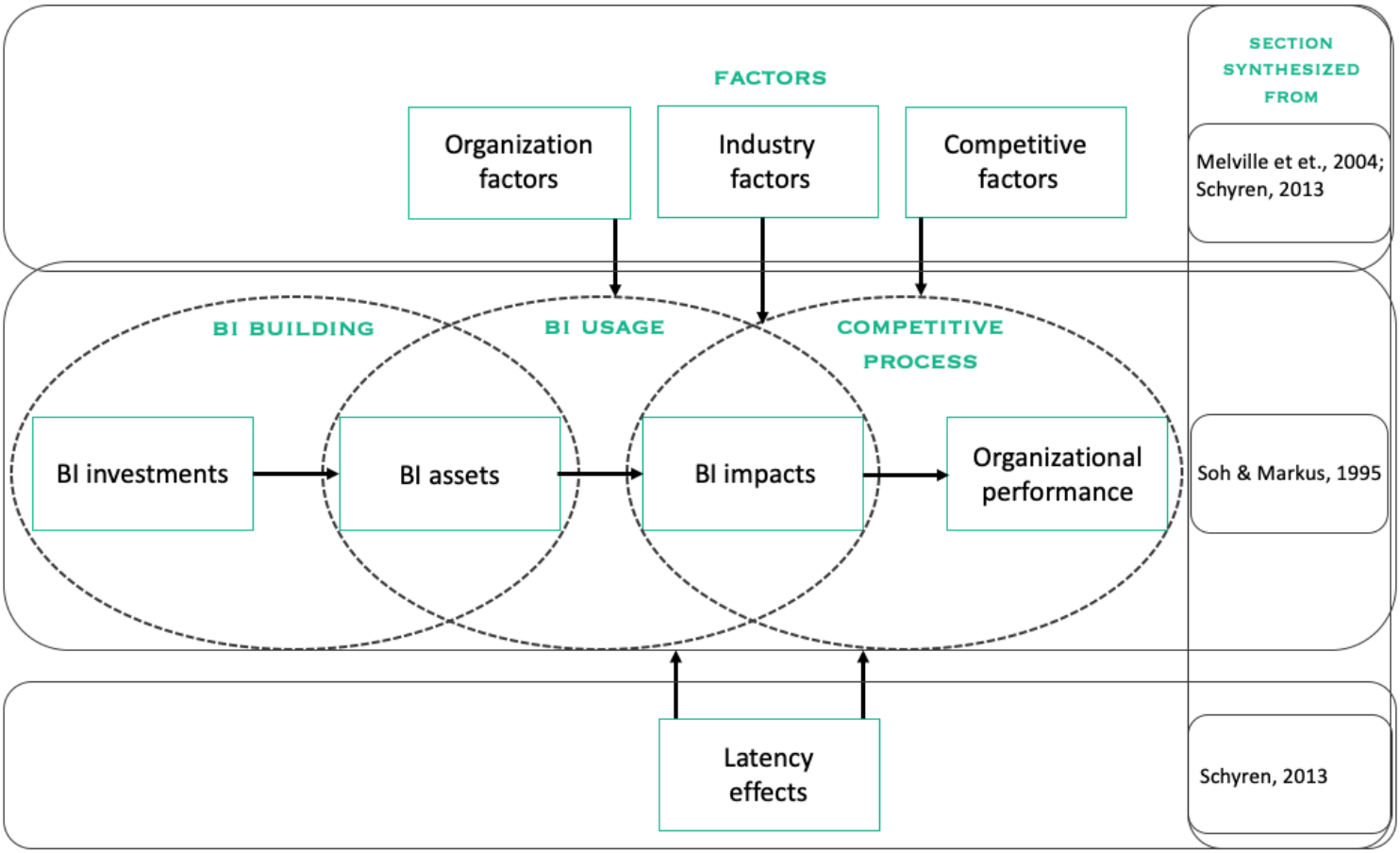

Figure 5 A model on how business intelligence generates business value (Adapted from Trieu (2017))

BI building is a process which is heavily impacted by the approach that management takes on it, either by applying BI on a larger scale from the start or by adapting it first to a specific section of the business processes such as finance or human resource functions (Trieu, 2007; Flink et al., 2016). The approach is often dictated by need and budget but often the building process takes time due to the process of data validation process and user experience design. Management's commitment to the development process is also in a key-role because the system is meant to serve the purpose of providing on-time KPI data and to draw new insights from the data and only the people who are concerned by these, can validate result and decide if it truly serves its the purpose (Trieu, 2007; Flink et al., 2016). The successful combination of these aspects then leads to creation of well-functioning BI asset (Trieu, 2007; Flink et al., 2016).

Adapting these built business intelligence solutions are often tested in the BI usage stage, where it they can be proved to be either effective or ineffective (Trieu, 2007; Soh & Markus, 1995). Usage is affected by firm factors which are organizational traits such as size and the capacity to absorb information and utilize it on an organizational level (Ramamurthy, Sen & Sinha, 2008). This step according to researchers has been found to be more successful in bigger organizations as they are more likely to utilize business intelligence's potential (Soh & Markus, 1995). If the BI assets are ineffective, they do not create actionable impacts, but if the assets are found effective, they create business value through impacts (Trieu, 2017; Soh & Markus, 1995).

As afore mentioned, BI impacts are most affected by the number factors in play and in combination they determine the volume of the impact (Trieu, 2007). In addition to affecting firm factors, the impacts are determined also buy industry and competitive factors which are acting as external determinants to impacts and through that to the organizational performance overall (Trieu, 2007; Soh & Markus, 1995). The competitive process reveals the true value of business intelligence assets and wheter they are adapted to create dynamic business value or not.

It is important to note that first adaptions of BI rarely begin immediately to generate dynamic business value, as the usage and competitive process are impacted by latency effects (Schyren, 2013; Trieu, 2007). Acceptance, adaptation, implementation, and analytical modelling are processes that take time and multiple iterations to successfully produce business value dynamically, that can be utilized in competitive efforts, and that the analysed data mirrors the current market situation (Schyren, 2013; Trieu, 2007). Successful adaptation of business intelligence is therefore a result of multiple iterations that validate the logic behind the analytical model and strategic sensemaking (Trieu, 2007).

2.1.2 Theoretical directions

Business intelligence has its theoretical roots drawn from two different scientific communities which are business and information technology (Talaoui & Kohtamäki, 2020). These communities began developing theories in the 1980s about business and information systems and how they could collaborate with one another. In the late 2000s business intelligence moved to be researched mainly by information technology community which then concluded business research community to fall behind from the business intelligence research (Talaoui & Kohtamäki, 2020). The cross-disciplinary relationship provides BI research a foundation, where it truly serves the both research streams as it is also heavily impacted by both (Richardson et al., 2020; Talaoui & Kohtamäki, 2020).

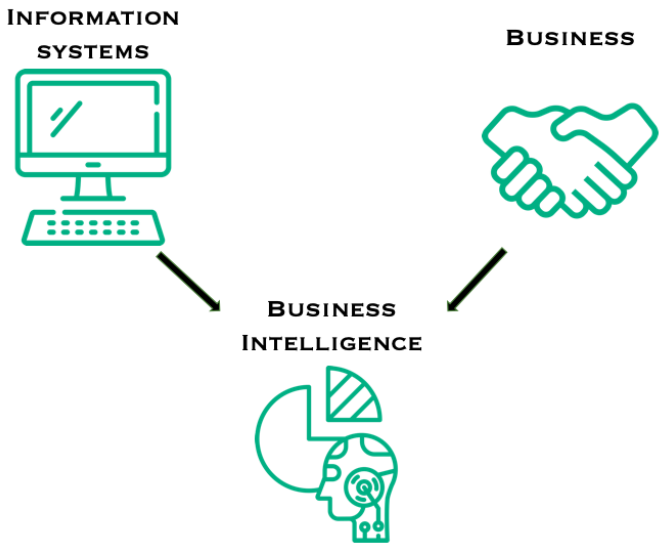

Figure 6 Foundational roots of business intelligence

Talaoui and Kohtamäki (2020) synthesized theories to identify how the field of BI has evolved and to structure the scientific landscape of business intelligence. The research identified six main clusters that represent different research and implementation orientation in BI. These clusters are environmental scanning, market intelligence, competitive intelligence, analytics technologies, analytics capabilities and the afore mentioned decision support (Talaoui & Kohtamäki, 2020). Due to the division between the research communities on the subject of BI these six clusters can be grouped in two as well. None solemnly belong to only one of the communities as they are affected by the

one another in some manner, however, a clear focus between the two can be identified (Talaoui & Kohtamäki, 2020).

Environmental scanning (ES), market intelligence (MI) and competitive intelligence (CI) clusters are mostly studies by the business research community (Talaoui & Kohtamäki, 2020). These business intelligence research clusters study the external environment to identify market conditions and risks within those markets, which then led to internal factors such as product development (Hubert & Daft, 1987). This data collection in the beginning happened mostly through more or less formal human sources, so no particular system being used to gather the information about the competitive market scene (Talaoui & Kohtamäki, 2020).

Analytics technologies (AT), decision support (DS) and analytics capabilities (AC) clusters are mainly studied by informatics research community (Talaoui & Kohtamäki, 2020). The clusters in this group focus on the internal development, at the beginning by studying DS and later in addition through practice theory and dynamic capabilities (Talaoui & Kohtamäki, 2020; Regnér, 2003). The aim has been to shift toward organizations micro-level operations and how to create a dynamic environment to implement business intelligence in order to create more adaptive analytical models towards business intelligence capability (Akter et al. 2016; Talaoui & Kohtamäki, 2020).

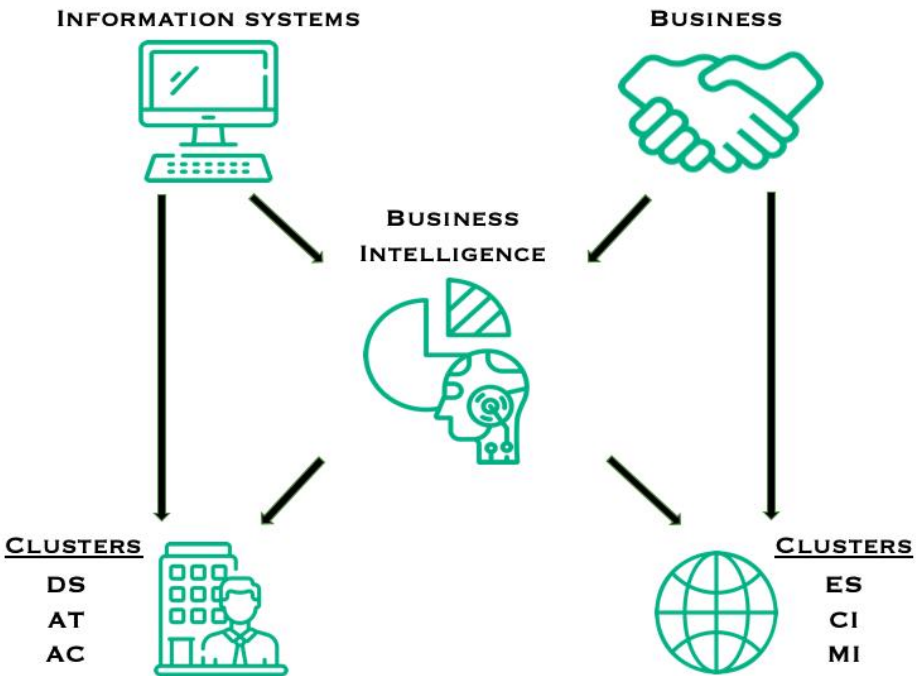

Figure 7 Constructs and Deconstructs of BI

Figure 7 illustrates the clusters as deconstructs of business intelligence in relation to its roots. From this it can be interpreted that the affecting relationships between BI clusters and where they are adapted from through business intelligence share an causal relationship to one another. The clusters are not as clearly divided as they might seem at first hand, the figure merely acts as an illustration on how the six clusters are grouped accordingly (Talaoui & Kohtamäki, 2020).

Table 1 Theoretical papers about the BI clusters between time periods (Adapted from Talaoui & Kohtamäki (2020))

BI Cluster	Before 2000s	2000 - 2010	2010 - 2015
ES	EL Sawy (1985); Daft, Sormunen & Parks (1988); Jennings & Lumpkin (1992); Brownlie (1994); Bernhardt (1994); Boyd & Fulk (1996); Elenkov (1997); May, Stewart, Sweo, Stewart & Sweo (2000)	Walters, Jiang & Klein (2003); Cho (2006); Qiu (2008)	Fabbe-Costes, Christine, Margaret & Taylor (2014); Reinmoeller & Ansari (2016); Pryor, Holmes, Webb & Liguori (2019)
CI	Ghoshal & Ki (1986); Ghoshal & Westney (1991); Peyrot, Doren, Van, Allen & Childs (1996)	Chen, Chau & Zeng (2002); Abramson, Currim & Sarin (2005); Wright & Calof (2006); Fleisher (2008); Tanev & Bailetti (2008); Liu & Wang (2008); Trim & Lee (2008); Dishman & Calof (2008); Tanev & Bailetti (2008); Wright, Eid, Fleisher & Fleisher (2009)	Opait, Bleoju, Nistor & Capatina (2016); Grover, Chiang, Liang & Zhang (2018); Merendino et al. (2018); Wang, Kung, Wang & Cegielski (2018)
MI	Maltz & Kohli (1996); Slater & Narver (2000)	Le Bon & Merunka (2006); Christen, Boulding & Staelin (2009)	Zheng, Fader & Padmanabhan (2012); Hughes, Le Bon & Rapp (2013); Ahearne, Lam, Hayati & Kraus (2013); Mariadoss, Milewicz, Lee & Sahaym (2014); Kumar, Saboo, Agarwal & Kumar (2020)

DS	Jones & McLeod (1986); Volonino, Watson & Robinson (1995);	Heinrichs & Lim (2003)	Elbashir, Collier & Sutton (2011); Ramakrishnan, Jones & Sidorova (2012); Kowalczyk & Buxmann (2015); Audzeyeva & Hudson (2015); Arnott, Lizama & Song (2017); Aversa, Cabantous & Haefliger (2018)
AT	McCrohan (1998)	Kohavi, Rothleder & Simoudis (2002); Srivastava & Cooley (2003); Chung, Chen, Nunamaker & Nunamaker (2005); Chau, Shiu, Chan & Chen (2007); Li, Shue & Lee (2008); Lin, Tsai, Shiang, Kuo & Tsai (2009)	Chaudhuri, Dayal & Narasayya (2011); Xu, Liao, Li & Song (2011); Cheung & Li (2012); Lau, Liao, Wong & Chiu (2012); Moro, Cortez & Rita (2015); Gupta & George (2016); Brichni, Dupuy-Chessa, Gzara, Mandran & Jeannet (2017); Hallin, Andersen & Tveterås (2017);
AC	Leidner & Elam (1993); Leidner & Elam (1995); Leidner, Carlsson, Elam & Corrales (1999)		Shollo & Galliers (2015); Akter, Wamba, Gunasekaran, Dubey & Childe (2016); Côrte-Real, Oliveira & Ruivo (2017); Wamba et al. (2017); Constantiou et al. 2019); Mikalef, Boura, Lekakos & Krogstie (2019); Ghasemaghaei & Calic (2020); Bordeleau et al. (2020)

2.1.3 Business intelligence clustering

Market intelligence, decision support systems, environmental scanning, competitive intelligence, analytical technologies and analytical capabilities are all clusters that combine and describe different types of analytical and research orientations (Talaoui & Kohtamäki, 2020). These orientations and their developments mirror the developments of business intelligence on more holistic manner.

