Valeria Boldosova

Facts tell, but stories sell

The power of storytelling in influencing human behavior toward big data analytics and smart services

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Julkaisun nimike

Faktat kertovat, mutta tarinat myyvät: Tarinankerronnan voima vaikutettaessa myönteisesti ihmisten käytökseen liittyen big data -analytiikkaan ja älypalveluihin

Tiivistelmä

Kun big datan merkitys kasvaa ja eri toimialat digitalisoituvat vauhdilla, yritysten on muutettava toimintatapojaan parantaakseen suoritus- ja kilpailukykyään markkinoilla. Digiteknologian hyödyntäminen liiketoimintaprosesseissa ja big data -vetoisten tuotteiden ja palveluiden myyminen on kuitenkin haastavaa. Digitalisoitumisen myötä yritykset kohtaavat useita teknologisia sekä organisaatioon ja käytökseen liittyviä esteitä, kun ne ottavat käyttöön big data -analytiikan (BDA) teknologioita työntekijöiden keskuudessa ja esittelevät uusia älypalveluita asiakkaille. Vaikeuksia aiheuttaa etenkin se, että yksilöt vastustavat teknologioiden muutoksia, luottamusta puuttuu ja uusia työtapoja ei haluta omaksua. Tämä luo haasteita johtajille, eikä aiheeseen liittyvää kirjallisuutta ole. Tässä väitöskirjassa hyödynnetään tarinankerronnan näkökulmaa, jolla havainnollistetaan johtajille ja tutkijoille, miten vaikutetaan myönteisesti ihmisten asenteisiin ja käytökseen liittyen big data -analytiikkaan ja älypalveluihin. Tässä monitieteisessä väitöstutkimuksessa on yhdistetty tietojärjestelmätieteen, palvelutieteen, markkinoinnin, lingvistiikan, psykologian ja neurotieteen näkemyksiä ja oivalluksia. Tutkimus rakentaa siltoja eri alojen välillä ja kuvaa, miten tarkoituksellisen tarinankerronnan avulla voidaan edistää big data -analytiikan käyttöä työntekijöiden keskuudessa ja kannustaa asiakkaita investoimaan älypalveluihin. Väitös keskittyy yksilöiden käyttäytymiseen organisaatioiden sisä- ja ulkopuolella. Se sisältää neljä tieteellistä julkaisua, jotka edistävät akateemista tutkimusta tarjoamalla empiirisiä todisteita ja luomalla uusia konsepteja. Väitöstutkimus avaa mahdollisuuksia käyttää tarinoita aivan uudenlaisin tavoin organisaatioiden erilaisissa konteksteissa ja osoittaa lisäksi tarinankerronnan toteutettavuuden esimerkeillä tosielämän onnistumisista. Väitöstutkimuksen tulokset ovat hyödyllisiä johtajille, jotka etsivät luotettavaa ja tehokasta tapaa integroida analytiikka organisaatioon tai lisätä älypalveluiden myyntiä.

Asiasanat

Tarinankerronta, big data -analytiikka, älypalvelut, omaksumiskäytös, liiketoiminta-analytiikka, liiketoimintaäly, big datan tulkinta, asiakasviite, B2B-myynti

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Abstract

With the increasing importance of big data and rapid digitalization across industries, companies have been forced to transform how they operate to become more efficient and competitive in the market. However, integrating digital technologies into business processes and selling big data-driven products and services are challenging tasks. As companies embrace digitalization, they encounter a number of technological, organizational and behavioral barriers in introducing new big data analytics (BDA) technology to employees and new smart services to customers. In particular, companies struggle with individual resistance to technological change, a lack of trust and an unwillingness to accept new working routines. Building on these managerial challenges and the lack of literature on the subject, this dissertation utilizes a storytelling lens to demonstrate how to positively influence human attitudes and behavior toward BDA and smart services for practitioners and scholars. Synthesizing insights from information systems, service science, marketing, linguistics, psychology and neuroscience, this interdisciplinary dissertation builds bridges across fields and explains how deliberate storytelling can facilitate BDA use among employees and can convince customers to invest in smart services. With a focus on individual behavior inside and outside of organizations, this dissertation consists of four scientific publications that move the academic field forward by offering empirical evidence and developing theories on new storytelling concepts (deliberate storytelling, big data-driven stories, BDA-enhanced stories, etc.). In addition to unlocking new, unconventional applications of stories to various organizational contexts, this dissertation also demonstrates the feasibility of storytelling through examples of real-life successes in industry. The findings of this dissertation are particularly useful for managers seeking a reliable and efficient method of integrating BDA inside their organization or increasing smart service sales.

Keywords

Storytelling, big data analytics, smart services, adoption behavior, business analytics, business intelligence, big data interpretation, customer reference, B2B sales

Dedicated to my parents
for their endless love, support and encouragement

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Valeria Boldosova
November 2021
Seinäjoki, Finland

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Abbreviations

AI	Artificial intelligence
BDA	Big data analytics
BI	Business intelligence
BI&A	Business intelligence and analytics
BOR	Behavioral operational research
B2B	Business-to-business
B2C	Business-to-consumer
COVID-19	Coronavirus disease 2019
DIMECC	Digital, internet, materials & engineering co-creation
ECS	Ethnographic case study
HR	Human resources
IS	Information system(s)
IT	Information technology
KPI	Key performance indicator
OEM	Original equipment manufacturer
OR	Operational research
R&D	Research and development
SME	Small and medium enterprise

Glossary of key terms

Since some of the terminology used in the dissertation may be unfamiliar to readers, in order to prevent misunderstanding and ensure clarity, brief definitions of key terms are provided below. The glossary is arranged in alphabetical order.

Big data	Large amounts of complex structured, unstructured and semistructured data (e.g., text, audio, video) generated continuously and collected from a variety of sources that cannot be processed with traditional software. The use of big data enables organizations to gain new insights and discover new business opportunities. The term big data is generally understood in terms of the following dimensions: volume, variety, velocity, veracity, variability, and value (Fosso Wamba et al., 2015; Gandomi & Haider, 2015; Elia et al., 2020).
Big data analytics	Advanced analytic technologies that reveal hidden trends, patterns and correlations in big data and support organizations in making informed business decisions. Big data analytics are usually grouped into four main categories: descriptive, diagnostic, predictive and prescriptive analytics (Lim, Chen & Chen, 2012; Holsapple, Lee-Post & Pakath, 2014; Delen & Zolbanin, 2018).
Business analytics	See definition of “Big data analytics”.
Business intelligence	See definition of “Big data analytics”.
B2B	Business-to-business transactions. A form of business in which the exchange of products and services occurs between companies, which differs from selling directly to individual consumers as in the business-to-consumer (B2C) model (Hadjikhani & LaPlaca, 2013; Cortez & Johnston, 2017).
Customer reference	A customer that utilizes a supplier’s products or services has a strong bond with the supplier and is willing to share his or her own positive experience with prospective customers upon the supplier’s request. The term customer referencing describes an activity in which a supplier leverages relationships with existing customers to increase

	trustworthiness and improve sales (Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018).
Digital age/era	From the 2000s onwards; a historical period characterized by the widespread use of digital technologies and the Internet across industries (Vial, 2019).
Digitalization	The use of digital technologies in everyday life and across business operations to increase revenue, reduce costs and improve efficiency (Legner et al., 2017).
Digitization	The process of converting information (e.g., text, image, sound) and physical objects into digital form (e.g., converting printed books into e-books). The term digitization also refers to the use of digital technology to automate manual business processes and to optimize workflows (Loebbecke & Picot, 2015; Oesterreich & Teuteberg, 2016).
Sensemaking	The process of how people deal with uncertainty by interpreting unfamiliar situations and assigning meaning to new experiences (Weick, Sutcliffe & Obstfeld, 2015; Kieran, McMahon & MacCurtain, 2019).
Sensegiving	The deliberate process of (leaders) influencing the sensemaking of others by communicating a desired image to them and thus shaping the preferred definition of organizational reality. The terms sensegiving and sensemaking are usually considered to be interrelated and complementary (Gioia & Chittipeddi, 1991; Maitlis, 2005; Rouleau, 2005; Kraft, Sparr & Peus, 2018).
Smart service	A preemptive service offering delivered in combination with a physically connected product that is characterized by embedded sensors and software used to produce, collect, transmit and process data in order to independently identify and proactively respond to problems and to adapt to individual user needs, preferences and environmental conditions (Allmendinger & Lombreglia, 2005; Porter & Heppelmann, 2014; Beverungen, Matzner & Janiesch, 2017).

Smart servitization	The transition of manufacturing companies from selling pure products toward adding smart services to their product portfolio and providing value-added bundles of smart products and services to customers in order to increase customer loyalty, revenue and competitiveness (Kamp, Ochoa & Diaz, 2017; Kaňovská & Tomášková, 2018).
Storytelling	The dissemination of stories (spoken or written narratives) with a plot and characters for a particular purpose, such as to educate, motivate, share knowledge with or emotionally connect with an audience (Sandelowski, 1991; Gabriel, 2000; James & Minnis, 2004; Denning, 2006).

Publications

This dissertation is based on the following appended publications:

[1] Boldosova, V. & Petäjä, E. (2017). Project management intelligence – Mastering the delivery of life cycle solutions. In Kohtamäki, M. (Ed.) *Real-Time Strategy and Business Intelligence: Digitizing practices and systems*. Cham: Palgrave Macmillan, 167–191.[1]

[2] Boldosova, V. (2019). Deliberate storytelling in big data analytics adoption. *Information Systems Journal* 29, 1126–1152.[2]

[3] Boldosova, V. & Luoto, S. (2020). Storytelling, business analytics and big data interpretation: Literature review and theoretical propositions. *Management Research Review* 43:2, 204–222.[3]

[4] Boldosova, V. (2020). Telling stories that sell: The role of storytelling and big data analytics in smart service sales. *Industrial Marketing Management* 86, 122–134.[4]

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1 INTRODUCTION

1.1 Research background and motivation

Over the past decade, a strong movement toward digitalization has led to the integration of digital technologies into all business areas and has revolutionized how companies operate and compete in the digital age (Verhoef et al., 2021). With the growing amount of digital data available and the improved availability of low-cost hardware for collecting and storing large datasets, an increasing number of companies are using big data analytics (BDA) software to convert data into actionable insights and uncover untapped business opportunities to stay ahead of their competition (Chen, Chiang & Storey, 2012; Mortenson, Doherty & Robinson, 2015; Delen & Zolbanin, 2018). Relying on big data-driven technologies helps organizations boost individual productivity, accelerate decision-making, enhance knowledge sharing, support teamwork, automate workloads, mitigate risks promptly, reduce costs, gain a competitive advantage and improve organizational agility, among other benefits (Braglia & Frosolini, 2014; Côrte-Real, Oliveira & Ruivo, 2017; Fosso Wamba et al., 2017; Gunasekaran et al., 2017; Trieu, 2017; Vitari & Raguseo, 2020).

Despite the rapid emergence of BDA (also known as business intelligence (BI) or business analytics (BA)[5]), many organizations struggle with various barriers that prevent them from maximizing the business potential of big data. As big data becomes increasingly crucial in the business world, managers are faced with the need to overcome challenges to BDA integration inside their organizations, which is more demanding and time consuming than the adoption of other technologies due to the unique characteristics of big data (e.g., volume, velocity, variety, veracity, variability) (Fosso Wamba et al., 2015; Gandomi & Haider, 2015; Elia et al., 2020). In addition to facing various technological, organizational and cultural obstacles in implementing analytics and leveraging it to create business value (Sivarajah et al., 2017; Omar, Minoufekr & Plapper, 2019; Tabesh, Mousavidin & Hasani, 2019), companies have to deal with resistance to adapting to new routines and embracing BDA in daily work from employees (Figure 1) (Alharti, Krotov & Bowman, 2017; Raguseo, 2018; Verma, Bhattacharyya & Kumar, 2018; Ain et al., 2019; Cabrero-Sanchez & Villarejo-Ramos, 2019; Shahbaz et al., 2019).

[5] Despite the heterogeneous terminology used across different fields, these terms share similar characteristics, and within the scope of this dissertation, the definitions of BI, BDA and BA are considered to overlap. The term BDA (or "analytics" for simplicity) is frequently utilized as an umbrella concept throughout the dissertation. For a more in-depth discussion of the variations in terminology in Articles I-IV, please see pp. 18-20.

Figure 1. Employee resistance to BDA adoption in the workplace

In particular, the greatest challenge stems from the majority of employees lacking a clear understanding of the business benefits of BDA and how to incorporate insights from big data into their daily workflow, which in turn reduces individual motivation to integrate analytics into decision-making (Caesarius & Hohenthal, 2018; Omar, Minoufekr & Plapper, 2019). Employees fear the disruption of well-established working habits and feel that new BDA technology threatens to take their jobs away (Caesarius & Hohenthal, 2018; Ain et al., 2019). Furthermore, employees have low levels of perceived self-efficacy toward BDA and feel anxious about working with big data, which negatively affects their intention to use analytics (Vargas et al., 2018; Shahbaz et al., 2020). Poor BDA usability and inconsistent data hinder user experience with analytics, and employees start seeking alternative ways of working without BDA due to the stress tied to working with it (Verma, Bhattacharyya & Kumar, 2018; Nam, Lee & Lee, 2019; Bolonne & Wijewardene, 2020). Understanding BDA dashboards and extracting business insights from complex technical data is a challenging task and represents another barrier to analytics adoption at the individual level (Bumblauskas et al., 2017). Employees lack proper data analytics training and skills, feel frustrated due to their inability to interpret big data and therefore resist using this new, unfamiliar technology in their everyday problem solving (Ain et al., 2019). Finally, to ensure BDA acceptance at the individual level, employees need time to build trust in big data and to become comfortable with making data-driven decisions instead of using intuition or prior experience (Omar, Minoufekr & Plapper, 2019).

While big data and analytics have become a game changer across industries, manufacturing companies armed with digital technologies have disrupted

traditional business models by increasing the digitization of their physical assets and transforming themselves into providers of digitally enabled products and smart services (Kohtamäki et al., 2019; Paschou et al., 2020; Tronvoll et al., 2020). By deploying new technologies, manufacturers have entered the smart servitization era (Kamp, Ochoa & Diaz, 2017) and have started offering customers value-added services based on remote connectivity to a physical product through embedded sensors and intelligent software. Smart services surpass these firms' standard offerings due to their preemptive nature and their ability to anticipate problems and independently take corrective actions, adapt to different surroundings and learn based on user preferences (Allmendinger & Lombreglia, 2005; Beverungen et al., 2017; Alter, 2020; Fischer et al., 2020; Romero et al., 2020). As a result, in comparison with traditional services, bundles of smart-connected products (Porter & Heppelmann, 2014) and services generate additional value for customers, enhance the customer experience and transform customer-supplier interactions in the digital era (Pagani & Pardo, 2017; Lim & Maglio, 2018).

Although new emerging technologies offer multiple opportunities for companies undertaking a smart servitization journey, manufacturers encounter nontechnical behavioral barriers to commercializing smart services. In particular, not only do organizations need to overcome resistance from employees with product-oriented mindsets, but they must also manage customer reluctance to accept new and unfamiliar smart services (Figure 2) (Kamp, Ochoa & Diaz, 2017; Klein, Biehl & Friedli, 2018). Servitization on its own is a challenging process of transformation (Baines et al., 2008), but when providing smart-connected products and services, companies need to put extra effort into ensuring that their new digitally enabled service logic fits with customers' mindsets (Töytäri et al., 2018).

The concept of smart services is new to customers, and since this trend is slowly gaining a reputation across industries, customers fail to understand the economic benefits of smart service offerings and therefore do not want to make risky investments (Mani & Chouk, 2018; Chouk & Mani, 2019). Due to high levels of digitization and the intangible nature of services, customers do not recognize the tangible impact of novel service-embedded products and hesitate to buy smart services (Vendrell-Herrero et al., 2017). Another behavioral obstacle is that customers feel deceived by smart services and believe that suppliers use smart services as a tactic to lure them into spending more money (Kamp, Ochoa & Diaz, 2017). Selling smart services is more challenging than selling traditional services because digitalization reduces the number of human interactions and customers do not see suppliers physically delivering services and are therefore reluctant to pay for intangible experiences (Grubic, 2014; Töytäri et al., 2018).

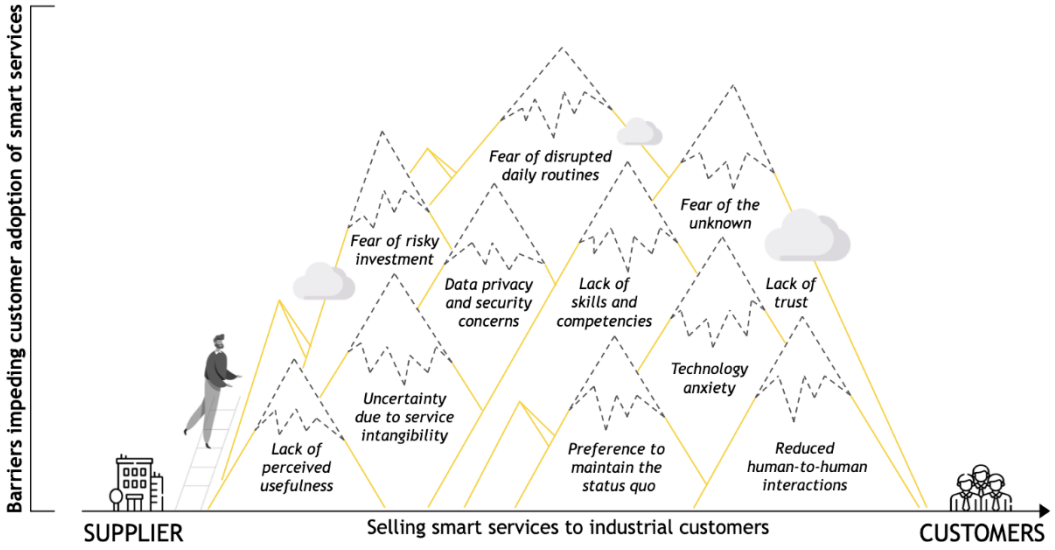

Figure 2. Customer resistance to suppliers' smart services

Furthermore, misunderstandings between customers and suppliers regarding the ownership of data collected for the purpose of smart service provision may result in customer demands that such services should be offered free of charge (Klein, Biehl & Friedli, 2018). Additionally, customers are concerned with privacy and the security of the collected data (Bonamigo & Frech, 2020) and resist granting remote access to their products as a part of smart service agreements (Klein, Biehl & Friedli, 2018; Töytäri et al., 2018). Due to the autonomous nature of smart services, customers feel anxious about technology intruding into their daily lives without their permission and breaching their personal privacy (Kamp, Ochoa & Diaz, 2017; Lu, Papagiannidis & Alamanos, 2018; Mani & Chouk, 2019). Finally, customers are worried about potential cyber attacks and unauthorized access to confidential data by the supplier or a third party (Wünderlich et al., 2015; Yang, Lee & Zo, 2017), which in turn negatively affects their attitudes toward adopting connected products and smart services.

Despite the managerial relevance of these phenomena, individual-level adoption of BDA and customer adoption of smart services have not been properly studied in the scientific literature. "So what? Why does this matter?" the readers might ask. First, without finding solutions to (at least some of) the abovementioned managerial challenges, these issues will remain an obstacle and will prevent organizations from unlocking the full business potential of digitalization and smart servitization. Due to missing insights from academia and a lack of understanding of the behavioral and psychological factors that influence human behavior in the digital age, organizations will continue to struggle with achieving widespread internal BDA usage and with generating revenue from smart services. Employees

represent the key end users of BDA inside organizations, and if managers are not able to ensure the use of this new technology in daily operations, then their organizations will have failed to manage technological change in the workplace. Similarly, if industrial customers do not trust smart services and refuse to buy them, manufacturing companies (the service providers) will face financial losses unless some measures are taken. As a result, not only do organizations risk failing to gain a return from their investment but the time wasted on dealing with employee resistance to new technology and customer concerns with smart services will also distract managers from other core business activities. Furthermore, the absence of practical guidance and examples of real-life successes from industry will continue to justify and reinforce companies' reluctance to embark on the journey of digital transformation and to evolve in the digital era, which in turn will reduce their ability to survive and succeed in a competitive business environment.

The purpose of this dissertation, which builds on observations of real-world events, is to support practitioners by addressing managerial challenges and facilitating progress in the research field by building new knowledge about how storytelling can positively influence human attitudes and behavior toward BDA and smart services. By establishing links among and synthesizing insights from computer science, service science, marketing, linguistics, psychology and neuroscience, this dissertation explains how storytelling affects the human brain and how companies can use corporate storytelling to facilitate employee adoption of BDA inside organizations and increase customer adoption of smart services in business-to-business (B2B) environments. This dissertation is located at the intersection of various research disciplines, and due to its interdisciplinary nature, its findings are useful to scholars from different fields.

The dissertation is composed of four peer-reviewed scholarly publications (Articles I-IV) that offer unique findings, complement each other and deepen our understanding of the multidimensional role of storytelling within organizations. Although the power of storytelling has been acknowledged in the fields of information systems (IS) (Davison, 2016; Hedman et al., 2018), management (Dowling, 2006; Spear & Roper, 2013; Laufer, 2019), industrial marketing (Gilliam & Flaherty, 2015; Bonnin & Alfonso, 2019; Anaza et al., 2020), operational research (OR) (Klein, Connell & Meyer, 2007; Klein, 2009), psychology (Yang, 2013; Krause & Rucker, 2020), and neuroscience (Martinez-Conde et al., 2019), this dissertation extends the current literature even further by revealing novel and creative applications of stories to change individual behavior in various organizational contexts. The goal of this dissertation is by no means to argue that storytelling is the only way to overcome resistance to BDA or smart services; instead, the purpose is to demonstrate to readers how storytelling serves

different business purposes, thus taking a step beyond the conventional understanding of telling tales. Reading this dissertation and (or) Articles I-IV will fundamentally transform the reader's understanding of what was known about storytelling and will shed light on the behavioral mechanisms underlying individuals' responses to BDA and smart services. In addition to introducing new storytelling concepts, revitalizing old research discussions and responding to prior research calls, this dissertation also empirically demonstrates the feasibility of storytelling with practical examples from industry, defines the key characteristics of effective storytelling and offers step-by-step guidance as to how practitioners can create and disseminate stories to employees and customers. As a result, this dissertation provides benefits both inside and outside academia by building theoretical and applied knowledge.

This dissertation is a contemporary and timely addition to the literature because, with the widespread use of big data and smart technologies across industries, an increasing number of organizations are facing the challenges addressed in Articles I-IV, thus ensuring the relevance and practicality of these findings in the digital age. This dissertation is recommended for business practitioners who currently struggle with integrating analytics inside their organizations or with selling smart services and are looking for an efficient and proven method for influencing human behavior. Finally, this dissertation moves the academic field forward through various contributions to the existing literature, which, together with the research gaps, are discussed in more detail in the next section. Therefore, without further ado, the readers are invited to begin their journey through this doctoral dissertation.

1.2 Research gaps and theoretical positioning of the dissertation

Building on the managerial motivation for developing this dissertation (stated in the previous section), the goal here is to introduce readers to the scientific value of this doctoral research and its contribution to different academic disciplines. While the research shortcomings are identified and thoroughly discussed in relation to the existing literature in the subsequent "Theoretical background" section, here, the intention is to provide an overview of the research gaps underlying the research questions in Articles I-IV. From a theoretical standpoint, this dissertation is positioned at the intersection of several scientific disciplines, and Articles I-IV extend existing knowledge by providing significant contributions to corresponding research streams. This section will clarify to the readers how the current dissertation is positioned within the wider disciplinary conversations.

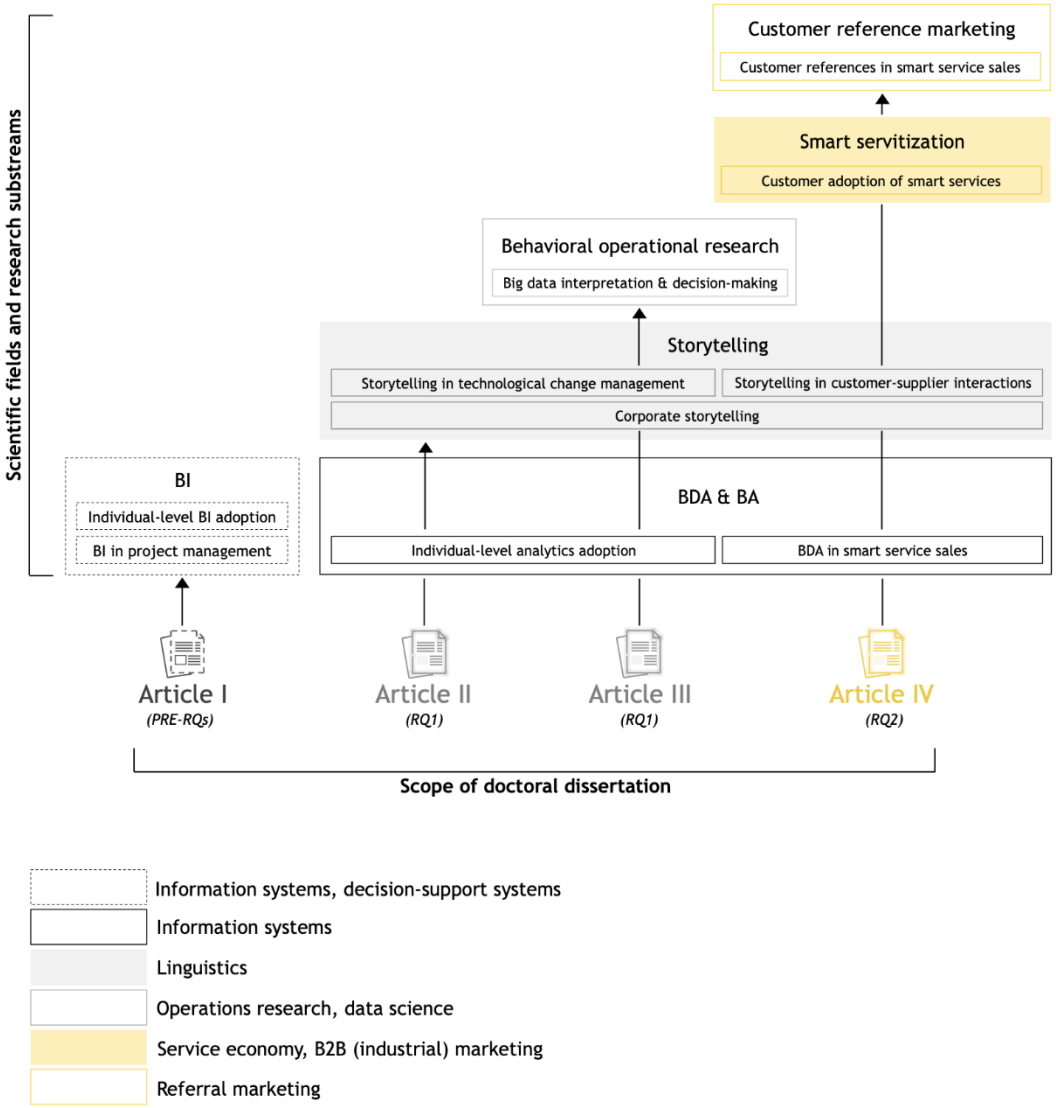

Figure 3. Theoretical positioning of dissertation in relation to academic disciplines

Figure 3 contextualizes the articles included in this article-based dissertation in relation to various academic disciplines and demonstrates how these publications intersect with different fields and contribute to a variety of literature streams. Figure 3 shows a clear picture of which research areas are addressed in all four articles and which are unique to certain publications. Nevertheless, Figure 3 should be interpreted with caution because it does not represent the entire theoretical foundation of Articles I-IV; instead, it sheds light on the academic locations of the key (but not all) research gaps.

As a first contribution to existing knowledge, Article I provides an overview of the BI solutions used in delivering projects and complements IS research (Trieu,

2017), which lacks practitioner-oriented studies that address the value of using BI tools in project management across the full project lifecycle. Additionally, building on the limited (at the time of publishing) discussions regarding the challenges that companies face while integrating BI into daily project management among employees, Article I advances the BI adoption literature (Watson & Wixom, 2007; Yeoh, Koronios & Gao, 2008; Grubljeŝiĉ & Jakliĉ, 2015) with a narrative literature review. Filling these research gaps is important for facilitating progress in computer science because the lack of understanding of how BI can help with gaining a competitive advantage in project-based businesses and of how managers can deal with the technological, organizational and behavioral barriers to BI adoption prevents practitioners from exploiting the full potential of BI.

Second, Article II bridges IS research and the linguistics discipline and contributes to filling the gap in the existing literature regarding the limited number of behavioral studies that explore the factors underlying employee adoption of BDA in organizations (Ain et al., 2019; Aboelmaged & Mouakket, 2020). In comparison with the numerous studies on organization-level BDA adoption (e.g., Dremel et al., 2017; Lai, Sun & Ren, 2018; Moktadir et al., 2019; Nam, Lee & Lee, 2019; Maroufkhani, Ismail & Ghobakhloo, 2020; Maroufkhani et al., 2020), there have been relatively few studies published on BDA adoption in organizations at the individual level. However, employees represent the key BDA users, and therefore, it is crucial for organizations to understand how to overcome individual resistance to analytics. Despite the growing community of researchers devoted to studying individual resistance to BDA (Vargas et al., 2018; Verma, Bhattacharyya & Kumar, 2018; Cabrero-Sanchez & Villarejo-Ramos, 2019; Shahbaz et al., 2020), far less attention has been given to qualitative studies offering practical guidance on how to successfully facilitate BDA use on a daily basis by influencing individual attitudes toward BDA. To date, a very limited number of empirical studies (Dremel et al., 2017; Tim et al., 2020) have contributed to providing successful examples of BDA implementation inside an organization. The BDA adoption process is more challenging at the individual level than that of other technologies due to major differences between BDA and those technologies (Fosso Wamba et al., 2015; Gandomi & Haider, 2015; Elia et al., 2020), which creates a need to explore new, unconventional approaches to overcoming BDA adoption barriers. As a result, Article II fills this research gap by borrowing a storytelling lens from linguistics research and generating new interdisciplinary knowledge on how deliberate storytelling can help reduce employee reluctance to use new, unfamiliar BDA technology.

Setting BDA adoption research gaps aside, Article II also extends the corporate storytelling literature, which lacks consistent terminology and comprises various

interrelated concepts (e.g., intentional storytelling, planned purposeful stories, narrative engineering, manipulative storytelling, etc.) (Klein, Connell & Meyer, 2007; Law, 2009; Vaara & Tienari, 2011; Auvinen et al., 2013). The lack of consensus and uniform language in the storytelling field remains a challenge and prevents researchers from further exploring applications of stories to organizational contexts in a consistent way. Therefore, to move the field of linguistics forward, Article II addresses this research gap and contributes to corporate storytelling research by defining a solid concept with a clear definition. Furthermore, despite the variety of studies demonstrating the importance of storytelling for organizational change (Driver, 2009; Whittle, Mueller & Mangan, 2009; Reissner, 2011; Vaara & Tienari, 2011; Laufer, 2019), there is a lack of studies on the importance of disseminating deliberate stories among employees to facilitate new technology adoption. However, filling this research gap and generating new knowledge on how corporate stories can facilitate BDA adoption unlocks a new approach to using storytelling in the digital age and can support the training of specialists and change managers who struggle with employee resistance to new technology. As a result, Article II provides a valuable contribution to both academia (BDA research and the storytelling literature) and industry because without such knowledge, managerial attempts to increase BDA use among employees will continue to be inefficient.

Given the shortcomings of the BDA adoption literature addressed by Article II, Article III extends this line of research even further and responds to the lack of knowledge on how to facilitate employee use of BA in daily work by improving employees' data interpretation and decision-making skills. In comparison with Article II, Article III adopts a different approach, and in addition to enriching the information systems and linguistics literature, it also deepens the knowledge in the emerging behavioral operations research literature.

Despite the increasing importance of big data and BA in organizations, employees lack the expertise and skills needed to derive useful insights from raw technical data and complex dashboards and therefore hesitate to use BA on a daily basis (Sivarajah et al., 2017). This lack of data interpretation skills and an inability to make decisions on the basis of BA represent major obstacles for organizations aiming to build a data-driven culture (Raut et al., 2021a). Although prior studies have attempted to direct researcher attention toward the role of storytelling skills in translating data into business insights for nonanalytical employees (Brady, Forde & Chadwick, 2017; Vidgen, Shaw & Grant, 2017; Fernandez & Gallardo-Gallardo, 2020), there has been a lack of research concerning how to use storytelling to explain to employees which business problems BA can resolve and how it can be used to make better and faster decisions. Filling this research gap

will improve the current research practices of scholars and practitioners by revealing a new useful application of storytelling in daily problem solving. Despite the ongoing academic debate over whether to recruit data scientists (Bose, 2009; Sun, Hall & Cegielski, 2020) or to train existing managers and improve their analytical skills (Brady, Forde & Chadwick, 2017; Behl et al., 2019; Carillo et al., 2019), there is a lack of practical guidance on how to support existing employees in making decisions based on data. For businesses to survive and succeed in a competitive business environment in the digital age, this research gap needs to be addressed due to the scarcity of data scientists on the job market and to the limited financial resources available to companies to recruit new, expensive labor. As a result, Article III fills the abovementioned research gaps and contributes to BA adoption and storytelling research by demonstrating how data-driven BA stories can convince employees of the usefulness of BA and motivate them to use this new technology more frequently. Additionally, Article III makes a valuable contribution to the emerging behavioral operational research (BOR) literature (Hämäläinen, Luoma & Saarinen, 2013; White, Burger & Yearworth, 2016) by providing a new perspective on how storytelling can be used as a narrative sensemaking heuristic during training sessions to support employees in problem solving.

Finally, Article IV contributes to existing scientific research by focusing on customers and their adoption behavior instead of employees, who were the main unit of analysis in Articles II-III. In contrast to Articles II-III, which explore the internal benefits of storytelling inside organizations, Article IV goes further to reveal the value of storytelling in customer-supplier interactions in the B2B context. The theoretical contribution of Article IV is (at least) fourfold because it provides valuable insights into several research streams simultaneously: IS (BDA), linguistics (storytelling), smart servitization (smart service sales) and customer reference marketing.

Despite the increasing digitalization of products and services in the industrial sector, manufacturing companies are confronted with customer resistance to novel and unfamiliar smart services (Klein, Biehl & Friedli, 2018; Töytäri et al., 2018), which differ from traditional service offerings along various technological, psychological and behavioral dimensions (Lim & Maglio, 2018; Fischer et al., 2020; Romero et al., 2020). From a theoretical standpoint, smart service research in the B2B context is scarce and suffers from a lack of behavioral studies addressing customer perceptions of and behaviors toward smart technologies (Wünderlich et al., 2015; Yang, Lee & Zo, 2017; Lu, Papagiannidis & Alamanos, 2018; Dreyer et al., 2019). Existing industrial marketing research lacks studies dealing with how manufacturing companies should adapt to the new logic of

digitally enabled service, transform their internal processes and modify their interactions with customers (Obal & Lancioni, 2013; Pagani & Pardo, 2017; Vendrell-Herrero et al., 2017; Kamalaldin et al., 2020). However, to help companies succeed with smart servitization in the manufacturing sector, there is a need to deepen our theoretical knowledge as well as to provide real-life examples from industry and practical implications for managers regarding how to overcome behavioral barriers to customer acceptance of suppliers' smart services (Wünderlich, Wangenheim & Bitner, 2012; Klein, Biehl & Friedli, 2018; Dreyer et al., 2019; Naik et al., 2020; Zheng et al., 2020). Without addressing the abovementioned research gaps and creating new knowledge, manufacturing companies will continue to struggle with selling smart services and will not be able to increase their service revenue. Article IV responds to these gaps and broadens the emerging smart servitization literature by demonstrating the change in customer-supplier interactions in the digital age and offering practical guidance on how to facilitate smart service sales.

Although industrial marketing researchers have emphasized the importance of sales managers as frontline employees in selling services to customers (Johnson & Sohi, 2017) and have demonstrated the need to enhance the skills of sales managers through training (Grubic, 2014; Lu, Papagiannidis & Alamanos, 2018; Bonamigo & Frech, 2020), less attention has been given to how to support sales managers in conveying the value of smart services to prospective customers in practice. Despite customer interest in the opinions and experiences of other users with smart services (Yang, Lee & Zo, 2017; Gonçalves et al., 2020), the existing literature lacks studies exploring the use of customer references in B2B marketing and service sales. The filling of this research gap and the generation of new knowledge may be of interest to managers responsible for smart service sales because in other contexts, customer references have traditionally been powerful tools in supporting sales arguments, highlighting trustworthiness, enhancing reputation and persuading prospective customers (Helm & Salminen, 2010; Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018). Correspondingly, Article IV addresses this research shortcoming and contributes to the customer reference marketing literature by drawing researchers' and practitioners' attention toward an example of successfully using customer references in facilitating smart service sales.

Furthermore, Article IV also advances the BDA literature, which has lacked empirical studies that examine applications of customer data and BDA to smart service marketing and B2B sales activities, even though researchers (Maglio & Lim, 2016; Lim, et al., 2017; Hallikainen, Savumäki & Laukkanen, 2020) suggest that the use of customer data can help companies improve service offerings and attract

new customers. By addressing this research gap, IS researchers can unlock a new, valuable application of customer data and BDA in selling smart services and therefore support smart servitization in manufacturing companies. Correspondingly, Article IV fills this research gap and contributes to BDA research by revealing how smart service providers can use BDA in customer reference marketing during sales negotiations with prospective customers as digitized evidence of smart service value.

Finally, Article IV enriches the storytelling literature and revitalizes old discussions (Gorry & Westbrook, 2011; Gilliam & Flaherty, 2015) on the relevance of storytelling in B2B sales. The existing industrial marketing literature lacks empirical studies and real-life examples of the use of stories in customer-supplier interactions in the industrial sector, which has prevented the field from moving forward. Although researchers have explored the role of storytelling in B2B branding (Bonnin & Alfonso, 2019) and B2B advertising (Anaza et al., 2020) from the managerial perspective, it is interesting to explore whether the use of storytelling as a tool for communicating with customers can support managers in selling smart services. Although prior research has pointed out the importance of collecting stories in customers' own voices about their experience (Gorry & Westbrook, 2011), it remains unclear how practical it is for suppliers to further reuse these stories in interactions with prospective customers. Furthermore, despite the existing studies on supplier-driven storytelling (Gilliam & Flaherty, 2015) and storytelling by customers (Gorry & Westbrook, 2011), storytelling research lacks empirical evidence on and a conceptual understanding of storytelling as a collective sensemaking and sensegiving tool where both customers and suppliers are involved in the process of telling stories. As a result, Article IV addresses the abovementioned research gaps and represents a valuable addition to both the storytelling and the industrial marketing literature by revealing how collected customer stories can be repurposed by sales managers and used in reference marketing to increase customer willingness to adopt smart services.

1.3 Dissertation purpose and research questions

Building on the research gaps mentioned in the previous section (and discussed in greater depth in relation to the prior literature in the "Theoretical background" section), the overarching purpose of this dissertation is to advance existing knowledge on BDA (BI, BA, analytics) adoption among employees inside organizations and customer adoption of suppliers' smart services through a storytelling lens. To achieve this goal, four independent publications were produced, and the findings of each article contribute uniquely to the studied topic.

Figure 4 summarizes the scope of the dissertation and illustrates the interrelations among Articles I-IV and the research questions, which are further discussed in the remainder of this section.

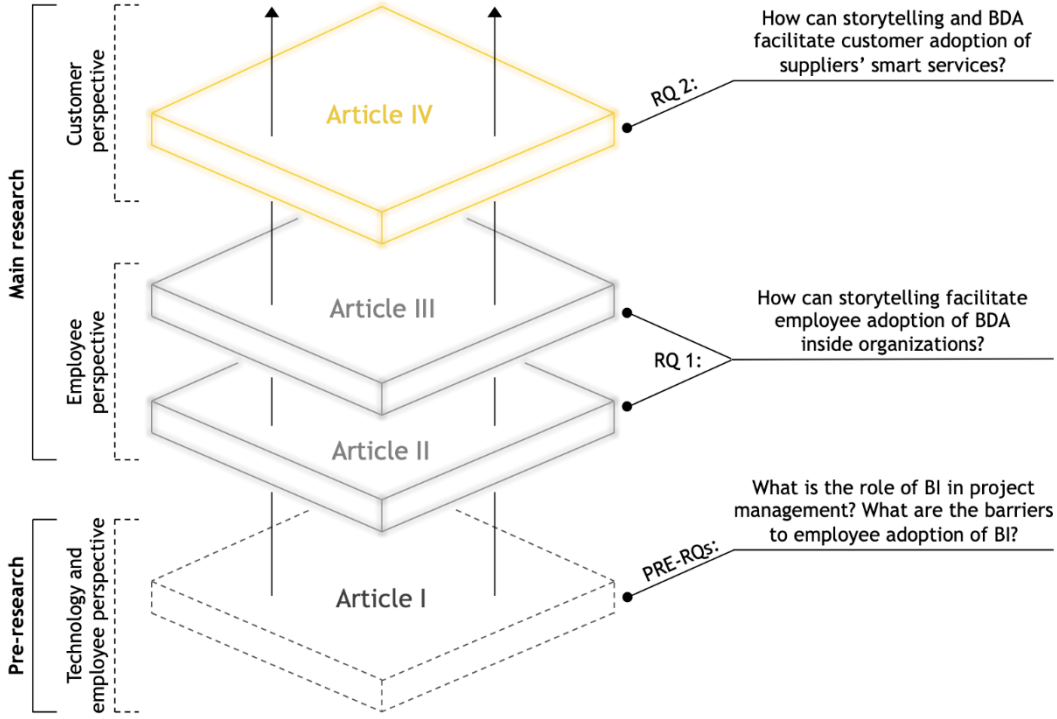

Figure 4. Conceptual framework of dissertation

Broadly speaking, the dissertation process was divided into two phases: 1) pre-research[6] and 2) main research. The pre-research phase was a preliminary and exploratory phase during which a broad area of interest was defined, terminology was explored and the dissertation theme was narrowed by specifying the research questions, which were subsequently addressed in the main research phase. During the pre-research phase, the following questions, which are addressed in Article I, were posed:

> **Pre-RQs:** What is the role of BI in project management? What are the barriers to employee adoption of BI inside organizations?

Article I is a book chapter, making it different in its theoretical and methodological nature from the rest of the articles included in this dissertation. However, Article I is an important milestone that marks the start of the dissertation and lays the groundwork for the main research. The purpose of Article I is to shed light on the importance of using BI tools in delivering projects and to highlight different

[6] In the context of this dissertation, 'pre' is used as an abbreviation for 'preliminary'.

managerial challenges to BI acceptance among employees in project-based organizations.

Upon careful consideration of the findings from the pre-research phase, it was decided to narrow the dissertation topic and to focus exclusively on BDA acceptance among employees and, in particular, on how storytelling can facilitate successful BDA adoption at the individual level inside organizations. Therefore, during the first half of the main research phase, the following research question was addressed in Articles II and III through empirical data collection and theory development:

> **RQ1:** How can storytelling facilitate employee adoption of BDA inside organizations?

Article II contributes to answering RQ1 by introducing the concept of deliberate storytelling and by providing empirical evidence on how corporate stories disseminated inside organizations can positively influence individual attitudes and behavior toward BDA. Taking a different but related approach, Article III extends the research in Article II and advances our theoretical understanding of how stories driven by BA data motivate employees to use BA on a daily basis by improving their data interpretation and decision-making skills.

While Articles II and III jointly provide answers to RQ1 by exploring the role of storytelling in employee analytics adoption inside organizations, RQ2 emerges from RQ1 and seeks an explanation of the role of storytelling and BDA (after it has already been adopted in organizations) in customer-supplier interactions during B2B sales negotiations. Although individuals and their behavior remain the main units of analysis throughout Articles I-IV, the research focuses on *employees* in Articles I-III, while Article IV takes a *customer* point of view. As a result, Article IV addresses the remaining research question, which arose during the second half of the main research phase of the dissertation:

> **RQ2:** How can storytelling and BDA facilitate customer adoption of suppliers' smart services?

By focusing on both customer and supplier behavior in a B2B environment, Article IV introduces storytelling as a means of collective sensemaking and sensegiving and explains how BDA-enhanced stories can improve customers' attitudes toward suppliers' smart services and their acceptance of these services.

Although Articles I-IV provide different insights by challenging and extending existing knowledge in various fields, all four publications intersect, complement

each other, and make a significant, value-adding contribution to the central dissertation theme. As a whole, this dissertation connects these articles and forms a coherent view of the multidimensional role of storytelling in influencing human behavior inside and outside the organization. A further discussion of the linkages between articles and their importance to the overall dissertation is continued in the section "Findings: Article summaries".

1.4 Dissertation structure

The main body of this dissertation is structured into six distinct sections. The first section, the *Introduction,* presents the background and motivation for this doctoral research by revealing managerial needs, identifying research gaps and formulating research questions. Upon reading this section, readers will gain an understanding of how digitalization causes new obstacles for managers, creating a need for scholars to address the behavioral barriers to introducing new digital technologies to employees and new smart services to customers. Furthermore, in the first section, readers are introduced to the structure of the doctoral dissertation and the significance of the pre-research and main research phases. In summary, the introductory section provides answers to the following questions: "Why is this topic important?", "Why is it important now?", and "What new information will I learn?"

The second section, *Theoretical background,* gives readers a brief overview of the key theories underlying the four articles included in the dissertation. In particular, after reading this section, readers will learn about the state of the existing literature in the fields of BI, BDA, storytelling and smart services. The key value of this section is in demonstrating to the readers: "What we know?" and "What we do not know?"

Then, the *Methodology* section reveals to readers why and how the interpretive research paradigm was selected and applied in the conceptual (Articles I and III) and empirical publications (Articles II and IV). Additionally, this third section familiarizes readers with the detailed data collection and analysis procedures carried out in each article. This section provides a transparent reporting of the actions taken to enhance the trustworthiness of the research so that the readers can evaluate the methodological rigor of findings for themselves. In summary, the third section is dedicated to advancing the readers' understanding of: "How this research was conducted?"

The fourth section, *Findings: Article summaries,* summarizes the key results of Articles I-IV and visually illustrates the new storytelling concepts introduced in the

dissertation. This section should give readers a clear idea about: "What new information this doctoral research produced?"

Next, the *Discussion and conclusions* section addresses how the four articles make value-adding contributions to existing knowledge and advance the research in different scientific disciplines. Furthermore, the practical value of the findings is highlighted, and readers can learn about the significance of this dissertation for executives and marketing, project, sales and service managers in organizations. Finally, the limitations of this dissertation are acknowledged, and future research suggestions are provided. In other words, this section interprets the results and explains to readers: "How this dissertation contributes to both theory and practice?"

Last, the full text of Articles I-IV and the author's role in each coauthored publication are presented in the *Appendices*.

2 THEORETICAL BACKGROUND

This section does not provide an exhaustive overview of everything that has ever been written on the subject of this dissertation; instead, it synthesizes and critically reviews the most relevant research on the main concepts addressed in Articles I-IV. Building on the predominant theoretical underpinnings of the four publications included in this dissertation (Figure 5), the following literature streams were selected for review in the remainder of the section: BI, BDA, data science, storytelling, servitization, and smart services.

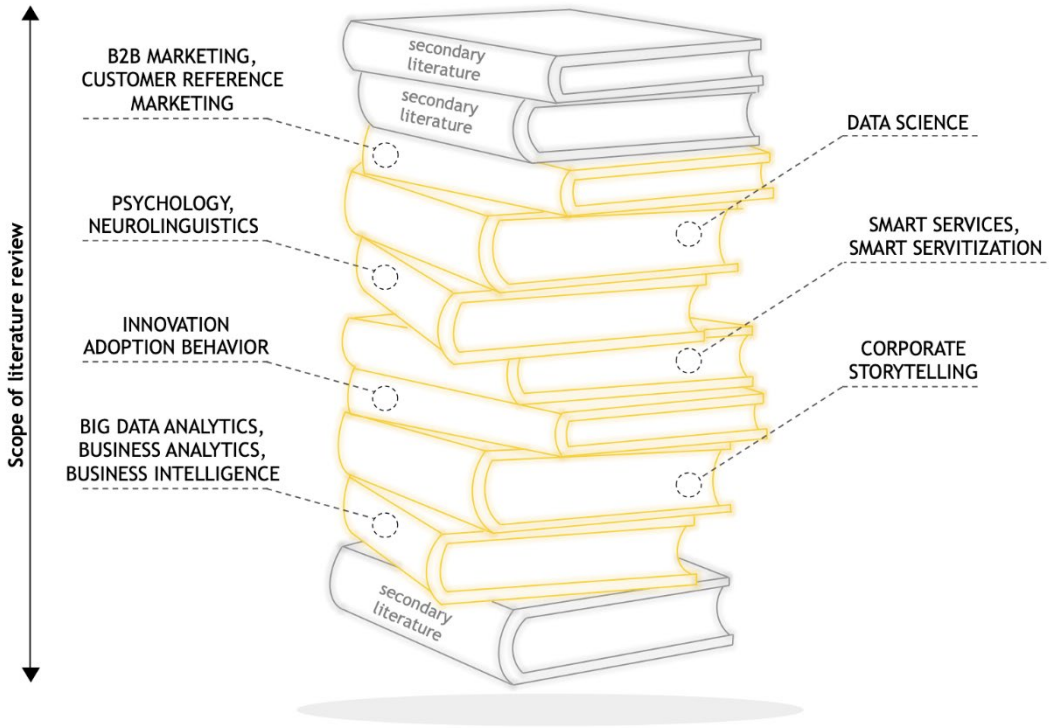

Figure 5. Scope of literature review in dissertation

This section will familiarize readers with the key vocabulary, terminology and theories applied throughout the dissertation as well as with significant shortcomings in the extant literature and the research gaps addressed by Articles I-IV. Notably, since every article represents an independent scientific publication with a unique theoretical foundation, readers will also come across the secondary supporting theories (specific to every article) in Articles I-IV in addition to the main concepts discussed in this section.

2.1 Business intelligence and big data analytics terminology

The intensifying competition, changing customer demands and increasing volumes of data generated by businesses have led to a growing interest in the extraction of business value from data in order to gain a competitive advantage among researchers and practitioners. As a result, over the past decades, the literature has experienced a proliferation of studies on BI systems, BDA and BA technologies that help capture actionable insights from data and support organizations in uncovering new business opportunities in the digital age (Lim, Chen & Chen, 2012; Holsapple, Lee-Post & Pakath, 2014; Delen & Zolbanin, 2018; Sheng, Amankwah-Amoah & Wang, 2019).

Although the academic field has demonstrated the powerful potential of data analytics in various organizational contexts (Popovič et al., 2018), there has been a continuous debate and a lack of consensus among researchers about the nature of, scope of and terminology for analytics. The analytics concept is continuously evolving, and it has been repeatedly redefined over the years to reflect emerging technological trends and multidisciplinary applications, which in turn has resulted in a multitude of buzzwords and overlapping definitions (Holsapple, Lee-Post & Pakath, 2014; Mortenson, Doherty & Robinson, 2015; Delen & Zolbanin, 2018; Liang & Liu, 2018; Yin & Fernandez, 2020).

Scholars have suggested that the analytics movement started in the 1960s-1980s with the emergence of decision-support systems characterized by the basic usage of computing technologies to enable quick and accurate decision-making (Mortenson, Doherty & Robinson, 2015; Delen & Zolbanin, 2018). Then, this period was followed by the growth of BI applications in the 1990s-2000s and the use of key performance indicators (KPIs) to measure operational and strategic improvements (Chen, Chiang & Storey, 2012). Finally, the increasing role of big data from the 2000s to the present day has led to a shift in focus toward more advanced predictive and prescriptive analytics (Holsapple, Lee-Post & Pakath, 2014; Delen & Zolbanin, 2018).

In the existing literature, the term BA often refers to a collection of technologies that enable data-driven problem solving and improve organizational performance in various business domains (e.g., marketing, HR, finance, sales) (Holsapple, Lee-Post & Pakath, 2014). Prior research distinguishes between several types of analytics: descriptive (and diagnostic), predictive and prescriptive analytics (Mortenson, Doherty & Robinson, 2015; Delen & Zolbanin, 2018). Some researchers have suggested that descriptive and diagnostic analytics are equivalent

to traditional BI systems, which are characterized by the use of data mining, reporting and visualization tools to find the root cause of a business problem and answer questions such as "What happened and why?" and "What is happening now?" (Larson & Chang, 2016). In contrast, predictive and prescriptive analytics involve more advanced statistical modeling, simulation and machine learning techniques to forecast future events and recommend a course of action (Delen & Zolbanin, 2018). Correspondingly, these types of analytics provide answers to questions such as "What is likely to happen in the future?" and "What should we do next?" (Mortenson, Doherty & Robinson, 2015). Similarly, other researchers (Holsapple, Lee-Post & Pakath, 2014; Chen & Nath, 2018; Yin & Fernandez, 2020) agree that BI capabilities are limited to handling only small volumes of structured data and rely mainly on descriptive analytics as opposed to the sophisticated mathematical modeling and forecasting techniques applied in BA to uncover patterns in unstructured and semistructured data and to predict future events. As a result, this particular community of researchers positions BI as a subset of BA and highlights that the emergence of big data (Fosso Wamba et al., 2015; Gandomi & Haider, 2015; Elia et al., 2020) is the main driver that prompted the transformation of traditional BI systems into predictive and prescriptive BDA.

In contrast to this perspective, Bose (2009) and Sheng, Amankwah-Amoah and Wang (2019) define BDA as a set of technical tools that help to derive BI from big data, where BI refers to business value. These researchers describe BDA as hardware and software techniques that use statistical analysis and data mining to process historical and real-time data and to identify relationships (Bose, 2009; Sheng, Amankwah-Amoah & Wang, 2019).

Despite the variation in terminology across existing research, scholars (Holsapple, Lee-Post & Pakath, 2014; Trieu, 2017; Delen & Zolbanin, 2018) have suggested that all these concepts share the common element of data-driven decision-making and are bounded by the conversion of data into meaningful insights and practical business outcomes. Therefore, researchers have proposed either using these terms interchangeably or taking advantage of a common analytics term to refer to various applications that support the processes of data interpretation and new knowledge creation. Likewise, Bose (2009) recommends applying the general term analytics when discussing the use of different statistical and predictive modeling techniques in problem solving. Furthermore, it has been suggested that analytics does not refer to a single technology, but rather encompasses a group of tools used to collect and process data and to extract valuable information in order to achieve organizational goals (Bose, 2009).

Building on this inconsistent and overlapping terminology, prior research has repeatedly called for a unified vocabulary for and definition of analytics (Chen, Chiang & Storey, 2012; Holsapple, Lee-Post & Pakath, 2014). Congruent with the prior research that has attempted to combine the BI, BDA and BA concepts, Chen, Chiang and Storey (2012) coined the unified term BI&A, which incorporates the functionalities of both BI and analytics. Similarly, Lim, Chen and Chen (2012) proposed the use of BI as an inclusive umbrella term to describe evidence-driven support systems, applications, tools and methodologies that support users in extracting valuable knowledge from complex data to improve products, services, organizational performance and customer relationships. Despite the heterogeneous vocabulary and perspectives applied across disciplines, a recent study has demonstrated the steady growth of big data-related terminology (BDA and BA) in academic journals (Liang & Liu, 2018).

In line with the reasoning of Bose (2009), Chen, Chiang and Storey (2012), Holsapple, Lee-Post and Pakath (2014), Trieu (2017), Delen and Zolbanin (2018), this dissertation does not use a narrow definition of analytics that refers only to descriptive analytics or to a single technology. Instead, an inclusive view is adopted by taking advantage of the various perspectives and analytics classifications in the existing literature. As a result, despite the use of the term BI in Article I, BDA in Articles II and IV, and BA in Article III, these concepts share similar underlying characteristics and a common definition that broadly refers to data-driven technologies designed to collect, process, analyze and visualize big data (using a combination of descriptive, predictive and prescriptive models) for the purpose of uncovering meaningful and useful information and of helping organizations to make informed (operational and strategic) business decisions. These different terms were used in Articles I-IV due to the particular focus of a scientific journal, the predetermined vocabulary in a call for papers (Articles III and IV) and the language used throughout the book (Article I). However, upon careful examination of the definitions of BI, BDA and BA given in Articles I-IV, readers will easily notice the semantic resemblance of these terms.

The terminology used in this dissertation is consistent with the terms applied in the publications. The dissertation utilizes the term BI when referring to the content of Article I, while the terms BDA and BA are used interchangeably or are substituted with the term analytics (for simplicity) since these concepts are commonly characterized by the use of big data. Congruent with the findings of Liang and Liu (2018), the use of the term BDA is predominant in the publications (Articles II and IV) and in this dissertation due to the increasing tendency to use big data-associated wording in scientific journals.

2.2 Capturing value from business intelligence and big data analytics

The ongoing digital transformation across different business sectors has positioned data at the center of every organization, thus transforming business operations and revolutionizing industries. As data analytics technologies become less expensive and easier to use, an increasing number of companies are attempting to align BI and BDA with business goals and to leverage them to gain operational and strategic benefits. Numerous studies have identified a positive relationship between BDA investments and firm's financial success (Fosso Wamba et al., 2017; Gunasekaran et al., 2017; Vitari & Raguseo, 2020). Additionally, prior research has demonstrated that analytics plays a supporting role in managing internal and external knowledge, creating organizational agility and gaining a competitive advantage (Côrte-Real, Oliveira & Ruivo, 2017).

2.2.1 Business intelligence in project management

Prior research has suggested that BI systems deliver value on multiple levels. At the individual level, BI improves individual productivity by assisting with individual decision-making and helping to manage large volumes of data (Trieu, 2017). At the team level, BI facilitates collaboration and teamwork across different departments throughout a project's lifecycle, while at the organizational and industrial levels, BI helps improve organizational performance and increase competitiveness on the market (Trieu, 2017).

During project delivery, BI technologies support project managers in sharing knowledge with team members (Oussama, Zitouni & Othmane, 2013), dealing with information overload in multiproject environments (Caniëls & Bakens, 2012), and identifying and mitigating risks based on the lessons learned from previous projects (Oliveira & Almeida, 2019). Capacity planning software and knowledge management databases help project managers effectively allocate resources by assigning workers to project tasks, taking into account their skills and availability (Braglia & Frosolini, 2014). Additionally, project management information systems offer time savings by continuously monitoring project progress, comparing it with the project baseline and notifying managers about discrepancies between the original plan and its execution (Braglia & Frosolini, 2014). Finally, information systems increase efficiency in project management by providing access to the latest project documentation and by keeping the project team involved and up-to-date during the project's lifecycle (Braglia & Frosolini, 2014).

Despite the emergence of a literature on BI benefits for delivering projects, there is a lack of research that provides a comprehensive overview of BI applications across the whole project delivery lifecycle. As a result, Article I addresses this research gap and provides support to managers in exploiting the full potential of BI by illustrating the variety of BI tools that can be used during all stages of project management in organizations.

2.2.2 Big data analytics applications across industries

In an industrial context, such as manufacturing, BDA helps organizations to improve equipment uptime through remote condition monitoring, estimate product delivery times and predict demand fluctuations based on forecasting models, and reduce waste and product returns by improving product quality and optimizing production processes (Popoviĉ et al., 2018).

In e-commerce businesses, data analytics can increase consumer loyalty by using targeted advertising and suggesting new products and personalized offers to users by continuously monitoring users' transaction histories, tastes and preferences (Akter & Fosso Wamba, 2016). Similarly, in online dating services, BDA utilizes information from social media, online shopping histories, personal dating profiles and personality test results to match users based on their compatibility (Akter & Fosso Wamba, 2016).

Extant research has also illustrated the business value of BDA to nurses and physicians in healthcare organizations. For example, on the basis of health histories, lifestyle choices, exercise patterns and dietary habits, BDA can predict possible diagnoses in advance, create personalized preventive care plans and prescribe treatments (Wang & Hajli, 2017). Additionally, BDA technology enables the continuous remote monitoring of patients with chronic diseases through wearable devices (e.g., fitness trackers, heart monitors, smart watches) to reduce healthcare costs (Sakr & Elgammal, 2016). During outbreaks of contagious diseases (e.g., Ebola, COVID-19), BDA can support government and healthcare professionals in reducing the spread of those diseases (Amankwah-Amoah, 2016; Jia et al., 2020). The use of BDA together with surveillance video systems, GPS phone tracking, credit card histories and location services in smartphone applications helps to trace the contacts of confirmed cases, identify high-risk areas and predict the geographical locations of future outbreaks (Alsunaidi et al., 2021). Through the use of data analytics, governments can isolate affected areas in a timely manner and allocate healthcare resources in advance. The emerging literature on the fight against the current COVID-19 pandemic also demonstrates

that BDA together with AI can be helpful in analyzing X-ray images and detecting existing pneumonia cases in their early stages (Agbehadji et al., 2020).

Similarly, researchers and practitioners have observed a number of cost reduction benefits from adopting big data technologies in the energy sector. For example, analytics enable the monitoring of and reductions in energy consumption in buildings based on occupancy (Marinakis et al., 2020). Home appliances, such as lights, furnaces, air conditioners, televisions and refrigerators, can be adjusted remotely when the occupant is away (Marinakis et al., 2020). Additionally, BDA enables the monitoring of air quality, CO_2 levels, humidity and temperature to improve occupant health and comfort (Silva, Khan & Han, 2020). In addition, BDA can account for meteorological factors (wind, temperature, humidity and precipitation) to predict weather- or lightning-related power outages and to forecast solar or wind power generation (Kezunovic et al., 2020).

Finally, in the railway transportation industry, BDA enables real-time remote condition monitoring of railway components such as trains, tracks and electrical overhead wires to prevent unexpected breakages (McMahon, Zhang & Dwight, 2020). Continuous data collection and analysis allow foreign objects on tracks to be detected, thus minimizing the risk of train derailment. Based on collections of historical accident data, BDA can analyze risk factors and identify route improvements to prevent future train accidents (McMahon, Zhang & Dwight, 2020). Additionally, as a part of centralized traffic control, BDA allows weather forecasts to be continuously monitored in order to predict train delays and alterations in passenger timetables (Ghofrani et al., 2018).

2.2.3 Big data and analytics in industrial services

Although numerous studies have explored the value of BDA in different industrial contexts, far less attention has been given to BDA applications in B2B environments. Researchers have claimed that BDA has extensive (yet unexplored) business potential for B2B firms and have therefore encouraged companies to concentrate on repurposing their customer data (Opresnik & Taisch, 2015; Paiola & Gebauer, 2020) and to engage in big data-driven marketing in B2B customer relationships (Hallikainen, Savimäki & Laukkanen, 2020). Prior research (Lim et al., 2017) has suggested that big data helps organizations better understand customer behavior, improve their service offers and attract new customers. An emerging literature has provided evidence that BDA can help improve customer experience journeys and touch points (Holmlund et al., 2020), develop personalized products and service offerings, improve customer satisfaction and thus foster B2B sales growth (Hallikainen, Savimäki & Laukkanen, 2020).

Nevertheless, a better understanding of how new digital technologies can facilitate B2B sales negotiations and mitigate those customer-perceived risks that prevent customers from adopting new products or services in the digital age (Obal & Lancioni, 2013) is needed. As a result, more qualitative in-depth research is needed to understand how customer data processed by BDA can be converted into business value in daily operations.

Although researchers have pointed out the importance of data on customer processes collected through sensors in equipment as a unique strategic asset in the B2B setting (Lim et al., 2017; Turunen, Eloranta & Hakanen, 2018; Paiola & Gebauer, 2020), practical examples of how these data can be used, for example, in B2B marketing activities or to facilitate service sales, remain unclear. Additionally, existing servitization research (Turunen, Eloranta & Hakanen, 2018) has focused mainly on data sharing and data ownership instead of moving forward by addressing how already-collected customer data can be repurposed by service providers in sales negotiations to achieve monetary benefits. Similarly, Yang, See-To and Papagiannidis (2020) direct attention to the need to prioritize the extraction of knowledge from internally collected data (e.g., business emails with customers) instead of acquiring external data from third-party providers.

With the increase in digitalization across industrial sectors and the emergence of the concept of smart services (which is rapidly gaining widespread applicability), both researchers and practitioners have started exploring the new opportunities that big data and analytics can offer for fostering new, disruptive service innovations in the digital age. Attempting to contribute to this scarce research area, Maglio and Lim (2016) suggest that smart services can be enhanced through the collection of, for example, product condition data or personal data (healthcare records, card purchase data). Although numerous industrial marketing scholars (Raddats et al., 2019; Grandinetti et al., 2020; Paiola & Gebauer, 2020) have acknowledged the importance of having access to customer data to develop new digitally enabled services, there is a lack of empirical research explaining how manufacturing firms can leverage big data and BDA to promote and sell smart services to customers. Companies are unprepared for and inexperienced with the digitalization of their service offerings (Paiola & Gebauer, 2020), and for this reason, real-life examples of successful B2B manufacturing companies are needed.

Filling the abovementioned research gaps and generating new knowledge on BDA applications to B2B relationships could provide researchers and practitioners with new insights regarding how to maximize the business potential of customer data and BDA in smart service sales. Without a deeper understanding of how data

analytics can be used in B2B marketing and sales at the operational level, it remains unclear how BDA can lead to new revenue generation from smart services.

Building on the identified shortcomings in the literature, Article IV unlocks a new application of BDA to smart service sales in the industrial B2B context. Article IV advances the current servitization and IS research and explains how suppliers can utilize BDA in customer reference marketing during B2B sales negotiations to highlight suppliers' trustworthiness and service value and, as a result, persuade prospective customers to buy smart services. Article IV facilitates the progress of the industrial marketing field by demonstrating how the use of digital technology (i.e., BDA) can help servitizing firms succeed in helping their interactions with customers evolve in the digital age (Obal & Lancioni, 2013; Pagani & Pardo, 2017).

2.3 Adoption of business intelligence and big data analytics in organizations

Despite the widespread acknowledgment of the operational and strategic business benefits that BI and BDA offer, the process of adopting these technologies within organizations has received scant attention in the literature. Only in recent years has academia witnessed an emerging number of conceptual and empirical contributions and a growing interest among researchers and practitioners in the factors that facilitate and that hinder the acceptance of BI and BDA at the individual and organizational levels.

2.3.1 Business intelligence adoption[7]

Prior research enhances our understanding of BI implementation in organizations by identifying organizational, technological and individual success factors such as the commitment of management, financial support, BI alignment with business objectives, clear roadmaps for BI implementation, cross-functional teams, the use of external consultants, a strong and flexible technical infrastructure, high-quality data, and the recruitment of qualified personnel and staff training (Watson & Wixom, 2007; Yeoh, Koronios & Gao, 2008; Ain et al., 2019; Becerra-Godinez et al., 2020; Bhatiasevi & Naglis, 2020). Additionally, researchers have highlighted the crucial role played by internal project champions (managers who create BI

[7] Despite the focus of this section on BI, it is worth mentioning that some recent studies (e.g., Ain et al. (2019), Bhatiasevi & Naglis (2020)) utilize a BI terminology that incorporates the concepts of big data and advanced predictive analytics, which are often regarded as BDA characteristics. Therefore, if the reader considers BI and BDA to be separate concepts, then the content of this section should be interpreted with caution.

awareness inside an organization, acquire support from top management, organize BI training, etc.) in successful BI adoption (Yeoh, Koronios & Gao, 2008; Puklavec, Oliveira & Popoviĉ, 2018). Recent studies have demonstrated the significance of the perceived usefulness and ease of use of BI on firm-level BI acceptance and have recommended that technology vendors focus on demonstrating these BI characteristics to top-level managers to justify their investment in BI (Pejic-Bach, Zoroja & Celjo, 2017; Ain et al., 2019).

From the user perspective, researchers (Grubljeŝiĉ & Jakliĉ, 2015; Ain et al., 2019) have emphasized individual-level acceptance and readiness for change as the most challenging behavioral aspects of incorporating BI into business operations. Existing literature (Ain et al., 2019) has suggested that employees lack motivation and technical expertise, fear the need to acquire the new skills needed to use BI, and worry about changes in the decision-making process—these are some of the main reasons why users are not willing to embed BI into their daily work. Consequently, organizations need to ensure a good fit between technology and users' working habits to positively impact users' intention to use BI (Jakliĉ, Grubljeŝiĉ & Popoviĉ, 2018). On the other hand, the lack of a data-driven culture and of IT support can negatively affect users' attitudes toward BI (Ain et al., 2019). Finally, researchers have proposed that to facilitate effective acceptance of BI, its relative advantages should be clearly visible and understood by everyone in the organization (Grubljeŝiĉ & Jakliĉ, 2015), and a rewarding environment should be created to incentivize employees to use BI in their daily work (Bhatiasevi & Naglis, 2020).

2.3.2 Big data analytics adoption

Over the past decade, the increasing role of large datasets has shifted the focus of researchers toward the way in which big data characteristics (volume, velocity, variety, veracity, variability and value) distinguish BDA from other technologies and make BDA adoption more challenging (Fosso Wamba et al., 2015; Gandomi & Haider, 2015; Elia et al., 2020). Despite the overlap in BI and BDA terminology and similarities in their adoption processes, the disruptive nature of big data has attracted researchers' attention and has motivated them to address the factors that help organizations overcome challenges in implementing big data and analytics.

From a broader perspective, prior research has identified three types of obstacles to BDA adoption: data-related challenges resulting from the characteristics of big data, process challenges related to data acquisition and interpretation, and management challenges in the integration of data into business operations (Sivarajah et al., 2017). Other researchers have taken a similar approach but

identified a different set of barriers: technological barriers related to the standardization of data collection and storage processes, barriers due to organizational culture associated with prioritizing data-informed decision-making over intuition, and monetization barriers concerned with utilizing BA data to create new business offerings (Omar, Minoufekr & Plapper, 2019).

The concept of big data is nebulous, which makes it difficult for employees and top management to understand the practical benefits of BDA. Management lacks certainty about long-term analytics usage and therefore hesitates to invest in big data technologies (Alharti, Krotov & Bowman, 2017; Caesarius & Hohenthal, 2018; Raut et al., 2021b). Correspondingly, numerous researchers have demonstrated that perceptions of strategic BDA benefits and top management support are significant factors facilitating a firm's intention to adopt analytics (Verma & Bhattacharyya, 2017; Lai, Sun & Ren, 2018; Nam, Lee & Lee, 2019; Zhang & Lam 2019; Maroufkhani, Ismail & Ghobakhloo, 2020; Maroufkhani et al., 2020).

Existing literature suggests that organizations aiming to capture value from big data technologies often face difficulties such as information overload, unreliable data, a lack of critical thinking capabilities, and a lack of analytics expertise (Alharti, Krotov & Bowman, 2017; Nam, Lee & Lee, 2019; Urbinati et al., 2019). Additionally, employees might feel threatened by the disruptive nature of BDA and how it transforms daily operations and job responsibilities (Caesarius & Hohenthal, 2018). Other technological and cultural obstacles that prevent organizations from implementing big data initiatives in daily decision-making include investing in costly infrastructure for collecting and storing data, addressing data privacy and security concerns, defining the organization's vision for a big data strategy, fostering a data-driven culture and promoting data-driven decision-making instead of making decisions on the basis of prior experience (Dremel et al., 2017; Sivarajah et al., 2017; Vidgen, Shaw & Grant, 2017; Raguseo, 2018; Moktadir et al., 2019; Tabesh, Mousavidin & Hasani, 2019; Bolonne & Wijewardene, 2020). A recent study (Nam, Lee & Lee, 2019) has also identified analytics centralization as a managerial obstacle impeding BA adoption in organizations and has recommended that organizations provide flexibility to departments in employing analytics and hiring skilled labor instead of concentrating power over BA within a single analytics team. Prior research (Maroufkhani, Ismail & Ghobakhloo, 2020; Maroufkhani et al., 2020) has claimed that from the organizational perspective, external support from technology vendors can decrease company reluctance to invest in BDA. To achieve this, BDA vendors should provide good technical support, trial versions, and flexible pricing plans and should use customer reference marketing and success stories from

similar industries to show their trustworthiness to company owners (Maroufkhani et al., 2020).

An increasing number of researchers have argued that successful BA implementation in organizations is not just a technical project; rather, the biggest barriers to BA adoption are organizational, and there is a need to transform existing organizational processes to align them with analytics (Vidgen, Shaw & Grant, 2017; Tim et al., 2020). Data analytics should be embedded into the organizational culture across all employee levels so that both managers and frontline employees can develop a data-driven mindset and everyone can use data-driven insights to make informed decisions (Carillo, 2017; Tim et al., 2020). According to existing literature, deriving business value from a BDA investment is predetermined by whether organizations can internally promote BDA as a strategic priority, can communicate top management's expectations for big data to employees, can invest in training sessions, and can continuously improve their BDA based on collected feedback (Côrte-Real et al., 2019; Zhang & Lam, 2019; Maroufkhani et al., 2020).

User experience with BDA is a key driving force that has a significant influence on the effective extraction of benefits from BDA (Côrte-Real et al., 2019). As a result, employee resistance to changes in old working habits and to the use of new technology is a serious risk that organizations are faced with when incorporating BDA into daily work (Alharti, Krotov & Bowman, 2017; Raguseo, 2018; Shahbaz et al., 2019). Prior research has suggested that organizations should pay attention to technological factors such as BDA system quality and usability and data accuracy and consistency, as these are crucial factors affecting user perceptions of the benefits of analytics, which in turn affect individuals' intentions to use technology (Vidgen, Shaw & Grant, 2017; Verma, Bhattacharyya & Kumar, 2018; Nam, Lee & Lee, 2019; Bolonne & Wijewardene, 2020). Other researchers (Cabrero-Sanchez & Villarejo-Ramos, 2019) have claimed that companies can overcome individual resistance to BDA use by showing employees examples of how BDA generates value for other companies in the same industry.

From the individual's viewpoint, low levels of self-efficacy, a fear of statistics and a lack of training strongly affect the intention to use BDA (Vargas et al., 2018; Shahbaz et al., 2020). According to prior research, male employees are more inclined to accept BDA than female employees, who tend to be more resistant due to computer illiteracy (Shahbaz et al., 2020). As a result, researchers have proposed that a positive attitude toward analytics can be nurtured by increasing employees' self-efficacy through analytics training or by restructuring existing teams and designing cross-functional analytical teams to facilitate engagement

and cross-learning between business experts and statisticians (Dremel et al., 2017; Vidgen, Shaw & Grant, 2017; Tim et al., 2020). On the other hand, in addition to (or instead of) developing the skills of existing employees, companies can hire data scientists, collaborate with third parties in government-supported programs or build skills through training provided by BDA vendors to compensate for the lack of in-house expertise (Alharti, Krotov & Bowman, 2017; Dremel et al., 2017; Maroufkhani, Ismail & Ghobakhloo, 2020; Maroufkhani et al., 2020).

Although a considerable number of studies have been published on the organizational and technological factors contributing to a favorable internal environment for effective BDA adoption, our present understanding of individual-level adoption and the user-related factors underlying employees' positive attitudes toward analytics remains too narrow (Ain et al., 2019; Aboelmaged & Mouakket, 2020). Although researchers over the years (Alharti, Krotov & Bowman, 2017; Raguseo, 2018; Shahbaz et al., 2019) have called attention to individual resistance to BDA and have attempted to explain which factors influence employee intentions to use analytics (Verma, Bhattacharyya & Kumar, 2018; Cabrero-Sanchez & Villarejo-Ramos, 2019; Shahbaz et al., 2020), recommendations and successful practical examples from the industry on how to influence the behavior of employees are lacking. Existing individual-level studies are mostly limited to quantitative research and tend to focus on revealing the reasons behind (instead of solutions to) employee resistance and individuals' negative perceptions of BDA. Without a doubt, identifying the barriers to BDA integration in organizations is crucial; however, it is only a first step, and a further, deeper understanding regarding how to overcome these barriers and boost BDA adoption is needed.

The lack of knowledge on how to improve employee attitudes toward analytics and how to facilitate BDA use remains an obstacle and prevents organizations from successfully integrating analytics into their business operations and unlocking the full business potential of BDA. Filling this research gap will advance current BDA and BA research, and new knowledge will be useful to practitioners aiming to create a data-driven culture in which BDA is utilized on a daily basis.

Following the recommendations of prior research (Aboelmaged & Mouakket, 2020; Maroufkhani et al., 2020) to explore analytics acceptance at the individual level based on data collected from respondents directly involved in BDA use and the BDA adoption process (instead of interviewing only senior management), Article II demonstrates how storytelling techniques can be used in organizations to positively influence human behavior toward BDA in everyday operations. Article II extends existing knowledge and contributes to previously published practical

examples of successful BDA implementation in organizations (Dremel et al., 2017; Tim et al., 2020). Building on insights from linguistics, psychology and neuroscience, Article III addresses the above shortcomings that have been identified in the literature from a different perspective and explains how the dissemination of stories related to BA data among employees improves their data interpretation and decision-making skills and therefore increases their motivation to use BA in their work.

2.4 Storytelling in organizations

Storytelling is an inherent part of human life—starting from early childhood tales to stories used for entertainment, marketing or political purposes, stories shared with friends and colleagues, and cultural myths and religious stories, to name a few (Kent, 2015). A large amount of daily information is communicated in the form of stories for the purpose of sharing knowledge, eliciting emotions, and persuading, inspiring, and educating audiences (James & Minnis, 2004; Denning, 2006).

Despite the increasing interest in organizational storytelling, researchers continue to debate what constitutes a story, and there is a lack of consensus in the literature on the nature of *stories* and *narratives* (Hawkins & Saleem, 2012; Spear & Roper, 2013; Beigi, Callahan & Michaelson, 2019). These terms have been defined in numerous ways, and while some researchers distinguish between them (Cunliffe, Luhman & Boje, 2004), others use the terms stories and narratives interchangeably (Sandelowski, 1991; Gabriel, 2000). This dissertation builds upon the latter interpretation and incorporates the attributes of both stories and narratives when defining the storytelling concept. As a result, in the context of this research, storytelling refers to the organizational process of developing and spreading compelling narratives (written or spoken messages) with characters and a coherent plotline that inform and persuade the target audience.

However, within the scope of this dissertation, Articles II-IV go beyond the basic definition of storytelling and shed light on how different types of stories can serve different business purposes. As a result, the rest of this section discusses strategic applications of stories in various organizational contexts and reveals how the concept of storytelling differs in Articles II-IV. In particular, Article II defines the new concept of deliberate storytelling used for the purpose of increasing analytics adoption among employees, while Article III presents a novel approach to telling BA data-driven stories through big data visualizations as a sensemaking heuristic to improve individual data interpretation skills. Finally, Article IV contributes to

this stream of research by revealing a new application of BDA-enhanced stories and collective storytelling between suppliers and customers that can be used as a sensemaking and sensegiving tool to speed up B2B negotiations and sales.

2.4.1 Corporate storytelling

The importance of storytelling to organizational culture has long been acknowledged in scientific research. In the organizational context, stories can be used as a means of modifying and controlling human behavior; guiding employees in problem solving and decision-making; fostering collaboration among employees; disclosing weaknesses, risks, mistakes from the past and lessons learned; demonstrating empathy and building trust; strengthening leaders' positions and reducing the distance between top management and subordinates; promoting new products to customers; communicating innovations; celebrating accomplishments; and envisioning the future (James & Minnis, 2004; Denning, 2006; Harris & Barnes, 2006; Auvinen et al., 2013; Taylor, 2021).

The increasing role of storytelling has led to a growing interest among researchers in identifying the variety of story plots used throughout history (e.g., stories about adventure, discovery, rescue, mystery, rising and falling, rivalry, and transformation) and the elements of compelling stories (e.g., a distinct purpose, convincing characters, a positive tone, credibility, plain language, thrilling plotlines, and a coherent structure with a beginning, middle and end) to identify the kind of stories that resonate with audiences and motivate people to listen and to act (Morgan & Dennehy, 1997; Barker & Gower, 2010; Marshall & Adamic, 2010; Kent, 2015).

Existing literature has demonstrated the powerful role of corporate stories in building a stronger brand and enhancing corporate reputation by communicating organizational activities and benefits to stakeholders; articulating organizational values to present the organization as an ethical, safe and responsible employer; and creating emotional bonds on a personal level with customers, investors and employees by taking care of the environment and contributing to society (Dowling, 2006; Spear & Roper, 2013; Gill, 2015). Storytelling has also been shown to be an effective way of internally communicating corporate strategy to employees to help them understand strategic visions and goals, make them feel proud about the organizations' achievements and help them see their role in executing strategies (Spear & Roper, 2016). For example, in the HR context, stories can be used as social maps of the company's philosophy, policies and practices (as an alternative to standard handbooks with guidelines) that convey to new organizational members which behaviors are acceptable and which are frowned upon (Wilkins,

1984). Researchers agree that effective internal storytelling can strengthen employee commitment to organizational goals, improve satisfaction with the workplace, and increase enthusiasm for performing job tasks (Gustomo et al., 2019). As a result, storytelling improves employee engagement, which in turn has a positive effect on organizational performance (Khdour, Masa'deh & Al-Raoush, 2020).

In the field of management, there has been growing interest in organizational storytelling as a tool for influencing audiences and reducing resistance during organizational change (e.g., internationalization, mergers, new technology adoption, and layoffs). While change often provokes anxiety in people, stories can help engage employees in the change process and help them overcome their fears. Several studies have found that intentional storytelling can aid in promoting change among organizational members and help them make sense of new corporate realities by demonstrating how new changes are approved by top management or how new goals are aligned with the organization's core principles and established routines (Reissner, 2011; Vaara & Tienari, 2011; Laufer, 2019). Prior research has suggested that planned, purposeful stories disseminated by management during training sessions help frontline employees learn about the benefits of technological change and make them feel supported and motivated when adapting to ongoing changes (Law, 2009). In operational research practice, researchers have encouraged managers to become narrative engineers and to use stories (true or fictional) as promotional material to share tacit knowledge, educate, enable sensemaking among organizational members and facilitate change inside organizations (Klein, Connell & Meyer, 2007; Klein, 2009).

Organizational storytelling does not necessarily refer to formal monologues rehearsed by senior management in official meeting rooms; small, informal stories can also be shared as part of everyday workplace conversations in hallways or lunchrooms. For example, during the change process in a workplace, employees can share personal stories with colleagues in which they portray themselves as heroes, survivors or victims in an attempt to defend and maintain their position and reputation within the organization (Whittle, Mueller & Mangan, 2009). By encouraging storytelling and collecting stories from employees, organizations can better understand how workers interpret change, how it affects their daily work and how they perceive their own role in the transformation (Driver, 2009).

Storytelling has also been recognized as a powerful crisis management tool for reassuring stakeholders and reducing their anxiety and uncertainty during organizational crises through positive messages (Kopp et al., 2011). For example, to prevent the public from incorrectly interpreting a scandal and to gain trust, a

designated spokesperson can deliver stories in the form of an apology through media and explain how the organization will survive the crisis through corrective actions (Clementson, 2020).

On the other hand, particularly as it relates to leadership, storytelling can be viewed as fraudulent and a form of management manipulation by distributing (deliberately or not) deceptive and biased messages to employees (Beigi, Callahan & Michaelson, 2019). In contrast to the dissemination of truthful stories (Morgan & Dennehy, 1997), the unethical use of storytelling can mislead audiences by distorting reality or by giving a false sense of empathy or support to serve management's own interests or to soften the hard truth for a greater good (Auvinen et al., 2013). For example, negative stories, gossip or rumors about organizational conflicts or incidents can spread virally in organizations through word of mouth. Nevertheless, organizations should welcome differences of opinion and encourage employees to share different stories to reveal and respond to potential problems in a timely manner instead of ignoring or suppressing such stories (Spear & Roper, 2016).

Despite various disciplines recognizing the power of corporate storytelling, different terms (intentional storytelling, planned purposeful stories, narrative engineering, manipulative storytelling, etc.) are scattered throughout this research stream (Klein, Connell & Meyer, 2007; Law, 2009; Vaara & Tienari, 2011; Auvinen et al., 2013), and the literature needs a unified concept with a clear definition to allow the field to advance. The inconsistency in terminology and lack of formal language remain obstacles and prevent researchers from systematically exploring the implications and practical applications of corporate stories further. Article II addresses this research gap and contributes to the existing literature by introducing and defining the concept of deliberate storytelling to extend our understanding of the planned and intentional use of stories to achieve a particular organizational goal.

Although a growing body of literature has addressed the importance of storytelling for organizational change (Driver, 2009; Whittle, Mueller & Mangan, 2009; Reissner, 2011; Vaara & Tienari, 2011; Laufer, 2019), research on how and practical examples demonstrating that stories deliberately disseminated by management can facilitate new technology adoption by employees are lacking. To advance the existing research and capture the untapped potential of stories, some scholars (Beigi, Callahan & Michaelson, 2019) have called for studies to explore the impact of organization-induced storytelling and how stories influence employees. Filling these research gaps will provide researchers and practitioners with a new perspective regarding the successful application of deliberate stories inside

organizations. In particular, this new knowledge will be valuable to the HR managers and change management leaders responsible for the implementation of new technology in organizations who are struggling with resistance from employees. As a result, in response to the abovementioned research gaps, Articles II-III focus on internal technological change and broaden current knowledge by presenting empirical evidence, building new theory and offering successful examples of the use of storytelling to facilitate individual-level BDA usage inside organizations.

Despite the existence of numerous studies on story types with different content and functions (Morgan & Dennehy, 1997; Denning, 2006; Marshall & Adamic, 2010; Spear & Roper, 2013; Kent, 2015), far less attention has been directed toward the synergy between stories with different plots and the immersion of audiences in multiperspective storytelling. While prior research (James & Minnis, 2004; Klein, Connell & Meyer, 2007) has suggested that story themes should be simple, straightforward and tailored to each particular audience, Article II takes the opposite approach and demonstrates how different stories disseminated simultaneously complement each other and increase individual-level BDA usage by resolving the different challenges that employees face (e.g., system usability, data interpretation, data quality, and privacy and security concerns). Congruent with Barker and Gower (2010), who recommend that future studies explore the attributes of successful storytelling and how to integrate stories into a workflow, Article II defines the characteristics and patterns of effective deliberate storytelling through a qualitative case study.

2.4.2 Storytelling from big data

The lack of skilled in-house employees able to extract insights from data is considered one the biggest obstacles that managers face when trying to integrate analytics inside organizations (Sivarajah et al., 2017; Raut et al., 2021a). The ability to understand dashboards, analyze large datasets and convert them into actionable knowledge is a crucial skill in a data-driven era (Bumblauskas et al., 2017). With the increasing complexity and veracity of collected data, analytics dashboards can be difficult to use, and as a result, managers need storytelling skills to translate data for executives or nonanalytical people through convincing data-driven stories (Brady, Forde & Chadwick, 2017; Vidgen, Shaw & Grant, 2017; Fernandez & Gallardo-Gallardo, 2020). Analytical stories from data can be descriptive, explanatory or predictive in nature and can report on past events or the current situation or suggest what the future will look like based on historical data (Davenport, 2014).

Neuroscientists claim that storytelling is a strategic asset that companies can leverage to transfer knowledge and share complex information in the workplace by engaging with listeners on both the intellectual and emotional level (Martinez-Conde et al., 2019). From the knowledge management perspective, stories are a valuable addition to data visualization, which alone is prone to uncertainty and potentially multiple (mis)interpretations (Kosara & Mackinlay, 2013). Stories can synthesize large quantities of information into formats and extract knowledge from datasets in ways that help listeners make sense of data findings (Kosara & Mackinlay, 2013). Prior research has suggested that PowerPoint presentations that use excessive bullet points, numbers and figures are not always the best way to transfer knowledge within organizations since organizational members can barely recall any information from such presentations after a meeting (Carriger, 2010). Instead, managers should use compelling, emotionally engaging and persuasive stories in addition to visual content to convey messages to the audience in a more meaningful way (Gershon & Page, 2001; Carriger, 2010).

In the field of information visualization, researchers have directed attention toward the concept of narrative visualizations or visualization stories that represent a combination of visual components (e.g., tables, graphs, charts) with storytelling techniques (Segel & Heer, 2010; Roels, Baeten & Signer, 2017). Visualization stories can be author-driven to ensure that a clear, structured message is delivered to the audience, or managers can disseminate reader-driven stories that require audiences to use their imagination and draw their own conclusions based on the provided data (Segel & Heer, 2010). Prior research suggests that the presence of a narrator aids listener understanding of data since the author steers the listeners' attention to certain issues within the statistical evidence during storytelling (Obie et al., 2019). As a knowledge transfer tool, interactive narrative visualization techniques help to deliver the correct message to the audience and ensure that the intended message is well understood and remembered (Roels, Baeten & Signer, 2017).

During workplace training, storytelling can help facilitate learning since stories are easier to understand than dry statistical arguments, ambiguous visualizations and hard numbers (Morgan & Dennehy, 1997). During storytelling, the human mind draws mental images and integrates the received information in a vivid manner so that listeners can relate to the story content through their personal experiences (Swap et al., 2001; Yang, 2013). Cognitive psychologists have suggested that the human mind finds information delivered through storytelling to be more appealing than information delivered in any other form (Swap et al., 2001; Yang, 2013). By connecting with listeners on a personal level, stories engage cognitive and emotional triggers in the brain, which improves information retention and

recall when needed (Swap et al., 2001; Yang, 2013). When dealing with complex or new information, stories help reduce audience anxiety and frustration with the presented facts (Martinez-Conde et al., 2019). As a result, stories are powerful persuasive devices that minimize counterarguments, reduce listener resistance to new information and lead audiences to accept the viewpoint of the storyteller (Krause & Rucker, 2020).

Although researchers over the years have demonstrated various strategic business applications for storytelling, our present understanding of stories in interpreting big data for decision-making remains too narrow. In particular, prior research has provided limited evidence regarding the role of storytelling in translating big data into business insights, and researchers (Obie et al., 2019) have recommended that future studies continue exploring how author-driven stories can influence users' understanding of data. Filling this research gap and unlocking a new creative application of storytelling within organizations could stimulate new research discussions and facilitate progress in interdisciplinary research.

In addition to the research gaps in the storytelling literature, there is a debate in the field of data analytics regarding whether organizations should hire data scientists or improve the abilities of their existing employees to interpret big data (Bose, 2009; Sun, Hall & Cegielski, 2020). In particular, data scientists position themselves as technical experts and are often criticized for their lack of a business mindset and inability to embed data analytics into decision-making, which results in an interpretation gap and communication barrier between data scientists and executive decision makers (Brady, Forde & Chadwick, 2017; Carillo, 2017). As a consequence, organizations need to invest in educating data scientists to ensure that they understand business operations and can position data findings in the context of cost savings, revenue and profit (Davenport & Patil, 2012; Harris & Mehrotra, 2014). As a result, researchers (Harris & Mehrotra, 2014; Carillo, 2017) have claimed that companies cannot rely only on the recruitment of expensive data scientists (especially given the limited availability of data science experts on the market). Instead, organizations should help existing managers gain basic analytical skills and knowledge in data science, transforming them from managers into manager-scientists (Brady, Forde & Chadwick, 2017; Behl et al., 2019; Carillo et al., 2019). Prior research has also recommended that managers focus on nurturing positive attitudes toward statistics and business analytics inside their organization to support employees in developing an analytics mindset and creating a data-driven culture (Carillo et al., 2019).

Despite the growing literature that supports the notion of teaching analytics skills to existing employees instead of outsourcing or hiring data scientists (Harris &

Mehrotra, 2014; Brady, Forde & Chadwick, 2017; Carillo, 2017; Behl et al., 2019; Carillo et al., 2019), less research has investigated exactly how management can improve employees' data interpretation skills and their subsequent data-driven decision-making. Without such knowledge, organizations will continue to struggle with a low analytics usage rate since the complexity of BA data will prevent employees from using this big data technology in daily decision-making.

To move the theoretical conceptualization forward in the field of BA and storytelling, Article III fills the abovementioned research gaps and provides a new perspective on how BA data-driven stories connect big data with business targets and educate employees about which business problems BA can resolve and how to use analytics to extract valuable knowledge. As a result, employees can better understand the usefulness of BA and become motivated to use analytics more frequently. The concept of BA data-driven storytelling is a valuable addition to the literature, considering that it accounts for constraints on organizational resources and provides employees with working knowledge and easy-to-remember fundamentals of data science.

Contributing to the limited prior research on the role of storytelling in translating big data into valuable insights (Davenport, 2014; Brady, Forde & Chadwick, 2017; Vidgen, Shaw & Grant, 2017; Fernandez & Gallardo-Gallardo, 2020), Article III sheds light on how storytelling can be used as a narrative sensemaking heuristic during training sessions to guide BA users toward how to correctly interpret and use data for making better and faster decisions. Article III enriches the existing storytelling literature by demonstrating how this particular type of (BA data-driven) story supports employees in understanding the essence of complex data visualizations and how the human brain is affected by this kind of communication from the psychological and neuroscientific points of view.

2.4.3 Storytelling in customer-supplier interactions

In the industrial marketing literature, storytelling has attracted increasing interest from academics over the past years. An emerging and growing community of researchers has been addressing storytelling as an informative, persuasive and bonding instrument in the B2B sales context (Gilliam & Flaherty, 2015). Researchers have demonstrated that sales representatives can use stories to bond with customers on a personal level, gain credibility, build trusting relationships, exchange information and persuade customers to buy products (Gilliam & Flaherty, 2015). Similarly, in the retail sector, marketing scholars have found that salespersons' stories can improve consumer attitudes toward a product and, as a result, increase intentions to purchase (Gilliam & Zablah, 2013).

The increasing role of storytelling in the industrial sector has led to an emerging interest in the use of narratives in marketing strategies and in B2B branding among researchers. For example, Bonnin and Alfonso (2019) reveal that successful industrial technology companies (Cisco, IBM) tend to distribute formal and informal branding narratives internally, through media and through conversations between salespeople and new prospects to promote their brand and increase the public's positive attitude toward technology. In contrast to the prevalent belief that technology represents a threat to society and nature, these branding stories describe how these companies' technological solutions resolve societal issues, support people, make daily life easier, and create a bright future through smart connected cities (Bonnin & Alfonso, 2019).

The powerful role of storytelling has also been demonstrated in the context of B2B advertising activities since organizational buyers are often influenced by emotions and attitudes toward a brand when making purchasing decisions. A recent study (Anaza et al., 2020) has suggested that story-based advertisements humanize brands, better capture and retain customer interest, and transport buyers into the narrative in such way that customers can personally relate to the story on an emotional level. By addressing customer pain points, narrative B2B advertisements create a personalized relationship between the supplier's brand and the buyer, and increase the trustworthiness and the likelihood of a buyer recommending the supplier's brand (Anaza et al., 2020).

In contrast to the researchers who promote the concept of supplier-driven storytelling (Gilliam & Flaherty, 2015), other researchers (Lacoste & La Rocca, 2015) have taken a different approach and hypothesized that buyers not only passively listen to sales stories but also engage in storytelling themselves. As a result, this research stream views storytelling as an interactive, collective sensemaking process and a communication tool between suppliers and customers that facilitates problem solving (Lacoste & La Rocca, 2015), creates a sense of community among different organizational members and helps to collectively construct a shared meaning of events (Boyce, 1995).

Building on management research, which claims that organizational sensemaking is closely connected to the related concept of sensegiving (Maitlis, 2005), strategic management researchers have gone further and suggested that storytelling is not only a social sensemaking process but also a sensegiving tool. In the organizational context, sensegiving refers to the process of influencing and controlling others' behavior and sensemaking or interpretation of certain events or actions toward an intended outcome or a preferred organizational reality for strategic or political reasons (Gioia & Chittipeddi, 1991). Sensegiving strategies vary (from low intensity

to high intensity) (Maitlis, 2005), but as an example, during organizational change, managers engage in sensegiving by organizing meetings to explain a vision of the future, disseminating positive messages about resolving the concerns of subordinates, addressing circulating rumors, reassuring employees, demonstrating attentiveness and availability for guidance, giving feedback, and asking opinions (Gioia & Chittipeddi, 1991; Kraft, Sparr & Peus, 2018). The strategic role of middle managers in sensemaking and sensegiving across an organization has been repeatedly acknowledged by prior research due to such managers' intermediary position between different organizational actors (Rouleau, 2005; Kieran, McMahon & MacCurtain, 2019). In times of organizational transformation, middle managers have a unique ability to spread the leadership's vision in a controllable and positive way and to influence the sensemaking of different individuals, teams and units (Kieran, McMahon & MacCurtain, 2019).

Finally, from the customer-oriented perspective, researchers (Gorry & Westbrook, 2011) have drawn attention to customer storytelling and particularly to the importance of listening to customer stories about their feelings and attitudes toward the company, products and services in order to gain better insight into customer needs. The assessment of customer voice in the form of feedback, suggestions or complaints can be useful in developing new products and services, adapting existing offerings to changing customer preferences, modifying marketing efforts and improving customer service (Gorry & Westbrook, 2011).

Despite the growing literature on the relevance of storytelling in industrial marketing, the research field lacks empirical validation and practical examples of how to successfully use storytelling in B2B relationships. This lack of knowledge limits our understanding of potential storytelling applications in customer-supplier interactions and prevents the field from moving beyond theoretical conceptualizations (which have little value to practitioners without real-life evidence). Responding to prior research calls to explore the role of storytelling in the sale of intangible goods (Gilliam & Flaherty, 2015), Article IV enriches the current literature with a longitudinal ethnographic study in a service context and a practical example of successful supplier storytelling during negotiations with customers to improve smart service sales. Given the rapid technological advancements and emergence of smart services in recent years, Article IV is a timely addition to the modern management literature by helping companies survive and succeed in a competitive digital age.

Although several researchers (Rouleau, 2005; Kieran, McMahon & MacCurtain, 2019) have considered the role of middle managers in the interpretation and sale

of strategic change inside organizations, prior research has neglected how sales managers can engage in sensegiving while interacting with prospective customers in everyday situations. However, new knowledge on external sensegiving opportunities for sales managers could improve current B2B research and identify new research avenues. In response to this research gap, Article IV focuses on the customer-supplier dyad and offers empirical evidence for and practical guidance to sales managers on how to use stories as a sensegiving instrument during sales negotiations to persuade customers to invest in smart services.

While existing studies have examined supplier storytelling (Gilliam & Flaherty, 2015) and customer stories (Gorry & Westbrook, 2011), far less attention has been given to storytelling as a collective sensemaking phenomenon (Boyce, 1995; Lacoste and La Rocca, 2015). Therefore, Article IV addresses this research shortcoming and broadens the existing literature by demonstrating how storytelling acts as a collective sensemaking and sensegiving tool and by mapping the process by which both customers and suppliers contribute to creating a story.

Finally, although Gorry and Westbrook (2011) seek to shed light on why and how to collect customer stories, how to practically benefit from customer storytelling in the B2B context remains unclear. Simply underlining the importance of storytelling is not enough, and to facilitate progress in the field, a clear roadmap of how to repurpose customer stories is needed. This lack of knowledge remains an obstacle that prevents researchers and practitioners from unlocking the full potential of storytelling in industrial marketing. Consequently, Article IV fills this research gap by explaining how suppliers can reutilize information from customers (e.g., BDA data on reference customers) in their own marketing stories to convince prospective customers of the tangible value of smart services.

2.5 Servitization and smart services

2.5.1 Impact of digitalization on servitization

The servitization phenomenon has become a prominent trend among manufacturing companies, and its importance has captured the attention of numerous industrial marketing researchers over the years (Vargo & Lusch, 2008; Martinez et al., 2009; Parida et al., 2015; Leoni, 2019; Raddats et al., 2019; Khanra et al., 2021; Rabetino et al., 2021). Servitization is usually described in the literature as the transition of manufacturing companies from providers of pure products into solution providers that offer customers products bundled with services (e.g., diagnostics and maintenance, training, consulting) (Vandermerwe

& Rada, 1988). Servitization is a transformative process that leads to a shift in customer-supplier relationships from transactional product-centric interactions into solutions-oriented engagement, with the latter being characterized by higher customer involvement and stronger, longer-lasting relationships (Oliva & Kallenberg, 2003). Manufacturing companies pursue servitization strategies to differentiate themselves from competitors, generate higher revenue and profits, gain better insights into customer needs and provide more tailored value-added offerings (Baines et al., 2008).