Environmental scanning (ES) focuses on the analysis of the external drivers providing outlook into the external affects and effects (Talaoui & Kohtamäki, 2020). As can be noted from the table 1 environmental scanning as a process is heavily rooted to theories and papers written between 1980s and 2000's. Environmental scanning at the time represented the more manual and human oriented data collection, meaning that most of the analysed data was gathered from humans by humans and analysed by business oriented people who had deeper knowledge of the market at the time (Jones & McLeod, 1986; Talaoui & Kohtamäki, 2020). This analytical orientation led the way later on for competitive and market intelligence, which are more focused external analytical orientations. ES represents a more holistic approach to analyse environmental conditions which on short or long-term affect the business operations (Pryor et al., 2019; Talaoui & Kohtamäki, 2020).

Competitive intelligence (CI) cluster has developed a top of the more overarching environmental scanning and focuses to draw analytical insight from the competitive forces (Talaoui & Kohtamäki, 2020; Wright & Calof, 2006). Developing CI effects, the organizations responsiveness to changes in the competitive scene, therefore, providing an organization valuable insight. For example, a company wants to put out a new product, but they want to be sure it provides the targeted segment the best option available. In this case competitive intelligence can aid the company's cause to interpret indications of the upcoming products of the competitor and if their product offers a better selection of features than the rivals. Utilizing the knowledge of the competitive outliers, provides competitive intelligence to offer valuable information which combined with other relevant market data can provide outlook into better risk coverage and market potential.

Market intelligence (MI) is the third more externally focused analytical orientation, which could be considered as a separate and a bit more holistic approach to competitive intelligence (Talaoui & Kohtamäki, 2020; Le Bon & Rapp, 2013). MI provides an organization critical insight from the markets where the company already functions on or from markets that the organization wants to penetrate into (Le Bon & Rapp 2013). Great sources to utilize for market intelligence are public instances like OECD and Confederation of Finnish industries, as these instances offer general data related to specific fields of operations and the economic insight to back their claims. The MI can also focus on internally collected data or be based on data that other private instances have collected and can be considered as reliable. If a company wants to expand their operations to abroad, they need to be aware of the requirement of the markets they operate to succeed in their expansion. While models like PEST or its more recent version PESTEL provide a solid framework to facilitate environmental scanning, companies still need to compress reliable data from the markets to be analysed through the framework the in the most effective way (Aguilar, 1967). Utilizing MI to execute reliable and ongoing analysis on the market requirements, risks, and demands among other important variables can offer the company more comprehensive outlook (Le Bon & Rapp, 2013)

Decision support (DS) systems differ from ES, CI, MI by concentrating on more of operational effectiveness and development and is more researched on the technical side of business intelligence (Talaoui & Kohtamäki, 2020). DS represents the more comprehensive outlook on BI and how the value can be best utilized from such a source, offering moreover a birds-eye-view to the collaboration of information's systems and business decision-making (Trieu, 2017; Talaoui & Kohtamäki, 2020). The load of information that organizations gather today to their ERP's or on spreadsheets, can be staggering. Driving valuable insight from such collected data, can offer completely new perspective for organizations operative facilitators or it can simply provide further verification that they are on a right path. DS business intelligence aims to provide analytical information to be used in a way that an organization has a comprehensive perspective to all parts of critical operations, therefore, providing overall support to the decision-making process on more a general perspective (Trieu, 2017; Arnott, Lizama & Song, 2017)

Analytical technologies (AT) cluster represents the orientation where analytical insights can be drawn faster and more efficiently to serve the need when it emerges (Talaoui & Kohtamäki, 2020). Ad hoc approach to business intelligence is one of the remarks of the AT cluster and it aims to bring business insight to an organization fast, but it is noteworthy to point out that data verification has to be still included in the process so that the provided insight can be valuable (Cheung & Li, 2012). Making business intelligence efficient and properly embedding its development in the organizational processes to ensure more flexibility and efficiency for the solution to function in an agile manner (Cheung & Li, 2012; Talaoui & Kohtamäki, 2020)

Analytical capabilities (AC), much like DS and AT, is more researched by the information technology community than the business research community (Talaoui & Kohtamäki, 2020). However, it is also a cluster that has a lot do with practise theory and strategy-as-practise, as well as sharing some similarities with the concept of sociomateriality (Talaoui & Kohtamäki, 2020; Côrte-Real, Oliveira & Ruivo, 2017). As AT represents the ad hoc approach to business intelligence AC intends to apply the operational analytics into capabilities meaning that the processes are deeply embedded in the process of business development and considered as concrete part of it and they evolve alongside the other organizational development (Côrte-Real, Oliveira & Ruivo, 2017; Leidner & Elam, 1993). The AC can also incorporate artificial intelligence in the core operational activities which increases the reliance of such an analytical processing while also providing a deeper insight into the operations themselves (Côrte-Real, Oliveira & Ruivo, 2017; Leidner & Elam, 1993; Talaoui & Kohtamäki, 2020).

2.2 Strategy-as-practice

Traditional strategy research concentrates on thorough planning, industry factors, organization performance and the outcomes of strategy, which are key areas in the field of strategic management (Jarzabkowski & Spee, 2009). Whereas, the more recent research orientation that is known as strategy-as-practice (SAP), focuses more on the people behind strategies and processes which create strategic actions (Vaara & Whittington, 2012). Earliest notations of SAP's history can be traced to 1950's, but it wasn't until the 1990's when the field was recognized in its current name and form (Whittington, 1996; Golsorkhi, Rouleau, Seidl & Vaara, 2010). The reason for this difference lies in the discussion amongst researchers that theory versus concrete actions in practical strategy formulation and implementation differ from each other (Jarzabkowski & Whittington, 2008). Strategy-as-practice focuses more on the concrete actions made in the organizations on its different levels as well as social culture and managers role in strategy work (Whittington, 2007; Chia & MacKay, 2007; Golsorkhi et al., 2010).

The traditional strategy research can be fairly controversial as it is interpreted different ways by different scholars (Venkateswaran & Prabhu, 2010). This applies to the field of SAP as well, as the research focuses heavily on studying the actions, which is heavily influenced by practices that cannot be clearly categorized whether they are strategic or not (Fenton & Langley, 2011; Jarzabkowski & Spee, 2009). SAP observes how people inside an organization create strategy through actions, rather than predefining how strategy should be implemented on each level. Social constructs and practices play a significantly higher role compared to traditional strategic management research, as they contribute to the management practice on a daily basis (Orlikowski, 2010; Chia & MacKay 2007).

SAP has been criticized due to its lack of focus to true organizational performance metrics, indicating to the economic measurement techniques (Venkateswaran & Prabhu, 2010). As SAP is heavily focused on the practice in its many forms, it rarely places financial measurement in the spotlight. Although, in the context of SAP it can be understood why the metrics are not in more central role. For SAP research, while focusing

on the practicalities and everyday activities of employees and managers, it might be challenging to synthesize everyday strategic activities with possible financial outcomes. Considering that SAP focuses on activities of people, the financial outcomes in contrast are fairly speculative when considering the linkages. (Venkateswaran & Prabhu, 2010; Vaara & Whittington, 2012).

Conventional strategic management research has been criticized for its lack of practicality or, moreover, its link to inefficient implementation (Jarzabkowski & Wilson, 2006). Researchers took a note of this undesired gap between the conventional approach and practicality, which then after formulated the field of SAP (Jarzabkowski & Whittington, 2008; Jarzabkowski & Wilson, 2006). SAP acts as a mediator between conventional strategy research and practice, by validating in the theoretical strategy approach matches the practical implications. The focus point on the practice contributes the best by highlighting the real issues that organizations come across, which then on helps in identifying problems in planning and implementing strategy (Golsorkhi et al., 2010; Johnson, Melin & Whittington ,2003).

The key differences between conventional strategic management research and strategy-as-practice could be summarized as follows:

- SAP is less focused on the financial aspects of a strategy
- SAP emphasizes the processual view to strategy
- SAP places people in the centre of strategy process
- SAP is not in competition with the conventional perspective

As described above, SAP views the processes in relation to strategy, but it also considers the people in the centre of those processes. Conventional strategic management research can have references to the people behind strategy process, but it has been noted that in many cases its absent from the overall perspective (Johnson et al., 2003; Jarzabkowski & Spee, 2009). If employees are mentioned in the conventional research context it is focused solemnly on the managers perspective and the managers role in enforcing strategy (Johnson et al., 2003). SAP in contrast considers the strategy implementation where people are truly connected to it as they have the most substantial role when considering the outcomes of an implemented strategy (Jarzabkowski, Balogun & Seidl, 2007). The

role of individuals will be further discussed later on, as this paper takes focus into the management practices through managers experiences.

As can be noted, in contrast SAP and conventional strategic management share common ground even though the perspective is different. As research streams they do not compete with one another, but rather support each other's narrative and strategic development as a field (Jarzabkowski & Spee, 2009). The two do not act as separate fields that are unrelated to one another, but they do have a clear difference on their approaches to strategy and are therefore separated concepts to view strategy (Whittington, 2003; Fenton & Langley, 2011; Venkateswaran & Prabhu, 2010).

Table 2 SAP and Conventional strategic management differences

	Strategy-as-practice	Conventional strategic management
Focus: Theory/Practice	Practice	Theory
Perspective	Micro	Macro
Fundamental theoretical foundation	Sociology combined with strategy process	Economics
Strategic outcome focus	Process	Financial
Orientation	People	Organization

2.2.1 Strategy-as-practice background and linkages

As afore established SAP shares a lot of common ground with the conventional strategic management research and clear differences can be noted. However, SAP shares theoretical baseline from other areas of research as well. Due to a fact that the research stream considers the practice approach, strategy-as-practice is heavily impacted by social sciences (Suddaby, Seidl & Lê, 2013; Schatzki, Knorr-Cetina & von Savigny, 2001). Apart from social sciences many other linkages could be made to other theoretical foundations such as the practice theory, however, there exists different views on how to

interpret the roots of SAP field of study as researches do not share unilateral opinion regarding it. (Johnson et al., 2003; Vaara & Whittington, 2012; Tsoukas, 2010).

Vaara and Whittington (2012) discuss the double meaning of practice in the concept of SAP and argue that it is can be seen from two perspectives, which are to exist alongside practitioners and to commit to theoretical work of sociology. These two views therefore complement one another and offer theoretical and practical support to strategy-as-practice research. SAP shares common approaches with strategy process (Foss, 2011; Burgelman, 1983; Pettigrew, 1985; Mintzberg & Waters, 1985) and with approach of Micro-Foundations (Eisenhardt, Furr, & Bingham, 2010). One of the key notable differences between these approaches is that strategy-as-practice draws more from the perspective of social practices and actions (Foss, 2011; Burgelman, 1983)

Strategy process has been argued to be the forefather of SAP research because of it is toward practice orientation in comparison to the conventional strategy research (Baraldi, Brennan, Harrison, Tunisini & Zolkiewski, 2007). Then again as Chia & MacKay (2007) point out that, to some extent, not all researchers acknowledge the linkage between SAP and the process perspective. As processual view is more considered in the organizational context phenomena's, SAP is focused on the managerial perspective and more specifically the actions of the managers (Whittington, 1996). Although, Whittington (1996) underlines these differences it does not refer to a fact that SAP wouldn't be influenced by organizational factors and therefore be disregarded and vice versa to process perceptive. The third way to view the linkages between the two is that they overlap to some extent or that SAP is an extension of the process perspective (Baraldi et al., 2007; Whittington, 2007).

Strategy work (Vaara & Whittington, 2012) as a concept means the practice of strategizing, therefore, seeming similar to the strategy-as-practice approach. However, the differences still exist in the similar context of organizational versus individual approach between strategy work and SAP (Vaara & Whittington, 2012). To clarify this difference, it could be presented so that strategy work regards the organizational processes and outcomes whereas strategy-as-practice considers the more individual practices contributing to the organizational cause.

Considering the above-mentioned linkages to strategy-as-practice and the similarities with it, it could be stated that SAP is a research stream that is populated through multitude of other research orientations. Some of which are challenged by different scholars from different research groups (Chia & MacKay, 2007; Burgelman, 1983). However, most linkages differ by perspective, which in many cases are related to economic factors or organizational processes leaving the role of individual performers out of scope. On this regard strategy-as-practice ties into sociology and utilizes its findings in the strategy field through SAP (Chia & Rasche, 2010; Orlikowski, 2010). Illustration of these foundational roots can be found below on figure 8.

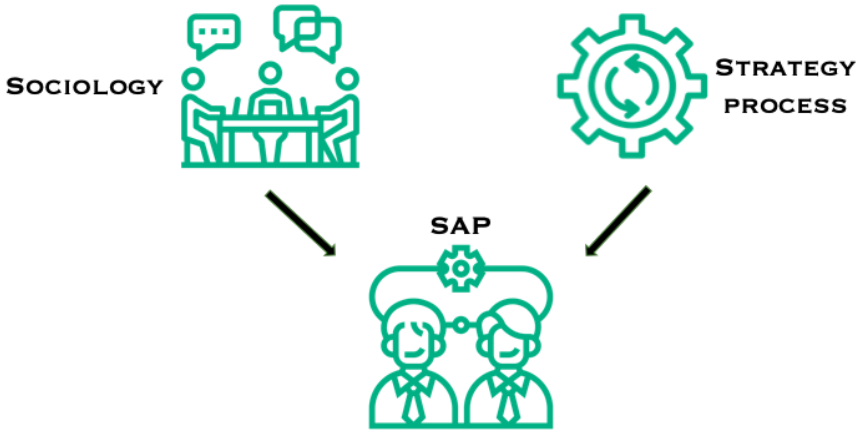

Figure 8 Foundational roots of strategy-as-practice

Vaara and Whittington (2012) researched the streams of organizational theory and strategic management in relation to actions taken by individual and how that shapes organizations and highlighting the emergence of strategic actions coming from individual practices. Their research heavily contributes to this paper, as it studies the importance of individual practices in organizational context and how individuals can affect massively on how the organization is shaped and how it perceives value from its operations (Vaara & Whittington, 2012).

2.2.2 Theoretical directions

The prior figure illustrated a very macro perspective on how strategy-as-practice has drawn from the conventional strategic management, strategy process and from sociology. There is a plethora of other more specifically linking research streams that are channelled through these established three, such as the dynamic capabilities (Regnér, 2003; Salvato, 2003) and the tradition of Weickian sensemaking (Rouleau, 2005; Balogun & Johnson, 2005). Social theorists have also contributed a huge amount to the institute of strategic management research, which deepens the connection between the economic and metric focused research with practice through social theories (Vaara & Whittington, 2012).

Considering how these two research groups intertwine into research orientation that is strategy-as-practice, broadens the lens on how strategy and strategic actions can be overviewed. Whereas conventional strategic management is intensively focused on the financial outcomes of strategies, but the affecting factors are not considered as deeply in this way of observation (Furrer, Thomas, & Goussevskaia, 2008). SAP's perspective to performance deals a lot with the concepts of manager's or individuals' performance, which is not tied to the economic performance metrics that conventional research stream recognizes as paramount observation theme (Goffman, 1959).

This deep, and understandable linkage, to economic performance has also made it more difficult to observe non-profit entities in the strategic management context (Nag, Hambrick, & Chen, 2007). As the focus was deeply in the quantitative metrics up until the beginning of 2000's the research stream of strategic management was neglecting the qualitative side of strategy research (Molina-Azorin, 2009). Through the more sociologic oriented approach, that is SAP, it was possible to observe the concrete actions of managers from very close distance. This then on deepens the understanding of the reasons behind certain strategic actions, behind the economic metrics and the pivotal role that individuals play in this context (Mantere, 2005; Regnér, 2003).

Table 3 Theoretical focus, key papers and SAP contribution group (Adapted from Vaara & Whittington (2012))

Theoretical focus	Key papers	Contribution group
Vygotsky: Activity theory	Jarzabkowski (2003), Jarratt & Stiles (2010), Jarzabkowski & Balogun (2009)	Practices, Praxis
Critical discourse theory	Vaara, Kleymann, & Seristö (2004)	Practices
Critical discourse analysis	Vaara, Sorsa & Pälli (2010)	Practices, Praxis
General practice theory	Molloy & Whittington (2005), Jarzabkowski & Fenton (2006), Hodgkinson, Whittington, Johnson & Schwarz (2006), Whittington, Molloy, Mayer, & Smith (2006), Hendry, Kiel & Nicholson (2010), Regnér (2003), Fauré´ & Rouleau (2011), Hoon (2007), Paroutis & Pettigrew (2007), Nordqvist & Melin (2008), Angwin, Paroutis & Mitson (2009)	Practices, Praxis, Practitioners
Foucauldian discourse analysis	McCabe (2010), Kornberger & Clegg (2011), Ezzamel & Willmott (2008),	Practices
Latour: Actor Network Theory	Giraudeau (2008), Whittle & Mueller (2010), Denis, Dompierre, Langley & Rouleau (2011)	Practices, Praxis
Callon and Latour: performativity	Cabantous, Gond & Johnson-Cramer (2010)	Practices
Johnson: embodied cognition theory	Heracleous & Jacobs (2008)	Practices
Luhmann: theory of episodes	Jarzabkowski & Seidl (2008)	Practices
Carnegie School tradition	Ocasio & Joseph (2008)	Practices
Visual cognition theory	Eppler & Platts (2009)	Practices
Sociology of technology	Moisander & Stenfors (2009)	Practices

Anthropological ritual theory	Johnson, Prashantham, Floyd, & Bourque (2010)	Practices
Schatzki: practice theory	Jørgensen & Messner (2010)	Practices
Bourdieu: field, habitus and capital	Gomez & Bouty (2011)	Practices
Discourse and political theories	Maitlis & Lawrence (2003)	Praxis
Dynamic capabilities theory	Salvato (2003)	Praxis
Garfinkel: ethnomethodology	Samra-Fredericks (2003)	Praxis
Weickian sensemaking	Balogun & Johnson (2005), Stensaker & Falkenberg (2007), Rouleau (2005), Rouleau & Balogun (2011)	Praxis, Practitioners
Resource-based view	Ambrosini, Bowman, & Burton-Taylor (2007)	Praxis
Giddens: structuration theory	Jarzabkowski (2008), Mantere (2005)	Praxis, Practitioners
Social movement theory	Kaplan (2008)	Praxis
Rhetorical theory	Sillince, Jarzabkowski, & Shaw (2011)	Praxis
Discourse theory	Clarke, Kwon & Wodak (2011)	Praxis, Practitioners
Ricoeur and Montreal School communication	Spee & Jarzabkowski (2011)	Praxis
Critical analysis (Habermas and ethnomethodology)	Samra-Fredericks (2005)	Practitioners
The Foucauldian concept of power	McCabe (2010)	Practitioners
De Certeau: practice theory	Suominen & Mantere (2010)	Practitioners
Abbott: sociology of the professions	Whittington, Basak-Yakis & Cailluet (2011).	Practitioners

Table 3 illustrates the contributions of several researchers to the sociologic strategy perspective, known as SAP. The table summarizes the key papers into different theoretic focus groups, as well as, contribution groups which are practices, praxis and practitioners. From this is possible to view how many authors have contributed into certain areas as well as which scholars have contributed the most in terms of volume of papers (Vaara and Whittington, 2012). Overall, authors such as Vaara, Jarzabkowski, Whittington and Rouleau have contributed a lot the SAP research and emphasized the sociologic factors in play when considering strategy.

2.2.3 Practices, praxis and practitioners

SAP has regarded to contain three study areas know as practices, praxis and practitioners. These groups are tightly interlinked, and they share similarities, but they contain different elements within the strategy-as-practice field (Vaara & Whittington, 2012). In terms how practices contribute in this equation is through enabling and constraining individual decision makers, such as managers, in regard to their strategic contribution. These practices exist in various forms such as analytical, socio-material and discursive practices, therefore, it is suitable to use as illusive term as “practices” because it contains several viewing points (Jarzabkowski, 2003; Vaara & Whittington, 2012).

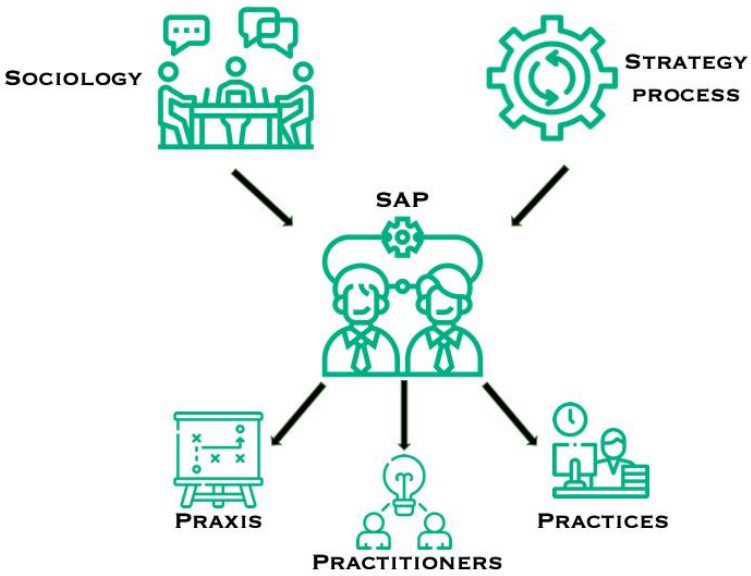

Figure 9 Constructs and Deconstructs of SAP

2.2.3.1 Practices

Strategic planning could be identified as one of the main focus areas of conventional strategic management, as it has been emphasized to a degree in related research (Whittington & Cailluet, 2008). In terms of practices, planning is considered as enabling factor to create something more complex in regard to strategic thinking, whilst still providing flexibility to the process. The practice of action oriented strategic planning makes it possible for individuals to collaborate across the responsibility areas in the company on a fairly detailed level, providing people in the organization a wider lens to understand the organizational interlinings (Jarzabkowski ,2003; Hendry et al., 2010). As a constraint, planning can be mandatory formal procedural practice that intentionally limits strategic change. In contrast to iterative strategic planning which builds knowledge through iterations, therefore developing and making more detailed and specific strategic moves (Giraudeau, 2008; Vaara & Whittington, 2012).

Analytical practices have gained foothold during the past few years in contrast to conventional way of thinking strategy (Jarrat & Stiles, 2010). Referring to the value that iteration produces in together with analytical approach. This aids in the process of identifying change and responding to it in a shorter timespan than conventional thinking deems necessary, as in the conventional method the strategic planning is done considering specifically the less immanent future (Jarrat & Stiles, 2010; Vaara & Whittington, 2012). As the business environment changes in more rapid manner, organizations need to be able to adapt to these changes faster as well, therefore the analytical and practical approach has been given more recognition (Jarrat & Stiles 2010; Vaara & Whittington, 2012).

Jarrat & Stiles (2010) have recognized three ways on how to use strategic tools which are routinized behaviour, imposed engagement, and reflective interaction. As prior mentioned, conventional thinking deems strategy as future oriented approach. This shares similarities with the routinized behaviour as it is a tool for those who consider future predictable, which in some industries is more possible than in others (Jarrat & Stiles ,2010; Vaara & Whittington, 2012). Imposed engagement enables to collaborate strategically with other organizational groups that differ from their own. Reflective interaction is then a step further from imposed engagement, as it considers wider range

of collaboration and reflecting upon it in iterative manner (Vaara & Whittington 2012). As these tools are not too literal, they should not be interpreted as such, but to be used as bridge to strategic creativity (Jarrat & Stiles, 2010). Strategy-as-practice focuses the social aspects of strategy and as such examines the social practices as well. These practices can be activities like workshops or meetings and more specifically social practices considers the practices which contain activities such as voting or scheduling, which are heavily impacted by social factors (Jarzabkowski & Seidl, 2008; Hodgkinson et al., 2006). In relation, discursive practices are commonly discussed which questions legitimating through aspects like problematizing and rationalizing. Discursive practices have often a lot do with concept of power (Vaara et al., 2004).

2.2.3.2 Praxis

The actual activities in strategy making is what defines praxis, in a simplistic way. In contrast to practices, praxis deals more with the process than the routines and power-play (Vaara et al., 2004; Whittington, 2007). Dynamic capabilities have been linked to praxis by Salvato (2003) pinning the daily activities in the strategy-as-practice concept. Regnér (2003) contributed to the praxis approach by linking emergent strategy with it. Strategy emergence (Mintzberg &Waters, 1985) is when strategies are being moulded by for example market conditions so that it need to be adjusted accordingly, in contrast to approach where strategies are made in a meeting room from start to finish (Vaara & Whittington, 2012).

One strongly linking topic to praxis is strategic sensemaking, which focuses on informal conduct between individuals and that shapes the strategy and they view on strategy (Balogun & Johnson, 2005). This way of sensemaking surrounding strategic shift in an organization can often be out of top managements control and it often has to do a lot with individuals not understanding the strategic shift (Stensaker & Falkenberg, 2007). This brings out a question regarding how and on what levels strategizing happens and is it always understandable to individuals who are not directly involved with the process but are an essential part in the execution process (Kaplan, 2008; Stensaker & Falkenberg, 2007). Vaara and Whittington (2012) surface a lot of problems regarding the interpretation of strategy on middle manager and individual levels in relation to praxis.

To the point where researchers do a multitude of qualitative studies on strategy-as-practice, based on the experiences of middle managers. Although, being aware of such possible shift changes caused by the informal communication, helps the researchers to identify this possible habit and react to it, as it also helps to understand the miscommunication between top and middle management levels (Samra-Fredericks, 2003; Vaara & Whittington, 2012).

2.2.3.3 Practitioners

Practices are about social routines and other social mechanisms and praxis is about the concrete process of strategy making, practitioners perspective studies the roles and identities of individual actors (Vaara & Whittington, 2012). Binding the views on interactions and their meanings together, in the middle of it, functions individual practitioners who each are their own complex entity (Rouleau, 2005). People have different levels of rhetorical and socio-political skills, as well as, their own heritage and history that are different form one another's. Individuals and their interactions create the complexity that eventually is responsible for strategies, through various means (Rouleau, 2005).