With the increasing digitization of products across industries, an emerging community of researchers has been engaged in merging the digitalization and servitization literature streams and exploring the business potential of digital technologies in the industrial sector (Frank et al., 2019; Pirola et al., 2020; Gebauer et al., 2021). Recent studies have demonstrated the powerful role of digitalization in enabling (Coreynen, Matthyssens & Van Bockhaven, 2017; Martín-Peña, Sánchez-López & Díaz-Garrido, 2019; Boehmer et al., 2020; Kamalaldin et al., 2020; Naik et al., 2020) and facilitating (Paschou et al., 2020) servitization among manufacturing companies, which in turn transforms the traditional customer-supplier interactions in industrial business networks (Pagani & Pardo, 2017). According to researchers, digitalization has a positive impact on servitization and on business performance (Abou-foul, Ruiz-Alba & Soares, 2020; Kohtamäki et al., 2020), and it is of practical importance for managers who want to increase their competitiveness in the market (Coreynen, Matthyssens & Van Bockhaven, 2017; Kamalaldin et al., 2020).

Prior research has suggested that digitalization can support manufacturing companies in improving their existing service offerings, developing new services or obtaining new customers (Pagani & Pardo, 2017). Similarly, Coreynen, Matthyssens and Van Bockhaven (2017) argue that companies can 1) exploit digitization internally to provide value-added services to customers, 2) use digital technologies to manage customer relationships through new forms of digital interaction, or 3) create new, disruptive, digitally enabled products that radically transform customers' business processes.

In response to the increasing relevance of digital technologies (e.g., big data analytics, cloud computing, artificial intelligence) in product-service systems, the servitization literature has experienced a shift toward new research substreams: digital servitization (Kohtamäki et al., 2019; Paschou et al., 2020; Tronvoll et al., 2020) and smart servitization (Kamp, Ochoa & Diaz, 2017; Kaňovská & Tomášková, 2018). Although these two emerging themes are interconnected, one research stream has evolved from the other. Digital servitization is often described

as the provision of digitally enabled services, while smart servitization goes beyond traditional or digital servitization because it offers preemptive value to customers through integrated intelligence in and connectivity to products that are capable of learning, adapting and making independent decisions (Beverungen et al., 2017; Fischer et al., 2020). The concept of smart servitization is based on the smartization of industrial assets and on the offering of services driven by smart connected products with embedded intelligent technology that are able to identify problems, anticipate user needs and act proactively (Kamp, Ochoa & Diaz, 2017).

Even though smart servitization offers multiple opportunities for manufacturing companies that want to broaden their service portfolio and increase their competitiveness in the digital age, during the smartization process, companies encounter not only technological obstacles but also cognitive barriers from employees and from customers who resist the change (Kamp, Ochoa & Diaz, 2017). Additionally, companies face the challenge of modifying their traditional product-centered relationships with their customers and adapting to a new digitally enabled service-oriented logic (Kamalaldin et al., 2020). Essentially, suppliers need to change their self-perceptions and identities in the market to providers of smart digital solutions, while customers need to adapt to suppliers' data-centric approaches (Tronvoll et al., 2020). Furthermore, the digitization and smartization of assets leads to the dematerialization of physical products, and as traditional products are substituted with new services, manufacturing companies have to address a new challenge: reduced customer perceptions of service value (Vendrell-Herrero et al., 2017). By addressing these challenging smartization issues, Article IV moves the smart servitization research forward and deepens our knowledge on how to overcome behavioral barriers from customers in accepting suppliers' smart services and on how to improve customer attitudes toward smart services by demonstrating their tangible service value through BDA.

Despite the growing research on digital and smart servitization in the manufacturing sector, industrial marketing studies exploring how companies transform and interact with customers with the emergence of new digital technologies are lacking (Obal & Lancioni, 2013; Pagani & Pardo, 2017; Vendrell-Herrero et al., 2017). As a result, scholars (Pagani & Pardo, 2017) have encouraged future research to demonstrate more practical real-life examples from industry regarding how B2B companies pursue the digitalization journey. Numerous researchers (Coreynen, Matthyssens & Van Bockhaven, 2017; Frank et al., 2019; Martín-Peña, Sánchez-López & Díaz-Garrido, 2019; Naik et al., 2020; Paschou et al., 2020; Pirola et al., 2020; Tronvoll et al., 2020) have pointed out that the practical implementation of digital technologies in service offerings remains an under-investigated research area and have called for more empirical studies with

managerial implications for, guidance on, and methods for how to harness digital technologies for new disruptive services, as well as with the tools to do so. Existing literature lacks clarity and action plans with practical guidance, which in turn prevents manufacturing companies from succeeding in smart servitization (Naik et al., 2020; Zheng et al., 2020). Filling these research gaps and generating new knowledge on how digital technologies affect B2B transactions can provide researchers and practitioners with new perspectives on how to maximize the business potential of digitalization and smartization in servitizing companies.

In response to the abovementioned calls for research, Article IV addresses the evolving nature of customer-supplier relationships in the digital era by demonstrating a real-life example of how BDA can successfully facilitate smart service sales in the sheet metal processing industry. Article IV advances the smart servitization literature by mapping customer-supplier interactions during smart service sales through a longitudinal case study, ethnographic immersion in the field and observations of daily behaviors in a natural organizational setting. Article IV is a valuable contribution to service science because it offers practical, useful implications for manufacturing companies attempting to embark on a smart servitization journey or struggling to increase revenue from smart services.

2.5.2 Smart connected products and services

While the preceding section discussed the concept of smart servitization, this section describes in more detail how the characteristic of smartness is addressed in the literature, and some examples of smart services from industry are provided.

The accelerating pace of digital transformation in consumer and industrial markets has led to the emergence of smart connected products with embedded sensors and advanced software for collecting and processing data in order to improve the performance of a physical product and enhance customer experiences (Porter & Heppelmann, 2014). Smart connected products are usually described by three main characteristics: 1) physical properties (the mechanical parts of the product), 2) smart properties (sensors and software for data analysis), and 3) connectivity elements (wired or wireless connection to the product) (Porter & Heppelmann, 2014). Smart products have real-time awareness of their surrounding environment, can interact and exchange data with other objects, react and adapt in a responsive manner, and work autonomously (Raff, Wentzel & Obwegeser, 2020).

Smart products and services are a growing research area and an interesting research venue that have recently established themselves as core concepts in the

digital age and in contemporary service science (Beverungen, Matzner & Janiesch, 2017). However, over the years, the concept of smartness has been evolving across various research domains, which has led to numerous heterogeneous definitions (Beverungen, Matzner & Janiesch, 2017; Alter, 2020; Raff, Wentzel & Obwegeser, 2020; Romero et al., 2020). As a result, there is a lack of consensus and of uniform language on smartness in the literature, even though existing conceptualizations have many characteristics in common.

For example, Lim and Maglio (2018) suggest that the concept of smartness is multidimensional and consists of 1) a connection between the provider and customer through infrastructure and connected networks, 2) the collection of data, 3) continuous monitoring of and learning from data, 4) computation and data analysis, and 5) communication and cocreation between people and things. Meanwhile, Romero et al. (2020) and Henkens, Verleye and Lariviere (2020) direct attention to key attributes of smartness, such as connectivity with other objects and actors; awareness of surroundings; self-adaptation; and the ability to learn, respond, and make independent decisions.

Understanding the logic behind smartness and smart connected products is important because smart services are delivered through intelligent products with embedded digital devices that enable connectivity to the object, remote data collection, data interpretation, storage and information visualization (Wünderlich et al., 2015; Beverungen, Matzner & Janiesch, 2017). According to the extant research (Fischer et al., 2020), smart services are different from traditional service offerings since they require connectivity to a physical product and intelligent software in order to collect and analyze product (and field) data, troubleshoot remotely, identify user behavior patterns and suggest improvements to customers. Smart services go beyond digital services because they are enabled by smart connected products and are capable of self-detecting, self-monitoring, self-diagnosing, self-correcting and self-organizing (to achieve a particular goal) according to their surroundings and to user preferences (Lim & Maglio, 2018; Alter, 2020; Fischer et al., 2020). Smart service offerings are preemptive in nature and focused on predicting unexpected events and preventing unpleasant surprises (Allmendinger & Lombreglia, 2005; Beverungen, Matzner & Janiesch, 2017).

In recent years, with the increasing use of smart products, there has been a proliferation of organizations transforming from product manufacturers into smart service providers in various organizational contexts. For example, in the automotive sector, car manufacturers offer smart services to drivers based on vehicle condition and driving data collected from the passenger car and processed with BDA and AI (Maglio & Lim, 2016). As a part of the smart service offering,

drivers are offered advice on how to increase fuel efficiency and improve safety, receive notifications about when to take rest breaks to prevent drowsy driving, receive lane departure warnings and assistance steering the car, obtain support in finding a gas (or charging) station, and receive navigation assistance in traffic jams (Lu, Papagiannidis & Alamanos, 2018).

Similarly, in farming, intelligent agricultural vehicles help farmers optimize and maximize the seeding process for each piece of land by analyzing soil condition data, seed quantity as well as data on the positioning and movement of agricultural machinery collected through embedded sensors and wireless networks (Lim & Maglio, 2018; Liu et al., 2021). As a growing trend in the indoor plants market, smart plant watering systems monitor the health of plants through different sensors (air temperature, humidity and lighting levels), display information in a mobile app and manage plant watering and fertilization without user intervention (Henkens, Verleye & Lariviere, 2020).

In the context of urban transport management, smart commercial vehicles (e.g., buses, trains) are equipped with sensors that continuously collect data on speed, fuel consumption, driving behavior, departure and arrival times as well as weather and traffic data to support transport managers in planning timetables and predicting delay times at each train station and bus stop (Khan et al., 2020). In the mining industry within the industrial sector, autonomous mining vehicles powered with AI and BDA help with remote excavations, identify and issue warnings about unsafe mining conditions, schedule preventative maintenance before breakdowns occur and, as a result, reduce human error, prolong equipment lifetime and eliminate safety hazards (Porter & Heppelmann, 2014).

From the consumer perspective, a good example of a smart connected product in the sporting goods industry is downhill ski boots that collect data on inclination, speed, turns, distances and elevation while the user is skiing and display that information in a mobile application with feedback for the skier on how to improve his or her skiing technique and become a safer skier (Henkens, Verleye & Lariviere, 2020). With the increasing emphasis on healthy lifestyles, a number of smart products and services have also emerged in the healthcare industry. For example, modern smart wearable technologies monitor the vital signs of patients with chronic diseases by measuring their pulse and heart rate, blood sugar, oxygen saturation, respiratory rate and cholesterol levels and send alerts to caregivers when certain thresholds are reached (Sakr & Elgammal, 2016). Another example comes from the printing industry, in which smart printers continuously monitor toner levels, make predictions about when the toner will run out and notify the

office manager to purchase cartridges in advance, make replacements and ensure that printer downtime is minimized (Allmendinger & Lombreglia, 2005).

Smart home services provide users with remote control over lighting and home appliances as well as intruder alert systems to manage safety and home security (Yang, Lee & Zo, 2017; Suresh, Reddy & Pushkal, 2019). Based on the network of connected devices and by tracking user sleep metrics (e.g., heart rate, pulse, oxygen levels, sleep stages, sleep disturbances and movements) through wearable devices, smart home services can adjust the room temperature during the night to enhance sleep quality (Yang, Lee & Zo, 2017). Based on user preferences during the day and night, smart indoor thermostats learn which climates the user prefers and adjust the temperature and humidity accordingly (Suresh, Reddy & Pushkal, 2019). A smart thermostat can also anticipate user habits and automatically regulate indoor temperatures when nobody is at home to save energy (Raff, Wentzel & Obwegeser, 2020). Similarly, a smart energy meter can continuously monitor energy consumption in residential areas, provide information to the owner about which devices consume the most energy and recommend ways to save energy and lower electricity bills (Suresh, Reddy & Pushkal, 2019). Furthermore, smart home services can send an alert to the owner if an air filter should be replaced, and they can schedule a maintenance visit if incorrect appliance operation is detected and a repair is needed (Suresh, Reddy & Pushkal, 2019).

Finally, in hospitality and tourism, smart services have been gaining popularity. For example, to enhance tourist experiences while traveling, hotels offer room service with personalized features through a tablet that can provide tailored suggestions for dining (based on user preferences or previous orders) with waiting times, provide information about the availability of fitness equipment in the hotel gym, start a shower at a desired temperature, and turn on the air conditioner in advance if arrival times are known (Kabadayi et al., 2019). Given the various applications of smart products and services across industries, whether in the consumer or the industrial context, smart services provide convenience for customers through automation, time savings, increased efficiency, safety and personalization. Service providers, on the other hand, gain financial value through creating lifetime partnerships with customers and increased customer purchases as a result of tailored offers that satisfy individual needs.

Nevertheless, researchers (Wünderlich et al., 2015) have suggested that the research on smart services is still in its infancy, and to further advance smart service marketing research and practice, there is a need for an in-depth understanding of customer perceptions and behaviors toward smart technologies. As a result, to guide smart service research toward new, contemporary issues and

to advance this scientific discipline, Article IV complements the current B2B literature with interdisciplinary research that explains how to improve customer attitudes toward suppliers' smart services through storytelling and BDA. In addition to adopting a human-centered perspective on smart servitization, Article IV contributes to the scant prior research on smart services in the industrial sector by unlocking a new application of predictive services in the machine tool manufacturing industry (Porter & Heppelmann, 2014; Beverungen, Matzner & Janiesch, 2017; Kamp, Ochoa & Diaz, 2017), for which empirical studies have been lacking. In particular, Article IV provides a practical real-life example of how to facilitate the sales of a smart service for remote monitoring of factory condition, which relies on intelligent machinery with self-diagnostic abilities to predict the wear on components in advance, schedule maintenance visits and order spare parts to maintain high product quality and prevent unexpected production interruptions.

2.5.3 Customer adoption of smart services

Despite the growing research interest in the benefits and applications of smart products and services, far less attention has been given to the practical integration of smart services into daily operations or to customer adoption of suppliers' smart services. However, for firms to survive and succeed in smart servitization, a further understanding of the barriers to smart service provision and of how suppliers can overcome these barriers is necessary (Klein, Biehl & Friedli, 2018; Bonamigo & Frech, 2020). Although existing research has focused on examining the factors that affect consumer resistance to smart services (Mani & Chouk, 2018; Chouk & Mani, 2019; Mani & Chouk, 2019; Gonçalves et al., 2020), only a few studies have attempted to explore the factors that hinder and facilitate smart service adoption in the B2B context (Wünderlich, Wangenheim & Bitner, 2012; Kamp, Ochoa & Diaz, 2017; Klein, Biehl & Friedli, 2018; Töytäri et al., 2018). The smart service field lacks behavioral studies, and researchers (Wünderlich et al., 2015; Yang, Lee & Zo, 2017; Lu, Papagiannidis & Alamanos, 2018; Dreyer et al., 2019) have recommended that future studies explore how customers perceive smart services and which factors influence their adoption behavior.

When transitioning from being product manufacturers to being service providers, companies realize that delivering services is more complex and challenging than delivering only manufacturing products, and some changes to organizational structure and daily processes are needed (Baines et al., 2008). To enable smart service adoption at the business ecosystem level and to ensure that customers accept the new innovation logic, there is a need to change the organizational

mindset of all partners within a business network so that old beliefs, norms and values are abandoned and new ways of thinking are developed (Töytäri et al., 2018). Prior industrial marketing research (Töytäri et al., 2018) sheds light on barriers such as internal mindsets, internal capabilities and alignment needs that prevent the successful provision and adoption of smart services. Similarly, Klein, Biehl and Friedli (2018) highlight the importance of addressing nontechnical behavioral barriers that manufacturing companies face while selling smart services (in addition to barriers such as a lack of support from top management, unclear smart service strategies, and insufficient infrastructure and financial resources).

In comparison with the provision of traditional products and services, the digitization and dematerialization of physical assets negatively affect how customers perceive service benefits, thus making it challenging for manufacturers to explain the practical, tangible value of digitally enabled smart services (Vendrell-Herrero et al., 2017). Both suppliers and customers feel anxious about new and unproven technologies, doubt the value of smart services and perceive such services as a risky investment due to their intangible nature (Wünderlich et al., 2012; Wünderlich et al., 2015; Töytäri et al., 2018). In some manufacturing companies, employees have a strong conservative product-oriented mindset and believe that only tangible products create value; therefore, they lack the motivation to sell novel, complicated smart service offerings and favor selling traditional services instead (Klein, Biehl & Friedli, 2018; Töytäri et al., 2018). The lack of perceived usefulness is a common barrier among consumers since users need time to use a service and understand the value it offers (Mani & Chouk, 2018). For example, in the industrial sector, the value of a remote monitoring technology (which a supplier utilizes as part of a smart service offering) might not be clear to customers in the beginning because it does not provide any direct benefits (Grubic, 2014). Instead, the value becomes apparent only after customers use the smart service support in practice and, as a result, gain time and cost savings by predicting and preventing machine breakdowns. Because of the low familiarity with smart technologies, consumers remain skeptical about using them, but with the increasing popularity of smart products and services, users can become more convinced of their trustworthiness and can gain confidence that service providers will deliver what was promised (Mani & Chouk, 2018; Chouk & Mani, 2019).

Prior research has revealed that data safety, user privacy, the regulation of data security and the ownership of data are among the key challenges to digitalization in the industrial service sector that contribute to negative customer attitudes toward smart products and services (Bonamigo & Frech, 2020). Customers hesitate to grant suppliers permission to remotely collect data for smart services

out of a fear of losing control over their production (Klein, Biehl & Friedli, 2018; Töytäri et al., 2018) or because they lack an understanding of the value that smart services offer (Kamp, Ochoa & Diaz, 2017; Lu, Papagiannidis & Alamanos, 2018; Mani & Chouk, 2019). Customers feel vulnerable and are concerned about cyber attacks and the risk of a third party (or a service provider) gaining unauthorized access to sensitive and confidential information, thus violating data privacy (Wünderlich et al., 2015; Yang, Lee & Zo, 2017; Lu, Papagiannidis & Alamanos, 2018; Mani & Chouk, 2018; Mani & Chouk, 2019). Additionally, users worry about overcontrolling surveillance and the intrusion of technology into their daily life without their permission (Kamp, Ochoa & Diaz, 2017; Lu, Papagiannidis & Alamanos, 2018; Mani & Chouk, 2019).

Another challenge to adoption is rooted in customer perceptions that smart services do not require much practical effort from the supplier due to high levels of computerization, which in turn diminishes customers' perceived value of smart services and results in customer reluctance to pay for invisible actions (Grubic, 2014; Töytäri et al., 2018). Furthermore, due to the lack of clear data ownership principles, customers believe that services should be provided free of charge and might even demand that the supplier pays for the data collected (Klein, Biehl & Friedli, 2018). Additionally, some customers hesitate to adopt smart services because they feel that suppliers want to trick them into spending more money, whereas other customers are simply not willing to be told how to do their job by the suppliers' smart technology (Kamp, Ochoa & Diaz, 2017).

Smart service provision is different from traditional services, and the lack of an internal understanding of the service value among sales managers can also create confusion among customers. If the employees of a service provider themselves underestimate the value of smart services and lack knowledge on how smart services can fulfill customer needs, they cannot adequately convey service value propositions to those customers (Klein, Biehl & Friedli, 2018; Töytäri et al., 2018). A supplier's lack of resources and ability to adjust marketing and sales operations as well as ineffective information exchange between sales managers and prospective customers lead to the inability of prospects to recognize the benefits of smart services (Grubic, 2014; Klein, Biehl & Friedli, 2018; Töytäri et al., 2018). Numerous researchers have drawn the attention of practitioners to developing a data-driven culture and training their salesforce to gain the necessary expertise and skills to articulate the value of services to customers in their particular industrial segment (Grubic, 2014; Lu, Papagiannidis & Alamanos, 2018; Bonamigo & Frech, 2020). Sales managers play a key role in introducing and selling new services to customers, as they are frontline representatives of the firm and mediators between the firm and the customer (Johnson & Sohi, 2017). However,

scholars acknowledge that sales managers are prone to resisting organizational changes in terms of new innovations or new firm strategies (Johnson & Sohi, 2017). Congruent with the prior research calling for more studies to explore how to enhance salespeople's ability to sell products (Johnson & Sohi, 2017), Article IV provides practical guidance and a template for sales managers on how to use reference customer data and to tell stories to prospective customers in everyday life to increase smart service sales.

Taking a consumer research perspective, scholars (Mani & Chouk, 2017; Mani & Chouk, 2018) have claimed that smart connected products are often perceived as expensive novelties that require special skills to be used, which results in consumer resistance to smart device purchases. Other researchers have suggested that the mobility and accessibility of the service are the key factors that influence customers' behavioral intentions to adopt and use smart services (Yang, Lee & Zo, 2017). Furthermore, the consumer-provider relationship is a key aspect that influences the consumer experience with smart services (Gonçalves et al., 2020). In particular, consumers want to feel that the supplier is knowledgeable in the area of smart services and can provide adequate technical support as well as reinforce data privacy and security (e.g., two-factor authentication, credit card encryption) (Chouk & Mani, 2019; Gonçalves et al., 2020). Prior research has also pointed to perceived service complexity as another important technology-oriented barrier underlying resistance to smart services (Chouk & Mani, 2019).

With respect to psychological barriers, smart services represent a change in and a disruption of customers' established daily routines (Mani & Chouk, 2018; Chouk & Mani, 2019). The use of smart services reduces the number of human interactions, something that users need time to adapt to. Additionally, the initial consumer response to smart service adoption might be negative due to smart services' lack of credibility and incompatibility with consumers' traditional habits and self-images (Mani & Chouk, 2018; Chouk & Mani, 2019). As a result, to reduce consumer resistance, service providers should promote smart products and services as easy-to-use, secure and closely compatible with traditional consumer lifestyles (Chouk & Mani, 2019). Existing research has also directed managerial attention to potential resistance factors such as consumers' technology anxiety (the fear that humans will be replaced with computers) and technological dependence (fear of being too dependent on smart technology and losing control over it) (Mani & Chouk, 2018). Finally, Mani and Chouk (2018) demonstrate the powerful effect of individual barriers and claim that consumers might enjoy inertia and prefer not to change their current lifestyle and therefore resist new smart technology. Similarly, due to various evolutionary and social factors, men are more eager to take risks and are therefore more enthusiastic in trying out smart technologies,

while women are more reluctant to participate in such technological change (Mani & Chouk, 2018).

Even though the IS field has experienced an increase in research exploring the intersection of digital technologies and services, there is a need to extend this line of research with a more interdisciplinary perspective and to merge different research disciplines in order to explore how digital technologies enable new value propositions in services (Beverungen et al., 2019). Service science researchers have emphasized the need to address smart service systems from the human-centered perspective and to create new interdisciplinary knowledge about human behavior and attitudes toward smart services by combining different areas of expertise (Medina-Borja, 2015). As a result, building on the abovementioned calls for research, Article IV builds a bridge between the behavioral sciences, storytelling research and BDA studies to create new interdisciplinary knowledge and unlock a new perspective on how to facilitate customer adoption of suppliers' smart services.

According to a recent study (Shahi & Sinha, 2020), one of the reasons why companies become discouraged when embarking on a digitalization journey is because they lack advice and guidance on how to tackle the technological, strategic and cultural challenges that arise. Dreyer et al. (2019) and Wünderlich, Wangenheim and Bitner (2012) claim that since smart services are a rather new phenomenon in research and practice, there is a need to define best practices, explore applications and provide real-life examples of smart service acceptance from different industries to help managers sell smart services more successfully. To fill these research gaps, Article IV offers an example from the sheet metal processing industry of how storytelling can be successfully used to reduce customer reluctance to accept smart services and therefore represents an important addition to the smart servitization literature.

To facilitate progress in the field of smart services and abandon old-fashioned and outdated managerial beliefs that prevent companies from adopting smart servitization, Töytäri et al. (2018) call for more empirical research with managerial implications on how to resolve smart service challenges. In response to this, Article IV advances the current smart service science by demonstrating how the value of smart services can be communicated to customers through stories and BDA so that customers stop underestimating the benefits of service and shift to positive attitudes toward smart services. Extant literature highlights the importance of finding new ways to build trust and credibility between suppliers and customers to increase customer willingness to adopt smart technology (Wünderlich, Wangenheim & Bitner, 2012; Kamp, Ochoa & Diaz, 2017; Boehmer et al., 2020).

Congruent with this line of reasoning, Article IV introduces suppliers to a new, effective approach: reusing reference customer data processed with BDA during B2B marketing and sales in order to demonstrate which business problems smart services can resolve, gain customer trust and improve customer confidence in smart services.

Because smart services are still in an early stage of development and represent novel service offerings driven by smart connected products, customers tend to rely on the opinions and experiences of other users (Yang, Lee & Zo, 2017; Gonçalves et al., 2020). Traditionally, in a B2B network, customer referencing refers to a set of practices and activities that suppliers direct toward prospective customers to demonstrate their established positive reputation with existing customers and to facilitate sales (Helm & Salminen, 2010; Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018). Customer references can help to facilitate sales arguments and improve buying practices by demonstrating expertise, capabilities and performance (Jaakkola & Aarikka-Stenroos, 2018). During B2B sales interactions, reference marketing helps suppliers persuade prospective buyers by adding concrete practical value to complex service offerings and by proving the functionality of novel technologies (Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018). However, scholars (Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018) have acknowledged that the literature exploring applications of customer references in B2B marketing and sales is scarce. Although industrial marketing researchers (Jaakkola & Aarikka-Stenroos, 2018) have encouraged manufacturing companies to utilize customer referencing when demonstrating the usefulness of services to prospective customers, empirical studies and practical examples from industry are lacking. In light of these research gaps, Article IV draws attention to the importance of using customer references in smart service sales, offers a practical example of what constitutes a smart service success story in the industrial sector and provides a template for companies to develop their own stories. Article IV unlocks a new application of storytelling and BDA in reference marketing by showing how reference customer data represent tangible digital proof of smart service benefits, demonstrate supplier credibility, reduce customers' perceived risks and lead to faster buying decisions.

3 METHODOLOGY

Thus far, this dissertation has focused on identifying the theoretical and empirical gaps in the literature, defining its research objectives and reviewing the prior literature on the subject. The purpose of this section is to turn the reader's attention to the philosophical assumptions and methodological choices guiding the research in the four articles included in this dissertation (Figure 6). The intention here is not to rigorously review or compare existing research philosophies and methods applied in social science but instead to demonstrate which paradigms and methodologies were selected to answer the research questions in this dissertation and why.

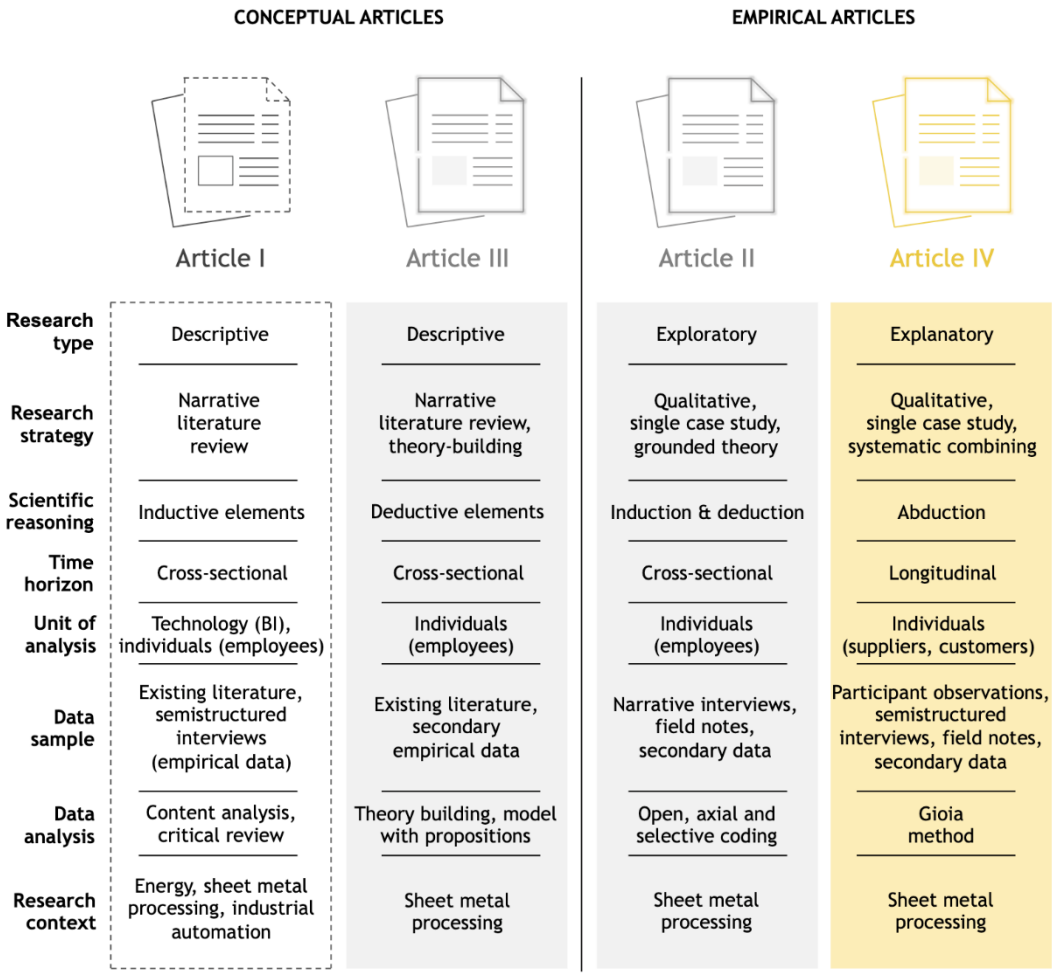

Figure 6. Summary of methodological choices in Articles I-IV

3.1 Research philosophy

Prior to embarking on a thorough discussion of the research strategies applied in Articles I-IV, the researcher's ontological (what is the nature of reality?), epistemological (what constitutes knowledge or truth?), anthropological (what is the relationship between humans and the environment?) and methodological (what are the means of acquiring knowledge?) assumptions (Burrell & Morgan, 1979) defining the scientific direction of this dissertation are worth mentioning. Understanding the research philosophy underlying this dissertation will support readers in interpreting its findings in regard to the researcher's beliefs and principles about and approach to the study of storytelling.

Building on a variety of competing sociological paradigms (Burrell & Morgan, 1979), qualitative research paradigms (Guba & Lincoln, 1994) and philosophical assumptions dominant in IS research (Orlikowski & Baroudi, 1991; Walsham, 1995), this dissertation is grounded in *interpretivism* and in the elated paradigm of *social constructivism* (Denzin & Lincoln, 2011). Rooted in the hermeneutic, phenomenological and symbolic interactionist schools of thought (Crotty, 1998), the interpretive research paradigm is considered appropriate for this dissertation, as this research seeks to capture and interpret the complexity of the human mind and of social interactions, processes and actions in a unique organizational context. Taking into account that the main purpose of this research is to explore how storytelling affects human attitudes and to explain why people act the way they do, the interpretive paradigm helps provide a rich understanding of the studied phenomena through real-life observations and interpretations of human behavior toward BDA and smart services.

The ontological foundation of interpretivism lies in *nominalism*, which assumes that there are multiple subjective realities shaped by human experiences and the meanings that people assign to social phenomena (Burrell & Morgan, 1979). With this in mind, this dissertation seeks to portray the complexity of storytelling applications in different organizational contexts across Articles II-IV instead of focusing on a narrow interpretation of deliberate stories in organizations.

The interpretive paradigm is often used interchangeably with *social constructivism* (Guba & Lincoln, 1994; Denzin & Lincoln, 2011), a viewpoint that suggests that humans socially construct reality; therefore, the studied phenomenon cannot be viewed separately from social actors. The interpretive philosophy argues that since the researcher is involved in interpreting the organizational reality, the researcher's ideological views are inherent in the findings (Orlikowski & Baroudi, 1991). Correspondingly, the researcher's prior

knowledge of the sheet metal processing industry supported the qualitative case study research conducted in Articles II and IV and helped the researcher acquire an empathic stance toward the organizational challenges resulting from human resistance. In congruence with interpretive case studies (Walsham, 1995), the empirical research (Articles II and IV) adopted a *weak* constructionist view (Orlikowski & Baroudi, 1991), resulting in the researcher adopting the role of a participant-observer and maintaining a passive, unobtrusive presence when immersed in natural settings.

Building on the prevalent practice of triangulating interpretivism and weak constructivism with other philosophical methods (Orlikowski & Baroudi, 1991), this dissertation has some characteristics of *positivistic* thinking, as Articles III and IV develop cause-effect frameworks that predict human behavior and encourage validation by future research.

Epistemologically, interpretivism is rooted in *anti-positivism* and suggests that social processes can be understood only from the inside and by individuals involved in the relevant social processes (Burrell & Morgan, 1979). Consequently, the empirical evidence in this dissertation was gathered directly from the participants through interviews (among other data collection methods). Coherent with the interpretive philosophy, Articles II and IV focus on understanding the everyday language of storytelling and the meanings that people attach to stories about BDA and smart services to achieve a particular goal. Furthermore, the reporting of findings in Articles II and IV relies extensively on illustrative quotations from participants to carefully reflect the organizational reality and portray the participants' views of and experiences with storytelling. Following the principles of interpretive case studies (Walsham, 1995), Articles II and IV utilize a narrative writing style to report thick descriptions (Geertz, 1973) of the studied context and detailed storytelling activities in the case company.

From the perspective of human nature, the interpretive paradigm accepts the *voluntarist* view and subjective approach to social science (Burrell & Morgan, 1979). The philosophical position of interpretivism is built on the premise that humans are independent and their actions are not determined by the environment in which they operate. In addition to adopting this basic assumption, the dissertation also aims to explore whether human behavior can be deliberately influenced by storytelling in such a way that humans are persuaded to behave in a certain manner instead of being ordered to do so.

The methodological standpoint of interpretivism is based on the *ideographic* approach, which argues that the researcher can grasp reality only by being involved in everyday life through observations and empirical data collection (Burrell &

Morgan, 1979). Following the interpretive philosophy, the empirical research in this dissertation utilizes a single in-depth *case study* strategy (Eisenhardt & Graebner, 2007) and naturalistic methods of data collection, such as interviews, field notes, observations and longitudinal data collection. Accordingly, Articles II and IV rely on *qualitative research* methods because this research is concerned with understanding the daily behavior of employees and customers in a unique organizational context, and qualitative research is appropriate for exploring a new phenomenon when prior literature on the subject is lacking (Denzin & Lincoln, 2011). Congruent with the use of theory in interpretive case studies (Walsham, 1995), Article II builds on the *grounded theory* approach (Corbin & Strauss, 1990) toward theory development from field data through a combination of *inductive* and *deductive* thinking, while Article IV employs an ethnographic case study (Visconti, 2010) and *abductive* scientific reasoning (Dubois & Gadde, 2002; Dubois & Gadde, 2014).

Finally, given that this dissertation comprises both empirical (Articles II and IV) and conceptual research (Articles I and III), it is also important to state the implications of interpretivism for the theoretical articles. Specifically, the conceptual articles extend our theoretical knowledge of storytelling through a comprehensive interpretation of prior literature (Baumeister & Leary, 1997; Snyder, 2019) and new theory building (Zmud, 1998; Rivard, 2014) based on critical sensemaking of interpretations that have accumulated in existing research. In line with the philosophical assumptions of the interpretive paradigm, Articles I and III represent only one of many possible subjective interpretations of prior research on the subject, and the author's own background, beliefs and experience played a crucial role in shaping these findings.

3.2 Research design and strategy

Drawing on the challenging endeavor of this dissertation to model human behavior, the research questions are addressed through the lens of both conceptual (Articles I and III) and empirical (Articles II and IV) publications. Utilizing different types of scientific research helps to advance theory by synthesizing existing literature as well as to develop new concepts by collecting empirical data from the field. Collectively, both the theoretical and the empirical research articles complement each other and contribute to the creation of new convincing theory and new knowledge about the role of storytelling in internal technological change and in B2B sales.

3.2.1 Conceptual articles

The methodology used in the conceptual articles (Articles I and III) relies on the *narrative literature review* approach (Baumeister & Leary, 1997; Green, Johnson & Adams, 2006). In particular, these articles identify and collect existing literature on the studied subject, synthesize prior findings, compare different approaches and contribute to the dissertation through the proposal of new frameworks and theoretical concepts. The purpose of Articles I and III is not to systematically review all literature published on the subject but instead to use a story-based approach to focus on the quality and synthesis of selected relevant publications from different disciplines and research streams. Article I focuses on presenting a comprehensive descriptive overview of the prior literature (Webster & Watson, 2002). Article III, on the other hand, broadens current knowledge by synthesizing extant research and using the review as a basis for building a new theory (Zmud, 1998; Rivard, 2014). Despite the fundamentally theoretical nature of Articles I and III, these publications also incorporate managerial insights from the field to demonstrate to practitioners the practical relevance of the findings.

3.2.2 Empirical articles

Congruent with the research strategies and methodological choices informed by interpretive philosophy (Orlikowski & Baroudi, 1991), both empirical articles (Articles II and IV) are based on qualitative *case study* research (Walsham, 1995). Building on the novelty of the studied phenomena, the scarcity of prior research on the topic and the need to interpret everyday human behavior in a unique real-life organizational setting, a *single* or *intrinsic* case study (Siggelkow, 2007; Denzin & Lincoln, 2011) was selected over a multiple-case approach to enable an in-depth examination of storytelling and theory building through the collection of rich empirical data.

Following the principles of *theoretical sampling* for the selection of a single case (Eisenhardt & Graebner, 2007), a company with unique experiences in storytelling, BDA and smart services was purposefully selected for Articles II and IV. The selected case company is an international original equipment manufacturer (OEM) operating in the machine tool manufacturing industry and delivering sheet metal punching, laser cutting, and bending solutions bundled with services to customers. In addition to representing an interesting and exemplary context for answering the research questions, one of the reasons for selecting this particular research setting was the company's willingness to provide the researcher with rich access to internal documentary data and an opportunity to observe people and daily processes during field visits. The researcher's knowledge of the

manufacturing industry and a prior part-time employment relationship with the case company facilitated the process of obtaining uncommon research access to the organization. More detailed descriptions of the case company and the industrial research settings specific to each article (and studied phenomenon) can be found in the full-text articles at the end of the dissertation.

Although both empirical publications employ the case study methodology, Article II is *cross-sectional* in nature, while Article IV builds on *longitudinal* data collection and ethnographic research methods to observe and explain the dynamics of customer-supplier interactions in the case company.

Furthermore, Articles II and IV vary in the use of research strategies and theory-building methods to provide answers to the research questions. Specifically, Article II utilizes the *exploratory* case study (Yin, 1994) and *grounded theory* approach (Corbin & Strauss, 1990; Matavire & Brown, 2013) to develop new theory and knowledge through constant comparative analysis of newly emerging data, extant empirical and secondary data, and prior literature. The selection of grounded theory in Article II is suitable given the lack of relevant literature on the role of storytelling in BDA adoption. On the other hand, Article IV is an *explanatory* ethnographic case study (Visconti, 2010), which uses abductive reasoning (Dubois & Gadde, 2002; Van Maanen, Sorensen & Mitchell, 2007) by first observing real-life phenomena in the field and then seeking a plausible theoretical explanation in order to construct a new theory. Originally inspired by interesting observations during the fieldwork, Article IV takes advantage of the abductive method of reasoning to find the *best explanation* for the observed phenomena given the complexity of the behavioral and psychological factors underlying human actions.

3.3 Data collection

Consistent with the variety of research questions guiding this dissertation, different data collection techniques were selected to address the studied phenomena in the theoretical (Articles I and III) and empirical publications (Articles II and IV). The purpose of this section is not to duplicate the methodological content of the full-text articles enclosed at the end of the dissertation, but instead to introduce readers to a brief summary of the data that was used to generate the findings. Additionally, taking into account the managerial literature style of Article I and the theory-building approach utilized in Article III, these conceptual publications lack detailed descriptions of the research methods

applied. Hence, the methodological choices made in Articles I and III are outlined here and in the subsequent "Data analysis" section.

3.3.1 Conceptual articles

Based on the guidelines for writing a literature review (Baumeister & Leary, 1997; Green, Johnson & Adams, 2006; Snyder, 2019), theoretical articles rely on summarizing and critically analyzing the existing knowledge base. Consequently, the data collection strategy in Articles I and III involved a comprehensive search of the relevant literature from different research streams to address those articles' specific research topics (Snyder, 2019). In particular, Article I focused on gathering literature from the project business, project management IS and BI literatures, while Article III concentrated on identifying and synthesizing insights from the BA and storytelling literature, behavioral operational research, psychology and neuroscience.

To ensure broad coverage, good quality and the relevance of the extant literature (Webster & Watson, 2002), several academic databases (e.g., Scopus, ScienceDirect and Web of Science) were utilized to find peer-reviewed articles by using Boolean searches. The literature search was deliberately limited to full texts in the English language, but no specific timeframe restrictions were applied. After an initial screening of the abstracts, the content of the articles was analyzed to discard studies that went beyond the scope of interest. Additionally, references and citations from the selected articles were reviewed to identify other relevant studies. Due to the diversity of the keywords used to search the prior literature and the narrative (rather than systematic) nature of the conceptual articles, the list of specific keywords or the number of articles found are not provided here.

Although Articles I and III primarily synthesize the existing literature, some of the content and frameworks in the conceptual articles build on the empirical data collected in the field to highlight practical implications of the conceptual results. For example, Article III provides a real-life example of a BA data-driven story acquired from the international sheet metal manufacturing company during the data collection from an earlier research collaboration. Similarly, one subsection of Article I (that devoted to the BI tools used during project delivery, pp. 177-180) was written based on interview data collected from the industrial companies participating in the government-funded DIMECC S4Fleet (Service Solutions for Fleet Management) project. Due to the scope of the project, three companies were purposefully selected because they represent leading international organizations in the energy sector, the sheet metal processing industry and the industrial automation field. These three companies provided empirically rich data on the

studied phenomena due to their project-oriented business models as well as their experience with BI tools. A total of 22 face-to-face semistructured interviews (or, in some cases, interviews via video conferencing software when it was not possible to reach a respondent in person) were conducted with those representatives from both middle and top management in the R&D, sales, services and project management departments who had been most frequently involved in project delivery and the use of BI. The purpose of the interviews was to identify applications for and the benefits of the BI tools used during the project delivery lifecycle in each company. Each interview lasted from 40 to 90 min, and all interviews were recorded and transcribed.

3.3.2 Empirical articles

Congruent with the epistemological and methodological foundations of the interpretive paradigm (Orlikowski & Baroudi, 1991; Walsham, 1995), the empirical publications (Articles II and IV) utilize a combination of common data collection techniques for qualitative inquiry: interviews, observations, field notes, and secondary documentary data. Although interviewing is the primary data collection strategy in Article II, the ethnographic research conducted in Article IV is based on interviews and field observations, with the latter as the main source of data.

Both empirical articles rely on qualitative face-to-face interviews to collect primary data from the field and provide a deeper understanding of storytelling through direct interactions with respondents. The primary data collected for Article II are based on 24 informal conversational interviews, while the empirical data in Article IV were obtained from 32 semistructured interviews. The interviews lasted on average 52 min and were recorded and transcribed verbatim.

Following the principles of grounded theory (Matavire & Brown, 2013) and due to the lack of prior academic knowledge on storytelling as it relates to BDA adoption, an interview guide was not developed a priori in Article II. Instead, data were collected through *in-depth narrative interviews* (Czarniawska, 1998) to explore the story types told in the case company and to allow the findings to emerge from the interview data. However, prior to entering the field, the researcher gained a preliminary idea of the observation area and formulated potential open-ended questions to ask employees from the case company regarding BDA adoption challenges and the role of storytelling. The use of a narrative research approach helped ensure that respondents told stories from their own point of view and with their own words.

By contrast, the research in Article IV utilized *semistructured interviews* (Saunders, Lewis & Thornhill, 2009) to collect in-depth data in a systematic way by covering topics that were specified in advance. The interview guide developed beforehand consisted of open-ended questions about the supplier's use of stories and BDA during interactions with customers. Despite the use of predetermined interview questions, a flexible interview style was adopted to allow for individual variation depending on the flow of the conversation. Although the focus of Article IV is on customer adoption of the supplier's smart services, it was not possible to interview the supplier's customers due to the sensitive nature of the topic and a request from the supplier to not involve customers in the research study.

The sample size in the empirical articles was not predetermined, and interviews continued until *theoretical saturation* (Saunders et al., 2017), the point in time when new data did not yield new theoretical categories, was reached. Theoretical sampling (Matavire & Brown, 2013) and purposeful snowball sampling strategies (Patton, 1990) were used in Articles II and IV, respectively, to identify information-rich respondents within the case company based on the ability of the employee to contribute to emergent theory. Article II focused on finding interviewees based on their daily involvement in deliberate storytelling to facilitate BDA adoption, while Article IV concentrated on identifying competent informants with experience in storytelling activities during smart service sales. To maximize variety in the responses obtained and to ensure the accuracy of the data for theory building, the researcher concentrated on obtaining a heterogeneous sample and interviewed representatives from different organizational levels (R&D, services, marketing and sales).

Despite the research importance of interviewing, the findings of the ethnographic case study in Article IV primarily rely on *observations of participants* (Delamont, 2004) in natural settings. The possibility of being immersed in the organizational reality and of observing customer-supplier interactions and storytelling activities in a real-life context (without interfering) is considered a unique and invaluable method of data collection. Observational data were collected over a 30-month period during field visits to the case company headquarters, to internal group meetings and to public customer events. A total of 55 events were visited and observed during the two and a half years of the study. The observed situations varied in duration and theme. For example, the author participated in customer and project meetings lasting for 60-180 min as well as trade events lasting for up to 9 hours per day.

The empirical data collection process in Articles II and IV was also complemented with *field notes* (Patton, 1990; Walford, 2009). A total of 38 pages of reflective

notes were recorded from the interviews in Article II, and over 90 pages of field notes were generated during the interviews and participant observations in Article IV. The use of field notes supported the researcher in interpreting the organizational reality through records of basic descriptions of the observed phenomena as well as the researcher's own reflections. Furthermore, the theory-building process based on the longitudinal data collected over a 30-month period in Article IV would have been almost impossible without the regular records of emerging theoretical insights in the field notes.

Finally, to support the analysis of the empirical data, *secondary documentary data* were obtained from the case company. In Article II, the researcher used internal documentation related to BDA adoption challenges, training materials, project presentation slides for storytelling activities, and BDA usage statistics to validate the effectiveness of storytelling on employee BDA adoption. Similarly, the research in Article IV relied on the sales presentations and marketing material used during B2B sales negotiations, as well as the service sales metrics acquired from the case company to verify the increase in customer adoption of smart services as a result of storytelling.

3.4 Data analysis

As stated earlier in the Introduction, this dissertation consists of a pre-research publication (Article I) and three main research publications (Articles II-IV) that vary in their research purposes, units of analysis (Patton, 1990) and contributions to the dissertation. Article I represents the first research milestone for the dissertation and provides solid groundwork for the main research in Articles II-IV. The units of analysis in Article I are both technology- and individual-oriented because Article I concerns the applications and benefits of BI in project management as well as the barriers to BI adoption among employees in organizations. Articles II-IV extend the research by addressing the studied phenomena more extensively at the individual level. In particular, in Articles II and III, the behavior of employees and the use of deliberate storytelling inside an organization is the main focus of the analysis. The primary focus of Article IV is on analyzing the behavior of suppliers and B2B customers as well as storytelling during customer-supplier sales interactions.

Given the variety of primary and secondary data collected to answer the research questions stated in the Introduction, different data analysis methods were applied in the articles to extract valuable insights. Accordingly, this section attempts to

demonstrate the similarities and differences in the data analysis techniques applied in both the conceptual and empirical articles in this dissertation.

3.4.1 Conceptual articles

Although the narrative literature review lies at the foundation of the theoretical publications, Articles I and III have different goals for reviewing the prior literature and consequently utilize different analytical techniques. In particular, Article I presents a review of existing knowledge (Baumeister & Leary, 1997; Webster & Watson, 2002) about project business and highlights the use of BI in project-based firms and BI adoption among employees as emerging phenomena, but it does not offer any new theory. Instead, Article I provides a snapshot of existing research on the subject, describes the key concepts, generates a visual framework that summarizes the phases of project delivery and the responsibilities of business units as identified in the prior literature (cf. Artto et al., 2008; Turkulainen et al., 2013; Artto, Valtakoski & Kärki, 2015) and describes future research directions.

Article III, by contrast, prioritizes new theory development (Zmud, 1998; Rivard, 2014) over a mere review of existing literature, but it utilizes a literature review to describe the context for a new interdisciplinary theory. Data analysis in Article III started with the identification of gaps in extant research to determine where and why a new theory on BA data-driven storytelling is needed. Then, following the guidelines for theory-building (Whetten, 1989; Wacker, 1998), Article III focused on seeking out the relationships among the studied constructs (BA adoption, storytelling, data interpretation, decision-making) in prior literature and providing convincing arguments and theoretical explanations for these causal relationships in the form of propositions. Based on its thorough analysis of the existing literature, Article III visually maps the key research fields, concepts and relevant studies that were selected and used as the building blocks for developing and justifying the propositions underlying the conceptual model. As a result, the new concept of BA data-driven storytelling is based on a synthesis of the prior research as well as the researcher's interpretations and understanding of how storytelling influences individual attitudes and behavior toward BA.