In contrast to conventional approach SAP is not focusing on top management but rather on the middle management and strategy specialists, offering new viewing points to why and how strategies succeed and fail (Angwin et al., 2009). The strategy specialists often being consultants, offer more overall perspective with multiple different contexts whereas middle managers have more substance knowledge and deeper social networks inside an organization (Paraoutis & Pettigrew, 2007; Mantere, 2005). Rouleau (2005) identifies middle managers as sellers and interpreters of strategy and they are therefore in pivotal role in the strategy implementation level, but most likely in the planning stage as well.
On the other hand, as they are in such pivotal role in implementing and planning the strategy, they are the ones whose skepticism and engagement affects the most (Suominen & Mantere, 2010). Middle management is the closest managing entity that affects concrete outcomes and sell the strategy to their subordinates. Therefore, if a middle manager is feeling disconnected from the strategy or its goals, they will most likely play

against it in some form or another (Suominen & Mantere, 2010). This then on has an effect on how the subordinates receive the strategy narrative.

2.3 Socio-materialism

2.3.1 Background

As SAP considers the business and strategy-oriented approach to practicing theory, sociomateriality can be described as technologies in practice (Feldman & Orlikowski, 2011). The research direction of sociomateriality aims to highlight the dependency between technological systems and social interaction that produces technologies that are considered relevant and evolved through social interaction (Orlikowski, 2000). Sociomateriality itself can be regarded as highly philosophical orientation which acts as a key concept to open up the very meaningful role of social interaction in relation to technological development in practice. Technological artefacts can be often valued by merely their performance predictability, tangibility, and stability amongst a plethora of technological details that can be described as building blocks of the system itself (Feldman & Orlikowski, 2011). However, to produce truly valuable technological system it needs to deliver outcomes situated as emergent, as well as, dynamic (Feldman & Orlikowski, 2011). Considering the figure 10, sociomateriality can be comprehended as an overarching concept between recurring social interaction through strategizing which develops analytical insights which then develops the strategizing, creating recurrence of development between SAP and BI (Feldman & Orlikowski, 2011; Talaoui & Kohtamäki, 2020; Giddens, 1976).

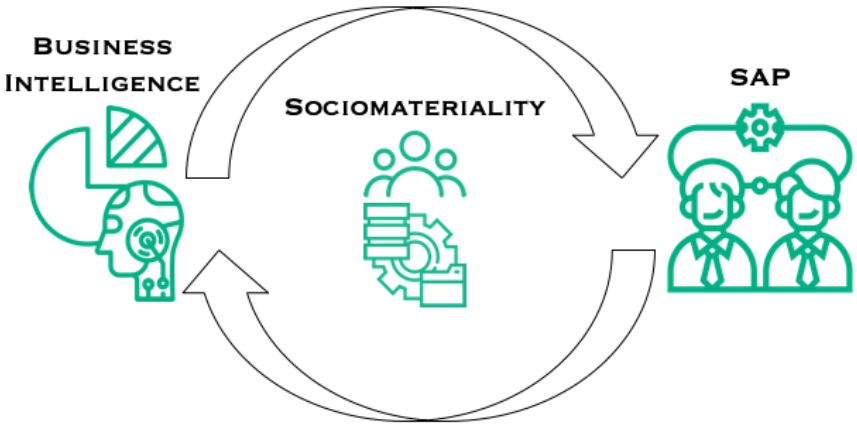

Figure 10 Concept of sociomateriality in relation to BI and SAP

2.3.2 Theoretical foundations

Practicing theory covers the concept of sociomateriality as well strategy-as-practice and opens up these terms into wider perspective of what practicing is (Feldman & Orlikowski, 2011). Practice lens is centralized around the idea that social life is continuously being produced and it is portrayed through recurrence of people's actions (Feldman & Orlikowski, 2011). Considering this lens in perspective a great number of attributes are affecting how people act in certain environments and under different types of power relationships (Feldman & Orlikowski, 2011). Feldman and Orlikowski (2011) point out the three cornerstones of positioning practice theory which outlay the principles on which SAP and sociomateriality can be further interpreted. The first viewing point is an empirical approach which draws attention into how people behave and execute tasks in organizational environment and in retrospective how it reflects on the organizational outcomes (Feldman & Orlikowski, 2011; Giddens, 1976).

These actions can include tasks which are performed as routines or as individual unrelated acts which have potential to affect the outcome in more of an indirect manner (Feldman & Orlikowski, 2011). Second approach is theoretical, which focuses on comprehending the dependencies between the taken actions by individuals and the organizational constructs, further on how these dependencies develop each side, therefore, ultimately effecting the activities which effect organizational outcomes (Latour, 2005; Feldman &

Orlikowski, 2011). Third approach is philosophical, which contains the premise of social reality as constructed of practices (Feldman & Orlikowski, 2011). Feldman and Orlikowski (2011) and Gherardi (2006) write that for the production of social reality, practices act as fundamental building block for such reality.

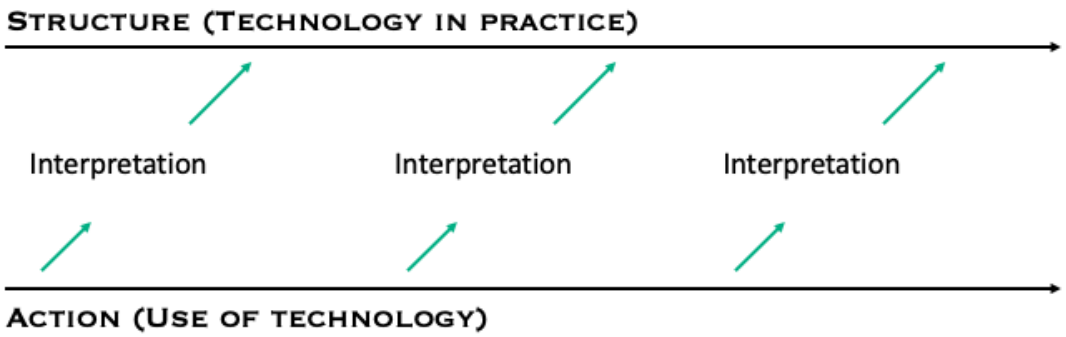

Figure 11 Practice lens (Orlikowski, 2000) adapted from Leonardi (2013).

Sociomateriality is concept born from combining practice theory, sociology and information systems, but it is a highly theoretical approach and better to be used as an overarching concept to explain relationships between social action and technological systems (Leonardi, 2013). The concept represents the philosophical argument that there is no material which is not social and vice versa, highlighting their dependency from each other (Orlikowski, 2000; Leonardi, 2013). Leonardi (2013) compresses the focus on two key research streams regarding sociomateriality, which are agential realism and critical realism.

Agential realism considers the reality of the concept of social and material and the key theorists regarding this research area are Orlikowski, Latour and Barad (Leonardi, 2013). Latour (2005) writes about actor-network theory which claims that terms social and material are separated terms from one another due to a scholarly need to distinct institution and human behaviour from one another, but Latour argues that there are no inherent differences between the two (Leonardi, 2013). Barad (1996) compliments the actor-network theory and draws perspective from it to some extent but takes on more epistemological approach to agential realism by trying to understand the surrounding

world (Leonard, 2013). Barad makes the claim that the world is conformed intersubjectively in people's endeavours to represent it, rather than being an abstract concept of reality (Leonardi, 2013).

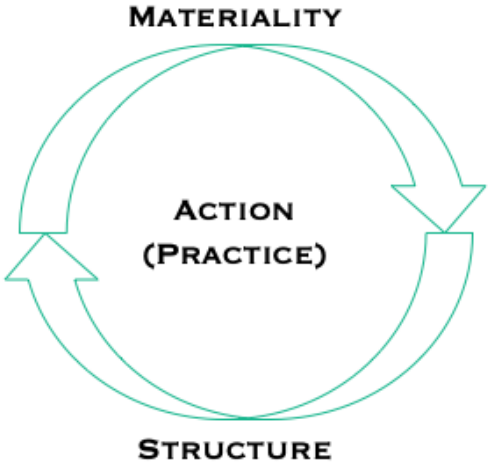

Figure 12 Sociomateriality Framework that is built on the Foundation of Agential Realism adapted from Leonardi (2013).

Structuration theory studies how sociomateriality shapes the organizational structures and therefore creates a lasting impact on organizational performance (Leonardi, 2013; Giddens, 1976). It considers the interconnectedness between technologies and organizational structures as to how for example the structures effect technologies applied and do the technologies require a certain type of organizational setting to be applied (Thompson & Bates, 1957; Leonardi, 2013). Barley (1986) utilized Giddens's work of structuration theory and argued that technologies can be more than determinants which are structural, being rather the process of implementation that can be an opportunity to an organization to re-imagine and evaluate the structures they work in (Leonardi, 2013).

Barley (1986) further elaborated the study by claiming that organizational structures can be created through adopting structuration theory together with individual and organizational social interaction (Leonardi, 2013). Combining technological aspects to this structure as mediators of social interaction it can be stated that information systems

carry a much larger role than just by being stand-alone material artefacts (Leonardi, 2013).

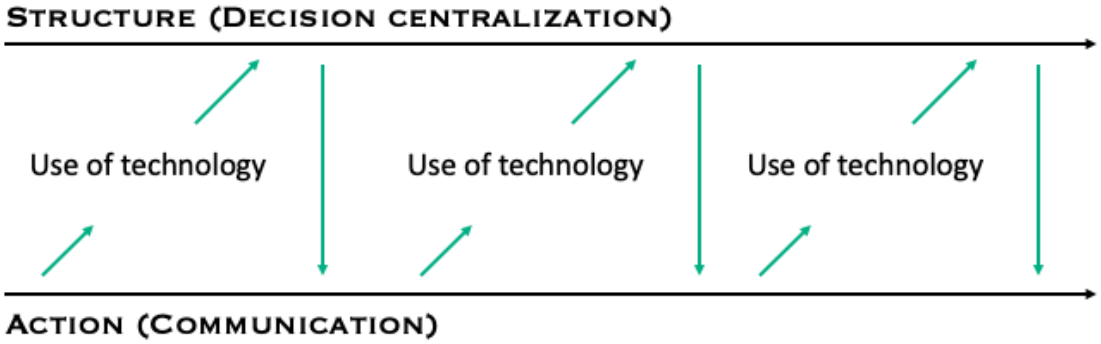

Figure 13 Structural change triggered by technology (Barley, 1986) adapted from Leonardi (2013).

Critical realism aims to correct some part of agential realism and provide alternative approaches to better comprehend the concept of sociomateriality (Leonardi, 2013). Mutch (2013) identifies four key problem areas from agential realism, which are lack of explanatory power, lack of ability to conduct empirical reserach which demonstrate sociomateriality, overlooking how activities are changed and sustained, and treat all affiliations as co-dependent or mutually constitutive. Lack of explanatory power, from the perspective of critical realism, is considered descriptive and is easy to replace with theories from actor-network theory or socio-technical systems (Leonardi, 2013; Mutch, 2013).

Mutch (2013) considers agential realism too difficult to study in terms of concrete empirical studies as the concept is hard to execute practical research approach. Critical realism could rectify this by considering why things appear rather than asking what, aiding the cause to execute empirical research (Leonardi, 2013). Thirdly agential realism overlooks how practices are sustained and changed whereas critical realism offers its solution by specifying certain mechanisms which link institution and action over time (Leonardi, 2013; Mutch, 2013). Lastly critical realism is concerned by the fact that agential realism treats relations as mutually co-dependent or constitutive, which it can

replace by examining how the relationship between social and material are connected (Leonardi, 2013; Mutch, 2013).

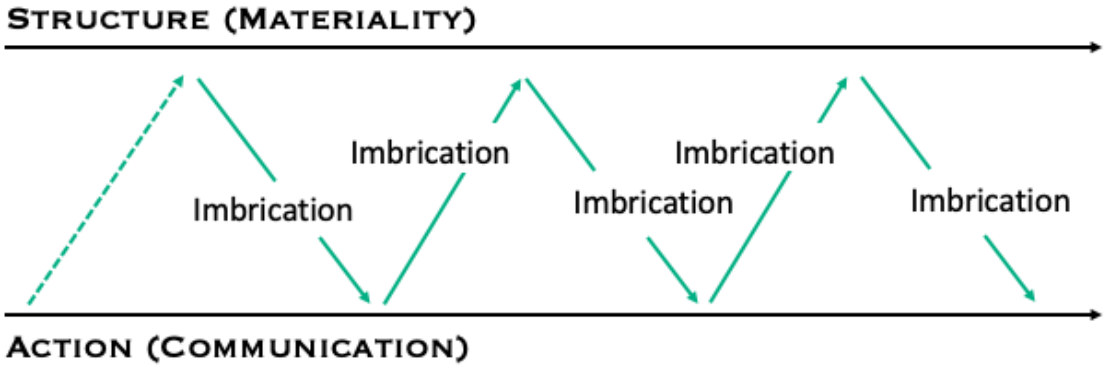

Figure 14 Sociomateriality Framework that is built on the Foundation of Critical Realism adapted from Leonardi (2013).

Feldman & Orlikowski (2011) studied the practice theory in sociometrical context, where material is most often described as a technology. In their findings they highlight that a large portion of organization theory is still mainly concentrated on entities, but they emphasize that sociomaterial practices influence a lot on how the organizations are shaped and managed (Feldman & Orlikowski, 2011). Their research contributes to this paper by providing the overarching concept to view SAP and BI effectively in relation to one another (Feldman & Orlikowski, 2011).

Sociomateriality is fairly complex and philosophical approach to how material and social action evolve one another (Feldman & Orlikowski, 2011). It aids the process of understanding the deeper connections which constitute the importance of information systems in organizational settings (Feldman & Orlikowski, 2011; Leonardi, 2013). Sociomateriality provides the framework to understand that technological systems or artefacts are not valuable as standalone material, but their value is created through social practices which provide the value to the system and enables its evolution (Feldman & Orlikowski, 2011; Leonardi, 2013).

2.4 Synthesis

As the aim of this paper is to answer the question how business intelligence shapes the management practices, the presented three research streams offer the framework to analyse research findings to produce applicable outcomes. These three frameworks offer the opportunity to focus on the point of how the routines and practices change before and after utilizing business intelligence in their organization.

Business intelligence literature provides the overall concept to understand the technology on its applicational levels. There was no specific need to go deeper into the functional layer of business intelligence in accordance with this specific study as it is not included the scope of observation. Taking use of the business intelligence clusters helps in the analysis to recognize orientations towards certain types of business intelligence solutions. For example, if the organization analyses data only related to market situation it possible to identify theoretical roots from the market intelligence cluster, if the analysis is drawn from several sources the theory can be scaled accordingly.

Strategy-as-practice provides the means to analyse the management practices in relation to organizational goal orientation and individual execution. This specific framework serves accordingly for the purpose of analysing the very practices and social conventions of the managers that ultimately affect the organizational outcomes. In relation between BI and SAP, sociomateriality provides an overarching theory that ties business intelligence and strategy-as-practice together as they represent organizational development that is executed through sociometrical practices.

Sociomateriality is a key concept because it is also based on the practice theory, but it ties technological development and information systems into the management practices, as well as, provides an observation framework to study business intelligence in relation to SAP. The lens presented in figure 15 is compressed of these three frameworks into a model that includes the varying aspects of BI, SAP and sociomateriality in the scope of this research in one model.

Empirically reflecting the researches of Trieu (2007), Vaara and Whittington (2012), and Feldman & Orlikowski (2011) it is possible to analyse BI's effects in relation to strategy-as-practice to illustrate how management processes are being shaped by business intelligence. Whereas sociomateriality helps viewing the deeper changes in managerial practices, as well as, how BI and individual managers shape one another's functions in order to develop organizational capabilities.

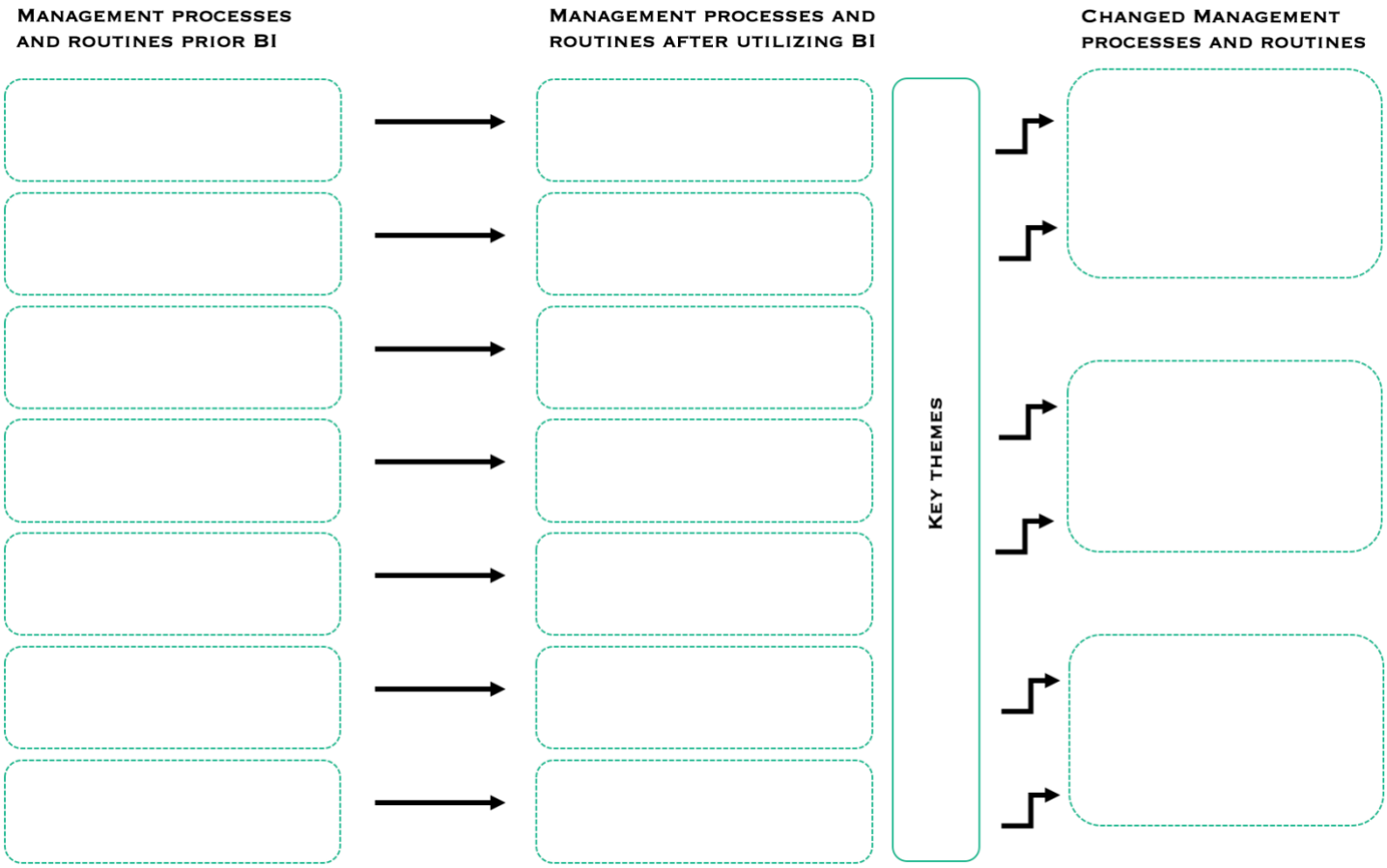

Figure 15 Theoretical lens

3 METHODOLOGY

This chapter opens up the methodology of this study and aims to describe the thought-process behind the made philosophical choices and to justify why a certain approach is suitable for this empirical research. In the context, research method and research strategy are further elaborated. Describing the case, data collection, and analysis are also essential part of this chapter, as they contribute immensely to the latter part of the section which considers the reliability and validity of the study.

3.1 Philosophical assumptions

Research philosophy offers a complex view to observe factual reality in relation to one's own presumptions, therefore exposing the study for vulnerabilities caused by the researcher (Saunders, Lewis & Thornhill 2016: 124–130). These assumptions made by the researcher are always present and are vital to recognize to best of one's abilities in order to provide the research its factual backbone (Saunders et al. 2016: 124–125). One approach to reduce unconscious bias is to view the research from different perspectives carefully to identify possible biases, while making sure that the research does not lack in clarity and cohesion (Saunders et al. 2016: 126–130).

As this research aims to identify how and if business intelligence shapes management practice through theory tied heavily into sociology and subjective reality, this research is bound to be observed through subjectivist ontology and epistemology (Eriksson & Kovalainen 2016: 14–15). Ontology refers to researchers' personal approach to subject as epistemology is concerned with the premise of knowledge and how it is built (Eriksson & Kovalainen 2016: 14–15). In the context of research philosophy, it is relevant to recognize that there are no universal facts, as everything is dependent on individual experiences of reality (Saunders et al. 2016: 126–130). Considering the references this paper has prior made to sociology, it is important to consider how individuals experience the reality around them and trying to find cohesion within the results. This same style

approach applies on how often researchers formulate unintentional biases (Eriksson & Kovalainen 2016: 14–15; Saunders et al. 2016: 126–130).

Considering the above-mentioned unintentional biases and individual realities, these are often formulated through iterations of interpretations of what researchers have studied and seen (Chowdhury, 2014). Furthermore, researchers tend to study subjects which they find interesting and appealing, which then already affects to some extent on how the study will be interpreted and how it is justified (Chowdhury, 2014). Interpretations are tightly connected to the concepts of sociology as well as subjectivist ontology and epistemology. Therefore, on a broader philosophy of this research is interpretivism as the perspectives are heavily bound to subjective reality (Chowdhury, 2014).

Induction, deduction and abduction are used to explain and formulate theory development. Induction utilizes the empirically collected material in the research and by utilizing results, then formulates the theory around it (Eriksson & Kovalainen 2016: 15; Saunders et al. 2016: 125–130). In deduction the researcher formulates theoretical framework and hypothesis which is then tested by doing an empirical research to prove the hypothesis (Saunders et al. 2016: 125–130). Abduction is the merged theory development model which draws from both induction and deduction. In abduction the researcher shifts between theory and empirical research to provide cohesive and solid research outcome (Eriksson & Kovalainen 2016: 15; Saunders et al. 2016: 125–130).

This paper is tied into practice theory, which is experienced through subjective reality, therefore suggesting inductive approach. However, the empirical part of this researches cannot be correctly formulated without considering the theoretical aspect of sociology in relation to the researched topic. These two approaches fulfil each other’s purposes in relation providing this research the best possible backbone. Thus, this research can draw most value from abductive approach due to its iterative approach between induction and abduction (Saunders et al. 2016: 125–130).

3.2 Research method

The nature of this study is to find out how business intelligence shapes the management practice it is relevant to consider, which way of collecting data and analysing it is the most optimal for the purpose. Reflecting on this there exists two options. One method of approach is to quantitative means, which would require a set of predefined questions which would be easy for the interview pool to answer in short time, but the number of responses should be quite high to provide validity for such study (Saunders et al. 2016: 318 – 388).

The other way of collecting data and analysing it would be to do a qualitative research where the volume of responses is lower, but individual responses carry more responsibility of the overall results in terms of validity and reliability (Saunders et al. 2016: 318 – 388). In this case the latter approach is more suitable for this particular research, through semi-structured interviews in case study context, as the primary data.

Semi-structured interviews provide responses clear unifying outline which makes the results comparable but providing the opportunity to discuss openly about the set core questions and important aspects around them. These then can point out other interesting information regarding the research agenda. Having the opportunity to choose correct wording for each situation to open up the conversation further could also point out important details which are not mentioned in the core questions. This combination therefore provides cohesion and variety at the same time without compromising the validity of the study.

Most of the interviews are done in Finnish, as it is the primary language for many of the interviewed people, in order to provide the interviewees further possibilities to express themselves in more detail, than they possibly could if the conversations would be had in English. A small portion of the interviews were made in English as it was the preferred language to some. These interviewees are be recorder and transcribed afterwards in English, and the results will be then also presented in English to provide this research cohesion and clarity.

3.3 Case selection process

A single case study serves the research purpose the best so that it is possible to reflect the answers in relation to one another as they share the similar context. At the same time interviewing managers who are responsible for different types key areas within the company provides variation, so that the results do not only reflect managerial practices singularly focusing only on certain types of tasks and routines. The outlining criteria is therefore important to recognize so that the company has the environment which enables business intelligence usage on multiple managerial levels. A large production company would offer more than sufficient environment for this research as they have the potential to follow several different types of metrics which are tightly interconnected with one another.

The case company is a large Finnish production company, which has been operating for over hundred years. They have domestic and international operations, which all utilize business intelligence solutions. The operations include aspects of sales, production, supply chain, financial management, human resource management and many other functions; providing an excellent environment for this particular study. The interviews are done on leadership and manager levels to provide variety of perspectives.

3.4 Data collection

The semi-structured interviews were done through one-on-one conversations with different managers which acts as the primary data. The interviews were scheduled individually and conducted as online meetings. Online meetings can oppose some difficulties in contrast to meeting in person. Considering aspects such as sufficient internet connection and equipment to run the meetings without difficulties can oppose challenges. However, the conducted interviews went smoothly in this case and everyone answered the asked set of core questions, which is found as the first appendix of this paper. The core questions were discussed with every interviewee and they naturally acted

as overarching theme for the interview, however, more questions and discussion were further elaborated depending on the experiences with business intelligence.
The interviewees were conducted during February and March 2021. The time of day for the interviews was always between 8.00 to 16.00. Therefore, we can conclude that at the time of the interviews, all were using the same version of the BI system and that interviews were kept in fairly similar time of day. The allocated time of one hour per interviewee, was sufficient in all of the cases and all the questions were went through during in that timeframe.

Each interview started with description of what the research is about, and the domain of the research was explained to the interviewee, so they fully comprehend the premise of the research. Then interviewees were asked to describe their typical tasks and routines in their work, so it would become more apparent what type of tasks the person is dealing with on a regular basis. Thirdly before starting the interview the researcher encouraged a dialog, so that anything relevant around the topic could be discussed. Starting the interview process this way ensured that interviewee understands the research and the researcher comprehends the professional domain of the interviewee. It also helped the process to ask more specific questions linked to the professional's domain. The interviewee was also encouraged to ask any questions if something was unclear regarding the premise of the research itself.

3.5 Data analysis

The case research in the context of theory can be best analysed through relational content analysis. In content analysis the approach is to observe the gathered data and conceptualise it in relation to research context (Weber, 1990). This research utilizes practice theory in means to comprehend how the actions of the management and leadership are shaped through BI utilization. In this regard content analysis provides the opportunity to observe the case as its own entity which contains different practices that can be best analyzed through qualitative means.

Opening the content analysis more, conceptual content analysis is a method where semantic analysis is applied by first identifying concepts through condensation from where data is coded into meaning units. (Weber, 1990; Mills, Durepos & Wiebe 2010). Meaning units are then categorized into groups where it is possible to draw themes. Relational content analysis includes the process on conceptual content analysis, but the data is also examined in relation to itself and through this it is possible indicate for example change between points in time (Weber, 1990; Mills et al. 2010).

As the aim of this research is to recognize how BI has shaped management practices. It is therefore logical to view the collected data in comparison between what were the key practices before utilizing BI and what are these practices when BI is utilized. Only viewing the directly relational changes where BI can be identified as the key influencer to this change, is the most relevant way to approach the data. The data is therefore analysed in relation to BI and the points in time to determine BI's cause and effect on managerial practices. Identifying the relational meaning units in both points in time indicate the key practical changes which can be interpreted as categories from which we can elaborate the themes (Weber, 1990; Mills et al. 2010). The theoretical lens in figure 15 acts as a tool to visualize how themes are generated from the produced data.

3.6 Reliability and validity

In this case study the matters of business management and business intelligence are at the centre of the research, therefore, business sensitive issues are discussed, and it is important that the company and the interviewed people can remain unnamed. Research reliability can be culminated so that research needs to be repeatable, meaning that the results could be achieved by another person through same means (Saunders et al. 2016: 202–203). In contrast reliability could be achieved fully if a person would have the name of the case firm and the question format would be structured. Therefore, the repeatability of this study can be interpretable on the long term. However, the reliability can improve through and critical analysis and transparency to its limited extent. Case studies which are related to such business sensitive matters are often anonymously made, due to the fact that the contained the information which is shared in these studies are valuable in many ways, therefore, the lack in reliability can be won in very practice-oriented content.