In addition to synthesizing insights from prior literature, Articles I and III also rely on an analysis of the empirical data collected in the field. In particular, one of the subsections of the book chapter (Article I) is dedicated to the use of BI tools during project management, and it incorporates findings from an analysis of interviews conducted with three industrial project-based companies. Given that Article I was not intended to identify new concepts or generate new theory from the collected

interview data, the qualitative data analysis did not require the use of a systematic and rigorous approach to data coding (e.g., the Gioia methodology) or the use of a software program (e.g., MAXQDA, NVivo). Instead, the interview transcripts were carefully read multiple times to familiarize the researcher with the data and provide a rich understanding of how companies utilize BI during project delivery. The qualitative content analysis concentrated on 1) identifying key words, phrases and sentences in interview records and 2) detecting patterns among the respondents to determine which benefits BI provides to each company throughout the project management lifecycle. After the within-case analysis, a cross-case analysis was performed to explore similarities and differences in the application of BI across the three companies. As a result, the most commonly used BI tools were identified and described in the text of Article I. Additionally, findings from the three companies were incorporated into a single visual framework according to project phase (pre-project, project execution and post-project) and responsible department (sales, project management and services). This framework summarizes the BI tools utilized in project-driven international organizations operating in the energy sector and the sheet metal processing and industrial automation industries. The purpose of the visual framework, which builds on the managerial implications, is to demonstrate real-life examples of BI tools from the industry and to guide future research toward validating and extending this list.

Finally, in addition to using a theory-building approach to contribute to the field of behavioral operational research, Article III incorporates a practical example of the use of BA software and BA data-driven stories obtained from the international sheet metal manufacturing company. These empirical data were retrieved from the company's internal marketing materials (in the context of remote machine diagnostics and maintenance), which were collected along with other secondary data during another research project. The organization that provided the data preferred to remain anonymous. Upon careful analysis of the collected data, the content of the story was extended from bullet points into a descriptive narrative and used in Article III to demonstrate the plot of a BA data-driven story. The updated description of the story was checked and verified by a company representative to ensure that the original meaning was retained. The screenshot of the BA software dashboard was retrieved from the same marketing materials and utilized in Article III to support the comparison of BA data interpretation with and without deliberate storytelling. The overarching purpose behind the use of these empirical data in the theoretical article was to bridge the gap between research and practice and to encourage readers to think about concrete applications of BA data-driven storytelling in real life. The story provided in Article III represents one of many practical examples of how the interpretation of complex BA data can be improved with the help of a story.

3.4.2 Empirical articles

Based upon the limited empirical evidence gathered, Articles II and IV summarize observations from the field and provide rich descriptions of the studied context in narrative form to facilitate readers' understanding of the research findings. Both articles describe the sequence of real-life events pertinent to the relationship between storytelling and BDA adoption or smart service adoption in the case company and explain why this social settings represents an interesting, exemplary context with empirically rich data in which to answer the research questions. Specifically, Article II creates a detailed chronological case history by describing the challenges in individual-level BDA adoption and the development and implementation activities of deliberate corporate stories in the company. Similarly, building on the interpretation of empirical data, Article IV provides general context for the studied phenomenon by explaining the role of BDA in smart services, demonstrating customer resistance to smart services, and outlining the chronology of storytelling activities in the case company.

Given the different research strategies applied in the empirical articles, in Article II, the collected data were analyzed according to the principles of grounded theory (Corbin & Strauss, 1990), while abductive reasoning (Dubois & Gadde, 2002; Dubois & Gadde, 2014) and interpretative ethnography guidelines (Visconti, 2010) were utilized in Article IV to generate the research findings. Despite the benefits of computer-assisted qualitative data analysis, the data in Articles II and IV were manually coded due to the researcher's goal of avoiding mechanistic data analysis of focusing on the depth of the data instead of their breadth. Furthermore, manual coding was considered appropriate due to the inability of the author to acquire the necessary skills to use new software during the limited time available for completing a PhD. The detailed data coding procedure from the initial concepts to the final categories can be found in the full-text versions of Articles II and IV at the end of the dissertation.

Following the canons of evolved grounded theory (Matavire & Brown, 2013), the data analysis procedure in Article II focused on a *constant comparison* and continuous iteration among new data, extant data and extant literature to construct a new theory grounded in the combination of past and present findings. Interpretive data analysis began simultaneously with data collection, and the research process involved moving among the interview transcripts, field notes, documentary secondary data, emerging theoretical framework and prior literature to search for similarities and differences.

Congruent with the guidelines of grounded theory (Corbin & Strauss, 1990), a systematic procedure for analyzing the data following three stages of coding (open,

axial and selective) was applied in Article II. The interview data were systematically transcribed and subjected to content analysis after each interview. During the *open* coding stage, data were analyzed line by line to extract relevant repeated words and phrases, assign labels, compare concepts and further reformulate those concepts. The emergence of theoretical concepts during the initial data coding procedure was followed by the collection of additional data, subsequent data coding and revisions of the emerging theoretical constructs to develop a new theory. Then, *axial* coding was performed to identify relationships among the initial concepts and group them together into categories. In the final phase of the interpretive data analysis (*selective* coding), categories were refined and combined into higher-level core categories, which resulted in four dimensions underlying the new theoretical framework. Additionally, content analysis of the field notes and the secondary archival data was utilized to derive categories and compare findings with the themes emerging from the interview data. As a result, the data analysis revealed four deliberate storytelling patterns, seven corporate stories and the features of effective deliberate storytelling.

During the data coding procedure used in Article II, the memo-writing technique (Corbin & Strauss, 1990) was utilized to document theoretical concepts and relationships between categories and to support the data analysis and the conceptualization of the new theory. Consistent with the *emergence* principle of grounded theory (Matavire & Brown, 2013), the researcher remained flexible and open to new data and theoretical concepts emerging throughout the data collection and analysis processes. Findings from the emergent theory were continuously revised during the research process to ensure that all theoretical concepts were integrated into the final theoretical framework.

During the earlier stages of data interpretation in Article II, the prior literature was not involved in the comparative analysis process in order to avoid confirmation bias and the development of preconceived hypotheses about the studied phenomenon from the existing literature (Urquhart & Fernández, 2013). However, prior to the research fieldwork, a preliminary literature review was conducted to define the scope of the research problem and outline the research gaps. Then, after the initial data coding, extant literature was introduced and used as another source of data in the comparison of emerging patterns. Finally, after defining core theoretical patterns, the researcher focused on theoretical integration and a comparison of the emergent theory with the existing body of knowledge to formulate a new formal theory and define the concept of deliberate storytelling.

In comparison with the methodological choices applied in Article II, the choices applied in Article IV were based on the data analysis features of *organizational*

ethnography (Visconti, 2010) and a systematic combining approach grounded in abductive reasoning to develop theory from a case study (Dubois & Gadde, 2002; Dubois & Gadde, 2014). By drawing upon these research methodologies, a nonlinear data interpretation method was utilized throughout the research project in Article IV. In line with the *matching* principle of systematic combining (Dubois & Gadde, 2002), the theoretical framework evolved simultaneously with the empirical observations and data analysis. As a result, the researcher was continuously rotating among observations, interviews, field notes, secondary data, data analysis and theory construction.

Despite the brief literature review conducted prior to the fieldwork in Article IV, existing theories were set aside and were used in the analysis only after the patterns emerging from the empirical data revealed their relevance. This was done to avoid formulating any theoretical ideas before the start of the research. As a result, the comparison of the emergent concepts with concepts from extant literature, conducted to find similarities and contradictions, began after the initial data coding procedure was completed. Complying with the recommendations for iterating between the empirical and conceptual domains (Van Maanen, Sorensen & Mitchell, 2007), the emergent findings were continually reinterpreted in light of existing theories, and by reducing the number of theoretical explanations, the hypothesis that best answered the research question was selected.

Given the guidelines for ethnographic research (Visconti, 2010) and a longitudinal time frame of two and a half years, prior to interpreting the primary and secondary data in Article IV, the researcher organized and reduced the data in order to select only the empirical evidence that was relevant for answering the research question and to enable systematic data coding. Then, the observational and interview data were subjected to qualitative content analysis following the Gioia method for systematic and rigorous data coding (Gioia, Corley & Hamilton, 2012). Interview transcripts were read multiple times to gain familiarity with the data and to verify the internal consistency of respondents' statements. Following the grounded theory coding (Corbin & Strauss, 1990), the Gioia approach started with a line-by-line analysis of the data to identify the initial concepts and extract the *first-order codes*, which represent the ethnographic account of the field data (Visconti, 2010). During the research process, these codes were continually refined, and based on the emerging patterns and comparisons with the extant literature, the *second-order* constructs were produced, which represent the theoretical account and the researcher's own interpretations of the initial codes (Visconti, 2010). Last, moving back and forth between the data and theory, the higher-order *aggregate dimensions* constituting the basis of the new theoretical framework were developed. The new theory was generated by increasing the level of abstraction

from narrow concepts toward formal theory. As a result, the findings revealed the role of BDA in facilitating customer adoption of smart services and identified storytelling as a collective sensemaking and sensegiving tool in B2B sales.

Following the *direction and redirection* principle of systematic combining (Dubois & Gadde, 2002), Article IV generated findings by combining multiple sources of data to create a convincing theory. Alongside the primary data analysis, the content of the secondary data was analyzed to verify the accuracy of the primary data and to provide new insights into the studied phenomenon, thus determining the direction of the findings in light of the newly collected data. Finally, consistent with the reporting principles for an ethnographic case study (Visconti, 2010), during the analysis of the data, relevant verbatim quotations from interviews were extracted to be included in the description of findings in order to present the study results objectively and in the respondents' own words.

3.5 Scientific rigor

Given the variety of existing methods for enhancing the trustworthiness of findings and the lack of agreement among scholars on the best quality assurance criteria, several measures were applied to ensure the methodological rigor of the research conducted in Articles I-IV. Consistent with the epistemological, ontological and methodological assumptions (Burrell & Morgan, 1979) underlying this dissertation, the conceptual (Articles I and III) and empirical (Articles II and IV) publications were evaluated against different research quality criteria to increase the reliability and validity of the findings. All articles were subjected to a rigorous double-blind review process and multiple rounds of revisions prior to final acceptance in international middle- and top-tier publications. As a result, the author hopes that the evaluation criteria described in this section (in addition to fact that the reviewers and journal editors were already convinced of the scientific soundness of this research) will strengthen the reader's confidence in the trustworthiness of the research results in Articles I-IV.

3.5.1 Conceptual articles

In compliance with the criteria for evaluating the quality of literature reviews (Baumeister & Leary, 1997; Snyder, 2019; Post et al., 2020), both Articles I and III demonstrate sufficient coverage of the existing literature on the studied topic. For example, Article III uses a figure to visually explain how a new theoretical model with propositions was shaped by the variety of research from different literatures so that the readers can themselves evaluate the strength of the supporting

evidence. The theoretical articles do not attempt to embrace the entire existing literature on the subjects covered but instead clearly delineate boundaries and provide a concise synthesis of the extant knowledge base by addressing particular research objectives. Taking into account the general audience, both Articles I and III utilize comprehensible language and illustrate the findings of the critical analysis in a visual format instead of through long tables with a list of reviewed literature that can be exhausting to read. Congruent with the common characteristics of good literature reviews (Callahan, 2014; Post et al., 2020), both articles describe their theoretical contributions to the existing body of knowledge by critically reflecting on the extant literature and proposing a new framework (in Article I) and a new theory with propositions (in Article III) through convincing argumentation.

Even though the presence of a formal methodological section in the review articles is considered a traditional quality assessment criterion, narrative literature reviews do not require a detailed explanation of the applied methodological approach, as the literature selection is based on the researcher's viewpoint and experience in the field (Baumeister & Leary, 1997; Post et al., 2020). Nevertheless, to enhance the transparency in the reporting of the research process in Articles I and III, the data collection and analysis strategies were clearly articulated for the readers in the dissertation to enable future research to replicate these studies. Last, the conceptual publications are not only based on historical evidence but are also future-oriented, and the findings of the review articles have useful implications for both scholars and practitioners because they reconceptualize the extant literature, reveal practical examples from the industry and inspire future research.

Given that Article III focuses on the building of a new theory in addition to the literature review, several criteria for theory evaluation (Whetten, 1989; Webster & Watson, 2002) as well as fundamental principles of theory construction (Rivard, 2014) were applied in the research process. In particular, the clarity of the newly constructed theoretical model with propositions was achieved by providing detailed definitions of the constructs, clear statements, logical explanations of the relationships between the constructs, and argumentation regarding how the new theory provides value-adding contribution to behavioral operational research. Additionally, the new storytelling concept for facilitating BA adoption among employees introduced in Article III satisfies the practical and contemporary criteria for a high-quality theoretical contribution in conceptual papers (Whetten, 1989). Individual-level adoption of new disruptive technologies remains a practical obstacle and a topic of great interest for organizations and researchers in the modern digital era, and this new theory is likely to become a remedy for these obstacles in management practice.

In line with the attributes of a good theory (Wacker, 1998), the concept of BA data-driven storytelling in Article III is both internally consistent and empirically risky. Modeling human behavior is a challenging research task, and advancing technology adoption theory with a new deliberate storytelling construct is an unconventional method that carries the risk of negative results after model validation. Nevertheless, despite the complex psychological and neuroscientific factors underlying human behavior, the modeled relationship between storytelling and BA use in Article III is not an overly complex mid-level abstract theory, but rather adheres to the principle of parsimony (Wacker, 1998).

Finally, corresponding to the guidelines for generating interesting social theory (Davis, 1971), Article III sheds new light on storytelling as a previously taken-for-granted activity in management and organizational studies. The interdisciplinary research in Article III challenges the existing literature and engages audiences by breaking traditional stereotypes of storytelling and synthesizing insights from multiple research streams: information systems, operational research, linguistics, psychology and neuroscience.

3.5.2 Empirical articles

The trustworthiness of the qualitative research in Articles II and IV was evaluated according to four criteria: credibility, transferability, dependability, and confirmability (Guba, 1981; Lincoln & Guba, 1985). These criteria were chosen on the basis of the ongoing debate across disciplines regarding which standards should be used to assess the quality of empirical findings. Despite the positivist underpinnings of the four criteria, these traditional research measures were considered appropriate, as they are widely accepted and frequently used to evaluate the rigor of qualitative studies in the management field. Furthermore, given the different research methodologies underlying the empirical articles, the grounded theory assessment criteria (Glaser & Strauss, 1967) were applied in Article II to help develop a rigorous and trustworthy theory, while the evaluation principles of the systematic combining approach (Dubois & Gadde, 2002; Dubois & Gibbert, 2010; Dubois & Gadde, 2014) were used in Article IV to enhance the quality of the findings.

To ensure the accuracy of the findings, research *credibility* (equivalent to internal validity) (Lincoln & Guba, 1985) was achieved in Articles II and IV by triangulating various data collection techniques and data sources to cross-examine the data and prevent response bias. Additionally, the researcher was engaged in the fieldwork for an extended period of time to become intimately familiar with the studied context and to prevent any preconceptions or biases from interfering with the

research process. The researcher's interpretation of data can be considered credible given the member-checking procedure applied in Articles II and IV. That is, during the research process, the emergent theory and final conclusions were checked by the key informants to eliminate errors and ensure the quality of the fit between the findings and reality.

Consistent with the interpretive philosophy guiding this dissertation, instead of seeking generalizability, the *transferability* (equivalent to the external validity) (Lincoln & Guba, 1985) of the findings was achieved by developing a thick description of the research setting and phenomena studied in Articles II and IV. As a result, readers can independently evaluate how and to what extent the conclusions generated from the data can be transferred to other contexts. During the initial research stages in Articles II and IV, a theoretical and purposive sampling strategy was applied to select an unusual, information-rich exemplary case, which implies that the studied phenomena are context bound and that the findings are not intended to be generalized. To enhance the transparency of the research process, the selection criteria applied to the case and the respondents are clearly articulated in the empirical articles.

To highlight the *dependability* (equivalent to reliability) (Lincoln & Guba, 1985) of the research, the data collection techniques, coding schemes and theory building procedures were documented in detail in Articles II and IV to allow possible external researchers to conduct an audit.

Last, the *confirmability* (equivalent to the objectivity) (Lincoln & Guba, 1985) of the findings was increased through the utilization of direct interview quotations throughout Articles II and IV to demonstrate to the readers how the findings were guided by the empirical data. Since the interpretive paradigm does not accept the notion of a single objective reality, the conclusions presented in the empirical articles were to a certain extent influenced by the researcher's background, experience and interpretation. Nevertheless, during the fieldwork, the researcher remained self-conscious, and the researcher's thoughts and observations were recorded in the reflective field notes. This was done to ensure that during the data analysis, the researcher's own biases and assumptions would not affect the research results.

Corresponding to the grounded theory methodology applied in Article II, in addition to the trustworthiness criteria for qualitative research, the theory generated in Article II was also evaluated according to the original principles for grounded theory rigor (Glaser & Strauss, 1967). In particular, as a result of the detailed codification of data, the new concept of deliberate storytelling accurately reflects the real-life organizational phenomenon observed and *fits* into the existing

substantive research area in IS and linguistics. Furthermore, the descriptions of the storytelling patterns and characteristics of effective storytelling in Article II were verified by the respondents in the case company to ensure that the theoretical framework is not too complex, is *understandable* and is useful from a managerial perspective. To ensure the practical and *general* applicability of the empirical findings, the grounded theory in Article II was subjected to several rounds of abstraction to allow for flexibility and the application of the theory to different situations. Finally, the proposed storytelling framework is dynamic and can be modified in the case of new emerging data (e.g., new BDA adoption challenges or new corporate stories) over time, which gives the researcher or the manager *control* over the theory. As a result, by achieving this level of quality, the continual relevance to and value in social research of the grounded theory in Article II is ensured.

Similar to Article II, the ethnographic case study in Article IV not only satisfies the trustworthiness criteria but also builds on the standards of good case study research prevailing in the industrial marketing literature (Beverland & Lindgreen 2010; Piekkari, Plakoyiannaki & Welch, 2010) and in the principles of systematic combining (Dubois & Gadde, 2002; Dubois & Gibbert, 2010; Dubois & Gadde, 2014). Given the traditional journal guidelines in the industrial marketing discipline, it was not possible to avoid giving a linear description of the methodology of the case study in Article IV. However, the use of abductive reasoning and the *iterative* theory building process were *transparently* documented to demonstrate to the readers how the theoretical framework evolved and how the researcher moved back and forth between the empirical observations and the theory. Despite the amount of data collected over two and a half years of fieldwork, the researcher was scrupulous in sorting the data and was *selective* in writing up the findings in the article to avoid providing an overabundance of information and to facilitate the reader's understanding of the studied phenomenon. Compared with the criteria of parsimony in theory building, the research findings in Article IV are presented as a *coherent* story narrating how the theory was developed and how the researcher arrived at the conclusions drawn.

4 FINDINGS: ARTICLE SUMMARIES

The findings of this dissertation are equivalent to the combined results of four independent publications that address the research questions formulated in the Introduction. Three articles (Articles II-IV) were published in refereed international journals, and one article (Article I) was published as a book chapter. Figure 7 synthesizes the key findings and demonstrates the new theoretical concepts introduced by Articles I-IV.

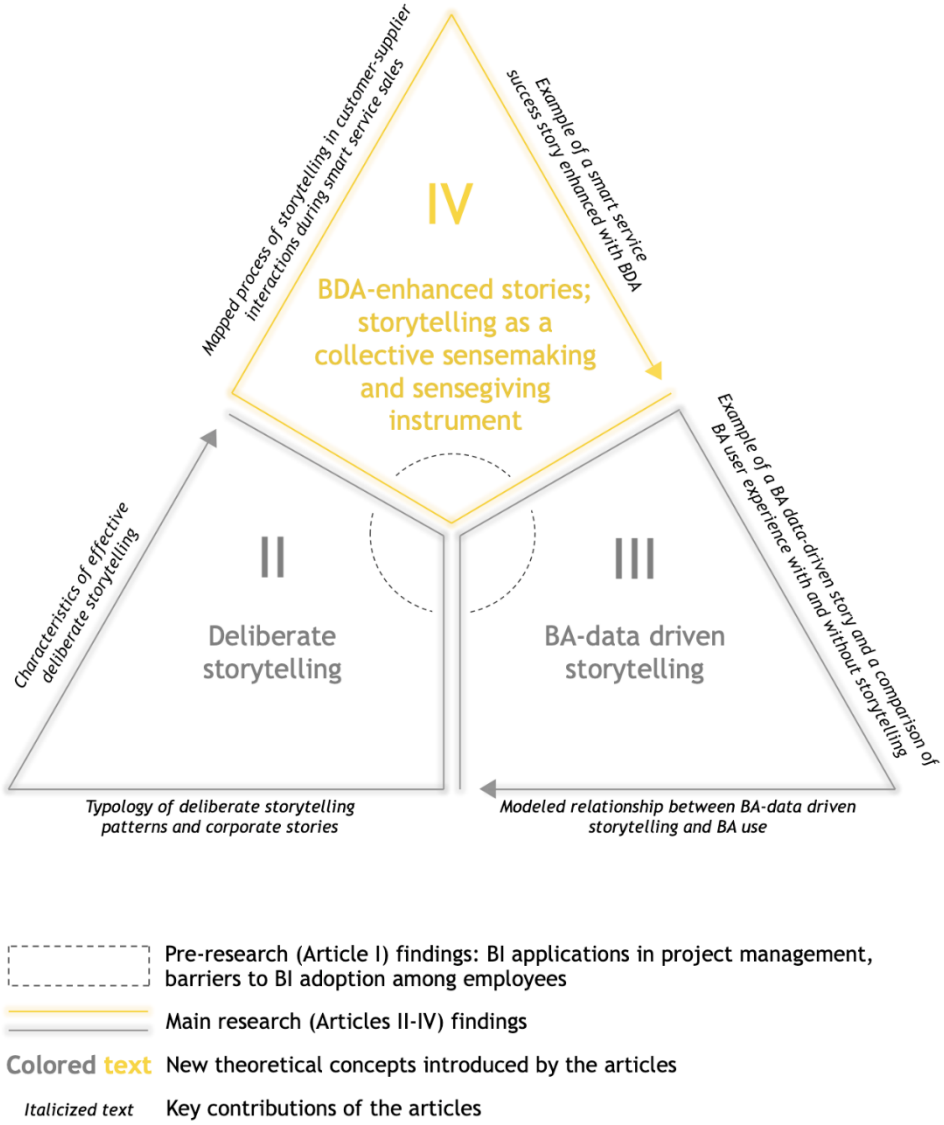

Figure 7. Overview of key findings

Collectively, the articles shed light on the multidimensional role of storytelling in organizations and the power of stories to influence human attitudes and behavior

toward accepting BDA (Articles II and III) and buying smart services (Article IV). The pre-research findings (Article I) represent the foundation and first milestone for the dissertation and inspired and paved the way for the main research in Articles II-IV.

The purpose of this section is to summarize the findings across the four publications, briefly introduce readers to the content of each article as well as highlight linkages among the publications. While this section is limited to summarizing the content of Articles I-IV, the subsequent section "Discussion and conclusions" interprets the research findings in relation to the research questions and existing literature. The original full-text articles can be found at the end of the dissertation in the Appendices.

4.1 Article I: Project management intelligence—Mastering the delivery of lifecycle solutions

Article I is a book chapter published as a result of the government-funded project DIMECC S4Fleet-Service Solutions for Fleet Management, which focused on the strategic use of BI technologies in delivering solutions to customers. Article I is conceptual in nature and provides an overview of the existing literature on how BI tools generate operational benefits when used across different phases of the project management lifecycle. In addition, Article I incorporates managerial insights collected through interviews with industrial companies participating in the S4Fleet project. The book chapter is written from the managerial perspective to provide SME practitioners with practical recommendations on how BI can help build a competitive advantage.

Published during the pre-research phase of the dissertation, Article I serves as an important starting point and provides solid ground for the main research in Articles II-IV. While the book chapter identifies different managerial challenges related to BI adoption among employees inside organizations, it creates a need for more in-depth research that focuses on the behavioral and psychological factors facilitating analytics adoption (addressed in Articles II-III).

When trying to survive in a highly competitive and dynamic environment, companies seek new ways to reap the benefits of digitalization to satisfy customer needs, improve the efficiency of project delivery and increase revenue. Article I contributes to the project management literature by demonstrating the variety of BI software used during project delivery and categorized according to the phase of the project lifecycle and the responsible department. These findings are illustrated in Figure 8.

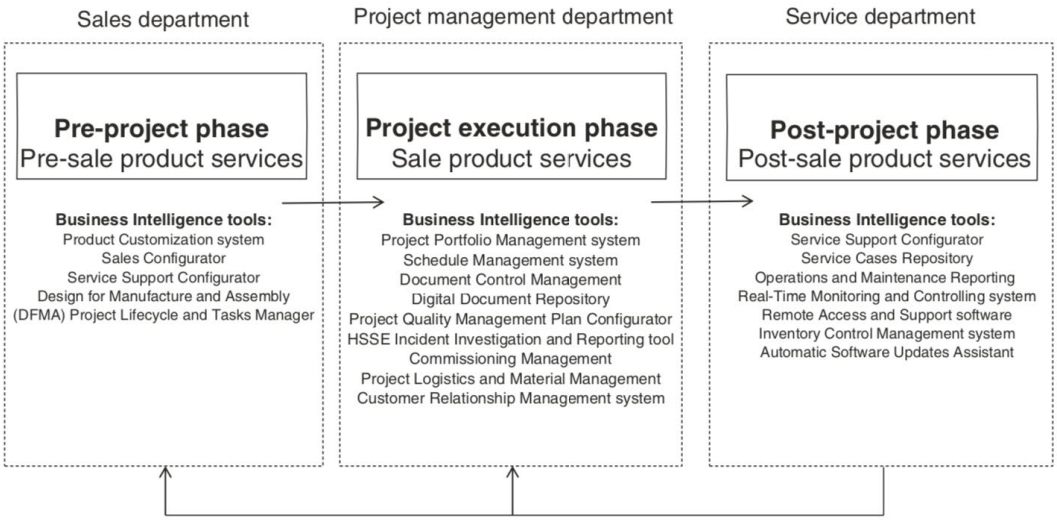

Figure 8. Key BI tools used during the project management lifecycle (Boldosova & Petäjä, 2017)[8]

The findings reveal that BI assists sales managers in better understanding customer needs, calculating real-time quotes and cocreating solutions together with customers during the initial stages of a project. During project execution, BI technologies help project managers track the status of the project, handle project documentation, allocate resources and communicate with customers and internal stakeholders. Finally, after the project is delivered, BI software supports service managers in remotely monitoring and troubleshooting the fleet, as well as in optimizing fleet performance based on historical and real-time data.

The use of BI in organizations also contributes to the development of a learning culture and helps to facilitate knowledge sharing between departments and projects. According to Article I, the integration of different BI applications helps to automate data transfer between departments and project phases and enables easy access to documentation and lessons learned from past and current projects for everyone involved in the project.

Despite the multiple benefits of using BI in project delivery, the book chapter also reveals a number of challenges companies face when integrating BI into employees' daily work. An inadequate technical infrastructure, an overabundance of BI technologies, insufficient connectivity between different BI tools, poor usability, low-quality data, information overload, insufficient training and a lack

[8] Reprinted by permission from Springer Nature: Palgrave Macmillan, *Real-Time Strategy and Business Intelligence: Digitizing practices and systems* by M. Kohtamäki (Ed.) © (2017).

of incentives are among the main barriers that prevent employees from utilizing BI to manage projects due to frustrating user experiences.

Article I suggests that organizations aiming to adopt and exploit BI to its fullest potential should allocate time and resources to the facilitation of learning among departments and across projects, as well as developing standard reporting routines that employees can use to share the lessons learned after each project. For successful adoption of BI at the individual level, it is important that top management reinforces the strategic role played by BI in project delivery and that clear instructions on how to use BI software are provided to all employees.

In conclusion, the book chapter predicts that with the continuous increase in the volume of big data, BI technologies will become even more advanced in regard to dashboards for data visualization and interpretation. According to Article I, the need to predict the future and to quantify the effects of possible outcomes will lead to a shift from descriptive BI to predictive and prescriptive analytics. Finally, Article I suggests that daily work behavior is likely to evolve toward a big data-driven organizational culture, and new skills and training will be needed for employees to be able to translate big data into actionable insights.

4.2 Article II: Deliberate storytelling in big data analytics adoption

While Article I directs attention to the managerial challenges related to BI adoption among employees, Article II extends this discussion and deepens our knowledge of the behavioral factors influencing individuals' adoption of BDA in organizations through a storytelling lens. Article II explores the how deliberate storytelling facilitates BDA acceptance among employees based on the collected empirical evidence, and Article III extends this line of research even further with a conceptual study.

Despite increasing interest in big data technologies and the emerging community of researchers addressing the benefits of analytics, existing literature lacks insights into the drivers of BDA adoption at the individual level. According to Article II, BDA adoption is more challenging than the adoption of other technologies because employees struggle to understand the concept of big data and the value of analytics, remain skeptical about the quality and privacy of data collected online, and need new skills and experience interpreting big data to use it for decision-making.

BDA is a (relatively) new disruptive technology, and Article II suggests that organizations striving to successfully adopt analytics need to consider the use of novel, unconventional methods to overcome employee resistance to this new and unfamiliar technology. Building on an extensive review of the literature related to technology adoption, BDA and storytelling, the main purpose of Article II is to demonstrate how BDA acceptance among employees can be facilitated through storytelling. One of the main contributions of this article to the extant literature is that it introduces the new concept of deliberate storytelling as the planned and intentional use of stories within organizations to achieve a particular goal (such as internal BDA adoption).

Article II is qualitative in nature and is based on a single exploratory, in-depth case study conducted in an international sheet metal processing company that achieved an 80% increase in BDA use among employees as a result of successful storytelling activities. To explore the impact of corporate stories on the behavior of employees, data were collected and analyzed through 24 informal face-to-face interviews, field notes and internal documentation obtained from the case company.

Article II offers a detailed description of the context studied and a timeline of the storytelling activities in the case company that resulted in increased BDA use. The findings of the data analysis suggest that stories deliberately created and disseminated about BDA inside an organization can improve individuals' attitudes toward BDA and motivate employees to use analytics in their daily work. Using a grounded theory approach, Article II contributes to the literature by identifying four deliberate storytelling patterns and seven corporate stories that communicate a favorable image of BDA to employees (Figure 9). According to the findings, the case company created and disseminated technology-, user-, organization-, and customer-oriented stories to improve employee attitudes toward analytics from four different perspectives. The content of each deliberately told story truthfully reflects organizational reality and resolves a particular BDA adoption challenge identified within the organization, and therefore reduced employee reluctance to use analytics.

Additionally, Article II suggests three main attributes of effective deliberate storytelling that companies should aim to incorporate: diversity of story plots, the multiperspective immersion of employees during storytelling, and internal cross-department collaboration that enables committing to storytelling activities within the organization. According to the article, companies should continually refine the content and number of disseminated stories based on the emergence of new adoption challenges.

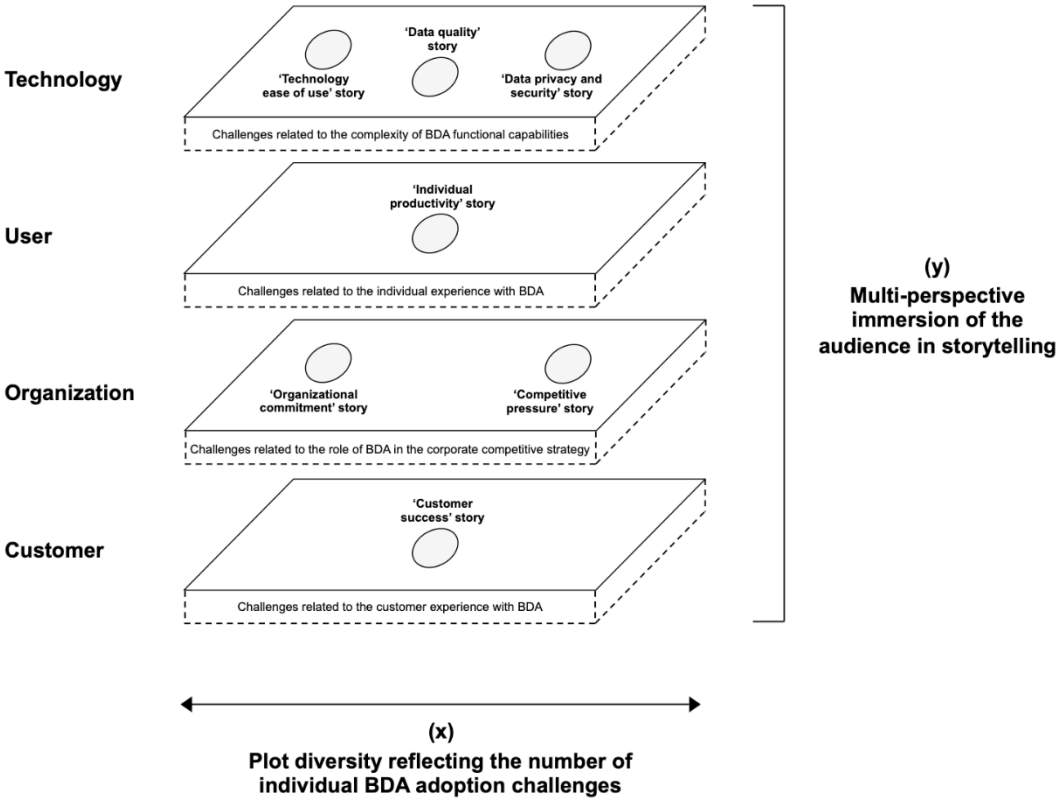

Figure 9. Deliberate storytelling in employee adoption of BDA (Boldosova, 2019)[9]

With regard to managerial impact, Article II recommends that managers use storytelling when planning to increase the BDA adoption rate inside their organization. The case study of the sheet metal processing company represents an interesting practical example and a useful benchmark for managers and executives regarding how deliberate stories can improve employee attitudes and influence employee behavior toward new BDA technology. This article is an endeavor to increase the managerial attention toward of storytelling and to guide managers in steering internal technological change with the help of Figure 9.

[9] Reprinted by permission from John Wiley and Sons: Boldosova, V. (2019). Deliberate storytelling in big data analytics adoption, *Information Systems Journal*, 29, 1126-1152. © 2019 John Wiley & Sons Ltd.

4.3 Article III: Storytelling, business analytics and big data interpretation: Literature review and theoretical propositions

Article III can be considered an extension of Article II because it seeks to further provide a theoretical explanation of and evidence on how storytelling can facilitate analytics adoption among employees. Building on the term deliberate storytelling introduced in Article II, Article III extends this research by developing a new storytelling concept and demonstrates that deliberate BA data-driven stories can have a positive impact on individuals' use of BA in organizations. While Article II explores how deliberate storytelling facilitates BDA use by resolving *different* individual-level BDA adoption challenges, Article III focuses on a *particular* challenge and demonstrates how BA data-driven stories can convince employees to use BA by improving their data interpretation and decision-making abilities. Taken altogether, Articles II and III contribute to advancing our understanding of the influence that storytelling has on *employees* and motivate the additional research in Article IV that addresses how storytelling can influence *customers*.

Article III is an interdisciplinary theoretical study that synthesizes insights from the BA, storytelling, behavioral operational research, linguistics, psychology and neuroscience literatures to explain how stories about BA data can positively transform employee attitudes toward BA use. This article is based on the premise that with the continuous growth in the complexity of big data, employees struggle with a lack of knowledge regarding how to interpret data and how to use it for decision-making, which in turn prevents them from using BA in their daily tasks. To overcome this challenge, companies look for new practical methods to improve employee skills in translating data into actionable insights.

Article III introduces the new concept of BA data-driven storytelling and defines it as a narrative sensemaking heuristic that helps employees understand raw technical data by integrating it into the business setting and explaining how analytics can resolve customer problems. According to the findings, even nontechnical experts can easily understand and remember BA data-driven stories, giving employees confidence in the usefulness of BA for decision-making. Article III suggests that every BA data-driven story should reflect a particular business challenge that BA can resolve in order to create a mental shortcut in the human mind and help employees recall the practical implications of the use of BA data while solving customer problems in real life. The number of disseminated stories should correspond to the number of data visualization tools that BA offers and the complexity of the BA functionalities.

Drawing on the linguistics, psychology and neuroscience literatures, Article III argues that BA data-driven stories activate certain parts of the brain and help employees make sense of unstructured data. Building on insights from psychology and neurolinguistics, Article III suggests that BA data-driven storytelling fills in the gaps in employee experiences related to a lack of understanding of how to interpret BA data.

Using the theory-building methodology, Article III constructs a conceptual model with propositions that illustrates the relationship between BA data-driven storytelling and BA usage (Figure 10). The article follows the key guidelines for conducting a narrative literature review and building a new theory and visually illustrates how different research streams contributed to the development of the conceptual model with propositions (P1-P3b). Article III advises organizations to create and disseminate BA data-driven stories among employees in order to improve those employees' abilities to interpret data and to understand how to apply BA data to solving problems in their daily work. This improvement in turn influences how employees perceive the ease of use and usefulness of BA. Despite its theoretical nature, Article III also offers a practical example of a BA data-driven story from industry that demonstrates how storytelling creates a positive employee experience with BA and results in an increased BA adoption rate.

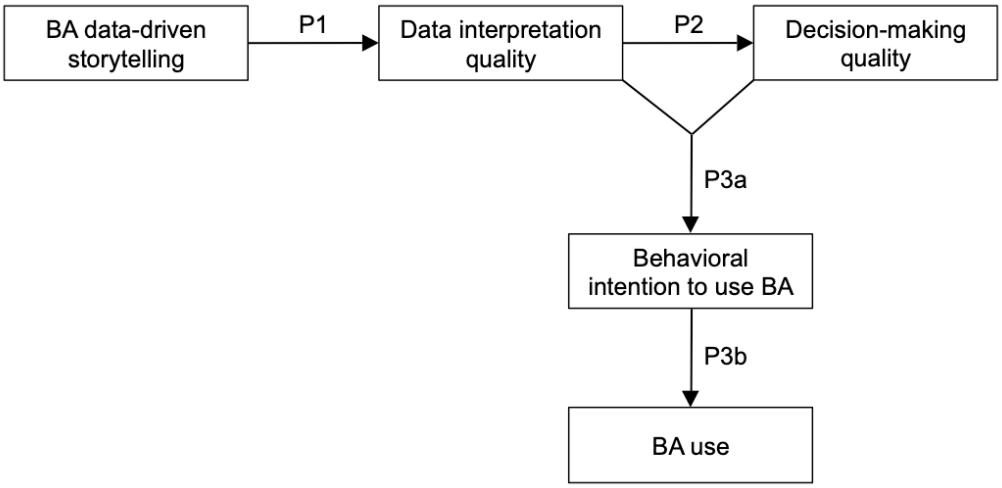

Figure 10. The impact of BA data-driven storytelling on BA use (Boldosova & Luoto, 2020) [10]

[10] Reprinted by permission from Emerald Publishing Limited: Boldosova, V. & Luoto, S. (2020). Storytelling, business analytics and big data interpretation: Literature review and theoretical propositions, *Management Research Review*, 43:2, 204-222. © Emerald Publishing Limited all rights reserved.

The findings of this article can be useful to executives and managers who observe that employees resist using BA due to difficulties in interpreting data and the fear of being unable to use BA for decision-making. Article III provides clear guidance on how to create and disseminate BA data-driven stories to increase the BA adoption rate at the individual level. One of the key managerial takeaways of Article III is managers are encouraged to utilize storytelling during training sessions to improve the skills of existing employees instead of hiring new (and potentially expensive) data scientists or data translators. This article claims that integrating BA data-driven stories into employees' daily tasks is one of the first steps in creating a data-driven mindset and culture in the long term.

4.4 Article IV: Telling stories that sell: The role of storytelling and big data analytics in smart service sales

Instead of focusing on *employee* behavior as the main unit of analysis as in Articles II-III, Article IV takes a different approach and contributes to the dissertation by explaining how storytelling affects *customer* adoption of suppliers' smart services in B2B sales. The overarching purpose of Articles II-III is to demonstrate to the readers how telling deliberate stories to employees creates internal benefits inside organizations. Article IV, on the other hand, looks beyond the mere adoption of analytics among employees and reveals how storytelling and the previous adoption of analytics within organizations can be further exploited in customer-supplier interactions. As a result, Articles II, III and IV collectively complement each other and contribute to an understanding of the multidimensional nature of storytelling by addressing different applications of storytelling both internally and externally.

Article IV is motivated by the recent trend toward the digitization of industrial products and the increased provision of data-driven smart service offerings. With the changing nature of services and customer-supplier interactions in the digital age, prior research examining how to facilitate smart service sales and overcome customer resistance to new services is lacking. According to the article, customers tend to underestimate the value of smart services and are hesitant to grant remote access to their equipment, which, along with other customer concerns, leads to the reluctance of customers to invest in suppliers' smart services.

Synthesizing insights from the smart servitization, BDA, storytelling and customer reference marketing literatures, Article IV is an interdisciplinary, qualitative research study that explains how to address cognitive and behavioral obstacles to smart service adoption in a B2B setting. Building on the increasing role of

storytelling in the industrial marketing literature, Article IV seeks to improve our knowledge of the use of storytelling and of BDA as unconventional methods for influencing customer attitudes and behavior toward smart services.

Taking a human-centered perspective and utilizing an ethnographic case study methodology, Article IV provides an explanation of how the case company used storytelling and BDA to increase sales of a remote service for industrial fleet management. Longitudinal data was collected over a period of two and a half years in an international OEM operating in the sheet metal processing industry. The purpose of the longitudinal data collection was to immerse the researcher in the study context and to gain a rich knowledge of organizational reality. Findings from an analysis of 32 semistructured face-to-face interviews, 92 pages of field notes, over 300 records of documentary data, and observations of customer-supplier interactions at 55 events introduce the concept of BDA-enhanced storytelling as a collective sensemaking and sensegiving process involving both customers and suppliers in story generation. Article IV contributes to prior research by mapping storytelling activities in smart service sales from both the supplier and customer perspectives (Figure 11).

According to the article, BDA-enhanced stories are produced in the communication between the supplier and the customers and are based on the customers' experience on the factory floor and the supplier's insights from utilizing BDA during troubleshooting. Despite stories of both successes and failures being generated as a result of customer-supplier interactions in the after-sales stage, sales managers engage in sensegiving and select which stories to tell to prospective customers to persuade them to acquire smart services.

Article IV suggests that the use of BDA data in stories helps prospective customers make sense of new smart service offerings since BDA represents digitized evidence of how smart services proactively resolve the real-life challenges of existing customers. According to the findings, sales managers can use BDA to demonstrate to prospective customers the extent to which existing customers' fleets are covered by smart services, hence highlighting the supplier's trustworthiness.

Article IV directs managerial attention toward storytelling as a novel practical method that managers can use to overcome customer resistance to smart services and to increase service revenue. Companies are encouraged to use the example of a BDA-enhanced story provided in the article as a benchmark when creating their own persuasive stories backed up with BDA data. Article IV advises sales managers to actively communicate with customers in the after-sales stage and to collaborate with the marketing department to jointly produce compelling stories. Finally, Article IV encourages managers to look beyond the traditional applications of BDA

inside organizations and to further explore how analytics can be used across different business functions.

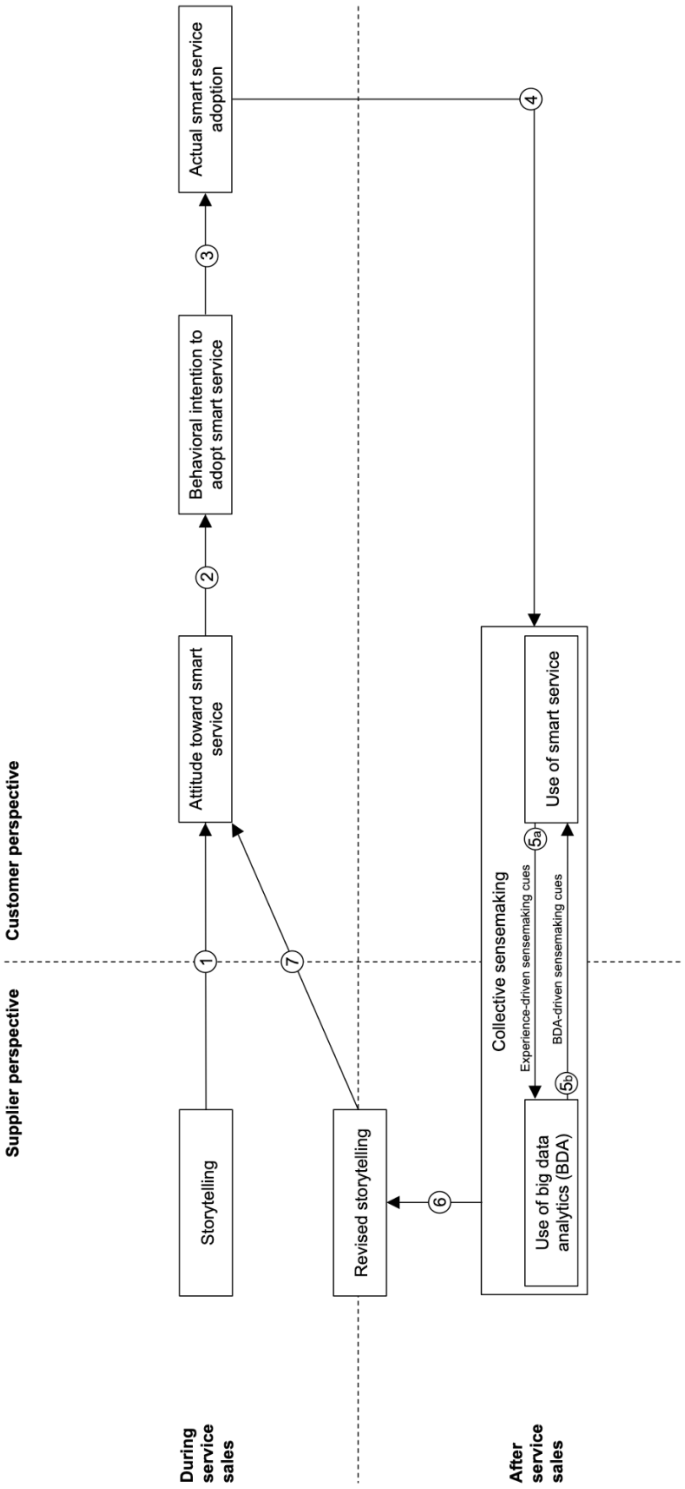

Figure 11. BDA-enhanced storytelling in smart service sales (Boldosova, 2020)[11]

[11] Reprinted by permission from Elsevier: Boldosova, V. (2020). Telling stories that sell: The role of storytelling and big data analytics in smart service sales, *Industrial Marketing Management*, 86, 122-134. Available from: https://doi.org/10.1016/j.indmarman.2019.12.004

4.5 Summary

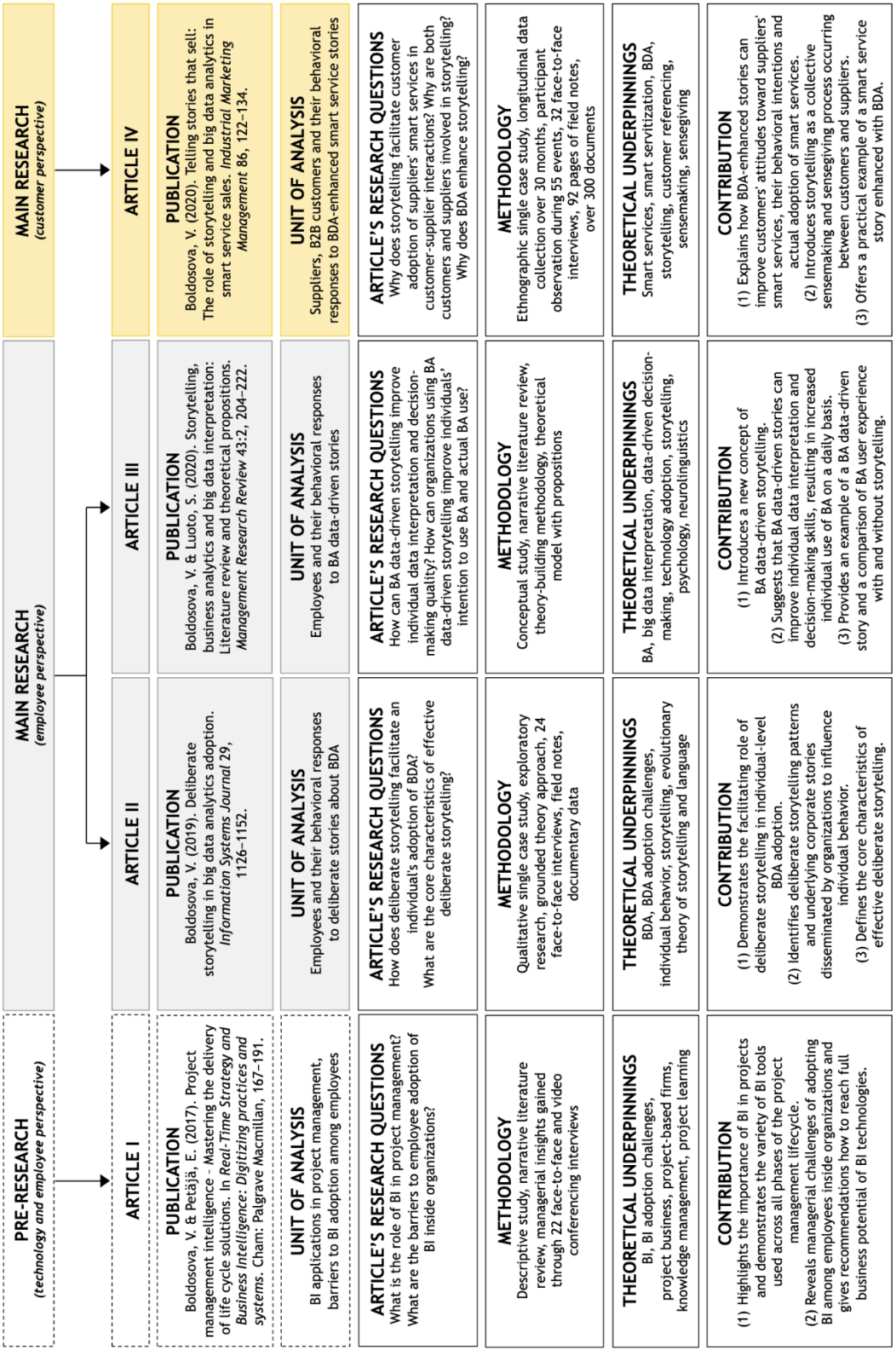

Figure 12. Summary of Articles I-IV

5 DISCUSSION AND CONCLUSIONS

While the previous section summarized the results of Articles I-IV, in this section, the findings are placed within a broader context, and their importance is discussed in relation to existing theory. The purpose of this concluding section is to demonstrate the theoretical and practical significance of the findings and to demonstrate to readers how this dissertation advances the current research practices of scholars and improves managerial practices within organizations. Despite making a significant value-adding contribution, the findings of this dissertation are also evaluated in terms of their limitations, and to guide scientific research toward new fruitful discussions, several recommendations for future studies are given.

5.1 Theoretical contribution

This dissertation was designed to provide empirical evidence and to develop a theoretical understanding of how storytelling can facilitate employee adoption of BDA inside organizations and customer adoption of suppliers' smart services in a B2B environment. The overall purpose of the dissertation has been fulfilled, and Articles I-IV were published to address the three research questions that were outlined in the Introduction and guided this doctoral research. Each article is an independent scientific publication and answers a particular research question, but collectively, the dissertation findings contribute to shaping the multidimensional nature of storytelling and shed light on its valuable applications in different contexts. As a result, the contribution of this dissertation is interdisciplinary and multilayered because it tackles different but closely related phenomena: BI applications in project management and BI adoption by employees (the pre-RQs, answered in Article I), BDA adoption by employees (RQ1, answered in Articles II-III), and smart service adoption by industrial customers (RQ2, answered in Article IV).

The *pre-RQs* were addressed in Article I, which contributes to existing literature by deepening our knowledge on the role of BI software in project management and revealing various managerial challenges related to individual-level BI adoption within organizations. In contrast to prior studies restricted to a focus on BI value in narrow and isolated project management processes (e.g., project risk management or multiproject management) (Caniëls & Bakens, 2012; Oliveira & Almeida, 2019), Article I takes a different approach and extends IS research by demonstrating the importance of BI software during all stages of a project management lifecycle. Article I makes a valuable contribution to the limited

research on BI applications in the project management literature (Oussama, Zitouni & Othmane, 2013) by providing a new, all-encompassing perspective and offering researchers a comprehensive framework with real-life examples of BI tools being used across different departments involved in delivering projects (Figure 8). Additionally, Article I enriches the scarce (at the time of publication) IS literature on BI adoption inside organizations (Watson & Wixom, 2007; Yeoh, Koronios & Gao, 2008; Grubljeŝiĉ & Jakliĉ, 2015) by drawing attention to the integration of BI technologies into employee tasks in project-based firms. Focusing on project-based businesses, Article I takes a practitioner-oriented perspective and contributes to the existing body of knowledge by synthesizing the available research through a narrative literature review of the different technological and behavioral barriers to successful BI implementation and adoption by employees in daily project management.

RQ1 was answered jointly by Articles II and III, which build a bridge between the IS literature and linguistics research and provide theoretical and empirical explanations of how storytelling improves employee attitudes toward BDA and, as a result, increases BDA use. However, each publication approaches the role of stories in facilitating analytics adoption inside organizations from a different angle and therefore provides a unique answer to RQ1.

Whereas prior research has placed great emphasis on examining organization-level BDA adoption (Dremel et al., 2017; Lai, Sun & Ren, 2018; Moktadir et al., 2019; Nam, Lee & Lee, 2019; Maroufkhani, Ismail & Ghobakhloo, 2020; Maroufkhani et al., 2020), Articles II-III respond to the research calls for behavioral and user-oriented studies in the IS literature (Ain et al., 2019; Aboelmaged & Mouakket, 2020) and advance our knowledge of individual-level BDA adoption within organizations through a storytelling lens. As a result, Articles II-III challenge the existing views on BDA implementation in organizations and, consistent with emerging research (Alharti, Krotov & Bowman, 2017; Raguseo, 2018; Shahbaz et al., 2019), direct scholars' attention to user experiences with BDA and to employees as the key actors in successful BDA adoption.

Article II departs from the common-sense IS research that explores the factors underlying individuals' resistance to BDA (Vargas et al., 2018; Verma, Bhattacharyya & Kumar, 2018; Cabrero-Sanchez & Villarejo-Ramos, 2019; Shahbaz et al., 2020); instead, it contributes novel unconventional insights into how deliberate storytelling can improve individuals' perceptions of new technology and therefore reduce their reluctance to use BDA. Instead of merely pointing out barriers to BDA adoption at the individual level, Article II follows a different strategy and enriches the literature by defining seven types of corporate

stories (Figure 9) that resolve individual-level BDA adoption concerns (e.g., the usability of the technology, data interpretation, data quality, privacy and security) and that communicate the value of BDA to employees, the organization and customers and therefore convince employees to use BDA in their daily work.

Furthermore, Article II moves the linguistics field forward by introducing the new comprehensive concept of deliberate storytelling and thus complements corporate storytelling research (Klein, Connell & Meyer, 2007; Law, 2009; Vaara & Tienari, 2011; Auvinen et al., 2013), which has featured inconsistent terminology (intentional storytelling, planned purposeful stories, narrative engineering, manipulative storytelling, etc.) and has lacked a uniform vocabulary. In addition to defining a new theoretical concept, Article II also adds to the limited empirical evidence on successful BDA implementation within organizations (Dremel et al., 2017; Tim et al., 2020) by demonstrating how deliberate storytelling is feasible and useful for solving real-life phenomena with a practical example from the sheet metal processing industry. Additionally, Article II increases the field's attention to and deepens the current understanding of storytelling in the organizational change literature (Driver, 2009; Whittle, Mueller & Mangan, 2009; Reissner, 2011; Vaara & Tienari, 2011; Laufer, 2019) by unlocking a new application of deliberate stories: facilitating technological change and offering researchers (e.g., HR management researchers) a new, creative solution to employee resistance toward new disruptive technology in the digital age.

In comparison with the numerous studies in the corporate storytelling literature (Dennehy, 1997; Denning, 2006; Marshall & Adamic, 2010; Spear & Roper, 2013; Kent, 2015) that identify different types of stories and their different characteristics, Article II focuses on the synergy between stories with different plots rather than addressing individual story plotlines and extends the existing research through the new approach of the multiperspective immersion of individuals in stories and the simultaneous distribution of stories from the technology-, user-, organization- and customer perspectives (Figure 9). In contrast to James and Minnis (2004) and Klein, Connell and Meyer (2007), who encourage the use of simple stories directed toward one particular audience at a time, Article II suggests an alternative way of thinking by demonstrating that the deliberate dissemination of multiple stories from different angles can be more efficient in reducing employee concerns related to new BDA technology.

In contrast to the extant literature that addresses the unethical dissemination of deceptive stories and manipulative storytelling inside organizations (Auvinen et al., 2013; Beigi, Callahan & Michaelson, 2019), the findings of Article II are consistent with Morgan and Dennehy (1997) and reveal that the dissemination of

true and believable stories that reflect organizational reality more effectively influences employee behavior toward BDA. Similarly, these findings are congruent with those of prior IS research (Dremel et al., 2017) regarding the importance of transforming existing organizational processes and improving cross-department collaboration for successful BDA adoption in organizations.

While Article II answered *RQ1* by identifying deliberate storytelling patterns and corporate stories that facilitate individual-level BDA adoption, Article III approaches *RQ1* from a different perspective and shows how BA data-driven stories support individuals in data interpretation and decision-making and therefore motivate employees to use BA in daily work. Article III extends the concept of deliberate storytelling in the management of technological change, which was introduced in Article II, with a new approach to how storytelling can help overcome particular barriers to BA adoption at the individual level: the challenge of interpreting big data and using it when solving problems. As a result, when the insights from Articles II-III are taken together, they shed light on how stories facilitate analytics adoption among employees, but from different angles.

The main contribution of Article III lies in unlocking a new application of storytelling and advancing the linguistics field by introducing the concept of BA data-driven storytelling as a strategic sensemaking heuristic and educational tool that can be used during training sessions to support employees in translating raw technical data into business insights. In contrast to the limited discussions of storytelling in operational research studies (Klein, Connell & Meyer, 2007; Klein, 2009), Article III transforms our understanding of storytelling mechanisms from that in previous operational research and reveals how the deliberate dissemination of BA data-driven stories helps employees understand what kind of customer-related business problems they can solve with BA. As a result, BA data-driven storytelling enhances employees' decision-making skills, improves perceived BA usefulness and therefore positively influences individuals' intention to use BA in their daily work (Figure 10).

Article III deviates from the traditional OR methods (analytical and technical) that facilitate daily problem solving and instead enriches the growing behavioral operational research literature (Hämäläinen, Luoma & Saarinen, 2013; White, Burger & Yearworth, 2016) by taking a human-oriented approach and focusing on human behavior in the context of operational research methods—in particular, how the unconventional use of storytelling can help employees make better and faster decisions. Whereas behavioral operational research (White, Burger & Yearworth, 2016) concentrates on identifying the challenges in interpreting big data and making decisions on the basis of those interpretations, Article III extends

this line of reasoning by offering a BA data-driven storytelling solution to the cognitive limitations of decision-makers when dealing with BA data.

In addition, Article III responds to prior research calls for BOR studies with strong interdisciplinary connections (Becker, 2016; Brocklesby, 2016) by synthesizing insights from linguistics, psychology and neuroscience and demonstrating how storytelling affects the human brain and facilitates problem solving. Article III is an important interdisciplinary contribution to the BOR literature because it explains how BA data-driven stories, in contrast to merely reading a written manual on how to use analytics, emotionally engage the audience and trigger new cognitive patterns.

Additionally, the findings of Article III contribute to the ongoing debate (Bose, 2009; Sun, Hall & Cegielski, 2020) in the data science literature on whether companies should recruit new data scientists and data translators or invest in training for existing employees on how to convert data into actionable knowledge. Consistent with prior studies that encourage companies to educate currently employed managers (Brady, Forde & Chadwick, 2017; Carillo, 2017; Behl et al., 2019; Carillo et al., 2019), Article III provides practical guidance on how to develop and disseminate BA data-driven stories to improve employees' analytical skills. Article III is a valuable addition to the data science research, as it challenges current knowledge and conceptualizes BA data-driven storytelling as a novel, cost-effective alternative to hiring new expensive labor in order to improve internal technological competences.

Finally, *RQ2* is addressed in Article IV, and in comparison with Articles I-III, which answered the *pre-RQs* and *RQ1,* Article IV adopts a different approach and reveals a new application for storytelling during customer-supplier negotiations in B2B sales.

In line with the suggestion of Medina-Borja (2015) to merge different research disciplines and focus on the behavioral issues underlying customer adoption of smart services, Article IV contributes to smart servitization research (Kamp, Ochoa & Diaz, 2017; Kaňovská & Tomášková, 2018) by suggesting storytelling as a successful method for overcoming customers' behavioral barriers to the adoption of suppliers' smart services. In contrast to prior industrial marketing studies that capture the challenges in selling smart services (Klein et al., 2018; Töytäri et al., 2018), Article IV enriches the emerging research on smart service adoption in the B2B context by introducing BDA-enhanced stories as a creative tool for improving customer attitudes toward suppliers' smart services and, as a result, positively influencing customers' buying decisions (Figure 11).

In comparison with the existing industrial marketing research that explores the role of storytelling in B2B branding (Bonnin & Alfonso, 2019) and in B2B advertising (Anaza et al., 2020), Article IV deepens our understanding of stories in the sale of B2B smart services. Article IV revitalizes the research discussion initiated by Lacoste and La Rocca (2015), which proposes that customers are not just passive listeners to suppliers' stories, and extends the storytelling literature by theorizing and empirically demonstrating how storytelling is a collective sensemaking and sensegiving process that takes place in interactions between suppliers and customers. In contrast to studies that address customer stories (Gorry & Westbrook, 2011) or supplier-induced storytelling (Gilliam & Flaherty, 2015) alone, Article IV builds on longitudinal data collected over two and a half years and conceptualizes storytelling as a collective process in which suppliers and customers collectively construct the story content.

Next, Article IV complements the limited research on the role of big data and BDA in enhancing smart services (Maglio & Lim, 2016) by unlocking a new application of BDA to the B2B environment. Specifically, Article IV offers an example of a real-life success from the manufacturing industry regarding how sales managers can integrate customer data processed with BDA into marketing stories as digitized evidence of smart service value to reduce customers' perceived risk of adopting new, unfamiliar services. As a result, Article IV responds to prior research discussions about customer perceptions of smart services having limited usefulness due to their intangible nature (Wünderlich, Wangenheim & Bitner, 2012; Vendrell-Herrero et al., 2017; Töytäri et al., 2018) by offering BDA-enhanced storytelling as a solution to this behavioral challenge.

Whereas prior research (Yang, Lee & Zo, 2017; Gonçalves et al., 2020) has claimed that customers express an interest in the experiences of other users with smart services, Article IV broadens our sparse knowledge on customer referencing in the industrial marketing literature (Helm & Salminen, 2010; Terho & Jalkala, 2017; Jaakkola & Aarikka-Stenroos, 2018) by offering concrete guidance and a template for how to develop reference customer stories with BDA to enhance suppliers' trustworthiness and gain customers' trust in smart services.

In conclusion, given the above theoretical contributions of Articles I-IV, this dissertation is of contemporary interest to scholars and represents a valuable addition to the existing literature because it is based on observations of real-life phenomena instead of simply seeking holes in published research. Additionally, by building on the interdisciplinary nature of Articles I-IV, this dissertation's findings contribute to various research streams and therefore are useful to a broad scholarly audience.

5.2 Managerial implications

From the beginning, this dissertation has been inspired by real-world managerial challenges, and as a result, it provides several valuable implications for practitioners experiencing digitalization. Every article included in the dissertation (Articles I-IV) has been designed to provide practical value and to serve managers in their efforts to integrate BDA across organizations or in the sale of smart services. While the managerial implications are thoroughly discussed in the full-text articles in the Appendices, the purpose of this section is to synthesize some of the main practical insights derived from the conceptual and empirical findings.

First, this dissertation directs the attention of B2B organizations to the importance of using analytics (i.e., BI) in their sales, project management and service departments throughout the project delivery lifecycle. The dissertation invites managers from different business functions to take advantage of Figure 8 (originally published in Article I) as a benchmark and to assess whether their company is lagging behind in its use of analytics and which new BI tools could be introduced to the company.

In addition to encouraging companies to recognize the operational and strategic benefits of analytics for project management, this dissertation advises management to invest time and resources in identifying and overcoming barriers to the internal adoption of BDA. One managerial implication of this research is for organizations to provide employees with better guidance on how to use analytics in their daily work routines. The findings of this dissertation suggest that IT staff should pay close attention to ensuring that BDA provides a good user experience in terms of usability as well as accurate, consistent and high-quality data. Senior managers are encouraged to offer incentives to employees to motivate them to use this new, unfamiliar technology. Additionally, top management should demonstrate their commitment to and share their vision of becoming a big data-driven organization with employees to ensure successful analytics adoption at the individual level.

One of the most important managerial takeaways from this dissertation involves the instructions on how companies should use deliberate storytelling to facilitate BDA adoption among employees within their organization. The findings of this dissertation suggest that managers (e.g., those in charge of change management) disseminate stories to positively influence employee behavior toward new BDA technology. Managers are encouraged to follow Figure 9 (originally published in Article II) and create stories with a variety of plots that address existing barriers to analytics adoption within their organization. Storytelling may seem unclear and

confusing for some companies at first sight. However, Figure 9 provides a visual reference to help managers understand how, in practice, every story should reflect a positive and practical impact of using BDA. For example, managers may find it beneficial to disseminate stories with real-life examples of how BDA increases employee productivity in daily tasks or how BDA helps keep customers happy by optimizing their production performance. Since BDA adoption is a challenging process, executives are advised to foster collaboration across departments (e.g., R&D, sales and marketing) in a quest to create and disseminate deliberate stories through different channels.

Despite the growing role of analytics in companies at the operational level, an increasing number of frontline employees struggle with interpreting big data and therefore resist using BA in their daily work. This dissertation advises managers to take advantage of BA data-driven stories during training seminars to assist employees in processing raw technical data by contextualizing it in a business setting. If BA has to be used by nontechnical experts, incorporating BA data into the business context will help employees understand which customer-related business problems these data can solve. Managers responsible for creating stories in an organization should ensure that the number of stories is directly proportional to the BA data visualization tools available and that one business challenge is assigned to each analytical function. According to the research findings, managers are encouraged to use compelling and vivid stories instead of tiresome technical instructions to reduce employee anxiety about analytics and to overcome resistance to BA. Figure 10 (originally published in Article III) gives middle-level managers a great opportunity to understand the line of reasoning behind how an employee's ability to interpret data and utilize it in decision-making influences their eagerness to use BA in their daily tasks.

In addition to revealing to managers how storytelling can increase analytics use among employees, this dissertation also provides practical insights into how stories can influence customer relationships and improve B2B sales. The research findings suggest that organizations wishing to increase smart service sales should use stories during sales negotiations with prospective customers. Marketing and sales managers are advised to follow Figure 11 (originally published in Article IV) as a benchmark for how to cocreate stories with customers, incorporate those stories into the sales process and extend organization's story portfolio through newly obtained customers. This dissertation recommends that marketing and sales managers stay in continual contact with customers after a successful service sale to record those customers' experiences with the service and to transform those experiences into a success story. According to the findings, every story should include an engaging title, a quotation from a customer and a brief statement about

the customer's geographical location and industrial sector. To ensure that the storytelling is effective, managers should create stories that clearly communicate a production challenge faced by a reference customer and how BDA helped to identify the root cause of that problem and resolve it. To convince prospective customers to invest in smart services, sales managers are advised to demonstrate the size of the online fleet with BDA (as evidence of high demand for smart services among existing customers) as well as to give real-life examples of how analytics provides value to current customers.

In conclusion, the key managerial contribution and significance of this dissertation is that it attempts to change the way managers think about storytelling, an overlooked method of engaging with audiences in organizations. Companies should not only become familiar with the potential benefits of storytelling in an organizational context but should also learn how to harness the power of stories in their interactions with both employees and customers. This dissertation offers valuable practical insights to a) organizations currently struggling with BDA adoption or smart service sales as well as b) companies that are already familiar with storytelling practices but are seeking novel ways to exploit their potential.

5.3 Limitations and future research directions

Despite offering numerous managerial insights and theoretical contributions to the existing research, this dissertation has at least five limitations that provide interesting directions for future research.

From a methodological point of view, Articles II and IV utilize a single case study research design to provide a rich understanding of storytelling in a B2B organization in the sheet metal processing industry. However, these findings are unique to this particular setting and are therefore difficult to extrapolate to other research contexts (Eisenhardt & Graebner, 2007). Given that the dissertation writing process has time constraints, collecting empirical evidence on storytelling from several companies within the scope of this PhD would require additional investments in terms of time and resources. As a result, future research would benefit from multiple case studies being conducted across different industries to explore the differences and similarities in storytelling patterns to create a more convincing theory.

Due to the novel and contemporary nature of the phenomena studied in the dissertation, there is a lack of prior literature that can be used as a solid foundation to build a new theory upon. Consequently, the conceptual frameworks developed in Articles I and III rely on the limited literature review and the researcher's

interpretive logic. Given that this dissertation is restricted to conceptual (Articles I and III) and qualitative research (Articles II and IV), future quantitative studies are needed to extend the theoretical models and test the hypotheses proposed in the articles. In particular, the frameworks constructed in Articles III and IV should be further validated by statistical techniques used on a large sample to determine the relationship between variables. The process of modeling human behavior is a challenging research task (Greasley & Owen, 2016), and the behavioral models proposed in Articles III and IV represent a simplified organizational reality and should therefore be interpreted with caution. Future quantitative research could also deepen our knowledge about whether individual attributes influence the effectiveness of storytelling in organizations. For example, different personalities and cultural and social backgrounds could yield different behavioral reactions to storytelling and prompt new fruitful research discussions.

Although this dissertation offers rich longitudinal data collected during ongoing storytelling activities (Article IV), future longitudinal research is needed to explore the evolving nature of storytelling in organizations over the long term. Articles II and III address the role of storytelling in the face of ongoing internal technological change, but they neglect the evolutionary dynamics of storytelling over time. An interesting possible avenue for further research would be to extend Article II by collecting follow-up data in the case company 1-3 years after the last period of data collection to explore whether storytelling has evolved and gained a permanent position in the organization or whether it was brought to an end. Additionally, future studies could contribute to the existing literature by conducting action research and helping companies achieve particular organizational goals through deliberate storytelling. Applying the action research philosophy (Checkland & Holwell, 1998) and actively participating in problem solving would enable scholars to obtain a unique hands-on understanding of how storytelling functions and transforms organizations.

Another limitation of this dissertation is that it does not account for a multilevel analysis of storytelling. Instead, each article focuses rigorously on a single level of analysis at a time. For example, Article IV explains how supplier storytelling affects customers by utilizing suppliers' sales metrics to justify customer adoption of smart services. Due to restrictions on access to customer data and an inability to directly interview customers during the case study, Article IV takes advantage of alternative data (the supplier's business metrics) to evaluate the customer adoption rate. However, future research would benefit from a dyadic approach involving multilevel data collected from both suppliers and customers to make cross-level comparisons and create a more holistic picture that incorporates empirical insights from both the storyteller and the audience.

To continue accumulating research and advancing the field of storytelling, future research should distinguish between the dissemination of true and false corporate stories. Within the scope of this dissertation, the findings from Article II reveal that the case company disseminated truthful stories among employees to improve individual-level BDA adoption. However, one interesting topic for future work would be to investigate how deceptive stories influence human behavior and whether they create dissonance in the human mind due to contradictions between the story heard and organizational reality. As a result, future research should continue to explore manipulative storytelling (Auvinen et al., 2013; Beigi, Callahan & Michaelson, 2019) and the unethical influence of power and internal politics in organizations through narratives.

Finally, building on the emerging research that demonstrates how the COVID-19 pandemic has affected sales and marketing operations in B2B firms (Cortez & Johnston, 2020; Hartmann & Lussier, 2020), future research could examine how corporate storytelling is evolving in light of unexpected and disruptive circumstances. With the increasing role of digital technologies during the COVID-19 pandemic, interesting avenues for future research would be to explore how B2B organizations disseminate digital stories to customers to facilitate virtual sales in times of remote work, the cancellation of customer events and travel restrictions.

5.4 Conclusion

One of the key takeaway messages from this dissertation is that researchers and practitioners should keep an open mind and move beyond traditional ways of doing business. This dissertation has demonstrated in practice how the novel, unconventional use of storytelling can be a powerful tool in overcoming managerial barriers to the adoption of new, disruptive technologies and services. As a result, building on the extensive doctoral research documented in this dissertation, the lesson to be learned is that there is no need to reinvent the wheel and waste time trying to solve a problem using old methods. Instead, the findings suggest that looking outside one's own area of expertise and taking advantage of ideas from other fields can be more beneficial. Taking into account the continuous and evolving nature of digital transformation in businesses as well as the calls for interdisciplinary research (Lindgreen & Di Benedetto, 2017; Markovic et al., 2021), this dissertation hopes to spark scholarly interest in cross-disciplinary studies and the further exploration of the psychological, neurobiological and behavioral factors that influence individual adoption of technology.

In the next decade, we are likely to witness a considerable increase in new digitalization trends shaping the world into a digitized economy. The digital transformation of businesses is a never-ending journey, and although this dissertation has demonstrated how to successfully solve some behavioral challenges, there are many more barriers that companies will face in the future. Therefore, researchers and practitioners should be on the lookout for new opportunities from these emerging obstacles. In conclusion, this dissertation encourages the academic community to dedicate future research not only to advancing the theory around diverse applications of storytelling but also to addressing the practical challenges that managers and executives face in the digital age.

References

Aboelmaged, M. & Mouakket, S. (2020). Influencing models and determinants in big data analytics research: A bibliometric analysis. *Information Processing and Management* 57:4.

Abou-foul, M., Ruiz-Alba, J. L. & Soares, A. (2020). The impact of digitalization and servitization on the financial performance of a firm: An empirical analysis. *Production Planning & Control.*

Agbehadji, I. E., Awuzie, B. O., Ngowi, A. B. & Millham, R. C. (2020). Review of big data analytics, artificial intelligence and nature-inspired computing models towards accurate detection of COVID-19 pandemic cases and contact tracing. *International Journal of Environmental Research and Public Health* 17:15.

Ain, N., Vaia, G., DeLone, W. H. & Waheed, M. (2019). Two decades of research on business intelligence system adoption, utilization and success – A systematic literature review. *Decision Support Systems* 125.

Akter, S. & Fosso Wamba, S. (2016). Big data analytics in E-commerce: A systematic review and agenda for future research. *Electronic Markets* 26:2, 173–194.

Allmendinger, G. & Lombreglia, R. (2005). Four strategies for the age of smart services. *Harvard Business Review* 83:10, 131–134.

Alharti, A., Krotov, V. & Bowman, M. (2017). Addressing barriers to big data. *Business Horizons* 60:3, 285–292.

Alsunaidi, S. J., Almuhaideb, A. M., Ibrahim, N. M., Shaikh, F. S., Alqudaihi, K. S., Alhaidari, F. A., Khan, I. U., Asiam, N. & Alshahrani, M. S. (2021). Applications of big data analytics to control COVID-19 pandemic. *Sensors* 21:7.

Alter, S. (2020). Making sense of smartness in the context of smart devices and smart systems. *Information Systems Frontiers* 22, 381–393.

Amankwah-Amoah, J. (2016). Emerging economies, emerging challenges: Mobilising and capturing value from big data. *Technological Forecasting & Social Change* 110, 167–174.

Anaza, N. A., Kemp, E., Briggs, E. & Borders, A. L. (2020). Tell me a story: The role of narrative transportation and the C-suite in B2B advertising. *Industrial Marketing Management* 89, 605–618.

Artto, K., Wikström, K., Hellström, M. & Kujala, J. (2008). Impact of services on project business. *International Journal of Project Management* 26:5, 497–508.

Artto, K., Valtakoski, A. & Kärki, H. (2015). Organizing for solutions: How project-based firms integrate project and service businesses. *Industrial Marketing Management* 45:1, 70–83.

Auvinen, T., Lämsä, A.-M., Sintonen, T. & Takala, T. (2013). Leadership manipulation and ethics in storytelling. *Journal of Business Ethics* 116:2, 415–431.

Baines, T. S., Lightfoot, H. W., Benedettini, O. & Kay, J. M. (2008). The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management* 20:5, 547–567.

Barker, R. T. & Gower, K. (2010). Strategic application of storytelling in organizations: Toward effective communication in a diverse world. *Journal of Business Communication* 47:3, 295–312.

Baumeister, R. F. & Leary, M. R. (1997). Writing narrative literature reviews. *Review of General Psychology* 1:3, 311–320.

Becerra-Godinez, J. A., Serralde-Coloapa, J. L., Ulloa-Marquez, M. S., Gordillo-Mejia, A. & Acosta-Gonzaga, E. (2020). Identifying the main factors involved in business intelligence implementation in SMEs. *Bulletin of Electrical Engineering and Informatics* 9:1, 304–310.

Becker, K. H. (2016). An outlook on behavioural OR – Three tasks, three pitfalls, one definition. *European Journal of Operational Research* 249:3, 806–815.

Behl, A., Dutta, P., Lessmann, S., Dwivedi, Y. K. & Kar, S. (2019). A conceptual framework for the adoption of big data analaytics by e-commerce startups. *Information Systems and e-Business Management* 17, 285–318.

Beigi, M., Callahan, J. & Michaelson, C. (2019). A critical plot twist: Changing characters and foreshadowing the future of organizational storytelling. *International Journal of Management Reviews* 21, 447–465.

Beverungen, D., Matzner, M. & Janiesch, C. (2017). Information systems for smart services. *Information Systems e-Business Management* 15, 781–787.

Beverungen, D., Müller, O., Matzner, M., Mendling, J. & vom Brocke, J. (2017). Conceptualizing smart service systems. *Electronic Markets* 29:1, 7–18.

Beverungen, D., Breidbach, C. G., Poeppelbuss, J. & Tuunainen, V. K. (2019). Smart service systems: An interdisciplinary perspective. *Information Systems Journal* 29, 1201–1206.

Beverland, M. & Lindgreen, A. (2010). What makes a good case study? A positivist review of qualitative case research published in Industrial Marketing Management, 1971-2006. *Industrial Marketing Management* 39, 56–63.

Bhatiasevi, V. & Naglis, M. (2020). Elucidating the determinants of business intelligence adoption and organizational performance. *Information Development* 36:1, 78–96.

Boehmer, J. H., Shukla, M., Kapletia, D. & Tiwari, M. K. (2020). The impact of the Internet of Things (IoT) on servitization: An exploration of changing supply relationships. *Production Planning & Control* 31:2-3, 203–219.

Boldosova, V. & Petäjä, E. (2017). Project management intelligence – Mastering the delivery of life cycle solutions. In Kohtamäki, M. (Ed.) *Real-Time Strategy and Business Intelligence: Digitizing practices and systems*. Cham: Palgrave Macmillan, 167–191.

Boldosova, V. (2019). Deliberate storytelling in big data analytics adoption. *Information Systems Journal* 29, 1126–1152.

Boldosova, V. & Luoto, S. (2020). Storytelling, business analytics and big data interpretation: Literature review and theoretical propositions. *Management Research Review* 43:2, 204–222.

Boldosova, V. (2020). Telling stories that sell: The role of storytelling and big data analytics in smart service sales. *Industrial Marketing Management* 86, 122–134.

Bolonne, H. & Wijewardene, P. (2020). Critical factors affecting the intention to adopt big data analytics in apparel sector, Sri Lanka. *International Journal of Advanced Computer Sciences and Applications* 11:6, 149–162.

Bonamigo, A. & Frech, C. G. (2020). Industry 4.0 in services: Challenges and opportunities for value co-creation. *Journal of Services Marketing*.

Bonnin, G. & Alfonso, M. R. (2019). The narrative strategies of B2B technology brands. *Journal of Business & Industrial Marketing* 34:7, 1448–1458.

Bose, R. (2009). Advanced analytics: Opportunities and challenges. *Industrial Management and Data Systems* 109:2, 155–172.

Boyce, M. E. (1995). Collective centring and collective sense-making in the stories and storytelling of one organization. *Organization Studies* 16:1, 107–137.

Brady, C., Forde, M. & Chadwick, S. (2017). Why your company needs data translators. *MIT Sloan Management Review* 58:2, 14–16.

Braglia, M. & Frosolini, M. (2014). An integrated approach to implement project management information systems within the extended enterprise. *International Journal of Project Management* 32:1, 18–29.

Brocklesby, J. (2016). The what, the why and the how of behavioural operational research – An invitation to potential sceptics. *European Journal of Operational Research* 249:3, 796–805.

Bumblauskas, D., Nold, H., Bumblauskas, P. & Igou, A. (2017). Big data analytics: Transforming data to action. *Business Process Management Journal* 23:3, 703–720.

Burrell, G. & Morgan, G. (1979). *Sociological paradigms and organizational analysis*. London: Heinemann.

Cabrero-Sanchez, J.-P. & Villarejo-Ramos, A. F. (2019). Factors affecting the adoption of big data analytics in companies. *Revista de Administracao de Empresas* 59:6, 415–429.

Caesarius, L. M. & Hohenthal, J. (2018). Searching for big data: How incumbents explore a possible adoption of big data technologies. *Scandinavian Journal of Management* 34:2, 129–140.

Callahan, J. L. (2014). Writing literature reviews: A reprise and update. *Human Resource Development Review* 13:3, 271–275.

Caniëls, M. C. J. & Bakens, R. J. J. M. (2012). The effects of project management information systems on decision making in a multi project environment. *International Journal of Project Management* 30:2, 162–175.

Carillo, K. D. A. (2017). Let's stop trying to be "sexy" – preparing managers for the (big) data-driven business era. *Business Process Management Journal* 23:3, 598–622.

Carillo, K. D. A., Galy, N., Guthrie, C. & Canhems, A. (2019). How to turn managers into data-driven decision makers: Measuring attitudes towards business analytics. *Business Process Management Journal* 25:3, 553–578.

Carriger, M. (2010). Narrative vs PowerPoint: For leaders, it may not be a matter of fact. *Strategy & Leadership* 38:2, 52–56.

Checkland, P. & Holwell, S. (1998). Action research: Its nature and validity. *Systemic Practice and Action Research* 11:1, 9–21.

Chen, H., Chiang, R. H. L. & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly* 36:4, 1165–1188.

Chouk, I. & Mani, Z. (2019). Factors for and against resistance to smart services: Role of consumer lifestyle and ecosystem related variables. *Journal of Services Marketing* 33:4, 449–462.

Clementson, D. E. (2020). Narrative persuasion, identification, attitudes, and trustworthiness in crisis communication. *Public Relations Review* 46:2.

Corbin, J. M. & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology* 13:1, 3–21.

Coreynen, W., Matthyssens, P. & Van Bockhaven, W. (2017). Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management* 60, 42–53.

Cortez, R. M. & Johnston, W. J. (2017). The future of B2B marketing theory: A historical and prospective analysis. *Industrial Marketing Management* 66, 90–102.

Cortez, R. M. & Johnston, W. J. (2020). The coronavirus crisis in B2B settings: Crisis uniqueness and managerial implications based on social exchange theory. *Industrial Marketing Management* 88, 125–135.

Côrte-Real, N., Oliveira, T. & Ruivo, P. (2017). Assessing business value of big data analytics in European firms. *Journal of Business Research* 70, 379–390.

Côrte-Real, N., Ruivo, P., Oliveira, T. & Popovič, A. (2019). Unlocking the drivers of big data analytics value in firms. *Journal of Business Research* 97, 160–173.

Crotty, M. (1998). *The Foundations of Social Research*. London: Sage Publications.

Cunliffe, A. L., Luhman, J. T. & Boje, D. M. (2004). Narrative temporality: Implications for organizational research. *Organization Studies* 25:2, 261–286.

Czarniawska, B. (1998). *A narrative approach to organization studies*. London: Sage Publications.

Davenport, T. H. & Patil, D. J. (2012). Data scientist: The sexiest job of the 21st century. *Harvard Business Review* 90:10, 70–76.

Davenport, T. H. (2014). 10 Kinds of stories to tell with data. *Harvard Business Review*. [Online] Available from: https://hbr.org/2014/05/10-kinds-of-stories-to-tell-with-data.

Davis, M. (1971). That's interesting! Towards a phenomenology of sociology and a sociology of phenomenology. *Philosophy of the Social Sciences* 1, 309–344.

Davison, R. M. (2016). The art of storytelling. *Information Systems Journal* 26:3, 191–194.

Delamont, S. (2004). Ethnography and participant observation. In Seale, C., Gobo, G., Gubrium, J. F. & Silverman D. (Eds.) *Qualitative research practice*. London: Sage Publications, 217–229.

Delen, D. & Zolbanin, H. M. (2018). The analytics paradigm in business research. *Journal of Business Research* 90, 186–195.

Denning, S. (2006). Effective storytelling: Strategic business narrative techniques. *Strategy & Leadership* 34:1, 42–48.

Denzin, N. K. & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research*. Thousand Oaks: Sage Publications.

Dowling, G. R. (2006). Communicating corporate reputation through stories. *California Management Review* 49:1, 82–100.

Dremel, C., Herterich, M. M., Wulf, J., Waizmann, J.-C. & Brenner, W. (2017). How AUDI AG established big data analytics in its digital transformation. *MIS Quarterly Executive* 16:2, 81–100.

Dreyer, S., Olivotti, D., Lebek, B. & Breitner, M. H. (2019). Focusing the customer through smart services: A literature review. *Electronic Markets* 29, 55–78.

Driver, M. (2009). From loss to lack: Stories of organizational change as encounters with failed fantasies of self, work and organization. *Organization* 16:3, 353–369.

Dubois, A. & Gadde, L.-E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research* 55:7, 553–560.

Dubois, A. & Gibbert, M. (2010). From complexity to transparency: Managing the interplay between theory, method and empirical phenomenon in IMM case studies. *Industrial Marketing Management* 39, 129–136.

Dubois, A. & Gadde, L.-E. (2014). Systematic combining – A decade later. *Journal of Business Research* 67, 1277–1284.

Eisenhardt, K. M. & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal* 50:1, 25–32.

Elia, G., Polimeno, G., Solazzo, G. & Passiante, G. (2020). A multi-dimension framework for calue creation through big data. *Industrial Marketing Management* 90, 617–632.

Fernandez, V. & Gallardo-Gallardo, E. (2020). Tackling the HR digitalization challenge: Key factors and barriers to HR analytics adoption. *Competitiveness Review: An International Business Journal* 31:1, 162–187.

Fischer, M., Heim, D., Hofmann, A., Janiesch, C., Klima, C. & Winkelmann, A. (2020). A taxonomy and archetypes of smart service for smart living. *Electronic Markets* 30, 131–149.

Fosso Wamba, S., Akter, S., Edwards, A., Chopin, G. & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics* 165, 234–246.

Fosso Wamba, S., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R. & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research* 70, 356–365.

Frank, A. G., Mendes, G. H. S., Ayala, N. F. & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting & Social Change* 141, 341–351.

Gabriel, Y. (2000). *Storytelling in organizations: Facts, fictions, and fantasies*. Oxford, UK: Oxford University Press.

Gandomi, A. & Haider, M. (2015). Beyond the hype: Big data concepts, methods and analytics. *International Journal of Information Management* 35:2, 137–144.

Gebauer, H., Paiola, M., Saccani, N. & Rapaccini, M. (2021). Digital servitization: Crossing the perspectives of digitization and servitization. *Industrial Marketing Management* 382–388.

Geertz, C. (1973). *The interpretation of cultures: Selected essays*. New York: Basic Books.

Gershon, N. & Page, W. (2001). What storytelling can do for information visualization. *Communications of the ACM* 44:8, 31–37.

Ghofrani, F., He, Q., Goverde, R. M. P. & Liu, X. (2018). Recent application of big data analytics in railway transportation systems: A survey. *Transportation Research Part C* 90, 226–246.

Gioia, D. A. & Chittipeddi, K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal* 12:6, 433–448.

Gioia, D. A., Corley, K. & Hamilton, A. L. (2012). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods* 16:1, 15–31.

Gill, R. (2015). Why the PR strategy of storytelling improves employee engagement and adds value to CSR: An integrated literature review. *Public Relations Review* 41:5, 662–674.

Gilliam, D. A. & Zablah, A. R. (2013). Storytelling during retail sales encounters. *Journal of Retailing and Consumer Services* 20:5, 488–494.

Gilliam, D. A. & Flaherty, K. E. (2015). Storytelling by the sales force and its effect on buyer–seller exchange. *Industrial Marketing Management* 46, 132–142.

Glaser, B. G. & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine Publishing.

Gorry, G. A. & Westbrook, R. A. (2011). Can you hear me now? Learning from customer stories. *Business Horizons* 54:6, 575–584.

Gonçalves, L., Patrício, L., Teixeira, J. G. & Wünderlich, N. V. (2020). Understanding the customer experience with smart services. *Journal of Service Management* 31:4, 723–744.

Grandinetti, R., Ciasullo, M. V., Paiola, M. & Schiavone, F. (2020). Fourth industrial revolution, digital servitization and relationship quality in Italian B2B manufacturing firms. An exploratory study. *The TQM Journal* 32:4, 647–671.

Greasley, A. & Owen, C. (2016). Behavior in models: A framework for representing human behavior. In Kunc, M., Malpass, J. & White, L. (Eds.) *Behavioral Operational Research: Theory, Methodology and Practice*. London: Palgrave Macmillan, 47–63.

Green, B. N., Johnson, C. D. & Adams, A. (2006). Writing narrative literature reviews for peer-reviewed journals: Secrets of the trade. *Journal of Chiropractic Medicine* 5:3, 101–117.

Grubljeŝiĉ, T. & Jakliĉ, J. (2015). Business intelligence acceptance: The prominence of organizational factors. *Information Systems Management* 32:4, 299–315.

Grubic, T. (2014). Servitization and remote monitoring technology: A literature review and research agenda. *Journal of Manufacturing Technology Management* 25:1, 100–124.

Guba, E. G. & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In Denzin, N. K. & Lincoln, Y. S. (Eds.) *Handbook of qualitative research*. Thousand Oaks: Sage Publications, 105–117.

Gunasekaran, A., Papadopoulos, T., Dubey, R., Fosso Wamba, S., Childe, S. J., Hazen, B. & Akter, S. (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research* 70, 308–317.

Gustomo, A., Febriansyah, H., Ginting, H. & Santoso, I. M. (2019). Understanding narrative effects: The impact of direct storytelling intervention on increasing employee engagement among the employees of state-owned enterprise in West Java, Indonesia. *Journal of Workplace Learning* 31:2, 166–191.

Hadjikhani, A. & LaPlaca, P. (2013). Development of B2B marketing theory. *Industrial Marketing Management* 42:3, 294–305.

Hallikainen, H., Savimäki, E. & Laukkanen, T. (2020). Fostering B2B sales with customer big data analytics. *Industrial Marketing Management* 86, 90–98.

Harris, J. & Barnes, K. (2006). Leadership storytelling. *Industrial and Commercial Training* 38:7, 350–353.

Harris, J. G. & Mehrotra, V. (2014). Getting value from your data scientists. *MIT Sloan Management Review* 56:1, 15–18.

Hartmann, N. N. & Lussier, B. (2020). Managing the sales force through the unexpected exogenous COVID-19 crisis. *Industrial Marketing Management* 88, 101–111.

Hawkins, M. A. & Saleem, F. Z. (2012). The omnipresent personal narrative: Story formulation and the interplat among narratives. *Journal of Organizational Change Management* 25:2, 204–219.

Hedman, J., Bødker, M., Gimpel, G. & Damsgaard, J. (2018). Translating evolving technology use into user stories: Technology life narratives of consumer technology use. *Information Systems Journal* 29:2, 1–23.

Helm, S. (2010). Basking in reflected glory: Using customer reference relationships to build reputation in industrial markets. *Industrial Marketing Management* 39:5, 737–743.

Henkens, B., Verleye, K. & Lariviere, B. (2020). The smarter, the better?! Customer well-being, engagement and perceptions in smart service systems. *International Journal of Research in Marketing*.

Holmlund, M., Vaerenbergh, Y. V., Ciuchita, R., Ravald, A., Sarantopoulos, P., Ordenes, F. V. & Zaki, M. (2020). Customer experience management in the age of big data analytics: A strategic framework. *Journal of Business Research* 116, 356–365.

Holsapple, C., Lee-Post, A. & Pakath, R. (2014). A unified foundation for business analytics. *Decision Support Systems* 64, 130–141.

Hämäläinen, R. P., Luoma, J. & Saarinen, E. (2013). On the importance of behavioral operational research: The case of understanding and communicating about dynamic systems. *European Journal of Operational Research* 228:3, 623–634.

Jaakkola, E. & Aarikka-Stenroos, L. (2018). Customer referencing as business actor engagement behavior – Creating value in and beyond triadic settings. *Industrial Marketing Management* 80, 27–42.

Jakliĉ, J., Grubljeŝiĉ, T. & Poloviĉ, A. (2018). The role of compatibility in predicting business intelligence and analytics use intentions. *International Journal of Information Management* 43, 305–318.

James, C. H. & Minnis, W. C. (2004). Organizational storytelling: It makes sense. *Business Horizons* 47:4, 23–32.

Jia, Q., Guo, Y., Wang, G. & Barnes, S. J. (2020). Big data analytics in the fight against major public health incidents (including COVID-19): A conceptual framework. *International Journal of Environmental Research and Public Health* 17:17.

Johnson, J. S. & Sohi, R. S. (2017). Getting business-to-business salespeople to implement strategies associated with introducing new products and services. *Industrial Marketing Management* 62, 137–149.

Kabadayi, S., Ali, F., Choi, H., Joosten, H. & Lu, C. (2019). Smart service experience in hospitality and tourism services. *Journal of Service Management* 30:3, 326–348.

Kamalaldin, A., Linde, L., Sjödin, D. & Parida, V. (2020). Transforming provider-customer relationships in digital servitization: A relational view on digitalization. *Industrial Marketing Management* 89, 306–325.

Kamp, B., Ochoa, A. & Diaz, J. (2017). Smart servitization within the context of industrial user–supplier relationships: Contingencies according to a machine tool manufacturer. *International Journal on Interactive Design and Manufacturing (IJIDeM)* 11:3, 651–663.

Kaňovská, L. & Tomášková, E. (2018). Drivers for smart servitization in manufacturing companies. *Agris On-line Papers in Economics and Informatics* 10:3, 57–68.

Kent, M. L. (2015). The power of storytelling in public relations: Introducing the 20 master plots. *Public Relations Review* 41:4, 480–489.

Kezunovic, M., Pinson, P., Obradovic, Z., Grijalva, S., Hong, T. & Bessa, R. (2020). Big data analytics for future electricity grids. *Electric Power Systems Research* 189.

Khan, N. A., Nebel, J.-C., Khaddaj, S. & Brujic-Okretic, V. (2020). Scalable system for smart urban transport management. *Journal of Advanced Transportation* 2020.

Khanra, S., Dhir, A., Parida, V. & Kohtamäki, M. (2021). Servitization research: A review and bibliometric analysis of past achievements and future promises. *Journal of Business Research* 131, 151–166.

Khdour, N., Masa'deh, R. & Al-Raoush, A. (2020). The impact of organizational storytelling on organizational performance within Jordanian telecommunication sector. *Journal of Workplace Learning* 32:5, 335–361.

Kieran, S., MacMahon, J. & MacCurtain, S. (2019). Strategic change and sensemaking practice: Enabling the role of the middle manager. *Baltic Journal of Management* 15:4, 1746–5265.

Klein, J. H., Connell, N. A. D. & Meyer, E. (2007). Operational research practice as storytelling. *Journal of the Operational Research Society* 58:12, 1535–1542.

Klein, J. (2009). Ackoff's fables revisited: Stories to inform operational research practice. *Omega* 37:3, 615–623.

Klein, M. M., Biehl, S. S. & Friedli, T. (2018). Barriers to smart services for manufacturing companies – an exploratory study in the capital goods industry. *Journal of Business & Industrial Marketing* 33:6, 846–856.

Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H. & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research* 104, 380–392.

Kohtamäki, M., Parida, V., Patel, P. C. & Gebauer, H. (2020). The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization. *Technological Forecasting & Social Change* 151.

Kopp, D. M., Nikolovska, I., Desiderio, K. P. & Guterman, J. T. (2011). Relaax, I remember the recession in the early 1980s…: Organizational storytelling as a crisis management tool. *Human Resource Development Quarterly* 22:3, 373–385.

Kosara, R. & Mackinlay, J. (2013). Storytelling: The next step for visualization. *Computer* 46:5, 44–50.

Kraft, A., Sparr, J. L. & Peus, C. (2018). Giving and making sense about change: The back and forth between leaders and employees. *Journal of Business and Psychology* 33:1, 71–87.

Krause, R. J. & Rucker, D. D. (2020). Strategic storytelling: When narratives help versus hurt the persuasive power of facts. *Personality and Social Psychology Bulletin* 46:2, 216–227.

Lacoste, S. & La Rocca, A. (2015). Commentary on "Storytelling by the sales force and its effect on buyer–seller exchange" by David Gilliam and Karen Flaherty. *Industrial Marketing Management* 46, 143–146.

Lai, Y., Sun, H. & Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: An empirical investigation. *The International Journal of Logistics Management* 29:2, 676–703.

Larson, D. & Chang, V. (2016). A review and future direction of agile, business intelligence, analytics and data science. *International Journal of Information Systems* 36, 700–710.

Laufer, M. (2019). Spinning stories: Communicating internationalization through organizational storytelling. *Journal of Studies in International Education*, 1–15.

Law, S. (2009). Learning from employee communication during technological change. *Journal of Workplace Learning* 21, 384–397.

Legner, C., Eymann, T., Hess, T., Matt, C., Böhmann, T., Drews, P., Mädche, A., Urbach, N. & Ahlemann, F. (2017). Digitalization: Opportunity and challenge for the business and information systems engineering community. *Business & Information Systems Engineering* 59:4, 301–308.

Leida, C. & Nath, R. (2018). Business analytics maturity of firms: An examination of the relationships between managerial perception of IT, business analytics maturity and success. *Information Systems Management* 35:1, 62–77.

Leoni, L. (2019). Servitization strategy adoption: Evidence from Italian manufacturing firms. *EuroMed Journal of Business* 14:2, 123–136.

Liang, T.-P. & Liu, Y.-H. (2018). Research landscape of business intelligence and big data analytics: A bibliometrics study. *Expert Systems with Applications* 111, 2–10.

Lim, E.-P., Chen, H. & Chen, G. (2012). Business intelligence and analytics: Research directions. *ACM Transactions on Management Information Systems* 3:4, 1–10.

Lim, C., Kim, M.-J., Kim, K.-H., Kim K.-J. & Maglio, P. P. (2017). Using data to advance service: Managerial issues and theoretical implications from action research. *Journal of Service Theory and Practice* 28:1, 99–128.

Lim, C. & Maglio, P. P. (2018). Data-driven understanding of smart service systems through text mining. *Service Science* 10:2, 154–180.

Lindgreen, A. & Di Benedetto, C. A. (2017). The future of Industrial Marketing Management. *Industrial Marketing Management* 67, 1–4.

Liu, Y., Ma, X., Shu, L., Hancke, G. P. & Abu-Mahfouz, A. M. (2021). From Industry 4.0 to Agriculture 4.0: Current status, enabling technologies, and research challenges. *IEEE Transactions on Industrial Informatics* 17:6, 4322–4334.

Loebbecke, C. & Picot, A. (2015). Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. *The Journal of Strategic Information Systems* 24:3, 149–157.

Lu, Y., Papagiannidis, S. & Alamanos, E. (2018). Internet of Things: A systematic review of the business literature from the user and organizational perspectives. *Technological Forecasting & Social Change* 136, 285–297.

Maglio, P. P. & Lim, C.-H. (2016). Innovation and big data in smart service systems. *Journal of Innovation Management* 4:1, 11–21.

Maitlis, S. (2005). The social processes of organizational sensemaking. *Academy of Management Journal* 48:1, 21–49.

Mani, Z. & Chouk, I. (2017). Drivers of consumers' resistance to smart products. *Journal of Marketing Management* 33:1-2, 76–97.

Mani, Z. & Chouk, I. (2018). Consumer resistance to innovation in services: Challenges and barriers in the Internet of Things era. *Journal of Product Innovation Management* 35:5, 780–807.