Validity means that the research measures are valid and achieved through the actions that the researcher has made (Saunders et al. 2016: 202–203). The approach to the data is described to extent where can be presented anonymously and the linkage between theory and empirical part is identifiable. The theory as well as the empirical part of this research are tightly linked to practices and practical approaches, therefore, the validity can be verified relatively well. Together validity and reliability form a combination which are the quality measures of the research.

4 FINDINGS

In this section the research findings are introduced by first going through the description of the case company to the possible extent without compromising the integrity of this research and the studied company. After the case presentation, the results are reviewed by drawing comparisons between the old and new practices to extract themes regarding the research agenda. The practice comparison is divided into seven parts to illustrate the different meaning units mirroring the key emerging practices which recurred with different people. Each part also includes the illustration of how the themes are extracted from the interview data.

After the practice comparison the themes are reviewed in relation to one another to extract the key changes that can be identified from the context in relation to practices. Each of these changes are then explained and the occurred negative and positive effects are also recognized from the interview data in relation these key change areas. Lastly in this section the full theoretical model will be presented including the content analysis results and highlights.

4.1 Case presentation

The case studied in the context of the research is a large Finnish production company which has operations across multiple different countries. The product portfolio consists of plethora of different items and services and the product offering is available to individual consumers as well as for B2B customers. The company has operated in its industry for a very long time and is the industry market leader in Finland. Operations include many different key operative areas such as sales, production, supply chain and logistics, marketing, legal, quality control and many more. Therefore, it is vital for the company to be able to track these processes as they are all very tied to one another

4.2 Practice comparison

All of the old and current practices were discussed in link to one another, so the connections between the practices can be identified without misinterpretation. Most of the interviews lasted approximately one hour which was also the reserved time from each participant. There were not cases where the allocated time would have been insufficient, which means the all of the relevant discussions were able to be had, so that the researcher got the material the was intended to be collected.

In the interviews the main focus was on the practices of each manager and how their routines have developed over time. These practices were also linked to business intelligence development, so that it is possible to draw connections between the old and current practices. These practice comparisons have been then formed as meaning units to describe the most occurring and relevant practices which were highlighted by the managers. There were seven core practices identified from the interview data which are information processing, knowledge sharing, operative overview, department management, performance review in data intervals, performance analysis, and operative causation.

There were other practices mentioned in the interviews as well, but many were more specific the context people were managing in their department and, therefore, they weren't repeatable to all managers or regarding as common management practices. There were also some more common management tasks and routines, but they weren't recognized by other interviewees. Other issues were also discussed, such as business intelligence architecture which was relevant to go through in contrast to what is studied in this research. The seven meaning units describe the core emerging practices, which were identifiable from many of these discussions.

4.2.1 Information processing

All of the interviewees pinpointed that before BI was available, the information was produced by the professional which took a lot of time. This meant that information was first logged, then gathered together and after that analysed. Today business intelligence system gathers and analyses the data by itself and produces the systematic analysis to the data, but nowadays managers have more time to review the initial analysis and go deeper in order to discover outliers and causal relationships. Many of the interviewees also highlighted that the system and logic to produce these analyses are still the same, but the process is handled automatically. Another thing in relation that was highlighted was that the actionable insights are still produced by the individuals, who interpret the data that exists in BI interface.

> "*In financial reporting on my opinion the biggest change has been, which did not exist before, that you have the ability to view the data on daily level or maybe even during the day, if you wish to do so. This can be followed transaction based and we can even calculate income statement daily, if we want to.*"

These underlined changes in practices indicate that efficiency has increased and that there is more time to further analyse the data. A good example of this case would be that a company used to put a lot of time to produce accurate ROI calculation, but through utilization of BI there is more time to investigate why return on investment has changed drastically in comparison to previous accounting period.

> *"If there were those 28 Excels in that time, that meant that you didn't have time to do anything else. The priority was just to have the report ready. And then we were in the situation where those came already made, but visualization was needed to be made by you then that took your time."*

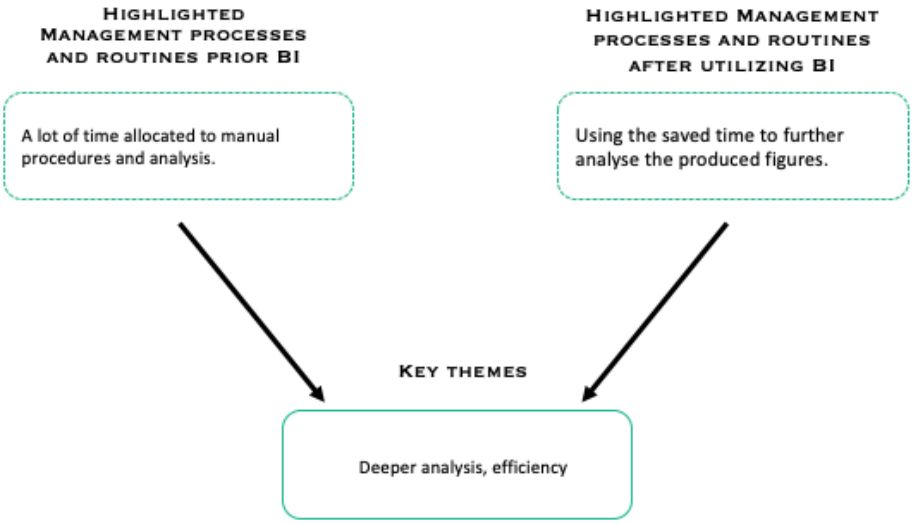

Figure 16 Information processing

4.2.2 Knowledge sharing

Before the business intelligence environment was available for the case firm the results of the manual and human dependent analysis were also presented in a fixed format, meaning that there was not a possibility to view the analysis based on different dimensions. The fixed format made the interpretation more difficult because if there were any questions rising from the analysis it could not be further investigated, without someone using time to produce another analysis that answers the question. One negative side in relation to BI usage, that was identified, was that it has a possibility to create knowledge gaps between professionals. In this type of situation people could be divided into people who remain in a usage group where people use static reporting and insufficient analysing methods, whilst dedicating time to issues which would no longer require manual analysing.

> *"It could be that we could risk creating an A-team and a B-team in our organization. As I said before there are people coming into our organization that knows exactly what BI is and what it can do. We also have people, not mainly coming in, but we have people inside our organization, who have been there for the past 20 to 30 years, who are nowhere near understanding what BI is. That is really creating a gap between some people."*

At the moment the company's BI system produces analysis and data that can be further investigated in seconds by switching dimensions or filtering the data to present outliers and explanations to answer further questions. In example if a company is reviewing sales per country and they wanted to see how sales has gone by product, another analysis was needed, but BI has the opportunity to produce that information in the same meeting with ease. BI enables data analysis and pivoting, which then on helps to answer questions about the data fast, which then on helps knowledge management.

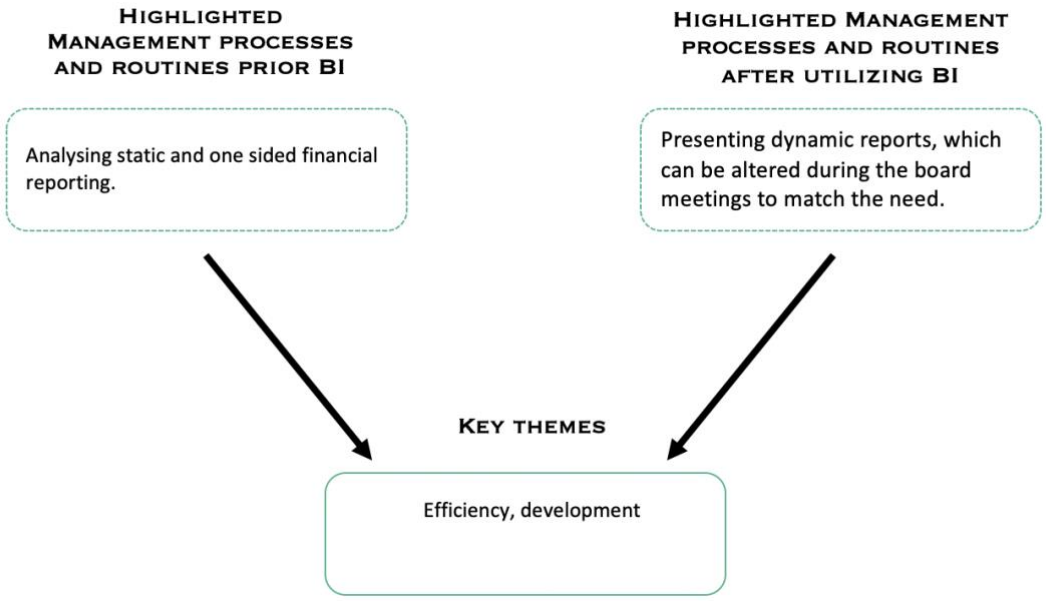

Figure 17 Knowledge sharing

4.2.3 Operative overview

The case company has a very wide scale of operative layers considering for example production, logistics and country specific aspects. All of these operations are also interlinked and dependent on one another, therefore, it is important to also be aware of multitude of different operative areas and to manage each one effectively. Before BI this was accomplished by sharing information through dialog and manual analysis.

> *"Often the case has been, and still is, that we would need to do this and that after which you think that damn it, I should still know this and that. And then if you don't have the knowledge, then you ask somebody that hey could you clarify this? But if you would have a tool and you could just press a button and then it outputs the answer, then you would not have the need to ask anybody"*

BI now produces more comprehensive outlook on the whole operational side and data can be further investigated and exploited through BI. It should however be noted that the dialog and the need for it still has not vanished, but now in that dialog deeper analysis can be shared as more people have the possibility to view the overall situation on more detailed level and analyse the whole operative landscape.

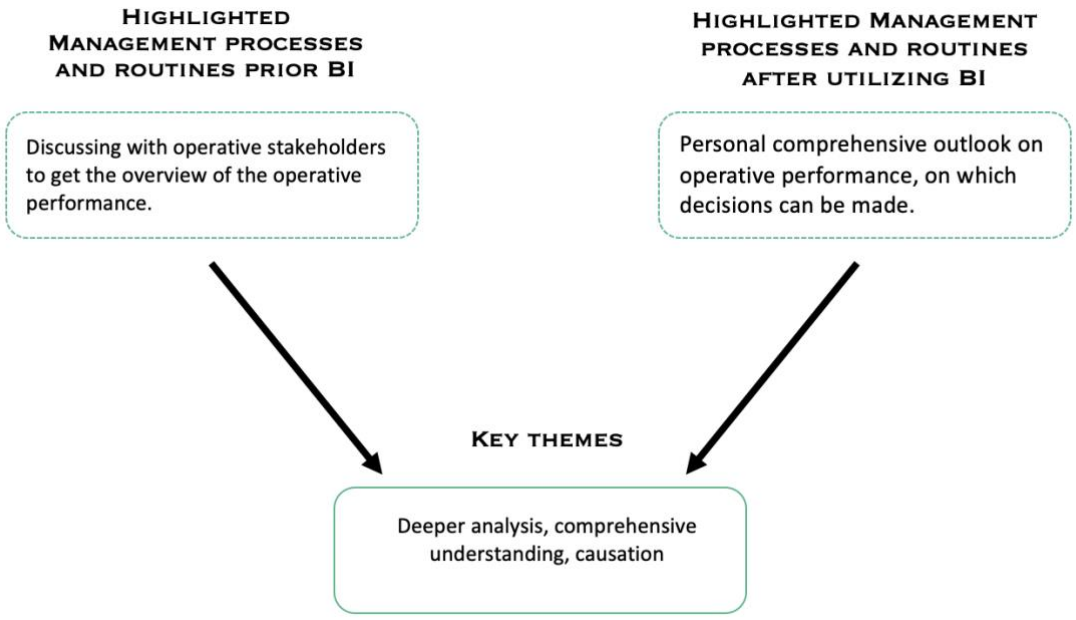

Figure 18 Operative overview

4.2.4 Department management

Before the modern business intelligence system, the data and analysis were produced manually and that took a lot of effort to do. This meant that for example in accounting or controlling there were more people working to produce analysis of the company situation, but now there are fewer people in those departments or that they have more cross-functional roles with different departments. The old procedures maintained the more departmentalized division, because there were not as many opportunities in terms of time to have more cross-functional roles.

> *"We have had many conversations about the fact, that the line between departments starts to fade little by little. It cannot be purely said that some guy is just IT, and that is just operations, and that is just finance; rather there are starting to exist these hybrid versions"*

Business intelligence is not the only identifiable cause for less departmentalized operation, but many of the interviewees identify it as one of the key causes why the operation is less department oriented. It was also underlined that the cross-functional roles enable wider knowledge-base and that people care more about the overall performance and not just their own dedicated department.