Mani, Z. & Chouk, I. (2019). Impact of privacy concerns on resistance to smart services: Does the 'Big Brother effect' matter? *Journal of Marketing Management* 35:15-16, 1460–1479.

Marinakis, V., Doukas, H., Tsapelas, J., Mouzakitis, S., Sicilia, A., Madrazo, L. & Sgouridis, S. (2020). From big data to smart energy services: An application for intelligent energy management. *Future Generation Computer Systems* 110, 572–586.

Markovic, S., Jaakkola, E., Lindgreen, A. & Di Benedetto, C. A. (2021). Editorial: Introducing interdisciplinary research in Industrial Marketing Management. *Industrial Marketing Management* 93, A1–A3.

Maroufkhani, P., Ismail, W. K. W. & Ghobakhloo, M. (2020). Big data analytics adoption model for small and medium enterprises. *Journal of Science and Technology Policy Management* 11:4, 483–513.

Maroufkhani, P., Tseng, M.-L., Iranmanesh, M., Ismail, W. K. W. & Khalid, H. (2020). Big data analytics adoption: Determinants and performance among small to medium-sized enterprises. *International Journal of Information Management* 54.

Marshall, J. & Adamic, M. (2010). The story is the message: Shaping corporate culture. *Journal of Business Strategy* 31:2, 18–23.

Martín-Peña, M.-L., Sánchez-López, J.-M. & Díaz-Garrido, E. (2019). Servitization and digitalization in manufacturing: The influence on firm performance. *Journal of Business & Industrial Marketing* 35:3, 564–574.

Martinez, V., Bastl, M., Kingston, J. & Evans, S. (2009). Challenges in transforming manufacturing organizations into product-service providers. *Journal of Manufacturing Technology Management* 21:4, 449–469.

Martinez-Conde, S., Alexander, R. G., Blum, D., Britton, N., Lipska, B. K., Quirk, G. J., Swiss, J. I., Willems, R. M. & Macknik, S. L. (2019). The storytelling brain:

How neuroscience stories help bridge the gap between research and society. *The Journal of Neuroscience* 39:42, 8285–8290.

Matavire, R. & Brown, I. (2013). Profiling grounded theory approaches in information systems research. *European Journal of Information Systems* 22:1, 119–129.

McMahon, P., Zhang, T. & Dwight, R. (2020). Requirements for big data adoption for railway asset management. *IEEE Access* 8, 15543–15564.

Medina-Borja, A. (2015). Editorial column-smart things as service providers: A call for convergence of disciplines to build a research agenda for the service systems of the future. *Service Science* 7:1, 2–5.

Moktadir, M. A., Ali S. M., Paul, S. K. & Shukla, N. (2019). Barriers to big data analytics in manufacturing supply chains: A case study from Bangladesh. *Computers & Industrial Engineering* 128, 1063–1075.

Morgan, S. & Dennehy, R. F. (1997). The power of organizational storytelling: A management development perspective. *Journal of Management Development* 16:7, 494–501.

Mortenson, M. J., Doherty, N. F. & Robinson, S. (2015). Operational research from Taylorsim to Terabytes: A research agenda for analytics age. *European Journal of Operational Research*, 241:3, 583–595.

Naik, P., Schroeder, A., Kapoor, K. K., Bigdeli, A. Z. & Baines, T. (2020). Behind the scenes of digital servitization: Actualizing IoT-enabled affordances. *Industrial Marketing Management* 89, 232–244.

Nam, D., Lee, J. & Lee, H. (2019). Business analytics adoption process: An innovation diffusion perspective. *International Journal of Information Management* 49, 411–423.

Obal, M. & Lancioni, R. A. (2013). Maximizing buyer–supplier relationships in the digital era: Concept and research agenda. *Industrial Marketing Management* 42:6, 851–854.

Obie, H. O., Chua, C., Avazpour, I., Abdelrazek, M., Grundy, J. & Bednarz, T. (2019). A study of the effects of narration on comprehension and memorability of visualizations. *Journal of Computer Languages* 52, 113–124.

Oesterreich, T. D. & Teuteberg, F. (2016). Understanding the implications of digitisation and automation in the context of Industry 4.0: A triangulation approach and elements of a research agenda for the construction industry. *Computers in Industry* 83, 121–139.

Oliva, R. & Kallenberg, R. (2003). Managing the transition from products to services. *International Journal of Service Industry Management* 14:2, 160–172.

Oliveira, A. & Almeida, J. R. (2019). Business intelligence application for multidimensional analysis of risks in complex projects. *IT Professional* 21:6, 33–39.

Omar, Y. M., Minoufekr, M. & Plapper, P. (2019). Business analytics in manufacturing: Current trends, challenges and pathway to market leadership. *Operations Research Perspectives* 6.

Opresnik, D. & Taisch, M. (2015). The value of Big Data in servitization. *International Journal of Production Economics* 165, 174–184.

Orlikowski, W. J. & Baroudi, J. J. (1991). Studying information technology in organisations: Research approaches and assumptions. *Information Systems Research* 2:1, 1–28.

Oussama, A. M., Zitouni, B. & Othmane, B. (2013). Towards an intelligent project based organization business model. *International Journal of Computer Science Issues* 10:1, 44–50.

Pagani, M. & Pardo, C. (2017). The impact of digital technology on relationships in a business network. *Industrial Marketing Management* 67, 185–192.

Paiola, M. & Gebauer, H. (2020). Internet of things technologies, digital servitization and business model innovation in B2B manufacturing firms. *Industrial Marketing Management* 89, 245–264.

Parida, V., Sjödin, D. R., Wincent, J. & Kohtamäki, M. (2015). Mastering the transition towards industrial product-service provision: Insights into business models, learning activities and capabilities. *Research Technology Management* 57:3, 44–52.

Paschou, T., Rapaccini, M., Adrodegari, F. & Saccani, N. (2020). Digital servitization in manufacturing: A systematic literature review and research agenda. *Industrial Marketing Management* 89, 278–292.

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods* (2nd Edition). Newbury Park: Sage Publications.

Pejic-Bach M., Zoroja, J. & Celjo, A. (2017). An extension of the technology acceptance model for business intelligence systems: Project management maturity perspective. *International Journal of Information Systems and Project Management* 5:2, 5–21.

Piekkari, R., Plakoyiannaki, E. & Welch, C. (2010). 'Good' case research in industrial marketing: Insights from research practice. *Industrial Marketing Management* 39, 109–117.

Pirola, F., Boucher, X., Wiesner, S. & Pezzotta, G. (2020). Digital technologies in product-service systems: A literature review. *Computers in Industry* 123.

Popoviĉ, A., Hackney, R., Tassabehji, R. & Castelli, M. (2018). The impact of big data analytics on firms' high value business performance. *Information Systems Frontiers* 20, 209–222.

Porter, M. E. & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review* 92:11, 11–64.

Post, C., Sarala, R., Gatrell, C. & Prescott, J. E. (2020). Advancing theory with review articles. *Journal of Management Studies* 57:2, 351–376.

Puklavec, B., Oliveira, T. & Popovič, A. (2018). Understanding the determinants of business intelligence system adoption stages: An empirical study of SMEs. *Industrial Management & Data Systems* 118:1, 236–261.

Rabetino, R., Kohtamäki, M., Brax, S. A. & Sihvonen, J. (2021). The tribes in the field of servitization: Discovering latent streams across 30 years of research. *Industrial Marketing Management* 95, 70–84.

Raddats, C., Kowalkowski, C., Benedettini, O., Burton, J. & Gebauer, H. (2019). Servitization: A contemporary thematic review of four major research streams. *Industrial Marketing Management* 83, 207–223.

Raff, S., Wentzel, D. & Obwegeser, N. (2020). Smart products: Conceptual review, synthesis and research directions. *Journal of Production Innovation Management* 37:5, 379–404.

Raguseo, E. (2018). Big data technologies: An empirical investigation on their adoption, benefits and risks for companies. *International Journal of Information Management* 38, 187–195.

Raut, R. D., Yadav, V. S., Cheikhrouhou, N., Narwane, V. S. & Narkhede, B. E. (2021a). Big data analytics: Implementation challenges in Indian manufacturing supply chains. *Computers in Industry* 125.

Raut, R., Narwane, V., Kumar Mangla, S., Yadav, V. S., Narkhede, B. E. & Luthra, S. (2021b). Unlocking causal relations of barriers to big data analytics in manufacturing firms. *Industrial Management & Data Systems*.

Reissner, S. C. (2011). Patterns of stories of organisational change. *Journal of Organizational Change Management* 24:5, 593–609.

Rivard, S. (2014). Editor's comments: The ions of theory construction. *MIS Quarterly* 38:2.

Roels, R., Baeten, Y. & Signer, B. (2017). Interactive and narrative data visualization for presentation-based knowledge transfer. *Communications in Computer and Information Science* 739.

Romero, M., Guedria, W., Panetto, H. & Barafort, B. (2020). Towards a characterization of smart systems: A systematic literature review. *Computers in Industry* 120.

Rouleau, L. (2005). Micro-practices of strategic sensemaking and sensegiving: How middle managers interpret and sell change every day. *Journal of Management Studies* 42:7, 1413–1441.

Sakr, S. & Elgammal, A. (2016). Towards a comprehensive data analytics framework for smart healthcare services. *Big Data Research* 4, 44–58.

Sandelowski, M. (1991). Telling stories: Narrative approaches in qualitative research. *Image: The Journal of Nursing Scholarship* 23:3, 161–166.

Saunders, M. N. K., Lewis, P. & Thornhill, A. (2009). *Research methods for business students* (5th Edition). London: Pearson Education.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B. & Jinks, C. (2017). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity* 52:4, 1893–1907.

Segel, E. & Heer, J. (2010). Narrative visualization: Telling stories with data. *IEEE Transactions on Visualization and Computer Graphics* 16:6, 1139–1148.

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F. & Hu, Y. (2019). Investigating the adoption of big data analytics in healthcare: The moderating role of resistance to change. *Journal of Big Data* 6:6, 1–20.

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F. & Arshad, M. R. (2020). Moderating effects of gender and resistance to change on the adoption of big data analytics in healthcare. *Complexity* 2020:13.

Shahi, C. & Sinha, M. (2020). Digital transformation: Challenges faced by organizations and their potential solutions. *International Journal of Innovation Science* 13:1, 17–33.

Sheng, J., Amankwah-Amoah, J. & Wang, X. (2019). Technology in the 21st century: New challenges and opportunities. *Technological Forecasting and Social Change* 143, 321–335.

Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal* 50:1, 20–24.

Silva, B. N., Khan, M. & Han, K. (2020). Integration of big data analytics embedded smart city architecture with RESTful web of things for efficient service provision and energy management. *Future Generation Computer Systems* 107, 975–987.

Sivarajah, U., Kamal, M. M., Irani, Z. & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research* 70, 263–286.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research* 104, 333–339.

Spear, S. & Roper, S. (2013). Using corporate stories to build the corporate brand: An impression management perspective. *Journal of Product & Brand Management* 22:7, 491–501.

Spear, S. & Roper, S. (2016). Storytelling in organizations: Supporting or subverting corporate strategy. *Corporate Communications: An International Journal* 21:4, 516–532.

Sun, S., Hall, D. J. & Cegielski, C. G. (2020). Organizational intention to adopt big data in the B2B context: An integrated view. *Industrial Marketing Management* 86, 109–121.

Suresh, K., Reddy, P. & Pushkal, P. (2019). Smart home services using cloud and internet of things. *International Journal of Advanced Trends in Computer Science and Engineering* 8:4, 1560–1567.

Swap, W., Leonard, D., Shields, M. & Abrams, L. (2001). Using mentoring and storytelling to transfer knowledge in the workplace. *Journal of Management Information Systems* 18:1, 95–114.

Tabesh, P., Mousavidin, E. & Hasani, S. (2019). Implementing big data strategies: A managerial perspective. *Business Horizons* 62:3, 347–358.

Taylor, K. T. (2021). Innovators must be powerful storytellers. *Research-Technology Management* 64:3, 43–47.

Terho, H. & Jalkala, A. (2017). Customer reference marketing: Conceptualization, measurement and link to selling performance. *Industrial Marketing Management* 64, 175–186.

Tim, Y., Hallikainen, P., Pan, S. L. & Tamm, T. (2020). Actualizing business analytics for organizational transformation: A case study of Rovio Entertainment. *European Journal of Operational Research* 281:3, 642–655.

Trieu, V.-H. (2017). Getting value from business intelligence systems: A review and research agenda. *Decision Support Systems* 93, 111–124.

Tronvoll, B., Sklyar, A., Sörhammar, D. & Kowalkowski, C. (2020). Transformational shifts through digital servitization. *Industrial Marketing Management* 89, 293–305.

Turunen, T., Eloranta, V. & Hakanen, E. (2018). Contemporary perspectives on the strategic role of information in internet of things-driven industrial services. *Journal of Business & Industrial Marketing* 33:6, 837–845.

Turkulainen, V., Kujala, J., Artto, K. & Levitt, R. E. (2013). Organizing in the context of global project-based firm — The case of sales-operations interface. *Industrial Marketing Management* 42:2, 223–233.

Töytäri, P., Turunen, T., Klein, M., Eloranta, V., Biehl, S. & Rajala, R. (2018). Aligning the mindset and capabilities within a business network for successful adoption of smart services. *Journal of Product Innovation Management* 35:5, 763–779.

Urbinati, A., Bogers, M., Chiesa, V. & Frattini, F. (2019). Creating and capturing value from Big Data: A multiple-case study analysis of provider companies. *Technovation* 84-85, 21–36.

Urquhart, C. & Fernández, W. (2013). Using grounded theory method in information systems: The researcher as blank slate and other myths. *Journal of Information Technology* 28, 224–236.

Vaara, R. & Tienari, J. (2011). On the narrative construction of multinational corporations: An antenarrative analysis of legitimation and resistance in a cross-buyer merger. *Organization Science* 22:2, 370–390.

Van Maanen, J., Sorensen, J. B. & Mitchell, T. R. (2007). The interplay between theory and method. *Academy of Management Review* 32:4, 1145–1154.

Vandermerwe, S. & Rada, J. (1988). Servitization of business: Adding value by adding services. *European Management Journal* 6:4, 314–324.

Vargo, S. L. & Lusch, R. F. (2008). Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science* 36:1, 1–10.

Vargas, R., Yurova, Y. V., Ruppel, C. P., Tworoger, L. C. & Greenwood, R. (2018). Individual adoption of HR analytics: A fine grained view of the early stages leading to adoption. *The International Journal of Human Resource Management* 29:22, 3046–3067.

Vendrell-Herrero, F., Bustinza, O. F., Parry, G. & Georgantzis, N. (2017). Servitization, digitization and supply chain interdependency. *Industrial Marketing Management* 60, 69–81.

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N. & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research* 122, 889–901.

Verma, S. & Bhattacharyya, S. S. (2017). Perceived strategic value-based adoption of Big Data Analytics in emerging economy. *Journal of Enterprise Information Management* 30:3, 354–382.

Verma, S., Bhattacharyya, S. S. & Kumar, S. (2018). An extension of the technology acceptance model in the big data analytics system implementation environment. *Information Processing & Management* 54, 791–806.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *Journal of Strategic Information Systems* 28:2, 118–144.

Vidgen, R., Shaw, S. & Grant, D. B. (2017). Management challenges in creating value from business analytics. *European Journal of Operational Research* 261:2, 626–639.

Visconti, L. M. (2010). Ethnographic case study (ECS): Abductive modeling of ethnography and improving the relevance in business marketing research. *Industrial Marketing Management* 39:1, 25–39.

Vitari, C. & Raguseo, E. (2020). Big data analytics business value and firm performance: Linking with environmental context. *International Journal of Production Research* 58:18, 5456–5476.

Wacker, J. G. (1998). A definition of theory: Research guidelines for different theory-building research methods in operations management. *Journal of Operations Management* 16, 361–385.

Walford, G. (2009). The practice of writing ethnographic fieldnotes. *Ethnography and Education* 4:2, 117–130.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems* 4:2, 74–81.

Wang, Y. & Hajli, N. (2017). Exploring the path to big data analytics success in healthcare. *Journal of Business Research* 70, 287–299.

Watson, H. J. & Wixom, B. H. (2007). The current state of business intelligence. *Computer* 40:9, 96–99.

Webster, J. & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly* 26:2.

Weick, K. E., Sutcliffe, K. M. & Obstfeld, D. (2005). Organizing and the process of sensemaking. *Organization Science* 16:4, 409–421.

Whetten, D. A. (1989). What constitutes a theoretical contribution? *Academy of Management Review* 14:4, 490–495.

Whittle, A., Mueller, F. & Mangan, A. (2009). Storytelling and 'character': Victims, villains and heroes in a case of technological change. *Organization* 16:3, 425–442.

White, L., Burger, K. & Yearworth, M. (2016). Big data and behavior in operational research: Towards a "Smart OR". In Kunc, M., Malpass, J. & White, L. (Eds.) *Behavioral Operational Research: Theory, Methodology and Practice*. London: Palgrave Macmillan, 177–193.

Wilkins, A. L. (1984). The creation of company cultures: The role of stories and human resource systems. *Human Resource Management* 23:1, 41–60.

Wünderlich, N. V., Wangenheim, F. V. & Bitner, M. J. (2012). High tech and high touch: A framework for understanding user attitudes and behaviors related to smart interactive services. *Journal of Service Research* 16:1, 3–20.

Wünderlich, N. V., Heinonen, K., Ostrom, A. L., Patricio, L., Sousa, R., Voss, C. & Lemmink, J. G. A. M. (2015). "Futurizing" smart service: Implications for service researchers and managers. *Journal of Services Marketing* 29:6/7, 442–447.

Yang, C. (2013). Telling tales at work. *Business Communication Quarterly* 76:2, 132–154.

Yang, H., Lee, H. & Zo, H. (2017). User acceptance of smart home services: An extension of the theory of planned behavior. *Industrial Management & Data Systems* 117:1, 68–89.

Yang, Y., See-To, E. W. K. & Papagiannidis, S. (2020). You have not been archiving emails for no reason! Using big data analytics to cluster B2B interest in products and services and link cluster to financial performance. *Industrial Marketing Management* 86, 16–29.

Yeoh, W., Koronios, A. & Gao, J. (2008). Managing the implementation of business intelligence systems: A critical success factors framework. *International Journal of Enterprise Information Systems* 4:3, 79–94.

Yin, R. K. (1994). *Case study research design and methods*. Newbury Park: Sage Publications.

Yin, J. & Fernandez, V. (2002). A systematic review on business analytics. *Journal of Industrial Engineering and Management* 13:2, 283–295.

Zheng, T., Ardolino, M., Bacchetti, A. & Perona, M. (2020). The applications of Industry 4.0 technologies in manufacturing context: A systematic literature review. *International Journal of Production Research* 59:6, 1922–1954.

Zmud, B. (1998). Editor's comments: Pure theory manuscripts. *MIS Quarterly* 19:2.

Appendices

Author contributions to Articles I-IV

Article I

Valeria Boldosova is the corresponding author for the article. Boldosova generated the idea; formulated the research goals; conducted the literature review; collected, analyzed, and interpreted the data; drew the conclusions; and revised the manuscript during the review process. The second author, Esko Petäjä, verified the managerial relevance of the book chapter and approved the final version.

Article II

Valeria Boldosova is the single author of this article.

Article III

Valeria Boldosova is the corresponding author for the article. Boldosova generated the idea, formulated the research goals, conducted the literature review, analyzed and interpreted the literature, designed the theoretical framework, collected the data, drew conclusions and revised the manuscript based on reviewer comments. The second author, Severi Luoto, contributed to the article by providing psychological insights on storytelling, providing feedback and checking spelling to ensure the correct use of English language in the article. All authors reviewed and approved the final version of the article.

Article IV

Valeria Boldosova is the single author of this article.

Article I

Project Management Intelligence — Mastering the Delivery of Life Cycle Solutions[12]

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Abstract

This chapter provides new insights into how business intelligence tools can be used to successfully deliver life cycle solutions as projects. During the past decade, the role of services in the industrial setting has grown, encouraging more companies to switch to service-oriented business models and to the delivery of life cycle solutions. Emerging technology trends and changing customer needs encourage businesses to digitize and use business intelligence tools to optimize internal processes transforming into intelligent learning organizations. This chapter outlines a step-by-step project delivery process and also provides insights for practitioners in the project business into how business intelligence tools can be used throughout the project delivery process to facilitate project learning.

Introduction

The importance of projects and service-oriented business models has grown over the years, encouraging companies to shift their business models toward the delivery of life cycle solutions (Davies et al. 2007; Gebauer 2008). Project-based firms (PBFs) operate in knowledge- and service-intensive industries and provide customers with long-term solutions based on combinations of products and advanced services (Davies et al. 2007; Hobday 2000). Integrated solution (IS) providers operate as PBFs, where projects are regarded as solutions comprising a product and service offering. In the project business, information acquisition and learning from previous experiences are core capabilities supporting competitiveness and the survival of a firm and enabling the development of long-term relationships with customers (Koskinen 2012; Blindenbach-Driessen and van den Ende 2006). In a continuously evolving environment, PBFs have to retain a dynamic and adaptive approach to changing customer needs and to the continuous optimization of products, services, and processes (Stringfellow and Bowen 2004).

In order to enlarge the knowledge base, optimize internal processes, fully grasp the needs of customers, and satisfy their requirements throughout the project life cycle, firms are increasingly adopting the use of business intelligence (BI) and transforming themselves

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into intelligent learning organizations. Business intelligence systems are data-driven decision support software solutions to gather, store, process, and analyze data and enable better decision-making in PBFs through all the stages of the project life cycle: consultative selling, conceptual design and customization, product and service configuration, installation, delivery, training, spare parts, updates and upgrades, maintenance, and diagnostics.

Research contributions on business intelligence in PBFs are limited, and accordingly, this chapter provides new insights by illustrating the role of business intelligence in the delivery of solutions. Additionally, this chapter sheds light on how integrated solution providers operate as PBFs through the integration of separate project business and service business units (Gebauer et al. 2010). This chapter explicates a step-by-step project delivery process and also outlines how to use business intelligence to successfully deliver solutions as projects.

The reminder of the chapter is organized as follows: In the following section, the nature of the project business and project-based firms is discussed, and a theoretical framework underlying the project delivery life cycle is presented. The same section also presents the managerial implications relating to how to deliver solutions as projects. In the third section, the various types of business intelligence tools used in the project delivery process are discussed, and the managerial implications of integrating BI tools in projects are reviewed. In the fourth section, the role of project learning in project-based firms is examined, and the managerial implications of facilitating within and across the project learning with business intelligence are presented. In the conclusion, the future of Project Management Intelligence is discussed and the scope of the chapter is summarized.

Project business and project-based firms

The term project-based firms or PBFs emerged from the project business literature, where such a firm is characterized by its delivery of complete project solutions to customers (Hobday 1998). Traditionally, the project business is defined as business or "the part of business that relates directly or indirectly to projects, with the purpose of achieving the objectives of a firm or several firms" (Artto and Wikström 2005). Project business is driven by the demand for customized project deliveries, and PBFs are usually engaged in several projects simultaneously (Artto and Kujala 2008). Projects exemplify complex combinations of product and service offerings and steer the growth of project-intensive industries that include manufacturing, construction, and automation technology (Hobday 2000; Davies et al. 2007). In practice, project business can be broadly portrayed by two related concepts: project business as the delivery of an external solution to a customer and project business as an internal solution for the company's own business (Artto and Kujala 2008). The projects delivered by PBFs can be divided into business projects and innovation projects: Business projects refer to the projects delivered at the request of a particular customer, while innovation projects are targeted at the development of systems and services for a variety of customers (Blindenbach-Driessen and van den Ende 2006).

Integrated solution providers are essentially PBFs where the projects concerned involve delivering solutions comprising both products and services (Brady et al. 2005). The focus of this particular type of project-based firm is on customization and the delivery of complex solutions and systems to customers through an organization-wide integration of project and service units. The solutions delivered by project-based firms cover the entire system life

cycle, including the development and the delivery of both the project and the subsequent services (Davies et al. 2007; Hobday 2000).

Delivering added value to customers through life cycle projects refers to the integration of services into the core business, resulting in long-lasting relationships with customers, and greater revenue and profits (Davies et al. 2007). Projects vary depending on the characteristics of the industry (e.g., the development of information systems, and/or of software systems, product and/or service design and installation, and operations outsourcing) and size (small-, medium-, and large-sized projects). Similarly, the type of project business determines the organizational flexibility and complexity.

The provision of comprehensive integrated solutions consisting of products and services is the key vehicle supporting solution providers in creating long-term continuous relationships with customers. The level of service offering depends heavily on the solution provider's business logic and the weight of benefits and drawbacks. Prior research distinguishes three types of solution delivery, which can be used to understand the projects at the solution level, those are: (1) transactional project deliveries; (2) project-led solutions; and (3) life cycle solutions (Kujala et al. 2011). Transactional project delivery implies simple project deliveries to a customer with a transactional service offering (spare parts, training, or support services) or no service offering. A project-led solution comprises core project delivery with an additional operation and management (O&M) service component. A life cycle solution includes a project delivery and O&M service as a single integrated solution and is focused on customer-based customization and a full-service project life cycle (Kujala et al. 2011).

Project delivery life cycle

The integration of product and services in integrated solution providers corresponds to the integration of the project business unit and service business unit within PBFs. In such PBFs, products and services are delivered throughout sequential stages of the project life cycle from the project phase to the operations phase (Davies 2004; Cooper and Budd 2007). The responsibility for project delivery is broadly divided between the sales, project business, and service business units (Artto et al. 2015) (Figure 1).

All three units complement each other and support the division of responsibilities and a controlled delivery of solutions to a customer. The core function of the sales and project business units (Cooper and Budd 2007) is the delivery of a product component: negotiating the offer with a customer and executing the delivery of the project. The service business unit is responsible for the delivery of the service component as a part of a single integrated solution. In the pre-project phase of the project delivery life cycle, sales managers identify customer needs, prepare a quotation and design, offer a solution based on customer needs, and then negotiate and draft the contract. Next, in the project execution phase, project managers implement the planning, execution, and the delivery of the project to the customer. Finally, in the post-project phase, service managers deliver O&M services including service contracts, diagnostics, spare parts, consulting updates, and upgrades (Artto et al. 2015; Kujala et al. 2011, 2010; Turkulainen et al. 2013).

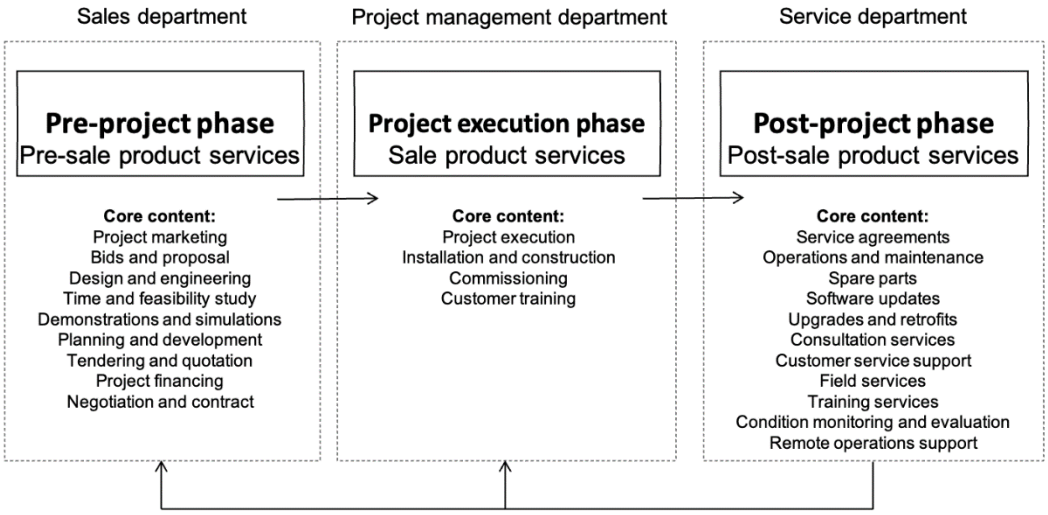

Figure 1. Project delivery life cycle in PBFs.

Despite consisting of three sequential phases, the project delivery process is not linear in nature, but dynamic and continuous. Preventive and proactive maintenance business intelligence tools used in the post-project phase support the decision-making of service managers and generate recommendations on further operational efficiency improvements in the product offering. As a result, service managers transfer the need for a retrofit solution or a software update to the project management or sales department, which again becomes involved in the project life cycle. The use of large sets of data to compare product performance across different customers can reveal product malfunctions and software deficiencies, the knowledge that is in turn transformed into vital lessons learned practices (Milton 2010; Weber et al. 2001) for the R&D department for further product–service innovation (Chirumalla 2016). Therefore, the project delivery life cycle not only contributes to short- and long-term asset performance from the customer perspective, but also generates large sets of historical data supporting product and service development in project-based organizations.

Service offerings at the different stages of the project delivery life cycle provide financial, strategic, and marketing benefits to PBFs (Kujala et al. 2013). Drawing on the classification of product services (Mathieu 2001; Frambach et al. 1997), service offerings in PBFs cover the entire life cycle of the project delivery, depending on whether they are offered before, during, or after the project sale. During the pre-project phase, pre-sale product services support customers in the purchasing process through customization, product, and service demonstrations. Sale product services support customers during the project execution phase through planning, system installation, and technical assistance. At the post-project phase, post-sale product services ensure customer satisfaction through maintenance, diagnostics, and operation support services (Mathieu 2001; Frambach et al. 1997). Service offerings provide PBFs with detailed insights into customers' internal processes, enabling the delivery of customized and competitive projects, and leading to the creation of long-term customer relationships (Kujala et al. 2013).

While service offerings play an essential role for customers, six impact types can be distinguished to provide an outline of how services also impact business performance in project-based firms: (1) customer entry; (2) customer value; (3) competitive advantage; (4) delivery efficiency; (5) service business; and (6) innovation and learning (Artto et al.

2008). Customer entry refers to the service serving as an entry point to a customer's business. The service offering provides more opportunities to maintain a relationship and access customers during different phases of the life cycle solution. Customer value is the value of the service offering to the customer itself. The service offering bundled with a product supports the customer's business, increases profitability, and provides other long-term strategic benefits. Given that services are difficult to imitate, an increase in the competitiveness of a product and service offering in the market generates competitive advantage from the perspective of a solution provider. Delivery efficiency depicts a positive impact of services leading to more lean and cost-effective internal processes. Training and education programs increase the level of competence, and supplementary industrial services lead to increased efficiency during the solution's life cycle. In addition to the impact of services on projects, service business itself generates value and profit through installations or customization activity. Finally, services contribute to innovation and learning. Services open new avenues for knowledge generation, the development of new capabilities and of improved products and processes (Artto et al. 2008).

Managerial implications: Delivering solutions as projects

The trend toward the provision of solutions rather than individual products or services has been steadily growing among the world's leading firms. However, managing and maintaining customer relationships in a complex context is a challenging task and requires certain measures. Services play an important role in the project business because they offer a continuous source of revenue and enable project managers to overcome what are termed sleeping phases in business projects. Prior research encourages project managers to systematically integrate the project business and service business, instead of solely relying on the pure combination of different departments. The choice of the project manager is very important, as the role is central to the integration of the project and service business units. Integrated solution providers should consider choosing a service-oriented project manager from the service unit, someone able to ensure the delivery of the solution throughout the project life cycle (Artto et al. 2015).

It is recommended that project managers involve customers in the process of decision-making on micro-level activities related to the project and service delivery. Customers tend to be interested in the detail of the decision-making process, and such a strategic approach can contribute to building a stronger customer relationship (Artto et al. 2015). While project managers focus on the overall management of business projects, it is important not to neglect the role of frontline employees, whose behavior, competences, and motivation can positively or negatively contribute to the relationship with customers. Additionally, integrated solution providers should invest in internal marketing and provide incentives to employees to act as part-time marketers when they are with customers. These organizational mechanisms at the micro-level contribute in different ways to enhanced internal relationships and relationships with customers. To ensure the integration of both the project business and service business units, IS providers should continually focus on the development of a service-oriented mindset, one that targets value co-creation with customers (Artto et al. 2015).

The integration of products and services is a challenging task, one that encourages PBFs to move away from traditional approaches and adopt smarter ways of working to survive in the dynamic and competitive environment. Therefore, the following section opens the discussion on how different BI tools can be utilized throughout the stages of the project delivery life cycle to facilitate efficient project delivery in PBFs. Emerging technology

trends change the dynamics of inter-organizational processes, thus revealing the need for adaptation in the age of digitization. As a result, the ability of companies to stay agile and flexible is determined by their ability to adopt technology in the organizational architecture. As the vice president of R&D for the marine and energy solution company, Wärtsilä Ilari Kallio states: "Quick turns and sudden changes are the new world order. We must focus on maintaining agility and flexibility and ensuring we are equipped to embrace change." (Wärtsilä 2015).

Business intelligence for successful project delivery

In the project business and knowledge-intensive industries, project-based firms require a customer-centered focus to understand customer needs and deliver customized solutions. Evolving customer needs force PBFs to maintain a dynamic and adaptive attitude to innovating new products and services and to the customization of those products and services (Stringfellow and Bowen 2004). To ensure that the organization can fully grasp the needs of customers and satisfy their requirements throughout the project life cycle, firms use flexible and intelligent technologies as they pursue the goal of becoming intelligent learning organizations.

As the complexity of projects increases, firms begin to adopt information technology platforms and tools to support the management of information. Information and communication technologies enable quick and easy access to the knowledge acquired in projects for everyone in a project-based firm (Loufrani-Fedida et al. 2014). Prior research emphasizes the need to strengthen information management systems to establish an organization based on learning capable of maintaining that learning basis throughout the duration of its projects (Hartmann and Dorée 2015; Chronéer and Backlund 2015). Previous studies focusing on knowledge management initiatives and learning processes offer evidence that technology and information system infrastructure have both enabled and hindered learning processes in PBFs (Moffett et al. 2003; Connelly and Kelloway 2003; Yeh et al. 2006).

Business intelligence systems used in PBFs are information-driven, stand-alone, or cloud-based solutions covering business analytics and performance management software. They gather, organize, process, store, and analyze data to deliver valuable insights to support project management. Business intelligence tools comprise decision support systems enabling the service offering in PBFs during the pre-project, project execution, and post-project phases. In PBFs, the services supported through the use of business intelligence tools are: consultative selling, conceptual design and customization, product and service configuration, installation, delivery, training, spare parts, updates and upgrades, maintenance, and diagnostics.

A considerable volume of research has addressed the specific business intelligence software applications used in the management of projects, which are known by the generic term project management information systems (PMIS). PMIS can help project managers to plan, control, and organize projects (Braglia and Frosolini 2014; Ahlemann 2009; Caniëls and Bakens 2012). Demand for business intelligence applications has been growing, and multiple software providers, such as Microsoft, IBM, Oracle, and SAS, now offer customized standalone and cloud-based solutions. The common features of PMIS cover the following tasks: scheduling, planning, resource allocation, time and budget tracking, templates and deliverables, assignments, risk management, monitoring, and quality control (Turner 2009). PMIS support project managers in forecasting and

forestalling issues with the delivery of a project, and hence help firms meet planned deadlines, increase efficiency, and deliver cost savings. As the complexity of the project management field grows, the focus of the PMIS shifts from single projects to "comprehensive systems that support the entire life cycle of project, project programs, and project portfolios" (Ahlemann 2009: 19; Braglia and Frosolini 2014).

The Guide to the Project Management Body of Knowledge suggests that project success "should be measured in terms of completing the project within the constraints of scope, time, cost, quality, resources, and risk as approved between the project managers and senior management" (Project Management Institute 2013: 35). Extensive research provides evidence of diverse business intelligence applications used for data-driven decision-making processes by project managers aiming to contribute to project success. Prior scientific research has focused on building an intelligent project-based organization model providing benefits to project-oriented organizations and enterprise intelligence (Oussama et al. 2013). From the risk management and controlling perspective, more and more companies get involved in using project management tools to improve the quality of project delivery, to decrease costs, and to meet deadlines. There are risk management decision-making tools that guide a project management team choosing how best to improve its project success rate while controlling the risks of doing so. The ProRisk methodology evaluates the impact of risks on project cost and schedule, so supporting the decision-making of project managers (Marmier et al. 2013; Nguyen et al. 2013).

With regard to project management critical success factors, the methodology developed by Constantino et al. (2015) aims to help project managers assess projects during the selection phase. Based on the artificial neural network, the model "acts as decision support system for the project selection process highlighting early signs of failure by considering the alignment of a project with corporate strategy and the riskiness of the project acceptance" (Constantino et al. 2015: 1751). The model takes into account such project critical success factors as company strategic objectives, the project manager's experience, and the competitive environment. The model can be used in any industry and helps project managers to identify the key areas in need of improvement and where resources must be allocated throughout the project life cycle (Constantino et al. 2015).

Large projects (or megaprojects) combine multiple, related, and strategically aligned projects to generate greater value. Megaprojects require different decision-making processes of project managers than single projects, and information-feed is crucial in managing them. Information-feed refers to scanning internal and external environments in order to define and forecast the factors that could influence the firm and its objectives. Prior studies show that project managers feel more confident in dealing with ambiguity, risks, and uncertainty when supported by information-feed. As a result, firms should allocate resources and investments to maintaining an advantageous project risk management system (Coulter 2000; Eweje et al. 2012).

Business intelligence tools used in project-based firms

The business intelligence tools used throughout a project delivery life cycle comprise the following key systems: a product customization system, a sales configurator, a service support configurator, a design for manufacture and assembly, a project life cycle and tasks manager, a project portfolio management system, schedule management, document control management, a digital document repository, a project quality management plan configurator, a health, safety, security, and the environment (HSSE) incident investigation

and reporting tool, commissioning management, project logistics and material management, a customer relationship management (CRM) system, a service cases repository, O&M reporting, a real-time monitoring and controlling system, remote access and support software, an inventory control management system, and an automatic software updates assistant (Figure 2).

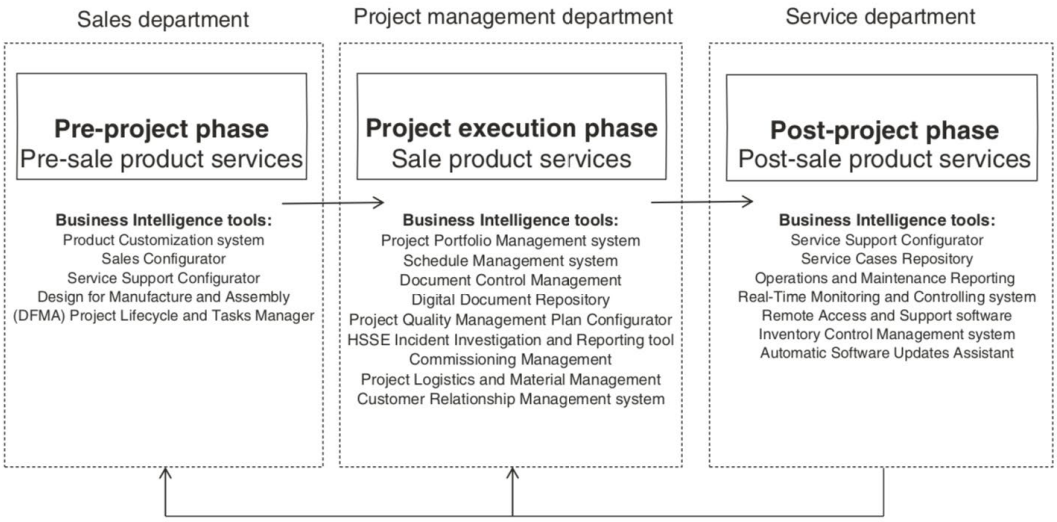

Figure 2. Key business intelligence tools used throughout a project delivery life cycle in PBFs.

In the pre-project phase of the project delivery process, firms commonly use product and service configuration tools. Product and service configuration software supports sales and service managers in the process of creating pricing in real time and constructing quotations and proposals based on the customer needs and inquiries. Configuration management software helps managers understand customer needs and co-create project solutions alongside a customer. The system is based on the concept of guided selling, where managers are able to discuss different options with the customer by establishing the relevant technical parameters. One of the ideas behind the configuration tool is to highlight customer benefits instead of focusing solely on the technical details of the solution. For example, companies in manufacturing industries use configuration management software to show their customers a 3D model of their dream factory with smart automated manufacturing devices.

In the project execution phase, project-based companies often extensively use a project portfolio management system, and also a digital document repository, and a CRM system. A project portfolio management system is a centralized warehousing and reporting business intelligence tool that supports project managers by offering an overview of current projects, so helping to prioritize tasks and allocate resources. A project portfolio management system helps managers to cope with large volumes of information, provides visibility of ongoing operations, and thus improves operational decision-making. The system offers a common platform for collaboration and storage of topical documents, so increasing the visibility of project activities and making the content of the project accessible.

A digital document repository is a document management system designed to save time for project workers when storing, searching, and retrieving documents. A digital document

repository supports project execution by providing all users with access to data on past and current projects, marketing material, images, product layouts, and technical data. A customer relationship management system supports sales managers in acquiring customer data and helps generate the most suitable proposal for a customer. The system systematically stores detailed information on customer cases and facilitates the sales process starting from the initial contact with a customer. A CRM system also collates the information on customer interactions and applies pattern recognition analysis to the customer behavior so as to improve the customer experience and customer satisfaction. A clear overview of the sales network performance and the dashboard for monitoring key performance indicators often found in CRM systems facilitates the work of sales directors and can lead to long-term improvements in the solution sales process.

In the post-project phase, firms use a service case repository and O&M reporting software. A service case repository is a reporting and online analytical processing tool used in sales, project management, and the service business unit. The repository contains such information as issue and solution reporting, troubleshooting, maintenance logs, visualization dashboards, and real-time access to data on the condition and performance of the customer's product. A service case repository supports the work of project workers through its systematic collation of the history of customer maintenance cases, field service logs, triggers, alarms, and solutions to problems.

The reporting software designed for O&M issues comprises performance analytics and product condition management features. The system provides service managers, engineers, and technicians with a complete overview of the entire product portfolio performance through sensors, cameras, and other devices connecting the customer product with the online cloud network. The system enables data monitoring in real time and supports the decision-making of service managers by generating recommendations on enhancing operational efficiency for customers. As the CEO of Finn-Power Oy (a member of Prima Industrie Group), Juha Mäkitalo highlights: "Closeness to the customer is at the heart of our industry. That's why as customer demands are evolving, we must embrace digital evolution and the opportunities it opens up. With tools such as big data analytics, we can make big inroads into service provision and enhance the customer experience" (CECIMO 2016: 5).

Managerial implications: Using business intelligence in projects

Despite the multiple benefits provided by business intelligence tools, its use can be challenging for project managers. While the importance of PMIS being user-friendly has been emphasized, practitioners have struggled with knowledge sharing barriers in the context of data codification (Santos et al. 2012). Knowledge sharing barriers such as inadequate IT, lack of motivation, resources, and time prevent business units from collaborating efficiently on projects by gathering and applying the knowledge learned from past projects (Ajmal et al. 2010). Firms have to ensure there are appropriate information systems supporting knowledge codification and sharing. Problems can arise if a knowledge sharing system cannot be integrated with other systems (e.g., e-mail or an intranet) or if it requires too much work (in terms of, e.g., logging in or navigation). Paying attention to and preventing such issues from arising can help ensure that employees use the PMIS. Additionally, project managers should provide proper training and incentives and encourage employees to use the BI tools. In the context of IS providers, a certain amount of time and resources must be devoted to dismantling any information barriers between

project and service business units to ensure efficient knowledge sharing among units (Santos et al. 2012).

Prior findings (Caniëls and Bakens 2012) indicate project managers tend to use PMIS more frequently with multiple projects than with single projects, probably owing to the system's complexity and the time it demands. Information quality, project overload, and information overload determine the quality of a project manager's decision-making. As a result, a PMIS that is easy to use can positively affect the quality of decision-making processes. Research findings (Caniëls and Bakens 2012) suggest top management of PBFs should periodically obtain feedback from project managers on the quality of the data in the business intelligence tools. In a multi-project environment, project managers have limited time to verify the information held in the BI system. Hence, the continued use of BI by a project manager depends on how the manager perceives the quality of the information the information system supplies and the benefits conferred by the system (Caniëls and Bakens 2012).

Business intelligence tools support the decision-making processes of different business units throughout the stages of the project delivery process contributing to projects being delivered within the preset parameters of scope, time, cost, quality, and resources. Nevertheless, when operating in knowledge-based industries, project learning within and across projects is an important resource for project-based firms seeking to enlarge the knowledge base in the long term. As a result, the following section opens the discussion on the role of project learning in project-based firms, and how business intelligence tools can facilitate intra- and inter-project learning.

Project learning in project-based firms

In project-driven industries, knowledge management practices and project learning play an important role. Project-based firms strengthen their learning mechanisms and processes to advance the firm's progress toward becoming a learning organization in order to retain and improve the firm's competitiveness. A learning organization is defined as "an organization skilled at creating, acquiring and transferring knowledge and at modifying its behavior to reflect new knowledge and insights" (Garvin 1993: 80). In the context of PBFs, learning in projects can be divided into two types: (1) intra-project learning and (2) inter-project learning (Figure 3) (Kotnour 2000).

Intra-project learning or within project learning refers to learning processes occurring within a project and facilitating successful project delivery. Inter-project learning or cross-project learning occurs when knowledge from past projects is shared across subsequent projects with the help of information technology or meetings (Kotnour 2000). In project-based firms and integrated solution providers, the learning process starts with intra-project learning. Knowledge acquired through that intra-project learning provides the pool of best practice and lessons learned for subsequent inter-project learning (Kotnour 2000).

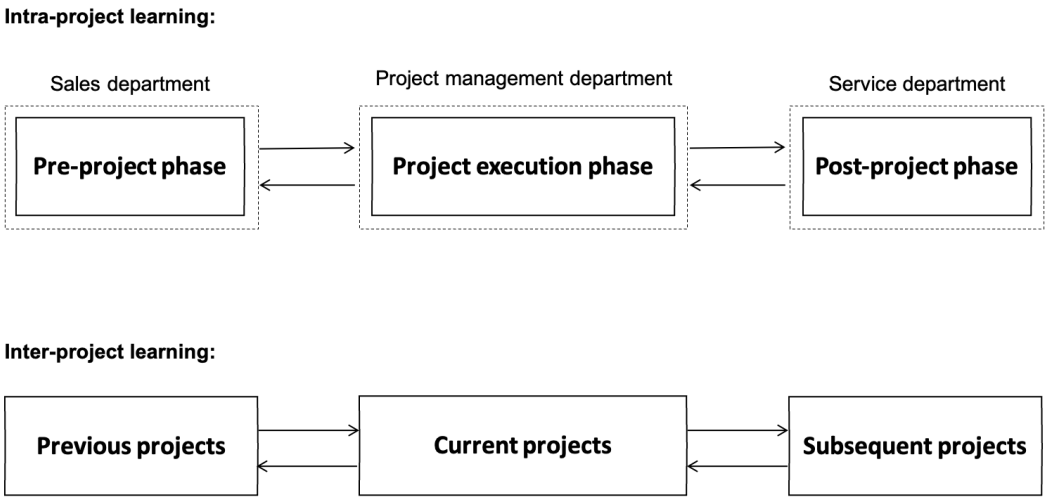

Figure 3. Characteristics of intra- and inter-project learning.

Managerial implications: The role of business intelligence and project learning

Researchers including Chronéer and Backlund (2015) emphasize the need for firms to adopt a systematic approach toward intra-project and inter-project learning. It is recommended IS providers create "a lesson-learned cycle that collects and distributes experiences from stakeholders and thus contributes to a systematic evaluation and reflection during project closure" (Chronéer and Backlund 2015: 71).

In the pre-project phase, product and service configuration software facilitates intra-project learning through its connection to the enterprise resource planning (ERP) and automated data transfer from the pre-project phase directly to the project management department.

In the project execution phase, a project portfolio management system supports intra- and inter-project learning by providing different departments access to documentation on previous and ongoing project progress activities. A digital document repository supports learning within and across projects by collecting and storing data from different sources on previous and current projects available to all business units involved in the project delivery process. Customer relationship management tool facilitates both the intra- and inter-project learning of the sales department by collecting and storing detailed historical customer data throughout the project life cycle and enabling access to lessons learned from previous customer projects.

In the post-project phase, a service case repository contributes to within and cross-project learning by providing project stakeholders access to resolved service cases and real-time data on topical cases. In addition, lessons learned from resolved service cases support the R&D department in product innovation. Similarly, an O&M reporting system supports inter-project learning through continuously tracking product malfunctions, wearing-out of components, and software bugs as part of preventive maintenance contracts, thus contributing to product and service innovation in the long term.

Given that project-based organizations tend to focus more on problem solving than on project learning, project managers must nurture the learning culture within their

organizations. Integrated solution providers should assign clear roles to project members in different project phases with the tasks related to systemic learning. Some roles should be assigned to project members who assimilate lessons learned across different projects, while the learning process owner should prioritize the knowledge derived and integrate useful experiences into practice. Knowledge sharing and integration may be fostered throughout the organizations by means of meetings or the use of different information communication technology solutions (Chronéer and Backlund 2015).

Technology is an enabling tool for the knowledge management culture; however, knowledge management processes in PBFs should be viewed not only through a lens of technology but also through a cultural lens. Organizational culture and people with different backgrounds contribute significantly to an effective knowledge management system. Global PBFs that target creating a knowledge management culture should look beyond the firm on an organizational level and should also pay attention to the cultural context. Prior research offers several sets of guidelines to help senior management and project managers to support knowledge management processes and develop a learning organization with people from different organizational, national, professional, and cultural backgrounds (Ajmal et al. 2009; Chirumalla 2016; Milton 2010).

First, to better organize the project learning process and transfer the lessons learned within and across projects, firms should ensure that employees involved in the project input the necessary documentation and information into the BI tools throughout the project delivery process, instead of doing it at the end of the project. At the end of the project, employees are usually assigned to new projects and project teams come under time pressure to fully document the lessons learned from the project. Additionally, because employees can struggle to recall the knowledge accumulated and valuable lessons learned throughout the project life cycle, inputting relevant data into BI systems at the end of the project can be challenging (Chirumalla 2016).