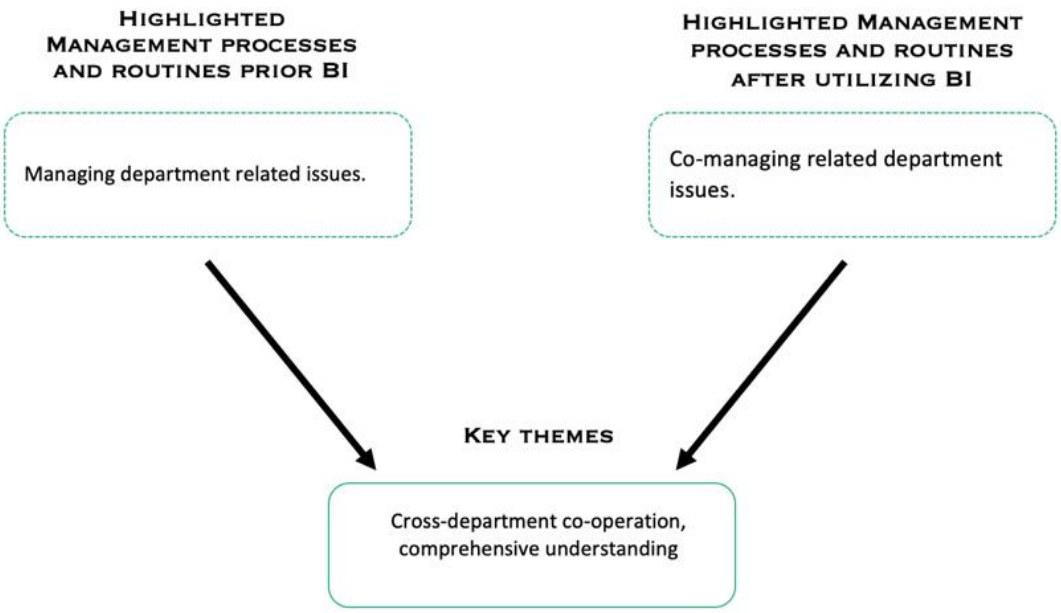

Figure 19 Department management

4.2.5 Performance review in data intervals

Almost all of the interviewees highlighted in their routines that they check the sales figures daily if not even more often. Multiple people stated that sales figures in their industry tell a lot about the overall buying power of the customers, as well as they tell about the markets situation. Drastic shifts in sales have to be analysed if there is a need to respond to these more drastic shifts it can be done fast. Before BI these figures were not produced as frequently, which caused a latency in counter measures.

> *"Today financial data comes faster, and it is more up-to-date, and you can drill-down to more detailed level than before. There is no need to go through accounting anymore. In the old days if we travel back several years or even decades, we needed to wait until the accounting sent an income statement to know how we were doing"*

Few people also mentioned in link to this subject that business intelligence offers the right amount of information to a point where still an industry professional will do the final analysis and they can decide what is the correct counter measure or is it even necessary. If BI would produce data that would make the decision for someone it most likely would go wrong, because there exist causal relationships which do not surface in numbered data format.

> *"These are then tactical actions but are all things where BI world brings that predictability, so that you have visibility to them. So that you don't see them so that, oops this fell onto my lap today, but rather you can be a little proactive and predict these situations."*

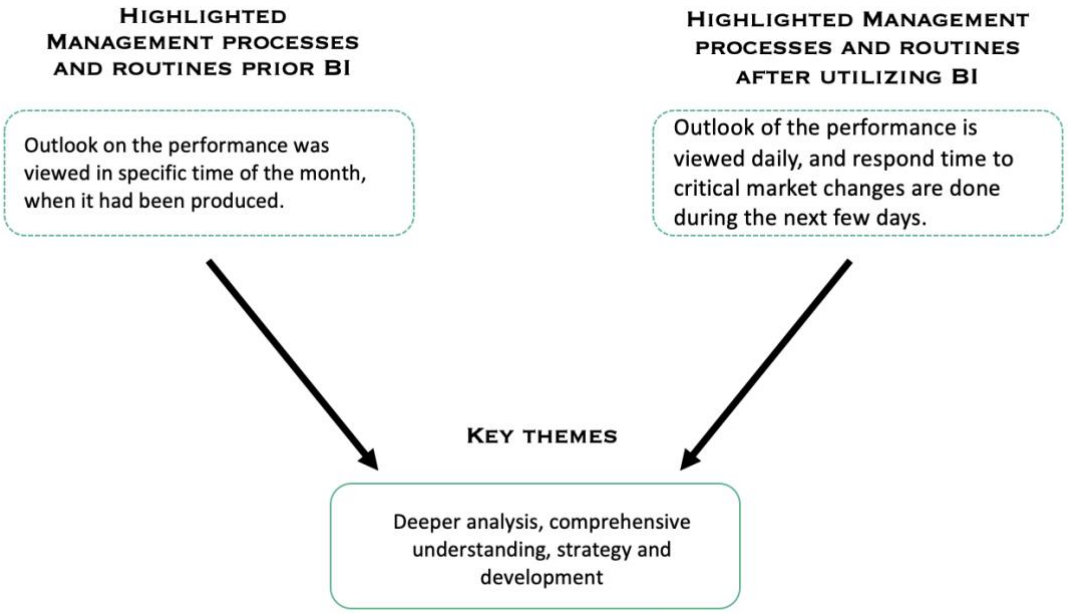

Figure 20 Performance review in data intervals

4.2.6 Performance analysis

Before business intelligence was involved in the process of decision-making, the only truly important unit of analysis for manager was their own department. This seems rational considering the time and effort aspects which were previously mentioned. And to some extent the situation has remained like this, but people now have more cross-functional roles where they can be involved in some development ventures as many of the interviewed managers were.

> *"So, in a way we are not in a place where we are like let's all sit down once a month and check how we did las month. Rather it is so that a screen shows that yesterday this thing was red. What happened yesterday? What should we do today, so that does not happen again?"*

BI enabled the department managers to share their knowledge with others, but they are still the responsible managers for their dedicated areas. However, many of the interviewed managers mentioned that this cross-department development has broadened their understanding of the whole operational field and that they are more aware about those a cross-department decencies, which were not as apparent before.

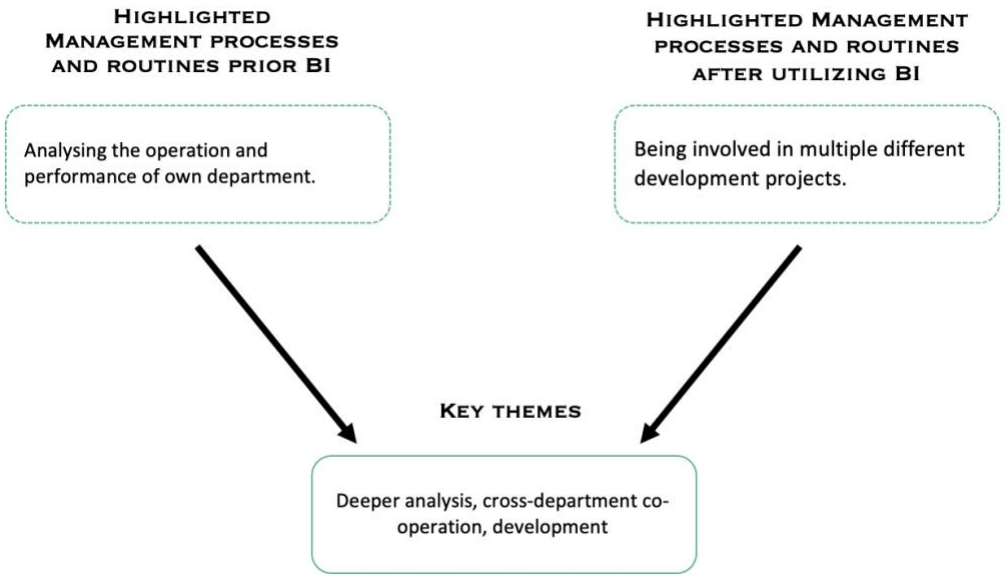

Figure 21 Performance analysis

4.2.7 Operative causation

At the moment business intelligence enables managers to have pre-analysed data available to the from the whole organizational spectrum which can be further analysed by each manger. One thing in particular which came up often in all interview's multiple times in relation to this information availability was that they can see and understand causation relationships better through business intelligence where it is in structural format.

> *"If we get data from a process, which we are able to analyze, which we then use to see things about that process. What we can fix by changing the process itself? For example, if we lose less money based on some deficit matters, then of course it shapes the management."*

To many causations were really hard to trace before business intelligence, because a lot of the time was put into producing the data and analysis from the figures of their own department. In many cases it has been always necessary to deep dive into these causations and they were as traceable then as they are now, but the difference is that these causal relationships are much easier to find and analyse, therefore, related problems can be fixed relatively quickly if necessary.

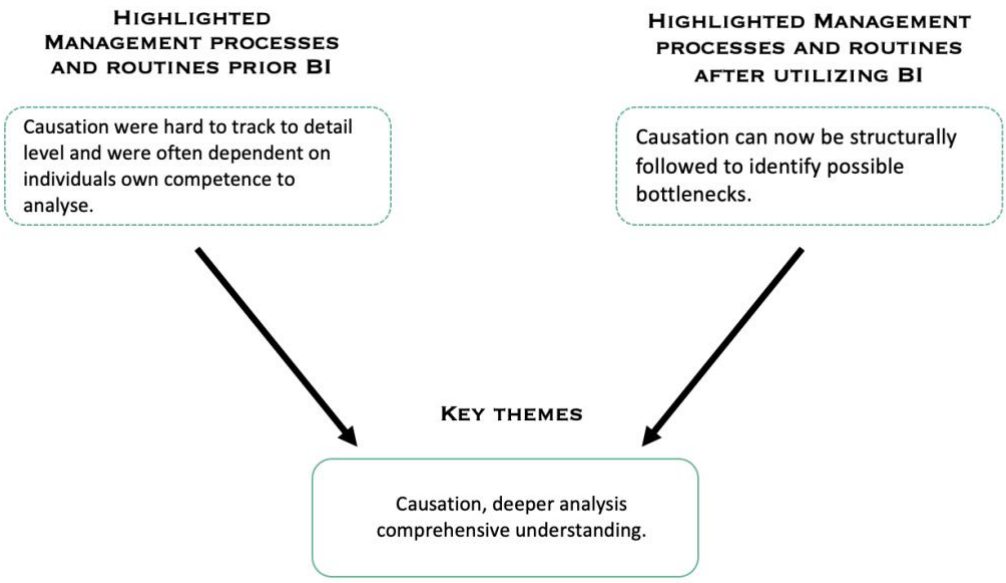

Figure 22 Operative causation

4.3 Synthesis

The synthesis of these findings is composed of three key identifiable change units in the managerial practices and they are presented as sub sections under the extracted themes. This is done in order to further elaborate how they are generated from the themes and how they relate to managerial practices and business management overall. At the end of the synthesis the full theoretical lens is presented to highlight the key empirical findings in contrast to the theoretical lens.

4.3.1 Extracted themes

Considering the extracted seven meaning units and the gathered themes from them it is possible to synthesize these practices and their core purposes into the change in the managerial practices. The identified themes from the data were selected based on the recurring practices which are represented as the meaning units. Considering these shared managerial practices, it is possible to identify commonalities and interlinking themes describing the changes in practices where business intelligences role can be identified in relation.

One of the most recurring themes was that managers have the possibility to analyse the performance and outliers in depth, through usage of business intelligence systems and that has shaped the way they view the operations. Second recurring theme was the efficiency change where fewer manual actions are needed to produce the analysis and that effort can be shifted more towards other operative analysis or responsive actions. Another more commonly affecting theme is that individual managers comprehend better how the company operates overall and how different parts of the operations function and they all link this change very tightly to business intelligence and its effects.

Next identifiable theme is cross-department co-operation. Business intelligence provides more wider perspective to overall operations and therefore eases the co-operation between different departments or business units. However, it should be noted that it is highly unlikely that business intelligence has solemnly created this change, but rather it has been

an integral part of wider cultural shift inside the organization. Fifth extracted theme was causation, which influences greatly how managers view the performance in retrospective as they have a better opportunity to view these linkages between departments and business units.

Last theme, which is more overarching in perspective to the other six themes, is strategy and development. Many managerial practices are tied to overall development; therefore, this theme cannot be identified as change in more comprehensive perspective as it cannot be described more specifically. However, it is clearly identifiable theme and many mangers underline that business intelligence has direct impact on how development and strategical choices are viewed.

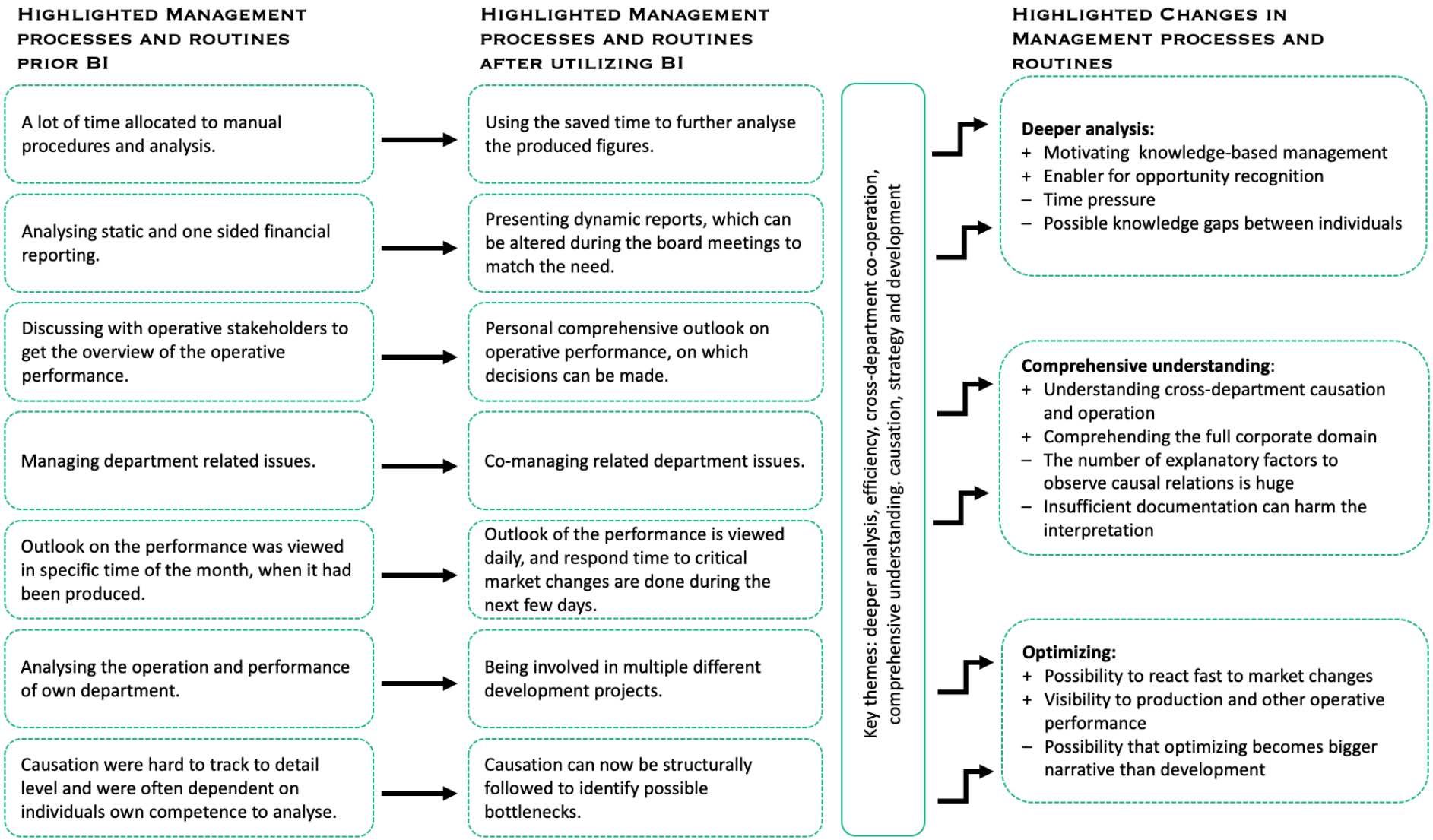

Figure 23 Theoretical lens with empirical results

4.3.2 Deeper analysis

Many of the identified themes can be viewed under this practice change. Business intelligence was viewed by the interviewed managers though the lens of efficiency. Efficiency in data producing and gathering acts as enabler for many other more pressing managerial practices such as in-depth analysis of different performance KPIs. Deeper analysis is very apparent in relation to business intelligence systems, as one of the systems main function is to provide analytical outputs to help decision making. The extracted key changes in this regard were as follows.