Second, knowledge documentation routines and the use of BI tools should be clear to everyone in the organization, and specific time and resources should be allocated to retaining acquired knowledge during and after each project (Ajmal et al. 2009). Project members should understand the fundamentals of knowledge management practices and their value. This could be encouraged by organizing seminars or workshops emphasizing the role of knowledge as the key resource in the organization (Ajmal et al. 2010).

Third, it is important to ensure staff understand the documentation policies and adhere to them as part of their daily routine (Ajmal et al. 2009; Chronéer and Backlund 2015). Project leaders should act as coordinators for the relevant employees, project, and service units to track progress and ensure all project personnel use the available PMIS (Ajmal et al. 2010; Chronéer and Backlund 2015). Apart from project managers, senior management also have a key role in developing and facilitating the use of formal learning procedures and principles (Chronéer and Backlund 2015).

Another requirement for efficient project learning is to ensure that each department has a standard method for capturing lessons learned in BI systems throughout the project. Although BI tools used in projects differ to some extent, and reporting methods differ between departments, firms should develop a common standard policy to store the relevant lessons learned in different digital repositories to ensure data consistency (Chirumalla 2016).

Additionally, empirical research provides evidence that data reporting in BI tools through bullet points does not capture the lessons learned well and does not contribute to a rich project learning experience through BI-based knowledge repositories. It is recommended firms ensure that templates, spreadsheets, and reports in PMIS are flexible and provide project workers the opportunity to be effective in sharing their learning experience on certain topics, instead of roughly filling in all the empty (and sometimes irrelevant) blanks (Chirumalla 2016).

Finally, top management should encourage the development of a no-blame culture, where people are encouraged to be open about the knowledge held within their project team. Employees should be encouraged to share lessons learned and knowledge of job-related routines across project and department boundaries (Chirumalla 2016). The process of developing the learning organization may fail if a project manager is unaware of subcultural differences. Those who are aware can help head off conflicts and misunderstandings (Ajmal et al. 2009, 2010).

The future of project management intelligence

While the project data volume continues to grow, it is important to tackle the issue of how different factors are shaping the future of Project Management Intelligence and what kind of emerging trends companies might face in the future. Digital business transformation is a journey, not a destination. Therefore, companies should remain agile and treat digitization as a continuously evolving process.

The large number of BI tools used in the project delivery process is one of the key challenges that companies face at the moment. Organizations are failing to build a robust IT infrastructure, capable of integrating data from a variety of BI tools into a single platform, designed to fulfill employees needs to access project information without logging into each of the BI tools separately (McCullen 2009). In the future, Project Management Intelligence tools should be developing toward flexible integrated software programs and dashboards, providing a holistic view and improving organizational efficiency (Braglia and Frosolini 2014). Software providers and project-based firms should pay particular attention to middleware, which connects multiple BI applications together and allows the data available in one BI tool to be accessed through another.

As project-based firms continue to generate ever larger volumes of data, so the variety of different BI tools to analyze the data can be expected to grow and improve. The field of Project Management Intelligence will experience a shift toward an extensive use of predictive and prescriptive analytics in the future, which will be driven by machine learning and artificial intelligence. Project Management BI tools will calculate the value of different scenarios and the impact of future decisions based on the numerous data points and calculations. Decision-makers will be able to apply analytics to predict what is going to happen, when it is going to happen, and why it is going to happen, thus using prescriptions to shape the desirable future.

Companies operating in a digital age must not only transform internal business processes and software, but also transform their organizational culture and train their employees to be more responsive in the process of becoming a data-driven organization. It is predicted that the data-driven business and BI-enabled decision-making will become a standard practice in organizations, which will also require skills appropriate to using insights effectively. As the number of projects and the volume of data will grow, companies will

recruit specialists such as *data translators*, who can analyze and derive the most useful insights from data. Additionally, companies will support employees involved in the project delivery process to develop new sets of advanced analytical skills to understand statistics and align project insights with business decisions.

Conclusion

This chapter provided insights for business practitioners into how different business intelligence tools can be used throughout the stages of the project delivery process in project-based firms: the pre-project phase, project execution phase, and post-project phase. Business intelligence systems facilitate the intra- and inter-project learning occurring in project-based firms and contribute to both short-term and long-term project management performance. Knowledge sharing tools facilitate the decision-making processes of project managers, sales managers, and service managers; however, such barriers as inadequate IT, lack of motivation, resources, and time can hinder the performance of business units at the individual and organizational levels. The role of projects and the delivery of customized solutions are growing and are changing firms' internal processes and learning mechanisms. Learning organizations are considered to offer advantages that include nurturing a learning mindset, creating, absorbing, and exploiting the knowledge gained from outside or inside the company. In the current context of digitization and the shift toward intelligent technologies, companies should increase their flexibility and continuously innovate in and optimize their internal decision-making processes to remain competitive.

References

Ahlemann, F. (2009). Towards a conceptual reference model for project management information systems. *International Journal of Production Management, 27*(1), 19–30.

Ajmal, M. M., Kekäle, T., & Takala, J. (2009). Cultural impacts on knowledge management and learning in project-based firms. *VINE, 39*(4), 339–352.

Ajmal, M., Helo, P., & Kekäle, T. (2010). Critical factors for knowledge management in project business. *Journal of Knowledge Management, 14*(1), 156–168.

Artto, K., & Kujala, J. (2008). Project business as a research field. *International Journal of Managing Projects in Business, 1*(4), 469–497.

Artto, K., & Wikström, K. (2005). What is project business? *International Journal of Project Management, 23*(5), 343–353.

Artto, K., Wikström, K., Hellström, M., & Kujala, J. (2008). Impact of services on project business. *International Journal of Project Management, 26*(5), 497–508.

Artto, K., Valtakoski, A., & Kärki, H. (2015). Organizing for solutions: How project-based firms integrate project and service businesses. *Industrial Marketing Management, 45*(1), 70–83.

Blindenbach-Driessen, F., & Van Den Ende, J. (2006). Innovation in project-based firms: The context dependency of success factors. *Research Policy, 35*(4), 545–561.

Brady, T., Davies, A., & Gann, D. M. (2005). Creating value by delivering integrated solutions. *International Journal of Project Management, 26*(5), 497–508.

Braglia, M., & Frosolini, M. (2014). An integrated approach to implement project management information systems within the extended enterprise. *International Journal of Project Management, 32*(1), 18–29.

Caniëls, M. C. J., & Bakens, R. J. J. M. (2012). The effects of project management information systems on decision making in a multi project environment. *International Journal of Project Management, 30*(2), 162–175.

CECIMO. (2016, Fall). *CECIMO report: Digitization in the European machine tool industry*. Brussels: CECIMO.

Chirumalla, K. (2016). Organizing lessons learned practice for product-service innovation. *Journal of Business Research, 69*(11), 4986–4991.

Chronéer, D., & Backlund, F. (2015). A holistic view on learning in project-based organizations. *Project Management Journal, 46*(3), 61–74.

Connelly, C. E., & Kelloway, E. K. (2003). Predictors of employees' perceptions of knowledge sharing culture. *Leadership & Organization Development Journal, 24*(5/6), 294–301.

Constantino, F., Gravio, D. G., & Nonino, F. (2015). Project selection in project portfolio management: An artificial neural network model based on critical success factors. *International Journal of Project Management, 33*(8), 1744–1754.

Cooper, M. J., & Budd, C. S. (2007). Tying the pieces together: A normative framework for integrating sales and project operations. *Industrial Marketing Management, 36*(2), 173–182.

Coulter, M. A. (2000). *Strategic management in action* (2nd ed.). New York: Prentice Hall.

Davies, A. (2004). Moving base into high-value integrated solutions: A value stream approach. *Industrial and Corporate Change, 13*(5), 727–756.

Davies, A., Brady, T., & Hobday, M. (2007). Organizing for solutions: System seller vs. systems integrator. *Industrial Marketing Management, 36*(2), 183–193.

Eweje, J., Turner, R., & Müller, R. (2012). Maximizing strategic value from megaprojects: The influence of information-feed on decision-making by the project manager. *International Journal of Project Management, 30*(6), 639–651.

Frambach, R. T., Wels-Lips, I., & Gündlach, A. (1997). Proactive product service strategies: An application in the European health market. *Industrial Marketing Management, 26*(4), 341–352.

Garvin, D. A. (1993). Building a learning organization. *Harvard Business Review, 71*(4), 78–91.

Gebauer, H. (2008). Identifying service strategies in product manufacturing companies by exploring environment-strategy configurations. *Industrial Marketing Management, 37*(3), 278–291.

Gebauer, H., Edvardsson, B., Gustafsson, A., & Witell, L. (2010). Match or mismatch: Strategy-structure configurations in the service business of manufacturing companies. *Journal of Service Research, 13*(2), 198–215.

Hartmann, A., & Dorée, A. (2015). Learning between projects: More than sending messages in bottles. *International Journal of Project Management, 33*(2), 341–351.

Hobday, M. (1998). Product complexity, innovation and industrial organization. *Research Policy, 26*(6), 689–710.

Hobday, M. (2000). The project-based organization: An ideal from the managing complex products and systems? *Research Policy, 29*(7/8), 871–893.

Koskinen, K. U. (2012). Organizational learning in project-based companies: A process thinking approach. *Project Management Journal, 43*(3), 40–49.

Kotnour, T. (2000). Organizational learning practices in the project management environment. *International Journal of Quality & Reliability Management, 17*(4/5), 393–406.

Kujala, S., Artto, K., Aaltonen, P., & Turkulainen, V. (2010). Business models in project-based firms—Towards a typology of solution-specific business models. *International Journal of Project Management, 28*(2), 96–106.

Kujala, S., Kujala, J., Aaltonen, P., Artto, K., Turkulainen, V., & Wikström, K. (2011). Factors influencing the choice of a solution-specific business model. *International Journal of Project Management, 29*(8), 960–970.

Kujala, J., Ahola, T., & Huikuri, S. (2013). Use of services to support the business of a project-based firm. *International Journal of Project Management, 31*(2), 177–189.

Loufrani-Fedida, S., Missonier, S., & Saglietto, L. (2014). Knowledge management in project-based organizations: An investigation into mechanisms. *The Journal of Modern Project Management, 1*(3), 6–17.

Marmier, F., Gourc, D., & Laarz, F. (2013). A risk oriented model to assess strategic decisions in new product development projects. *Decision Support Systems, 56,* 74–82.

Mathieu, V. (2001). Service strategies within the manufacturing sector: Benefits, costs and partnership. *International Journal of Service Industry Management, 12*(5), 451–475.

McCullen, M. (2009). The evolution of project management software. *Project Manager Today, 21*(10), 23–32.

Milton, N. (2010). *The lessons learned handbook: Practical knowledge-based approach to learning from experience*. Oxford: Chandos Publishing.

Moffett, S., McAdam, R., & Parkinson, S. (2003). An empirical analysis of knowledge management applications. *Journal of Knowledge Management, 7*(3), 6–26.

Nguyen, T.-H., Marmier, F., & Gourc, D. (2013). A decision-making tool to maximize chances of meeting project commitments. *International Journal of Production Economics, 142*(2), 214–224.

Oussama, A. M., Zitouni, B., & Othmane, B. (2013). Towards an intelligent project based organization business model. *International Journal of Computer Science Issues, 10*(1), 44–50.

Project Management Institute (PMI). (2013). *A guide to the project management body of knowledge (PMBOK Guide)*. Newtown Square, PA: Project Management Institute Inc.

Santos, V. R., Soares, A. L., & Carvalho, J. A. (2012). Knowledge sharing barriers in complex research and development projects: An exploratory study on the perception of project managers. *Knowledge and Process Management, 19*(1), 27–38.

Stringfellow, A. N. W., & Bowen, D. E. (2004). Profiting from understanding customer needs. *Business Horizons, 47*(5), 45–52.

Turkulainen, V., Kujala, J., Artto, K., & Levitt, R. E. (2013). Organizing in the context of global project-based firm—The case of sales-operations interface. *Industrial Marketing Management, 42*(2), 223–233.

Turner, J. R. (2009). *The handbook of project-based management*. London: McGraw-Hill.

Wärtsilä. (2015). *Wärtsilä Technical Journal Indetail* (Vol. 2). Helsinki: Wärtsilä Corp.

Weber, R., Aha, D. W., & Becerra-Fernandez, I. (2001). Intelligent lessons learned systems. *Journal of Expert Systems Research & Applications, 20*(1), 17–34.

Yeh, Y. J., Lai, S. Q., & Ho, C. T. (2006). Knowledge management enablers: A case study. *Industrial Management and Data Systems, 106*(6), 793–810.

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Deliberate storytelling in big data analytics adoption

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Abstract

The emergence of big data analytics (BDA) has posed opportunities as well as multiple challenges to business practitioners, who have called for research on the behavioural factors underlying BDA adoption at the individual level. The purpose of this study is to extend the information systems (IS) research on storytelling and to explore the role and characteristics of deliberate storytelling in individual-level BDA adoption. This case study used the grounded theory approach to extract qualitative data from 24 interviews, field notes, and documentary data. The explicit contributions of the study to the literature include (a) increasing our understanding of the facilitating role of deliberate storytelling in individual-level BDA adoption, (b) identifying four deliberate storytelling patterns and seven underlying corporate stories disseminated by organizations to influence individual behaviour, and (c) defining the core characteristics of effective deliberate storytelling. This study has multiple implications for business practitioners and demonstrates how deliberate storytelling can be used as a facilitating mechanism in daily business practice.

KEYWORDS

big data analytics, deliberate storytelling, individual behaviour, technology adoption

1 | INTRODUCTION

With the growing importance of big data in recent years (Yaqoob et al., 2016), an increasing number of organizations have been adopting big data–enabled emerging technologies. The use of big data analytics (BDA) (Bose, 2009; Côrte-

Real, Oliveira, & Ruivo, 2017; Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015) has become a trending practice for organizations that supports their decision-making by deriving valuable insights from big data. BDA constitutes a new generation of disruptive technologies that use big data to analyse business operations (Davenport, Barth, & Bean, 2012), improve business performance (Popovič, Hackney, Tassabehji, & Castelli, 2018; Wamba et al., 2017), and gain competitiveness (Côrte-Real et al., 2017). Research on BDA has therefore become increasingly important to scholars and practitioners over the past decade.

However, given the complexity of big data and the analytical methods underlying BDA, organizations face multiple challenges concerning data processing and data management (Agarwal & Dhar, 2014; Sivarajah, Kamal, Irani, & Weerakkody, 2017). Organizations aiming to integrate BDA into their daily routines at the individual level struggle with the elusiveness of the BDA concept, the transformative effects of big data, and a lack of knowledge about and experience with managing disruptive BDA technology (Caesarius & Hohenthal, 2018; Kwon, Lee, & Shin, 2014). The unwillingness of employees to accept a new and unfamiliar technology (Lyytinen & Rose, 2003) and a shift in problem-solving analytical skills (Vidgen, Shaw, & Grant, 2017) impede the individual use of BDA on a daily basis. Employees face the complexity of processing and interpreting big data (Bose, 2009), insufficient data quality, security and privacy (Clarke, 2016; Sivarajah et al., 2017), and a lack of understanding of how BDA creates strategic business value in an organization (Beath, Becerra-Fernandez, Ross, & Short, 2012). These challenges render individual-level BDA adoption complex and time consuming compared with the adoption of other technologies.

To unlock the full potential of digitization and BDA, it is crucial for organizations to support employees in adopting new technology and in addressing BDA challenges (McAfee & Brynjolfsson, 2012; Sivarajah et al., 2017). Although researchers have recently explored the antecedents of organizational BDA adoption intention (Caesarius & Hohenthal, 2018; Lai, Sun, & Ren, 2018) and postadoption usage (Obal, 2017), the impact of BDA adoption on firm performance (Gunasekaran et al., 2017), and organizational digital transformation (Dremel, Wulf, Herterich, Waizmann, & Brenner, 2017), the prior research has neglected the factors underlying the *individual-level adoption* of BDA (Verma, Bhattacharyya, & Kumar, 2018). This remains an obstacle and a relevant topic for organizations aiming to understand individual behaviour and increase individual-level BDA usage.

With increased focus on emerging disruptive technologies and BDA, information systems (IS) literature has shed light on technology-induced organizational change through a storytelling lens (Enninga & Van der Lugt, 2016; Fincham, 2002; Hekkala, Stein, & Rossi, 2018; Whittle, Mueller, & Mangan, 2009). Despite the emergence of interrelated concepts such as "manipulative storytelling" (Auvinen, Lämsä, Sintonen, & Takala, 2013), "narrative engineering" (Klein, Connell, & Meyer, 2007), "planned purposive storytelling" (Law, 2009), and "shared storytelling" (Boyce, 1995), there is a need for deeper understanding of the ways in which storytelling facilitates the individual-level adoption of new technology.

While prior research has demonstrated the differences between organization-driven storytelling patterns and characteristics (Denning, 2006; Marshall & Adamic, 2010; Spear & Roper, 2013), influencing individuals on different levels, there has been less management research on the potential synergy between storytelling patterns.

Storytelling is a powerful narrative technique with a deep evolutionary history in *Homo sapiens* (Boyd, 2018). Building on the storytelling research summarized above, this study introduces the concept of "deliberate storytelling." Deliberate storytelling refers to the planned and intentional use of stories (created by an organization for employees) for the purpose of achieving a particular goal. Deliberate storytelling can be used as a tool to support organizations in addressing the adoption of new technology by spreading stories that help individuals make sense of new technology through narratives (Baker, 2014).

This article investigates the role of deliberate storytelling in the individual adoption of BDA and thus contributes to the IS research on storytelling and BDA. Storytelling is here seen as a lens with which to study the individual-level BDA adoption that occurs when stories are deliberately disseminated by an organization to individuals.

Using grounded theory approach and a single case study, this research explores the characteristics and patterns of effective deliberate storytelling employed in an organization that has undergone a successful BDA adoption at the individual level. This article answers two research questions. First, how does deliberate storytelling facilitate an

individual's adoption of BDA? Second, building on the first question, what are the core characteristics of effective deliberate storytelling?

Given the growing number of big data–driven companies, this research has important managerial implications for practitioners, as it highlights the importance of storytelling in daily practice. Companies that have not yet adopted BDA can obtain a view of the potential gains from integrating and effectively using deliberate storytelling as a change management practice.

2 | THEORETICAL BACKGROUND

This article conceptualizes the development of deliberate storytelling in the IS research by drawing insights from the literature on BDA, technology adoption, and storytelling.

2.1 | Adoption of big data analytics in organizations

BDA as a new generation of technologies is targeted at using large volumes of data and applying data mining, machine learning, optimization, and visualization techniques with the purpose of collecting, processing, analysing, visualizing, and interpreting big data and ultimately enabling informed decision-making (Davenport & Harris, 2007; Goes, 2014; Mortenson, Doherty, & Robinson, 2015). A trend toward data-driven decision-making and the increased use of big data has become a crucial element of daily business processes, leading to fundamental changes in company business value (Seddon, Constantinidis, Tamm, & Dod, 2017), business models (Loebbecke & Picot, 2015), business performance (Popovič et al., 2018; Wamba et al., 2017), and competitive dynamics (Côrte-Real et al., 2017).

Despite the multiple benefits that BDA offers, the process of integrating BDA into an organization at the individual level remains a gap in the research and a challenge for organizations (Agarwal & Dhar, 2014; Sivarajah et al., 2017). Organizations lack confidence, experience, and knowledge of the facilitating factors of BDA adoption at the individual and organizational levels (Kwon et al., 2014). One of the difficulties in adopting disruptive technology such as BDA is the reluctance of employees to abandon established work routines and accept new emerging technology (Lyytinen & Rose, 2003). The elusive nature of big data technologies and the transformative effect of BDA on the organization are some of the factors that affect incumbents' exploration of and resistance to adopting BDA (Caesarius & Hohenthal, 2018). The volume, velocity, variety, veracity, variability, visualization, and value of big data are the unique characteristics that clearly distinguish the disruptive nature of BDA from other technologies, requiring increased attention to the mechanisms underlying BDA adoption in organizations (McAfee & Brynjolfsson, 2012). Organizations aiming to successfully adopt and use BDA face data, process, and management challenges (Sivarajah et al., 2017). These include—and are not limited to—deriving business value from big data (Beath et al., 2012), encouraging BDA use through rewards and incentives (Kiron, Prentice, & Ferguson, 2014), employing data visualization and interpretation (Bose, 2009), implementing employee training (Kiron et al., 2014), maintaining data quality (Clarke, 2016) and decision-making quality (Janssen, Van der Voort, & Wahyudi, 2017), overcoming inadequate and costly IT infrastructure (Sivarajah et al., 2017), ensuring data security and privacy (Bose, 2009), respecting data ownership (Sivarajah et al., 2017), lacking in-house analytical expertise, and meeting the high costs of hiring analytics professionals (Davenport et al., 2012). BDA is a continuously evolving advanced technology, which poses difficulties for users in understanding how to use it and how to keep up with new functionalities (Bose, 2009). From a behavioural perspective, users adopting BDA on a daily basis require a shift in problem-solving skills to turn big data into actionable business insights (Vidgen et al., 2017). An articulation of a corporate analytics strategy to employees specifying how and where the value from big data is created can support the challenging process of integrating BDA and becoming a data-driven organization (Vidgen et al., 2017). Digitization and the use of BDA in organizations are inevitable processes transforming people, products, and organizations; thus, future research is needed to tackle the emerging BDA challenges and opportunities (Loebbecke & Picot, 2015).

An increased focus on big data has led to a growing interest among researchers in the concepts of acceptance behaviour toward BDA. Understanding individual behaviour and intentions offers practitioners and researchers useful insights for successfully adopting the technology and aligning it with organizational needs (Venkatesh, Morris, Davis, & Davis, 2003). Prior research has revealed different approaches for organizations to follow when exploring BDA and experiencing resistance to its adoption (Caesarius & Hohenthal, 2018). Recent research has suggested that adopting and assimilating BDA into an organization's operations transform decision-making and require BDA capabilities (Dremel et al., 2017). Drawing on the achievement of competitive advantage, scholars have shed light on how the acceptance, routinization, and assimilation of BDA improve organizational performance (Gunasekaran et al., 2017). The extant literature has provided evidence for the relationship between technological (perceived benefits) and organizational (top management support) factors with the intention to adopt BDA (Lai et al., 2018). Additionally, prior research has demonstrated that satisfaction with the postadoption usage of disruptive technologies is positively correlated with the time and effort invested in searching for the most appropriate technology (Obal, 2017). Aiming to advance our understanding of individual-level BDA use, Verma et al. (2018) demonstrated how the system and information quality have both direct and indirect effects on BDA adoption.

Despite the emergence of research emphasizing BDA adoption, existing studies have primarily focused on examining the impact of BDA adoption on *organizational*-level digital transformation (Dremel et al., 2017) and firm performance (Gunasekaran et al., 2017), which are determinants of organizational BDA adoption intention (Caesarius & Hohenthal, 2018; Lai et al., 2018), as well as antecedents of disruptive technology adoption at the firm level (Obal, 2017). Given that this research stream lacks studies exploring the drivers of *individual*-level BDA adoption (Verma et al., 2018), this study endeavours both to provide richer insights into the underlying mechanisms of human behaviour and to fill the abovementioned research gap.

2.2 | Toward the development of deliberate storytelling

Storytelling has been used as a powerful strategic tool to tap into the hidden potential of human nature and make sense of the corporate world through narratives (Baker, 2014; Barker & Gower, 2010). The field of narrative research has been significantly fragmented by inconsistent definitions of narratives and stories (Brown, Gabriel, & Gherardi, 2009), and while some researchers have defined narratives and stories as different concepts, others have overlapped their definitions and used the two terms as synonyms (Gabriel, 2000). This study builds upon the definition of storytelling coined by Gabriel (2000, p. 135), who defined stories as “emotionally and symbolically charged narratives” oral or written that “usually have a plot, characters, aim to entertain, persuade or win over.”

In an organizational context, stories are used to communicate and reinforce a company's strategic initiatives, create a sense of collective work, increase the sense of pride in the organization, engage employees, and inspire and influence individual employees' behaviours (Denning, 2006; Parkin, 2004; Vaara, Sonenshein, & Boje, 2017). Prior research has demonstrated that organizational narratives can influence stakeholders' acceptance of organizational transformation (Dalpiaz & Di Stefano, 2018; Kaplan & Orlikowski, 2014). With the proliferation of studies investigating the role of narratives in strategic management, the extant research has recommended that managers craft strategic narratives linking the company's past, present concerns, and future possibilities (Kaplan & Orlikowski, 2014). Similarly, acknowledging the importance of strategic change, Dalpiaz and Di Stefano (2018) suggested that effective organizational narratives should construct a shared understanding of emerging changes, portray novel changes as a continuation of the firm's past, and illustrate organizational changes as a transcendent endeavour.

Storytelling has also been gaining importance in the change management research because it helps employees to perceive and make sense of organizational changes (Thomas, 2018). While the extant research has focused primarily on collecting individual stories to understand differences and similarities in how humans experience organizational changes (Brown & Humphreys, 2003; Driver, 2009; Steuer & Wood, 2008), less attention has been paid to exploring the organization-driven stories used to deliberately facilitate technological change within an organization.

One of the existing concepts related to deliberate storytelling is the notion of "manipulative storytelling" (Auvinen et al., 2013). Despite discussing manipulative storytelling as an unethical approach and suggesting different types of leaders' manipulative stories, scholars (Auvinen et al., 2013) have primarily focused on unethical forms of leadership manipulation (lying, disinformation, and misinformation), neglecting the positive aspects of deliberate storytelling.

Drawing primarily on the context of operational research, scholars in operational research practice have proposed the concept of "narrative engineering" (Klein et al., 2007). Prior research (Klein et al., 2007) suggested the use of narrative engineering from different perspectives (changing values, changing strategy or policy, and changing operations) but failed to empirically demonstrate the use of narrative engineering in organizations.

Another related concept introduced in the literature is "planned purposive storytelling" (Law, 2009). Planned stories are discussed as a means of understanding the benefits and costs of technological changes (Law, 2009); however, the study lacked a broader theoretical development of this abstract concept. Finally, as opposed to the informal dissemination of individual stories in an organization, Boyce (1995) discussed "shared storytelling," which is developed by intentional collective story sharing and the sensemaking of groups and organizational members. The studies reviewed above described scattered levels of story gathering, story making, and storytelling and demonstrated a lack of theoretical and empirical validation of the "deliberate storytelling" concept, thus calling for a clarified definition.

Consistent with the concepts discussed above and identified research gaps, this study introduces the term "deliberate storytelling." This term was constructed based on the preliminary prior literature review and emerging primary and secondary data findings. Although the term is a result of the grounded theory methodology applied in this research, it was considered appropriate to provide the full definition already at the beginning and to guide readers throughout the study.

Deliberate storytelling describes the planned and intentional use of stories or narratives (that can be either true or false) spread by key organizational actors to other individuals in an organization for the achievement of specific organizational goals and outcomes (e.g., imposing new technology adoption on employees). In contrast to Auvinen et al. (2013) and Boyce (1995), this study does not limit the concept of deliberate storytelling to *unethical* forms of storytelling or purposeful story gathering at the *group* level. In contrast to Klein et al. (2007), this study does not focus on deliberate storytelling as an "engineering" approach limited to the operational research context. While the studies of corporate storytelling have focused primarily on emphasizing the organization's moral behaviour and strengthening its corporate brand and corporate reputation (Dowling, 2006; Gill, 2015; Spear & Roper, 2013), this study utilizes deliberate storytelling in a different context, namely, facilitating organizational strategic initiatives. As opposed to the unplanned informal use of individual stories, deliberate storytelling is here viewed as an intentional communication tool activating an individual's imagination and bridging experiential gaps between individuals in a systematic manner internally in an organization (Dor, 2017). This study suggests that deliberate storytelling is a mutually constructed language driven by the storyteller's intention to share his or her experience, influencing the behaviours of other individual(s) in a particular way (Dor, 2017).

Organizational studies have distinguished between intentional storytelling at different levels of analysis: individual-derived stories told in organizations (Martin, Feldman, Hatch, & Sitkin, 1983; Reissner, 2011); storytelling to customers by salespeople (Gilliam & Flaherty, 2015); and corporate storytelling about people, strategies, and policies to internal and external stakeholders (Dowling, 2006; Gill, 2015; Marzec, 2007). This study builds on the latter level of analysis and explores how organization-driven stories influence employees' attitudes toward BDA. Despite an extensive literature on organization-driven stories (Denning, 2006; Marshall & Adamic, 2010; Marzec, 2007; Spear & Roper, 2013), only a limited number of studies have discussed story types (Table 1). In particular, two bodies of literature (Denning, 2006; Spear & Roper, 2013) appear to provide some explanation of the differences between narrative patterns and storytelling themes suitable for *different* business purposes and affecting different stakeholders. Less attention in the prior literature has been paid to the *combined* use of different story types for a *common* business purpose as a key characteristic of effective storytelling. As a result, the existing literature lacks discussion of the potential synergy between stories, ie, whether the combined use of storytelling patterns is more effective than the use of a single story.

TABLE 1 Characteristics of organization-driven stories in prior research

Author(s) (year)	Description and Context	Description	Functions
Denning (2006)	A typology of strategic business narrative techniques; storytelling in management and leadership	Narrative patterns	
		Springboard stories	Sparking action
		Identity stories	Communicating who you are
		Value stories	Transmitting values
		Corporate branding stories	Transmitting who the firm is
		Community-building stories	Fostering collaboration
		Political stories	Taming the grapevine
		Tacit knowledge stories	Sharing knowledge
		Inspirational and vision stories	Leading people into the future
Spear and Roper (2013)	Themes of corporate storytelling; storytelling in building corporate brands and reputations	Corporate story themes	
		Activities	Communicating key activities, competencies and accomplishments
		Benefits	Emphasizing the benefits to internal and external stakeholders
		Emotions	Establishing an emotional bond with stakeholders
		Strategies	Communicating the organization's strategy and values

2.3 | Storytelling in IS research

The stream of research on storytelling and narratives that has contributed to IS practices has gradually evolved over the years. Prior studies have demonstrated the relevance of narratives in IS research and have focused on examining the use of failure and success narratives (Fincham, 2002) in failed technological change (Law, 2009; Whittle et al., 2009), the role of narratives in IS development process research (McLeod & Doolin, 2012), the importance of stories to innovation project leadership (Enninga & Van der Lugt, 2016), and the use of metaphors in IS development projects (Hekkala et al., 2018).

With the increased focus on technology-induced organizational change, the prior literature (Law, 2009) has suggested that storytelling provides the context for facilitating strategic initiatives and supports individuals in understanding and making sense of new technology. Other research has emphasized the role of individuals' stories in understanding failed technological change (Whittle et al., 2009). The prior literature (Fincham, 2002) has offered insights into how success and failure organizational narratives evolve, change, and influence behaviour in computer systems development. From a project management perspective, the extant studies have suggested that storytelling should be utilized by project leaders in managing innovation projects to support their leading roles in organizations (Enninga & Van der Lugt, 2016), while the intentional use of metaphors by project team members can enhance the sensemaking of complex IS development projects (Hekkala et al., 2018). Finally, a study by McLeod and Doolin (2012) proposed the use of narratives in conceptualizing and visualizing the continuity and complexity of IS development processes.

Despite the diversity of the phenomena addressed in the prior research, many of these studies lacked the theoretical depth and theory building that stem from case studies, larger data samples, extension of validity, multiple units of analysis, and data triangulation. These gaps suggest the need to address the shortcomings by addressing the relevance of storytelling in IS. Hence, the present study contributes to new theory building in the IS research and explores deliberate storytelling as a facilitating mechanism in individual-level BDA technology adoption.

2.4 | Synthesis

Building on a thematic review of the prior research and identified research gaps, this study contributes to an underresearched topic: increased individual-level BDA adoption through deliberate storytelling. While the term "deliberate storytelling" was introduced earlier in the study, the subsequent sections elaborate on the link between deliberate storytelling and individual BDA adoption and discuss the core characteristics of effective deliberate storytelling. In particular, in the subsequent sections, this study seeks to advance our understanding of how deliberately communicated stories resolve challenges associated with BDA, construct an enhanced image around BDA use, and improve individuals' attitudes toward the technology, thus increasing the number of individuals using BDA on daily basis.

3 | METHODOLOGY

Given the exploratory nature of the research and the relative novelty of the studied phenomena, grounded theory approach (Corbin & Strauss, 1990; Wiesche, Jurisch, Yetton, & Krcmar, 2017) was considered as the appropriate methodology, as it allows qualitative interpretations of daily realities and theory building from the data themselves. This article is based on a single case study, an approach favoured here due to the possibility of collecting rich data and studying in-depth the scope and complexity of the phenomena (Eisenhardt & Graebner, 2007).

3.1 | Case selection

The selection of the case plays a central role in case study research. After gaining preliminary insights from the literature, the case company was selected to address existing research gaps. Purposive sampling (Eisenhardt & Graebner, 2007) was used to identify the context and a single case providing empirically rich data on the studied phenomena. Hence, three main criteria were used for case selection. First, the case company needed to qualify as a leading company in the industry in terms of BDA development. Second, the company must have been actively undergoing successful adoption of BDA in recent years and must have a deep understanding of the individual-level BDA challenges. Third, the case company would allow the researchers access to rich data for research purposes. Based on these criteria, an organization referred to here as "Metal Corp." (a pseudonym given for an international organization operating in the manufacturing industry) was selected. Following case study guidelines (Yin, 1994), Metal Corp. was considered an appropriate case with which to address the research question because it provides an information-rich setting with unique and uncommon research access.

Metal Corp. is an exemplary case for the purposes of this study because the company has faced the challenges of individual-level BDA adoption. To ensure a high technology adoption rate, it disseminated deliberate stories in September 2016. Given that Metal Corp. has successfully gone through an organizational change concerning individual-level BDA adoption, this company was selected for the study to identify the lessons learned from successful individual-level BDA adoption. The company's success in individual-level BDA adoption was verified by Metal Corp.'s objective measurement of BDA usage data, which demonstrates a steady increase in BDA-active users between September 2015 and September 2017 after corporate stories were introduced (Figure 1).

3.2 | Case description: Metal Corp.'s use of big data analytics

With worldwide presence and over 800 employees, Metal Corp. has manufacturing facilities in North America, Europe, and Asia. Metal Corp. offers sheet metal manufacturing solutions in the areas of laser processing, punching, shearing, and bending. In Metal Corp., BDA is a cloud-based technology rooted in the operations and maintenance (O&M) reporting principle and used primarily in the R&D, service, and sales departments. Metal Corp.'s BDA collects

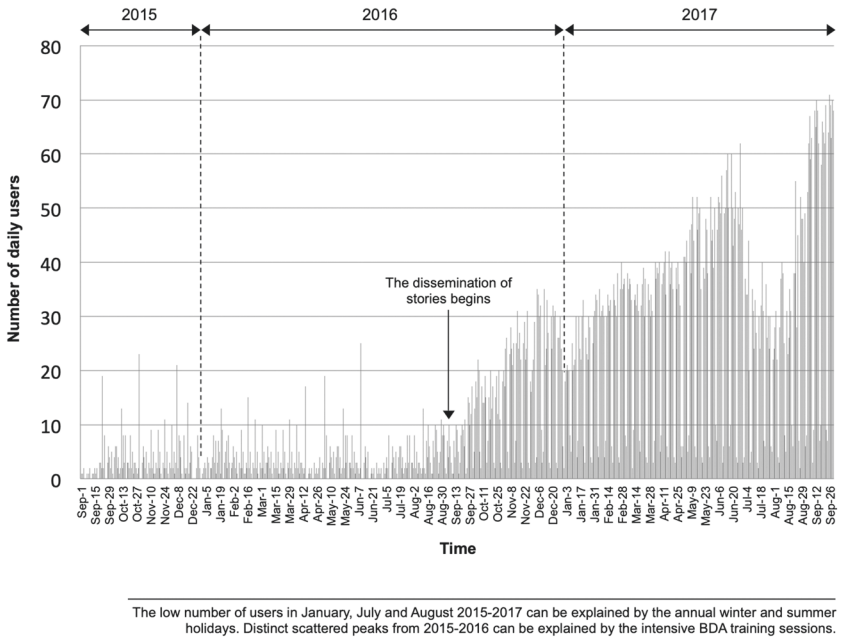

FIGURE 1 BDA usage statistics from September 2015–September 2017 in Metal Corp.

real-time usage data and records the operation history from Metal Corp. manufacturing machinery at customers' sites through sensors, cameras, and machine parameters. BDA thus provides Metal Corp. with an overview of the entire product portfolio and supports the informed decision-making in the company. BDA technology supports Metal Corp. in providing fast remote support to customers in case of unexpected interventions and helps generate recommended actions for improving the overall manufacturing efficiency.

3.3 | Data collection

For the data collection process, a combination of primary and secondary sources was adopted (Table 2). The primary source of data was derived from a total of 24 informal face-to-face interviews conducted at Metal Corp.'s headquarters and supported by field notes (one to three pages per interview) recorded by the interviewer. The appropriate number of interviews was reached upon achieving the data saturation point, which indicated that no new themes were emerging and there was enough rich-quality data to replicate the study (Gerring, 2011; Gibbert & Ruigrok, 2010). Data from secondary sources were obtained from Metal Corp.'s internal documentation on its BDA adoption project, including workshop data, reports, project plans, and presentations, which were used to corroborate the data collected during face-to-face interviews. Specifically, secondary data on storytelling activities, BDA adoption challenges, and stories developed and disseminated inside Metal Corp. were utilized to verify the storytelling patterns identified during interviews.

TABLE 2 Data sources

Type	Data Source	Description
Primary data	Interviews	24 face-to-face interviews with Metal Corp. employees in R&D, services, marketing, and sales involved in storytelling and the individual-level BDA adoption process
	Field notes	Field notes (one to three pages per interview)
Secondary data	Documents	Internal documentary and archival data received from Metal Corp., e.g., BDA usage statistics, project plan reporting, project meeting minutes, internal training reports, and development workshop presentations

The purpose of the interviews was to identify patterns of stories employed in Metal Corp. The interviewees were carefully selected from various organizational levels by means of selective theoretical sampling (Corbin & Strauss, 1990) based on their level of daily involvement with BDA. The aim of the sampling protocol was to select information-rich informants in the case company for the study. Interview data were collected from Metal Corp.'s employees who had been most frequently involved in the development and promotion of BDA and had engaged in deliberate storytelling in situations in which a large number of employees were involved. To represent a variety of perspectives on deliberate storytelling, the interviewees included R&D managers, an application engineer and trainers, the managing director, service engineers, service managers, the global support and spare part support manager, the O&M maintenance coordinator, the vice president of service, product managers, area sales managers, the marketing manager, and the vice president of sales and marketing.

Each interview lasted from 32 to 63 minutes, and all interviews were recorded and transcribed immediately after each meeting. The detailed interviewee information is summarized in Table 3 with an emphasis on the interviewee role in deliberate storytelling and individual-level BDA adoption in Metal Corp.

Data were collected using a narrative approach (Lieblich, Tuval-Maschiach, & Zilber, 1998) through narrative interviewing (Czarniawska, 1997). Narrative interviews, ie, qualitative in-depth interviews, were used to gain a rich understanding of an individual interviewee's experiences regarding storytelling and the adoption of BDA in Metal Corp. The narrative approach was selected to enable the collection of rich data to aid the theory-building process.

Following grounded theory methodology (Matavire & Brown, 2013; Wiesche et al., 2017), a literature review was conducted that preceded data collection and justified the motivation and context for the study. Given the lack of relevant extant literature, an interview guide was not developed a priori or guided by theory. As a result, the findings were emergent and originated from the data themselves. Primary data were collected using unstructured interviews to facilitate the free flow of conversation and collection of narratives. Interviewees were asked to describe their experiences with (a) what corporate stories are told in Metal Corp. to facilitate individual-level BDA adoption and (b) how these stories help to overcome the challenges of BDA adoption at Metal Corp.

3.4 | Data analysis

Following grounded theory guidelines in IS research (Matavire & Brown, 2013), the primary data analysis procedures occurred alongside the data collection and followed three sequential stages: open, axial, and selective coding. The data analysis largely focused on interpreting interviewees' narratives by formulating patterns of deliberate corporate stories that prevailed in Metal Corp. (see Figure 2).

Drawing upon the storytelling terminology utilized and introduced earlier in this study (Gabriel, 2000; Ricoeur, 1984), the data analysis concentrated on reviewing interview transcripts to uncover deliberate stories, defined here as persuasive corporate narratives with hidden or apparent storylines surrounding the advantages of BDA adoption. Although the case company provided extensive internal documentation on the BDA adoption project, the available reporting on storytelling themes was scattered; therefore, the identification of storytelling patterns relied primarily on the interviews as a means of eliciting information about the studied phenomenon.

In open coding, the interview data were reviewed and labelled via detailed reading and rereading of the transcripts. Using the constant comparison technique, the labels given to events, actions, and interactions were constantly revised and compared across other transcripts. After this process of conceptualization and the assigning of the relevant “in vivo” codes (Corbin & Strauss, 1990), a total of 32 initial labels were extracted from the data. This iterative process revealed the most frequently occurring concepts. A further coding procedure was employed to consolidate concepts pertaining to the same phenomenon; finally, 14 qualitatively distinct categories were formed.

In axial coding, the relationships and causal linkages between the categories were identified, and hypotheses were formed based on similarities and differences. The memo-writing technique (Corbin & Strauss, 1990) was utilized to record, formulate, and reflect on the emerging themes and underlying codes. Theoretical saturation (Corbin & Strauss,

TABLE 3 Data description

Organizational Function	Job Title	Interviewee Role in Deliberate Storytelling; Interviewee Engaged in Storytelling During:	Number of Interviewees	Identification Code	Duration, min
R&D	R&D Manager[b]	(a) technical implementation of BDA, (b) coordinating BDA internal trainings, (c) reporting to management team, (d) BDA development workshops, (e) meetings on strategy and techniques development for individual-level BDA adoption, and (f) management meetings on formulating policies and strategic plans.	2	RD1 RD2	63 45
	Application Engineer and Trainer[a]	(a) internal BDA technical guidance and support, (b) planning, managing, and leading internal BDA trainings, and (c) reporting collected customer feedback.	4	RD3 RD4 RD5 RD6	51 40 47 32
	Managing Director[b]	(a) BDA development workshops, (b) meetings on strategy and techniques development for individual-level BDA adoption, and (c) management meetings on formulating policies and strategic plans.	1	RD7	58
Services	Service Engineer[a]	(a) installation of BDA, (b) internal BDA training, and (c) reporting collected customer feedback.	4	S1 S2 S3 S4	39 42 37 46
	Service Manager[b]	(a) coaching and performance monitoring of service engineers, (b) reporting to management team, (c) BDA development workshops, (d) reporting collected customer feedback, and (e) meetings on strategy and techniques development for individual-level BDA adoption.	3	S5 S6 S7	59 48 53
	Global Support and Spare Part Support Manager[a]	(a) global BDA technical guidance and support, (b) internal BDA trainings, (c) reporting to management team, and (d) BDA development workshops.	1	S8	56
	O&M Maintenance Coordinator[b]	(a) internal BDA technical guidance and support, (b) internal BDA trainings, (c) reporting to management team, (d) BDA development workshops, and (e) meetings on strategy and techniques development for individual-level BDA adoption.	1	S9	51
	Vice President of Service[b]	(a) planning, directing, and coordinating service productivity activities, (b) management meetings on formulating policies and strategic plans, (c) internal BDA trainings, (d) BDA development workshops, and (e) meetings on strategy and techniques development for individual-level BDA adoption.	1	S10	54

(Continues)

TABLE 3 (Continued)

Organizational Function	Job Title	Interviewee Role in Deliberate Storytelling; Interviewee Engaged in Storytelling During:	Number of Interviewees	Identification Code	Duration, min
Marketing and Sales	Product Manager[b]	(a) BDA development workshops, (b) internal BDA trainings, (c) reporting to management team, (d) meetings on strategy and techniques development for individual-level BDA adoption, and (e) reporting collected customer feedback.	3	MS1 MS2 MS3	46 50 53
	Area Sales Manager[b]	(a) BDA development workshops, (b) internal BDA trainings, (c) reporting to management team, (d) meetings on strategy and techniques development for individual-level BDA adoption, and (e) reporting collected customer feedback.	2	MS4 MS5	60 57
	Marketing Manager[b]	(a) meetings on strategy and techniques development for individual-level BDA adoption and (b) designing, planning, and implementing internal marketing campaigns.	1	MS6	47
	Vice President of Sales and Marketing[b]	(a) meetings on strategy and techniques development for individual-level BDA adoption and (b) management meetings on formulating policies and strategic plans.	1	MS7	59
Total:			24		1189

[a]Responsible for disseminating stories.

[b]Responsible for developing stories, coordinating storytelling activities, and disseminating stories.

2015) was reached when the coding procedure stopped generating new categories from the new instances of data emerging in the course of data collection and analysis.

Finally, during selective coding, the categories were reviewed and systematically refined to gradually delimit coding to the core categories. The seven core storytelling categories that emerged from the analysis are (a) technology ease-of-use, (b) data quality, (c) data privacy and security, (d) individual productivity, (e) organizational commitment, (f) competitive pressure, and (g) customer success. Finally, the core categories were further analysed to identify the following higher level abstract patterns of deliberate storytelling to be integrated into a sound theory: (a) technology-oriented, (b) user-oriented, (c) organization-oriented, and (d) customer-oriented. The emerging themes identified represent the central phenomena of the study and depict the emerging theoretical constructs that constitute theory building.

Considering grounded theory canons (Corbin & Strauss, 1990), an iterative approach to data analysis comprised constant comparison and interplay among extant interview data, emerging interview data, interview transcripts, archival documents, field notes, extant literature, and the emerging theoretical frameworks. Alongside the primary and secondary data analyses, the clarified definition and the key characteristics of deliberate storytelling emerged from the data. The analysis of field notes and secondary documentary data was fundamental for verifying the study results. The recurring narrative elements of storytelling themes in the interviews were compared with the documentary data on the BDA adoption project provided by the case company to ensure the completeness of data. The secondary data analysis primarily concentrated on examining the content of email newsletters, marketing campaigns, survey results, training presentations, and reports for the identification of (a) individual BDA adoption challenges and (b) deliberately disseminated stories. The documentary data were carefully analysed for textual patterns and

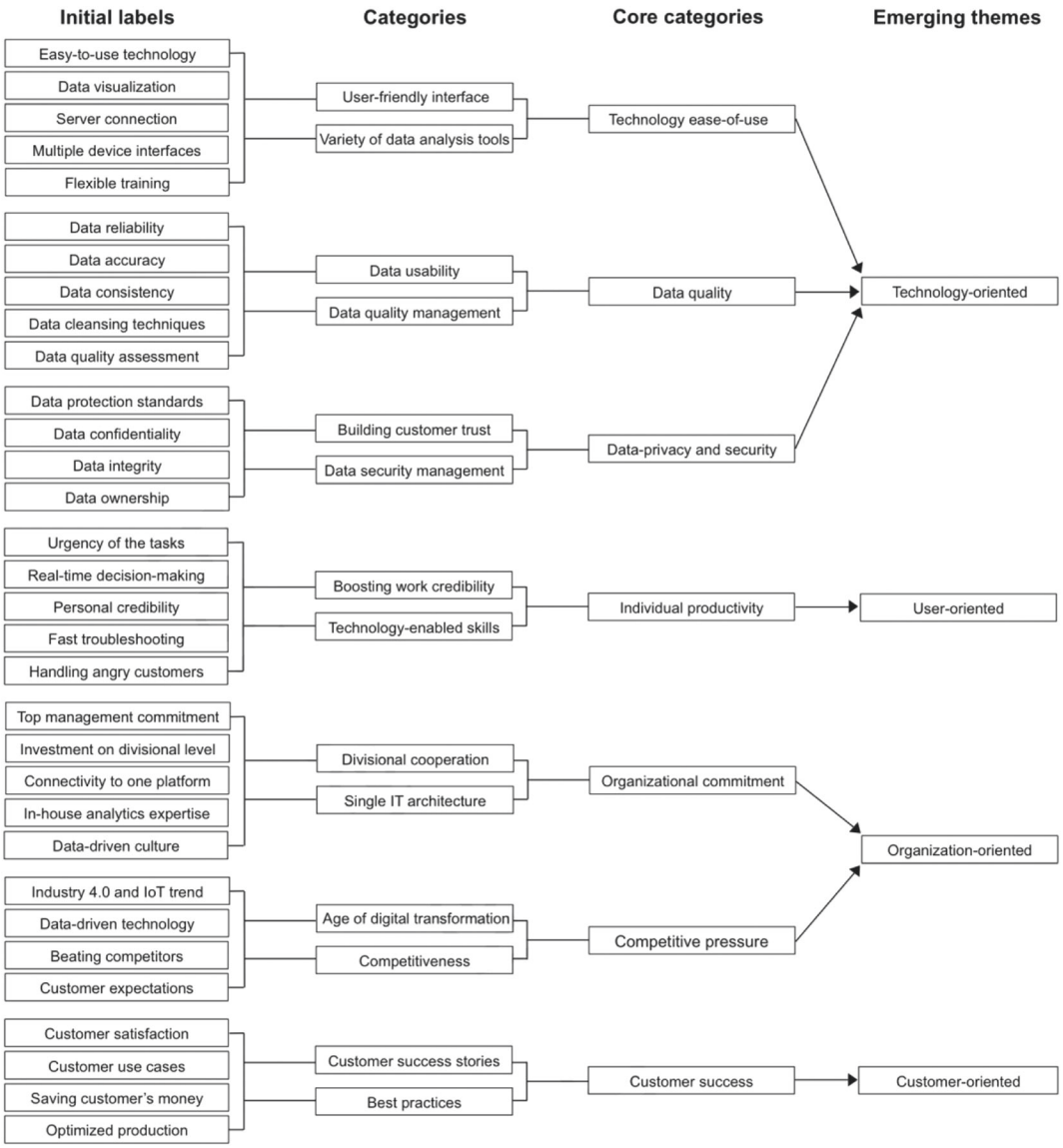

FIGURE 2 Data structure and coding procedure

keywords corresponding to labels, categories, and storytelling themes emerging from the interviews. As a result, the interview data were cross-checked with secondary data interpretations of deliberate stories to identify similarities and differences. Documented survey results and analysis of internal interviews with BDA users on the adoption challenges (provided by Metal Corp.) were utilized to support the descriptions of four storytelling patterns in Section 4.