Positive:

- Motivating knowledge-based management
- Enabler for opportunity recognition

Negative:

- Time pressure
- Possible knowledge gaps between the individuals

It should be noted that many BI systems generate analysis based on underlying data, which is produced often by individuals, as well as, the analysis is conditioned by the professionals. Therefore, business intelligence provides only outputs which are predetermined by the business itself and the presented analysis does not provide anything that has not been seen before. But rather it can provide new ways to look at the analysis through different perspective though pivoting and hierarchical division.

Interviewees often highlighted that even though deeper analysis can be made it is still done by the individual professionals. The deeper analysis is produced still based on the professional competences and capabilities, after which the more honed analysis could be integrated to the already existing analytical views or KPIs. More individuals can better grasp the more essential corner stones of performance and consider their role in contrast, how do they affect the result. Another aspect that is relevant to this context is that if the

key performance indicators are not clear as they are presented in the BI system, it can be interpreted according to individuals understanding.

When the underlying data is produced through automated information processing it also enhances the information flow through the organization to all relevant stakeholders. Management has for example income statement and balance sheet available much faster in contrast to situation before BI systems increasing the opportunity to effective knowledge management. According to few interviewed managers, as the business environment shifts towards even more rapid change it is vital for businesses to have on time information available to them in order to effectively compete in the markets.

The interviewees were also asked if they recognize negative sides or risks related to business intelligence usage. In regard to deeper analysis it was highlighted that as BI systems have enabled faster information generation and with it has also come time pressure to produce information. In contrast when previously it took a month to produce an analysis and reports now approximately with same ratio the timeframe to produce viable analysis has shortened. In certain points of view this is something that companies want to strive for, but it was highlighted that is vital for the professional to indicate if the timeframe is not sufficient to produce viable analysis.

Another negative side that was identified by some of the managers in relation was that there could be a situation when there is an X and Y groups of people. In the case here X represents the group where people use business intelligence and Y represents people who do not use business intelligence. If there are such groups there is a risk where real knowledge gaps can be formed, and people are not aligned on the decision-making process because they analyse the data based on different source of information.

4.3.3 Comprehensive understanding

Industry professionals were the ones to analyse and fully comprehend all the twists and turns regarding their business unit or department performance even before business intelligence and the situation on that regard stays the same even when BI system is

utilized. BI has made analysing easier on multiple contexts and broadened the visibility to cross-department transactions, but the most actionable insight comes through professional evaluation by the people who have the knowledge of industry. The extracted key changes in this regard were as follows.

Positive:

- Understanding cross-department causation and operation
- Comprehending the corporate domain

Negative:

- The number of explanatory factors to observe causal relations is huge
- Insufficient documentation can harm the interpretation

Business intelligence has enabled outlook to different departments and acted as an enabler to see data in relation to what different individuals need to see. Cross-department causation comes more apparent through business intelligence than it did before and studying other departments key performance indicators can help in the interpretation of what is important to each department or business unit.

Understanding the data in this wider context makes it easier for management to evaluate their performance in contrast to overall performance. It also opens the view to see for example if there are latencies in production, which are important to know by supply chain management and logistics, as well as, salespeople and business controllers. These causation linkages are vital to understand, and they should be seen by all the relevant stakeholders so that they have the ability to react to these and adjust their own operations accordingly. When the company scales up and new export opportunities are recognized, the whole capacity needs to be mapped to understand growth capabilities.

Today business development projects include either wider range of professionals or few professional with wider understanding of different fields. However, the project teams before BI were not insufficiently represented but rather constructed a bit differently. Business intelligences role in this regard can be viewed as a part of a wider organizational development that has happened on multiple fronts over the similar period.

The negative sides and risks were also identified as part of this change group. As professional have more information available to them in a larger scale than before, they have the opportunity to analyse these causal relationships better and dive into the data to extract the most relevant linking points of interests. However, when the range of observed explanatory factors gets too broad, the risk of misinterpretation grows with it. Following this can come actions which are based on false analysis. Therefore, many of the interviewed managers highlighted that the best information comes from the industry professionals and when they synthesize their findings together.

Few managers also underlined the importance of sufficient documentation regarding the produced metrics and views. As people can view same data with different way of observing it, they can understand the meaning of the figures differently. Therefore, it is seen as crucial to understand how the underlaying data has been analysed and how the data has been designed to be viewed. These same managers also noted in relation to this concern that it very important to understand where and what data is being utilized under the analysis, because there might similar type of data existing, but it should be interpreted through different perspective.

4.3.4 Optimizing

The operative benefits were highlighted by many of the managers especially regarding production overview and how it could be developed. One of the interviewees mentioned that production optimization was not reliably possible before business intelligence, there were metrics on which it was executed but today it is much more accurate and reliable. When the production scale is relatively large, as in the case company, optimization is an integral part of the operative performance. The extracted key changes in this regard were as follows.

Positive:

- Possibility to react fast to market changes
- Visibility to production and other operative performance

Negative:

- Possibility that optimizing becomes bigger narrative than development

Production equipment is huge investment and a top of that they need to do maintenance on the production equipment regularly in order to maintain sufficient production levels. Optimization helps in that process to identify bottlenecks and necessary maintenance intervals through data that the machines or the operators provide for the business intelligence system to analyse.

Optimizing is happening on multiple fronts, not just in production, and optimizing has existed even before BI systems, it was just bit more complex to achieve without BI. The company has now visibility to view most recent market data and optimise sales processes accordingly or in relation to production capacity. Afore mentioned better overall visibility to operative performance improves the optimization possibilities to be viewed on a larger perspective as well.

The operational efficiency and development, in overall perspective, were the key highlights from all of the managers responses, and many of them highlighted the improved possibility to optimize. One of the interviewees also mentioned that optimizing

should, however, be put in relation to the scale of activities that are necessary, as it is not the best practice to overdo it. Over optimization can increase volatility to sudden exogenic impacts which are hard to predict.

Considering the negative and risk aspects, optimizing can be regarded as a process which takes into consideration different scenarios and determines from them what is the standard optimization level. Exogenic impacts are, as just mentioned, hard to predict and therefore it becomes harder to evaluate a risk buffer for scenarios, which cannot be yet identified. However, this does not mean that optimization should not be done, but rather it should be done with moderation. In relation, there could be a scenario where optimization becomes the main driving narrative to drive costs lower, which could then lead to the over optimization and stop focusing on development.

5 CONCLUSIONS

The goal for this research was to describe how business intelligence shapes management practices by an analysing a case study through the theoretical lens that includes the concepts of business intelligence, strategy-as-practice, and sociomateriality. The approach and methods for it were introduced by first opening up the premise and motivation for the study, following with the three-dimensional theoretical context. Next, the methodological part was opened up to explain the core methods of approaching the empirical research, following then findings of the described approach. They key findings were then compressed into a model described in figure 23.

The theoretical lens was formulated considering the premise of the research itself, which aimed to define the changes in managerial practices in relation to business intelligence usage and availability. Therefore, the core theoretical approaches were combined together in a form of the theoretical lens. Business intelligence framework, presented in its dedicated section, provides this research the context to view what business intelligence is and how analysing can be executed through it (Richardson et al., 2020). Strategy-as-practice in this study aims to define the practice-oriented approach to how business and organizational decision-making is deconstructed to individual level (Jarzabkowski & Whittington, 2008). Sociomateriality is the overarching theory to describe the relationships and dependencies between business intelligence and strategy-as-practice (Feldman & Orlikowski, 2011).

From the business intelligence perspective, the analysis provides a view to identify, how the practices of the managers are linked to different BI clusters (Akter et al. 2016; Talaoui & Kohtamäki, 2020). Decision support was the most apparent cluster and most frequently emerging in the interviewees as well (Trieu, 2017; Arnott, Lizama & Song, 2017). Analytical technologies cluster can be also identified from the context, as ad-hoc data manipulation is tightly related to managers practical need to analyse the data from different viewing points (Cheung & Li, 2012). Market intelligence was the third more clearly underlined need for business intelligence, as the company needs to have on-time market data to effectively manage their related operations (Le Bon & Rapp 2013).

All of the interviewed managers were able to recognize, how business intelligence directly has affected their work and how they utilize information technology in their routines. Some also were able to describe their perspective on how the BI system is being developed and shaped by the managers in contrast to their on-going usage, highlighting the impact of sociomaterial practices (Feldman & Orlikowski, 2011). To be more specific, many of the mangers recognized that their use of BI feeds the development of the system itself. This is because managers are able to identify business intelligences role in their routines and practices.

From the analysis it is possible to interpret that many of the emphasized managerial practices consider the aspect of time and, moreover, how it is used. In relation it can be highlighted which practices are important considering the involvement of business intelligence. It can be stated that business intelligence has impacted the managerial practices on multiple levels, however, the change can bring negative aspects with it. BI is also not the singular affecting variable for the underlined changes, but the interviewed managers recognized its direct impact on how they operate.

Three core business intelligence related changes in managerial practices were identified from the interviews. Managers have the ability to more deeply analyse the data, as business intelligence provides them with the analysis that has constant variables. Managers can then use this information to further analyse for example the market situation where the analysis cannot always be based solemnly on constant variables. Through BI managers have more possibilities to engage in effective knowledge-based management. Business intelligence provides more comprehensive view to the company's operations, engaging managers to further understand the dependencies between departments and business units. Causal relationships are also now easier to trace and investigate to identify outliers from the data that can be used to develop operations. Business intelligence has had a role in shaping managerial practices and the concrete actions. Managers now focus more on the operative management and development activities, rather than using the time to do more manual data analysis to extract relevant information.

5.1 Theoretical contributions

This research provides concrete approach to view business intelligences role in business management. The practice-oriented approach helps the researcher to reliably connect business intelligence and business development together and view the causes of business intelligence usage. The approach of this research broadens the scope to see the concrete organizational changes that business intelligence usage creates, and it also helps to identify possible drawbacks of using business intelligence. The provided theoretical lens can be used to identify the practice linkages between SAP and BI in relation to sociomaterial practices.

5.2 Managerial implications

Based on this case study it is possible to recognize managerial implications, however, it should be noted that every organization has unique constructs which should be taken into account when analysing the findings of this research. Business intelligence can act as an enabler for knowledge management and it can widen the scope of individuals to understand the company constructs and causal relationships better. With BI there are also knowledge management procedures which should be considered in contrast to how people should view the data and how the data security is being managed. Business intelligence can also help in opportunity recognition and optimization of business processes.

Developing a business intelligence environment takes time, because the more users there are the more ways there are to view the same data. Business intelligence development is cyclical and iterative process which is done with multiple different stakeholders to ensure data quality. The BI systems are continuously developed as the business users get more ideas on how different KPIs and analysis could be produced, to better understand how to develop the business operations.

5.3 Suggestions for future research

As this case study was executed with an unnamed company, this study could be replicated and more detailed information could be provided about the organizational context to better comprehend the practices of the managers. A cross-case study could also highlight some interesting differences between practices, considering that there would also be two different business intelligence infrastructures. The role of sociomaterial practices could also be further studied, as it would be interesting to know how the cyclical development is philosophically constructed.

5.4 Limitations

This study was done in co-operation with a case company who wished to remain unnamed which is very understandable considering the premise of the research. However, this makes it more difficult to repeat this study without knowing all of the context of the studied case company. This research successfully identified changes in similar managerial practices, however, many of the managers control a different domain which could have an effect on how the results are tied together. Therefore, the research done with a cross-case approach could have provided the results with even better reliablitiy.

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7 APPENDICES

Interview questions

Background:

Date:
Interview format:
Interviewee number:
Interviewees position in the company:
Interviewee has worked for the company for: years

Premise

By using your own words, how would you describe typical tasks and routines on your position?

Have you worked in the company/ your current position prior BI?

Have the BI-tools you use been developed during your time at the company/ current position?

How long have you been using BI in your current position?

Usage

Considering the earlier discussed typical tasks and routines on your position. Have they changed from when you started in the position and if yes, what was different before?

If you compare your business intelligence usage from first contact to present day, has it changed along the way and how?

How would describe your management actions and observations being affected by using BI?

How would you describe the effects of BI usage and its development to your job tasks?

Development

Have you been involved in the process of developing an existing or a new BI-solution?

YES:

How would you describe the development process?

Do you consider it providing you a new perspective on how the company operates?

Did you identify business development opportunities while developing the solution?

NO:

Have noticed that something should be improved in the BI solution you use?

Do you consider that the current solution could serve you better in your job, if yes how?