3.5 | Methodological rigour

To avoid subjective researcher interpretations and to ensure the robustness of the findings, assessment criteria appropriate for qualitative research (Lincoln & Guba, 1985) and grounded theory (Corbin & Strauss, 1990) were employed in this study. To maximize research credibility, the methodological triangulation of the data was conducted

by complementing interviews with the field notes and an analysis of the internal documentary data on BDA provided by Metal Corp. To capitalize on the richness of the data, the qualitative study findings were supported with convergent quantitative data on BDA usage within the case company (Figure 1). The use of several data sources confirmed that the interviewees' responses were not biased and that Metal Corp. employees shared the same experiences and attitudes. The transferability of the research findings was achieved by providing a thick case description and detailed methodology to enable application of the study findings to other similar contexts. To ensure the transparency and dependability of the findings, the interview data were recorded, transcribed, and coded according to grounded theory research guidelines. Data confirmability was achieved by presenting the preliminary findings to the interviewees for feedback and verification of the accuracy of the data. The study findings were supported with illustrative quotations from the interviewees to accurately capture the interviewees' narratives and avoid potential researcher bias.

The study findings were examined in consideration of qualitative evaluative criteria as well as the grounded theory quality characteristics: fit, understanding, generality, and control (Corbin & Strauss, 2015). The emerging theoretical constructs were carefully induced from the interview transcripts to ensure a close fit to the substantive setting. To ensure that the theory is comprehensible to the involved participants and that it accurately reflects the studied phenomenon, the interviewees were asked to verify the findings and comment on the understanding and application of grounded theory from a practitioner perspective. In-depth interviews covering multiple positions, management levels, and business units within the case company were conducted to obtain a comprehensive understanding of the nature of the studied phenomenon and to conceptualize an abstract and flexible theory applicable in different contexts. Drawing upon primary and secondary data, the new theory was formulated in this study in such a way that it allows users to control the use of the theoretical framework by adjusting and extending it to the situational reality.

4 | RESULTS

This section begins with a detailed description of the role of deliberate storytelling in the BDA adoption process in the case company, thus providing a general context of the studied phenomenon. Then the emerging theoretical frameworks of deliberate storytelling are presented, and the characteristics and storytelling patterns underlying successful individual BDA adoption are discussed.

4.1 | Metal Corp.'s deliberate storytelling

Metal Corp.'s strategy of introducing BDA to employees is an interesting example of a company case that has reached high individual-level BDA adoption by creating and disseminating deliberately told corporate stories. The timeline and the phases of the BDA adoption process in Metal Corp. are illustrated in Figure 3.

The integration of BDA in Metal Corp. started in September 2015 in the pilot phase. The monitoring and controlling phase started simultaneously with the pilot phase in September 2015. Metal Corp. carried out continuous measurement of the success of individual-level BDA adoption by collecting employee feedback on BDA usage, surveying employee activity, and monitoring the number of employees engaged in using BDA on a daily basis. Based on the feedback, the company's BDA underwent continuous technical advancements from September 2015–September 2017. However, in the pilot phase, the level of BDA adoption remained low due to obstacles such as poor IT infrastructure, weak online connection to the cloud, and a lack of cross-department collaboration. By the end of the 6-month pilot phase (March 2016), the average number of users per month had reached 10 users, which was 13% of the established target of 75 employees.

As a result, to improve the BDA adoption rate, the key challenges of BDA adoption were identified, and stories to help overcome these challenges from different perspectives were developed during the planning phase from March 2016–September 2016. The committee responsible for the individual BDA adoption project (comprising representatives from R&D, services, marketing, and sales) repeatedly collected feedback from the users to identify individual

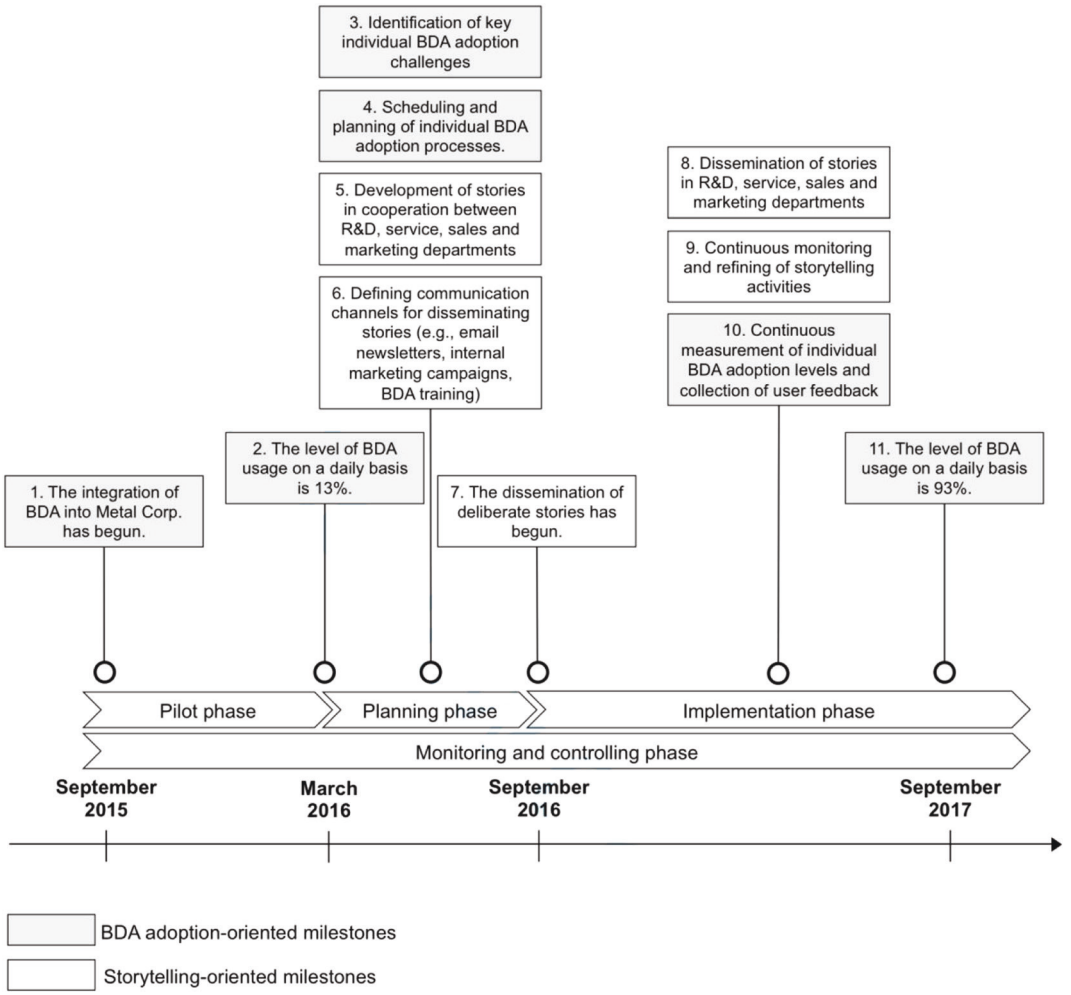

FIGURE 3 The timeline of storytelling and BDA adoption

BDA adoption challenges by means of collective brainstorming workshops during BDA trainings, digital surveys, and personal and group face-to-face informal interviews.

In the planning phase, the scheduling of the technology adoption process was planned in collaboration with the R&D, services, marketing, and sales departments during multiple meetings. Stories were developed during regular meetings on strategy and techniques development to facilitate individual-level BDA adoption in collaboration among R&D managers, the managing director, service managers, the O&M maintenance coordinator, the vice president of service, product managers, area sales managers, the marketing manager, and the vice president of sales and marketing.

The deliberate stories underwent several rounds of review, during which company representatives verified the content to ensure consistency. Upon reaching consensus regarding the storylines, a new email newsletter, marketing campaign, and training documentation (fully devoted to stories) were developed to communicate the deliberate content to the audience. Additionally, corporate stories were integrated on a smaller scale into existing technical, product, and service newsletters, among other regular communication channels and documentation. To ensure that online content with deliberate stories was opened and read, the Metal Corp. marketing team focused on developing creative, uncluttered, and balanced content educating employees and promoting BDA.

The dissemination of corporate stories occurred during the implementation phase from September 2016 to September 2017. It involved employees in the R&D (R&D managers, application engineer and trainers, and managing director), services (service engineers, service managers, global support and spare part support manager, O&M maintenance coordinator, and vice president of service), marketing, and sales (product managers, area sales managers, marketing manager, and vice president of sales and marketing) departments in a number of activities aiming to facilitate individual-level BDA adoption. All seven corporate stories were simultaneously disseminated through different channels to ensure consistency in storytelling and to avoid possible biased attitudes toward BDA. During the implementation phase, Metal Corp. consciously disseminated stories to individuals in the R&D, service, and sales departments by various means, most notably email newsletters, internal marketing campaigns, BDA training, BDA development workshops, seminars on the technical implementation of BDA, progress reporting meetings with the management team, and management meetings on formulating policies and strategic plans. Stories were disseminated in a context where employees were able to learn, collaborate, reflect upon, and/or share their experiences and opinions about BDA. Metal Corp. utilized web tools for tracking users' online activity with newsletters, campaigns, and online training pages devoted to storytelling. Although separate email lists were utilized for disseminating the same deliberate stories to different audiences, the storylines were developed to be easily perceived by all BDA users regardless of background differences. During the dissemination of stories at internal workshops, seminars, and management meetings, an individual and substantial time slot in the agenda was devoted to the storytelling activities occurring alongside other significant operational topics. This presented ensured that stories were told in a planned, organized matter and that top management approved storytelling. In September 2017, the rate of individual-level BDA usage had met the Metal Corp.'s requirement of 93% of the key personnel using BDA on a daily basis.

4.2 | Deliberate storytelling in individual BDA adoption

The findings of the study suggest that the case company utilized deliberate storytelling to motivate and achieve individual-level BDA adoption by communicating seven deliberate stories across four perspectives: technology-, user-, organization-, and customer-oriented storytelling (Figure 4). These storytelling patterns are characterized by the multiperspective immersion of the audience in deliberate storytelling and the diversity of plots reflecting the number of individual BDA adoption challenges.

Each pattern represents a different storytelling perspective utilized to improve individuals' attitudes toward BDA. Square brackets (y) illustrate the scope of complementary storytelling patterns and simultaneously influencing individuals' attitudes toward BDA from four different perspectives. Each pattern comprises deliberately told stories that bridge the experiential gaps between individuals by providing clues to the identified BDA adoption challenges in Metal Corp., thus constructing and communicating an enhanced image around BDA use. A double-headed arrow (x) represents the directionality of stories growing and evolving as the organization faces new challenges impeding BDA adoption. The rest of this section provides a detailed discussion of each deliberate storytelling pattern and relevant illustrative quotes supporting each corporate story.

4.3 | Technology-oriented storytelling

The first deliberate storytelling pattern is characterized by a group of individual challenges related to the complexity of the BDA functional capabilities that were identified in Metal Corp. According to the documentation of the collected user experience provided by the company, employees expressed concerns about complexity of the processing and analysing data with BDA. Additionally, employees were reluctant to use BDA due to questionable and unreliable data quality, privacy, and security issues.

Hence, this storytelling pattern refers to the group of stories that resolve the aforementioned challenges and improve individuals' understanding of technology-related characteristics and abilities to facilitate individual-level

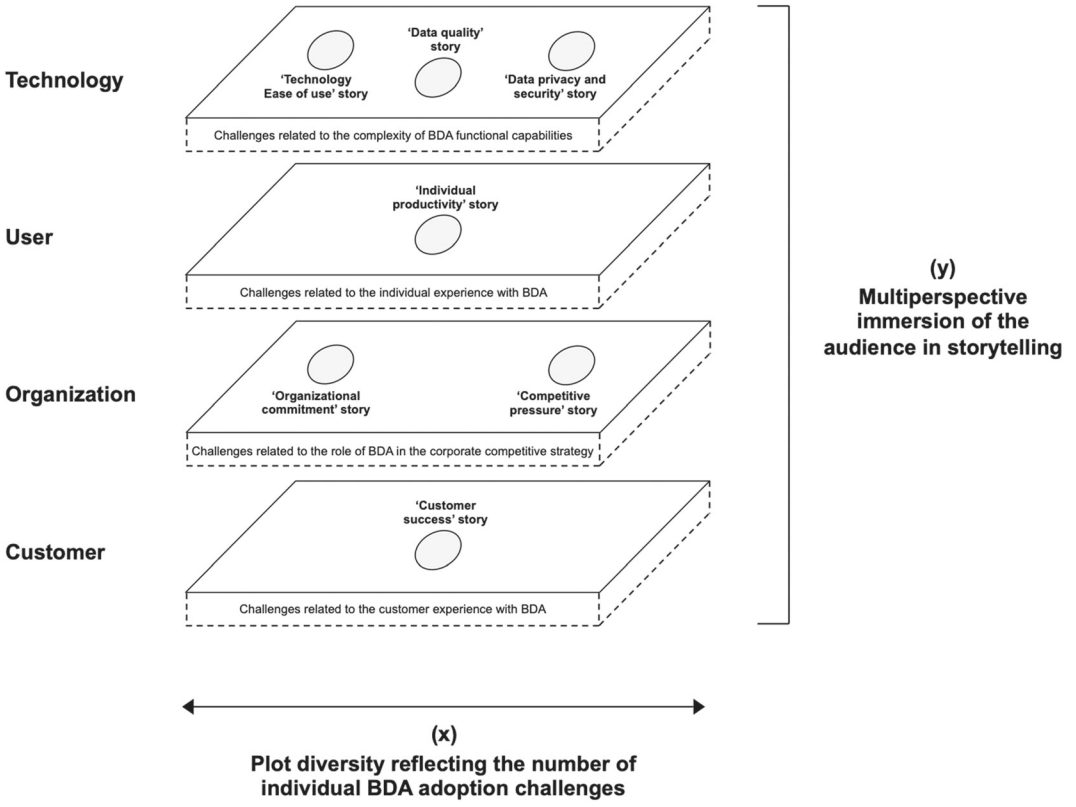

FIGURE 4 Deliberate storytelling in individual-level BDA adoption

BDA adoption. Drawing on the collected data, the technology-oriented storytelling pattern comprises three stories disseminated in the case company: the stories of "Technology ease-of-use," "Data quality," and "Data privacy and security."

4.3.1 | Story of "technology ease-of-use"

The story emphasizes user satisfaction with a user-friendly BDA interface and a variety of data analytics tools, despite the complex nature of machine-generated data and predictive-prescriptive statistical modelling. The story describes about multiple device interfaces (computer, tablet, or phone) and cloud-based access to BDA without any additional credentials. The story continues with describing how the user-friendly interface has integrated advanced data visualization and data mining techniques, allowing the user to choose among different clustering, classification, or segmentation tools to efficiently interpret data and extract insights. The story draws attention to easy-to-use data extraction tools and spreadsheets that can be generated to further analyse and make data-driven decisions:

> *BDA is a very clean software, and you can learn to use it easily once you start using it. (S5)*
> *The usability of BDA is wide. It suits different people and different needs. The failure tracking, alarm analysis, and trigger graphs are some of the most important and useful analytics. (S10)*

The story highlights good IT infrastructure and server connection in comparison with older technologies, enabling faster decision-making for users:

> *We have been moving servers, and the speed of data transmission in BDA is much better now than what we used to have in the past. (S8)*

Regular, ad hoc, and online training sessions support employees on their way to becoming data scientists, providing useful hands-on guidance for developing necessary skills to work on real-life customer problems together with BDA. Finally, the story concludes that the process of abandoning old working practices and adopting BDA is a slow-paced learning process, which does not require quick adaptation to new technology. As a result, the story highlights the BDA ease-of-use without putting pressure on employees regarding the adoption of technology.

4.3.2 | Story of "data quality"

The story draws attention to the quality of BDA data in terms of reliability, accuracy, and consistency. To illustrate data usability, the story highlights BDA's rigorous data verification techniques and compliance with international standards to screen out redundant, inaccurate, and duplicated data. The story assures the audience that BDA is a reliable technology by describing the resources that Metal Corp. invests to continuously improve BDA and guarantee the high quality and consistency of data:

> *From our perspective, it is very bad if users cannot trust the data. That's why data quality is very important to us and we have to make sure that we trust the data. When further developing analytics, we always make sure that it is of good quality. (RD2)*

Furthermore, the story underlines the decision-making mistakes committed in the past without the use of BDA in comparison with the reliable and accurate data from BDA, which enable better decision-making. The story provides an example of how poor-quality data hindered troubleshooting in the past, misleading both Metal Corp. and a customer. The use of inaccurate data can be costly and risky, and so the story emphasizes the continuous process of collecting user feedback to improve BDA and sustain high-quality data:

> *Our customers have also confirmed that the information that we have in BDA is reliable and accurate. (MS4)*

4.3.3 | Story of "data privacy and security"

The story illustrates the importance of Metal Corp. data security management activities that ensure secure data collection and storage, enabling employees to reduce customer concerns regarding security risks. To ensure that BDA has a robust security infrastructure, the story emphasizes the number of standard data protection certifications and privacy security laws that the technology adheres to:

> *Our staff are concerned with personal data privacy issues. That's why we need to communicate to them how we are protecting their own and customer rights. (S7)*
> *If I am a customer, of course, I would be scared about how do we collect and keep this information inside our house. I can understand them. That's why we tell our customers about our security policies. In Metal Corp. we follow several ISO standards for that reason. (S9)*

What is more, the story encourages users to be transparent with customers when communicating BDA data confidentiality policy and data ownership. This is done to assure that customers enjoy safe and secure handling of individual and organizational data by Metal Corp.:

> *It can be "fashionable" to sell data. However, we cannot do that, and there is a point when we tell the customer that we are only using online collected data to improve our own products and improve the customer's machine usage or usability. That's it. We are not selling the data to the third party. It's always quite an important thing to mention to the customer. (S6)*

4.4 | User-oriented storytelling

The second deliberate storytelling pattern is characterized by the challenges related to individual experience and the benefits from using BDA. The user feedback collected by Metal Corp. suggested that the usefulness of BDA to employees remained unclear, in turn determining the reluctance of employees to abandon the old ways of working and to accept the new technology. As a result, to reflect the abovementioned challenge, this storytelling pattern highlights the usefulness of BDA from the user's perspective, underlining how BDA enhances the user's productivity and job performance. By constructing an improved image of BDA from the user perspective, stories improve employees' attitudes toward BDA and motivate BDA use on a daily basis. The underlying story that constitutes the user-oriented storytelling pattern is the story of 'Individual productivity'.

4.4.1 | Story of "individual productivity"

The story describes the enabling role that BDA plays in boosting Metal Corp. employee credibility at work. The story also focuses on improving individual performance and productivity, hence encouraging individuals to adopt the new technology. The story exemplifies how BDA improves decision-making quality and enables fast troubleshooting in urgent and stressful cases with customers when it is crucial to remotely connect to the customer's machine and resolve an issue. The story narrates the circumstances of an employee's visit to a customer's factory for troubleshooting purposes and another employee's phone discussion with an angry customer. In both cases, due to the complexity of the machines, it was not possible to determine and fix the cause of the malfunctioning machine. These situations resulted in troubleshooting delays and annoyed customers who ended up questioning the employee's competence and the purchase of a Metal Corp. machine:

> *The [BDA] system gives us more credibility. When the customer has a problem and we know that it has been happening already many times before, it is easier to understand the problem. (RD4)*
> *We often get calls from angry customers. They complain about the machine interruption and ask for their money back. But in this case, we can use BDA to check the reason of interruption and fix it. (S4)*

The use of BDA improves the user's analytical skills and capabilities, supports real-time decision-making, boosts personal credibility, and helps maintain customer satisfaction:

> *Human understanding is fundamental, but our understanding is based on data collection through analytics. When an error occurs, we receive a call from the customer, but we need to combine what happened at the customer's [factory] with the data from BDA to make the right decision. (RD5)*

4.5 | Organization-oriented storytelling

The third deliberate storytelling pattern facilitates individual-level BDA adoption from the organizational perspective and is characterized by a number of challenges related to the role of BDA in corporate competitive strategy. According to the data collected and provided by Metal Corp., employees were unable to understand the role of BDA from an organizational "big picture" perspective and viewed the use of BDA as an insignificant temporary activity not crucial to the corporate strategy.

Hence, resolving the aforementioned challenges, this pattern applies to the group of stories focusing on BDA as a crucial element of the organization's corporate strategy, supported by the top management's commitment and investment. This category of stories encourages employees to use BDA to contribute to the organization's success, which is affected by the competitive pressure within the industry. Based on the study findings, the organization-oriented storytelling pattern comprises the stories of "Organizational commitment" and "Competitive pressure."

4.5.1 | Story of "organizational commitment"

The story highlights how organizational resources support the development and integration of BDA, thus providing users with the necessary infrastructure and support. The story describes the top management's commitment to and investment in the BDA project by connecting different product units to a common cloud-based platform. The story motivates users to adopt BDA technology by emphasizing the importance of BDA to top management and the organizational resources spent on its development:

> *The number one step in the divisional project is to connect all machines to a common platform. This is time consuming to collect all the requirements for new data collection, but we have enough people and resources. (MS3)*
> *We are having divisional project meetings with all the parties involved every few weeks now. For service purposes, it is really important to have connectivity and to see in one snapshot the main information about all customer machines. (MS1)*
> *The message so far has been positive. Customers are happy that we are using BDA. They are happy that we can help remotely. Management is happy, and we apply for more funding. (RD1)*

Emphasizing the time and resources invested into the technology adoption at a divisional level, the story assures employees that there is strong in-house analytics expertise and a commitment to continuing the implementation and use of BDA. The story draws attention to the newly appointed divisional managers taking care of operational matters related to BDA and supporting regional offices in case of emergencies.

4.5.2 | Story of "competitive pressure"

The story highlights BDA as the Industry 4.0 technology and emphasizes the importance of staying up to date with the latest technological trends in order to outperform competitors and keep customers satisfied. The emergence of Industry 4.0 and Internet of Things (IoT) has been recognized in a number of industries. The story therefore shows that customers are expecting Metal Corp. to follow the technological trends and satisfy continuously evolving data-driven customer needs:

> *Many companies in Europe already have many similar technologies within Industry 4.0. Our customers are interested if we are able to do it as well and connect to machines remotely. Our BDA is very good, and the feedback that I receive from customers is positive. (S10)*

The story describes the age of digital transformation in manufacturing and data-driven technologies that competitors use, thus encouraging users to adopt BDA to contribute to the organization's success, outperform competitors, and maintain a leading position in the industry:

> *All of this IoT is more and more expected as an industry standard. Our competitors are doing it, and we should offer it, too. We just won the Industry 4.0 award for innovation, and we should continue in this way. (RD7)*

4.6 | Customer-oriented storytelling

The fourth deliberate storytelling pattern builds on the challenges related to the customer experience with using BDA and illustrates the usefulness of BDA from the customer's perspective. The findings from the secondary data analysis suggest that employees did not understand how using BDA on a daily basis provides multiple benefits to customers. Hence, this pattern draws employee attention to customer success stories enabled by BDA, thus emphasizing

practical BDA use and motivating individual BDA adoption for customer production and satisfaction. The underlying story that constitutes the customer-oriented storytelling pattern is the story of "Customer success."

4.6.1 | Story of "customer success"

This story focuses on providing the audience with exemplary real-life case studies and business cases that demonstrate how BDA optimizes customer production, improves performance, and saves money. The story demonstrates the business value of BDA from the customer's perspective. By illustrating customers' success stories, this story highlights how individual-level use of technology keeps customers satisfied:

> *The most efficient training so far has been based on the use cases or problem statement-based training showing how real-life problems can be solved. It gives people a good overview of the [BDA] system, and they see the strong practical point in using it. They learn how to solve the customer issues in this way. (RD1)*

The story exemplifies customer use cases and how a variety of technology analytics tools helps to resolve specific customer problems:

> *The majority of the staff that we have, who are using BDA, are hands-on people. For them, it's good to log in, press all the buttons and check one or two of the customers. However, BDA use cases are a must. They help to understand BDA alarms and triggers in real-life customer examples. (MS5)*

4.7 | Characteristics of effective deliberate storytelling

The findings of the study suggest that three important characteristics shape the nature of effective deliberate storytelling in an organization: plot diversity, multiperspective immersion, and internal collaboration. In the context of this study, *effective* deliberate storytelling refers to the successful use of deliberate stories resulting in individual BDA adoption. In addition to the interviews and documentary data, which provided insights into the factors that affected the success of deliberate storytelling, BDA usage statistics were utilized to verify the powerful impact of stories on individual BDA adoption (Figure 1). According to the study findings, effective deliberate storytelling resulted in a substantial (80%) increase in the number of individuals using BDA on a daily basis.

The first characteristic is *plot diversity*, which represents stories with different (but complementary) plots that reflect and resolve the individual-level BDA adoption challenges identified in an organization. Various stories communicate different positive aspects of using BDA on a daily basis, thereby improving employee attitude toward BDA and leading to increased motivation to use BDA. The plot diversity is dynamic, and new stories continue to be developed and refined as new challenges to BDA adoption are identified in the organization:

> *We expect that our people will have new concerns about BDA in the future. It's human nature to question new things. I think we will have to review and adjust our stories. (MS7)*

The second characteristic, *multiperspective immersion*, demonstrates that a storyteller simultaneously immerses the audience in deliberate stories from the technology, user, organization, and customer perspectives. The data analysis suggests that the four deliberate storytelling patterns identified in the study complement one another by activating an individual's imagination from multiple perspectives and creating synergy between stories, both of which are integral to successful individual-level BDA adoption. The seven stories underlying the four storytelling patterns provide answers and solutions to each of the critical individual BDA adoption challenges. Therefore, the multiperspective immersion of the audience in storytelling is crucial because a single storytelling pattern cannot resolve all individual BDA adoption concerns and cannot fully convince employees to adopt BDA:

> *One story wouldn't fit all of our people. We have been learning this from the past. (S10)*

The third characteristic is *internal collaboration*, which depicts cross-department collaboration, efforts, and commitment to deliberate storytelling activities in an organization. The findings of the study suggest that the successful BDA adoption in Metal Corp. was facilitated by the strong collaboration among and commitment of the R&D, services, marketing, and sales departments to storytelling activities:

> *Integrating new [BDA] technology at such a scale was new to our organization. I'm happy to see that we were able to break organizational silos and work together for a common goal. (RD7)*

Coordinated cross-department collaboration enabled the planning, developing and disseminating of *true* deliberate stories across multiple channels to ensure that the story plots *truthfully* reflected the organizational reality and that a large proportion of internal stakeholders were exposed to stories:

> *The problem with storytelling is that you can't see, touch or smell it. My colleagues wouldn't believe stories unless they saw evidence of it in real life by themselves. (MS5)*

Study findings suggest that organizations aiming to succeed in deliberate storytelling practices and to increase individuals' BDA adoption should aim to achieve all three characteristics.

5 | DISCUSSION

5.1 | Theoretical implications

The present study addresses the gaps in the storytelling and IS literature by utilizing a grounded theory approach and investigating the multidimensional role of deliberate storytelling underlying individual-level BDA adoption. Following Corbin and Strauss's (2015) guidelines on the theoretical integration of a grounded theory approach, the study's findings were evaluated against prior literature to identify commonalities and contradictions. The study's theoretical contribution is threefold.

First, whereas existing BDA studies have paid considerable attention to *organization*-level BDA adoption (Caesarius & Hohenthal, 2018; Dremel et al., 2017; Gunasekaran et al., 2017; Lai et al., 2018; Obal, 2017; Venkatesh et al., 2003), this study extends the *individual*-level adoption research (Verma et al., 2018) by suggesting a new behavioural perspective that focuses on the facilitating role of storytelling in BDA adoption at the *individual* level. As a result, this study increases the research field's attention to the factors enabling individual BDA adoption, and it encourages future research to explore human behaviour with BDA. The present findings contribute to the BDA adoption research and suggest that the story *plot diversity* plays a crucial role in enabling successful individual-level acceptance of technological change. The study suggests that deliberately told stories facilitate individual-level BDA usage due to the distinct focus of each story on resolving the BDA adoption challenges identified in the prior literature (Bose, 2009; Sivarajah et al., 2017; Verma et al., 2018; Wamba et al., 2015) by improving technology ease of use, data visualization, and interpretation and by ensuring data quality, data privacy, and security. Congruent with prior research on the enabling factors of BDA adoption in organizations (Caesarius & Hohenthal, 2018; Lai et al., 2018), this study demonstrates the importance of communicating stories about the benefits of BDA for both an organization and its customers, top management commitment, and competitive pressure in an organization to facilitate internal BDA adoption.

Second, while previous IS studies of storytelling have focused on studying *failed* technological changes (Law, 2009; Whittle et al., 2009), this study extends the IS literature by adopting the opposite approach and demonstrating the importance of storytelling in achieving *successful* technological changes and an increased rate of BDA adoption at the individual level.

Whereas existing studies have provided limited evidence for the concepts of "manipulative storytelling" (Auvinen et al., 2013), "narrative engineering" (Klein et al., 2007), "planned purposive storytelling" (Law, 2009), and "shared storytelling" (Boyce, 1995), the literature has lacked theoretical and empirical validation of "deliberate storytelling" as an encompassing concept. In response to this gap, this study complements the literature on deliberate storytelling by further defining the concept and identifying four complementary storytelling patterns crucial to successful individual-level BDA adoption: technology-, user-, organization-, and customer-oriented storytelling. Building on the limited earlier conceptualizations of storytelling in the literature, the present study recommends deliberate storytelling as a new perspective, which exceeds what was previously understood in the restricted sense of unethical storytelling (Auvinen et al., 2013), group-level storytelling (Boyce, 1995), corporate storytelling (Dowling, 2006; Gill, 2015; Spear & Roper, 2013), or operational-level storytelling (Klein et al., 2007). Congruent with evolutionary theories about the development of human language (Dor, 2017), this study suggests that deliberate storytelling is an evolved form of communication that reprograms the audience's cognition by bridging the *experiential gap* between the storyteller and the audience. Deliberate storytelling thus creates a common cognitive understanding of the benefits of BDA adoption. This outcome is reached *despite* the audience's lack of the same experiential background as the storyteller.

The present study is an important addition to the literature on organization-induced storytelling (Denning, 2006; Marshall & Adamic, 2010; Marzec, 2007; Spear & Roper, 2013), which has tended to focus on the differences between storytelling patterns and characteristics rather than on the *synergy* between stories. To address this research gap, the present study challenges the existing knowledge and reveals a new way of understanding how deliberate storytelling influences individuals through the simultaneous dissemination of complementary stories from four different perspectives. These results indicate that the success of deliberate storytelling in influencing a target audience is predetermined by the organization's ability to achieve *multiperspective immersion* of the audience in a storytelling context through the simultaneous dissemination of complementary stories from the perspectives of the technology, the users, the organization, and the customers. Therefore, rather than fixating solely on one storytelling theme, future research on deliberate storytelling should consider all four perspectives to persuade the audience. Building on Dor (2017), this study finds that consistent deliberate storytelling enhances the intersubjectivity of language and contributes to bridging the experiential gaps between individuals. This study has potential implications for the limited research on narrative immersion (Martinez, 2014) by enriching the understanding of narrating stories from multiple perspectives to engage audiences in stories on a deeper level.

Additionally, this study contributes to the storytelling literature and current managerial practice by demonstrating the importance of *internal collaboration* as one of the core characteristics of effective deliberate storytelling. Congruent with prior findings about the importance of the involvement of the IT, sales, and marketing departments in the process of the integration of BDA (Dremel et al., 2017), this study emphasizes the importance of cross-department internal collaboration in the planning and dissemination of deliberate storytelling. Additionally, consistent with previous research (Morgan & Dennehy, 1997), this study emphasizes the importance of disseminating "true" deliberate stories that are believed by listeners due to the congruence between the stories and organizational reality.

Third, while the focus of this study is on BDA technology, the identified deliberate storytelling patterns may be common to other technologies falling under the unified term "business intelligence and analytics" (BI&A) (Chen, Chiang, & Storey, 2012). The results of this study therefore have potential implications for organizations that are in the process of introducing BI&A to employees with an explicit purpose of adopting a new technology and improving individual-level decision-making.

5.2 | Managerial implications

This study offers important managerial implications for business practitioners. Deliberate storytelling framework (Figure 4) can support managers in their daily practice as a tool to manage technological changes, transfer

knowledge, and influence employees' behaviour in using new BDA technology. Prior to influencing the BDA adoption process at the individual level, managers should identify employee habits and attitudes with respect to BDA usage to understand the behavioural processes and potential challenges underlying the use of BDA at the individual level. Organizations wishing to become successful at individual-level BDA adoption should plan and disseminate deliberate stories enhancing the image around BDA use through different communication channels. To reach the full potential of deliberate storytelling, organizations should aim for committed cross-department collaboration.

5.3 | Limitations and future research directions

Given the limitations of the study, three potential future research avenues are suggested. First, from a methodological point of view, the scope of the study is limited to a single case study, and therefore, multiple case study research in different industries could yield other types of deliberate storytelling patterns or characteristics and prompt additional studies. Second, this research was conducted during the process of organizational technological change, and it therefore neglects the dynamics of deliberate storytelling after technology acceptance. Future research should therefore collect longitudinal data to address the evolving nature of deliberate storytelling in organizations. Third, while this article focused purely on the analysis of the "true" dimension of deliberate storytelling, future research could deepen our knowledge by shedding light on "false" deliberate storytelling patterns.

6 | CONCLUSION

The present study contributes to the IS research by (a) introducing the concept of deliberate storytelling in individual-level BDA adoption; (b) providing evidence for four deliberate storytelling patterns and seven underlying deliberate stories critical to successful technological changes; and (c) identifying the characteristics of effective deliberate storytelling. The results of this study suggest that to achieve internal individual-level BDA adoption, organizations should concentrate on story plot diversity, multiperspective immersion of the audience in the storytelling, and internal collaboration when disseminating deliberate stories to employees.

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REFERENCES

Agarwal, R., & Dhar, V. (2014). Editorial—Big data, data science, and analytics: The opportunity and challenge for IS research. *Information Systems Research*, 25, 443–448. https://doi.org/10.1287/isre.2014.0546

Auvinen, T. P., Lämsä, A.-M., Sintonen, T., & Takala, T. (2013). Leadership manipulation and ethics in storytelling. *Journal of Business Ethics*, 116, 415–431. https://doi.org/10.1007/s10551-012-1454-8

Baker, B. (2014). Use storytelling to engage and align employees around your strategic plans. *Industrial and Commercial Training*, 46(1), 25–28. https://doi.org/10.1108/ict-10-2013-0065

Barker, R. T., & Gower, K. (2010). Strategic application of storytelling in organizations: Toward effective communication in a diverse world. *Journal of Business Communication*, 47, 295–312. https://doi.org/10.1177/0021943610369782

Beath, C., Becerra-Fernandez, I., Ross, J., & Short, J. (2012). Finding value in the information explosion. *MIT Sloan Management Review*, 53(4), 18–20.

Bose, R. (2009). Advanced analytics: Opportunities and challenges. *Industrial Management & Data Systems*, 109(2), 155–172. https://doi.org/10.1108/02635570910930073

Boyce, M. E. (1995). Collective centring and collective sense-making in the stories and storytelling of one organization. *Organization Studies*, 16(1), 107–137. https://doi.org/10.1177/017084069501600106

Boyd, B. (2018). The evolution of stories: From mimesis to language, from fact to fiction. *Wiley Interdisciplinary Reviews: Cognitive Science*, 9, e1444. https://doi.org/10.1002/wcs.1444

Brown, A. D., Gabriel, Y., & Gherardi, S. (2009). Storytelling and change: An unfolding story. *Organization*, 16, 323–333. https://doi.org/10.1177/1350508409102298

Brown, A. D., & Humphreys, M. (2003). Epic and tragic tales. *The Journal of Applied Behavioral Science*, 39(2), 121–144. https://doi.org/10.1177/0021886303255557

Caesarius, L. M., & Hohenthal, J. (2018). Searching for big data: How incumbents explore a possible adoption of big data technologies. *Scandinavian Journal of Management*, 34(2), 129–140. https://doi.org/10.1016/j.scaman.2017.12.002

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, 36, 1165–1188. https://doi.org/10.2307/41703503

Clarke, R. (2016). Big data, big risks. *Information Systems Journal*, 26(1), 77–90. https://doi.org/10.1111/isj.12088

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13(1), 3–21. https://doi.org/10.1007/bf00988593

Corbin, J. M., & Strauss, A. L. (2015). *Basic of qualitative research: Techniques and procedures for developing grounded theory* (4th ed.). Thousand Oaks, CA: Sage Publications Inc.

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of big data analytics in European firms. *Journal of Business Research*, 70, 379–390. https://doi.org/10.1016/j.jbusres.2016.08.011

Czarniawska, B. (1997). *Narrating the organization: Dramas of institutional identity*. Chicago, IL: University of Chicago Press.

Dalpiaz, E., & Di Stefano, G. (2018). A universe of stories: Mobilizing narrative practices during transformative change. *Strategic Management Journal*, 39, 664–696. https://doi.org/10.1002/smj.2730

Davenport, T. H., Barth, P., & Bean, R. (2012). How 'big data' is different. *MIT Sloan Management Review*, 54(1), 43–46.

Davenport, T. H., & Harris, J. G. (2007). *Competing on analytics: The new science of winning*. Boston, MA: Harvard Business School Press.

Denning, S. (2006). Effective storytelling: Strategic business narrative techniques. *Strategy & Leadership*, 34(1), 42–48. https://doi.org/10.1108/10878570610637885

Dor, D. (2017). From experience to imagination: Language and its evolution as a social communication technology. *Journal of Neurolinguistics*, 43, 107–119. https://doi.org/10.1016/j.jneuroling.2016.10.003

Dowling, G. R. (2006). Communicating corporate reputation through stories. *California Management Review*, 49(1), 82–100. https://doi.org/10.2307/41166372

Dremel, C., Wulf, J., Herterich, M. M., Waizmann, J.-C., & Brenner, W. (2017). How Audi AG established big data analytics in its digital transformation. *MIS Quarterly Executive*, 16, 81–100.

Driver, M. (2009). From loss to lack: Stories of organizational change as encounters with failed fantasies of self, work and organization. *Organization*, 16, 353–369. https://doi.org/10.1177/1350508409102300

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25–32. https://doi.org/10.5465/amj.2007.24160888

Enninga, T., & Van der Lugt, R. (2016). The innovation journey and the skipper of the raft: About the role of narratives in innovation project leadership. *Project Management Journal*, 47(2), 103–114. https://doi.org/10.1002/pmj.21578

Fincham, R. (2002). Narratives of success and failure in systems development. *British Journal of Management*, 13(1), 1–14. https://doi.org/10.1111/1467-8551.00219

Gabriel, Y. (2000). *Storytelling in organizations: Facts, fictions, and fantasies*. Oxford, UK: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198290957.001.0001

Gerring, J. (2011). How good is good enough? A multidimensional, best-possible standard for research design. *Political Research Quarterly*, 64, 625–636. https://doi.org/10.1177/1065912910361221

Gibbert, M., & Ruigrok, W. (2010). The "what" and "how" of case study rigor: Three strategies based on published work. *Organizational Research Methods*, 13, 710–737. https://doi.org/10.1177/1094428109351319

Gill, R. (2015). Why the PR strategy of storytelling improves employee engagement and adds value to CSR: An integrated literature review. *Public Relations Review*, 41, 662–674. https://doi.org/10.1016/j.pubrev.2014.02.012

Gilliam, D. A., & Flaherty, K. E. (2015). Storytelling by the sales force and its effect on buyer–seller exchange. *Industrial Marketing Management*, 46, 132–142. https://doi.org/10.1016/j.indmarman.2015.01.013

Goes, P. B. (2014). Big data and IS research. *MIS Quarterly*, 38(3), 3–8.

Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B., & Akter, S. (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research*, 70, 308–317. https://doi.org/10.1016/j.jbusres.2016.08.004

Hekkala, R., Stein, M.-K., & Rossi, M. (2018). Metaphors in managerial and employee sensemaking in an information systems project. *Information Systems Journal*, 28(1), 142–174. https://doi.org/10.1111/isj.12133

Janssen, M., Van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, 70, 338–345. https://doi.org/10.1016/j.jbusres.2016.08.007

Kaplan, S., & Orlikowski, W. (2014). Beyond forecasting: Creating new strategic narratives. *MIT Sloan Management Review*, 56(1), 23–28.

Kiron, D., Prentice, P. K., & Ferguson, R. B. (2014). The analytics mandate. *MIT Sloan Management Review*, 55(4), 1–25.

Klein, J. H., Connell, N. A. D., & Meyer, E. (2007). Operational research practice as storytelling. *Journal of the Operational Research Society*, 58, 1535–1542. https://doi.org/10.1057/palgrave.jors.2602277

Kwon, O., Lee, N., & Shin, B. (2014). Data quality management, data usage experience and acquisition intention of big data analytics. *International Journal of Information Management*, 34, 387–394. https://doi.org/10.1016/j.ijinfomgt.2014.02.002

Lai, Y., Sun, H., & Ren, J. (2018). Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: An empirical investigation. *The International Journal of Logistics Management*, 29, 676–703. https://doi.org/10.1108/ijlm-06-2017-0153

Law, S. (2009). Learning from employee communication during technological change. *Journal of Workplace Learning*, 21, 384–397. https://doi.org/10.1108/13665620910966794

Lieblich, A., Tuval-Maschiach, R., & Zilber, T. (1998). *Narrative research: Reading, analysis, and interpretation*. Thousand Oaks, CA: Sage Publications Inc. https://doi.org/10.4135/9781412985253

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 9) (pp. 438–439). Newbury Park, CA: Sage Publications Inc. https://doi.org/10.1016/0147-1767(85)90062-8

Loebbecke, C., & Picot, A. (2015). Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. *The Journal of Strategic Information Systems*, 24(3), 149–157. https://doi.org/10.1016/j.jsis.2015.08.002

Lyytinen, K., & Rose, G. M. (2003). The disruptive nature of information technology innovations: The case of internet computing in systems development organizations. *MIS Quarterly*, 27, 557–596. https://doi.org/10.2307/30036549

Marshall, J., & Adamic, M. (2010). The story is the message: Shaping corporate culture. *Journal of Business Strategy*, 31(2), 18–23. https://doi.org/10.1108/02756661011025035

Martin, J., Feldman, M. S., Hatch, M. J., & Sitkin, S. B. (1983). The uniqueness paradox in organizational stories. *Administrative Science Quarterly*, 28, 438–453. https://doi.org/10.2307/2392251

Martinez, M. A. (2014). Storyworld possible selves and the phenomenon of narrative immersion: Testing a new theoretical construct. *Narrative*, 22(1), 110–131. https://doi.org/10.1353/nar.2014.0004

Marzec, M. (2007). Telling the corporate story: Vision into action. *Journal of Business Strategy*, 28(1), 26–36. https://doi.org/10.1108/02756660710723189

Matavire, R., & Brown, I. (2013). Profiling grounded theory approaches in information systems research. *European Journal of Information Systems*, 22(1), 119–129. https://doi.org/10.1057/ejis.2011.35

McAfee, A., & Brynjolfsson, E. (2012). Big data: The management revolution. *Harvard Business Review*, 90(10), 60–68. 128

McLeod, L., & Doolin, B. (2012). Information systems development as situated socio-technical change: A process approach. *European Journal of Information Systems*, 21(2), 176–191. https://doi.org/10.1057/ejis.2011.43

Morgan, S., & Dennehy, R. F. (1997). The power of organizational storytelling: A management development perspective. *Journal of Management Development*, 16, 494–501. https://doi.org/10.1108/02621719710169585

Mortenson, M. J., Doherty, N. F., & Robinson, S. (2015). Operational research from taylorism to terabytes: A research agenda for the analytics age. *European Journal of Operational Research*, 241, 583–595. https://doi.org/10.1016/j.ejor.2014.08.029

Obal, M. (2017). What drives post-adoption usage? Investigating the negative and positive antecedents of disruptive technology continuous adoption intentions. *Industrial Marketing Management*, 63, 42–52. https://doi.org/10.1016/j.indmarman.2017.01.003

Parkin, M. (2004). *Using storytelling to develop people and organizations*. London and Sterling, VA: Kogan Page Limited.

Popovič, A., Hackney, R., Tassabehji, R., & Castelli, M. (2018). The impact of big data analytics on firms' high value business performance. *Information Systems Frontiers*, 20, 209–222. https://doi.org/10.1007/s10796-016-9720-4

Reissner, S. C. (2011). Patterns of stories of organisational change. *Journal of Organizational Change Management*, 24, 593–609. https://doi.org/10.1108/09534811111158877

Ricoeur, P. (1984). *Time and narrative*. Chicago, IL: University of Chicago Press.

Seddon, P. B., Constantinidis, D., Tamm, T., & Dod, H. (2017). How does business analytics contribute to business value? *Information Systems Journal*, 27, 237–269. https://doi.org/10.1111/isj.12101

Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research*, 70, 263–286. https://doi.org/10.1016/j.jbusres.2016.08.001

Spear, S., & Roper, S. (2013). Using corporate stories to build the corporate brand: An impression management perspective. *Journal of Product & Brand Management*, 22, 491–501. https://doi.org/10.1108/jpbm-09-2013-0387

Steuer, R., & Wood, T. (2008). Storytellers and their discursive strategies in a post-acquisition process. *Journal of Organizational Change Management*, 21, 574–588. https://doi.org/10.1108/09534810810903225

Thomas, N. (2018). Two aspects of knowledge transfer: What every manager should know about using analogy and narrative. *Development and Learning in Organizations: An International Journal*. https://doi.org/10.1108/dlo-04-2018-0046, 33, 12–15.

Vaara, E., Sonenshein, S., & Boje, D. (2017). Narratives as sources of stability and change in organizations: Approaches and directions for future research. *Academy of Management Annals*, 10, 495–560. https://doi.org/10.5465/19416520.2016.1120963

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27, 425–478. https://doi.org/10.2307/30036540

Verma, S., Bhattacharyya, S. S., & Kumar, S. (2018). An extension of the technology acceptance model in the big data analytics system implementation environment. *Information Processing & Management*, 54, 791–806. https://doi.org/10.1016/j.ipm.2018.01.004

Vidgen, R., Shaw, S., & Grant, D. B. (2017). Management challenges in creating value from business analytics. *European Journal of Operational Research*, 261, 626–639. https://doi.org/10.1016/j.ejor.2017.02.023

Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics*, 165, 234–246. https://doi.org/10.1016/j.ijpe.2014.12.031

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365. https://doi.org/10.1016/j.jbusres.2016.08.009

Whittle, A., Mueller, F., & Mangan, A. (2009). Storytelling and 'character': Victims, villains and heroes in a case of technological change. *Organization*, 16, 425–442. https://doi.org/10.1177/1350508409102305

Wiesche, M., Jurisch, M. C., Yetton, P. W., & Krcmar, H. (2017). Grounded theory methodology in information systems research. *MIS Quarterly*, 41, 685–701. https://doi.org/10.25300/misq/2017/41.3.02

Yaqoob, I., Hashem, I. A. T., Gani, A., Mokhtar, S., Ahmed, E., Anuar, N. B., & Vasilakos, A. V. (2016). Big data: From beginning to future. *International Journal of Information Management*, 36, 1231–1247. https://doi.org/10.1016/j.ijinfomgt.2016.07.009

Yin, R. K. (1994). *Case study research design and methods*. Newbury Park, CA: Sage Publications Inc.

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Article III

Storytelling, business analytics and big data interpretation: Literature review and theoretical propositions[13]

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Abstract

Purpose*:* The purpose of this paper is to explore the role of storytelling in data interpretation, decision-making and individual-level adoption of business analytics (BA).
Design/methodology/approach*:* Existing theory is extended by introducing the concept of BA data-driven storytelling and by synthesizing insights from BA, storytelling, behavioral research, linguistics, psychology and neuroscience. Using theory-building methodology, a model with propositions is introduced to demonstrate the relationship between storytelling, data interpretation quality, decision-making quality, intention to use BA and actual BA use.
Findings*:* BA data-driven storytelling is a narrative sensemaking heuristic positively influencing human behavior towards BA use. Organizations deliberately disseminating BA data-driven stories can improve the quality of individual data interpretation and decision-making, resulting in increased individual utilization of BA on a daily basis.
Research limitations/implications*:* To acquire a deeper understanding of BA data-driven storytelling in behavioral operational research (BOR), future studies should test the theoretical model of this study and focus on exploring the complexity and diversity in individual attitudes toward BA.
Practical implications*:* This study provides practical guidance for business practitioners who struggle with interpreting vast amounts of complex data, making data-driven decisions and incorporating BA into daily operations.
Originality/value*:* This cross-disciplinary study develops existing BOR, storytelling and BA literature by showing how a novel BA data-driven storytelling approach can facilitate BA adoption in organizations.
Keywords: storytelling, business analytics, data interpretation, decision-making, behavioral operational research
Article classification: Conceptual paper/Literature review

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1 Introduction

The increasing number of organizations adopting big data practices has led scholars to become interested in the drivers and challenges of business analytics (BA) (Sivarajah *et al.*, 2017). BA is an emerging trend and has been defined as "the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions" (Davenport and Harris, 2007). Prior research has explored how companies can benefit from data and analytics through the positive relationship between BA and business performance (Aydiner *et al.*, 2019), the impact of BA on value creation (Seddon *et al.*, 2017) and on strategic planning (Kunc and O'Brien, 2019). Despite the value that BA offers, however, organizations face behavioral challenges when adopting BA into daily operations (Agarwal and Dhar, 2014; Vidgen *et al.*, 2017). Extant research has primarily focused on the *organizational* adoption of analytics (Caesarius and Hohenthal, 2018; Gunasekaran *et al.*, 2017; Kwon *et al.*, 2014; Lai *et al.*, 2018; Moktadir *et al.*, 2019) while overlooking behavioral factors that underlie *individual*-level BA adoption (Shahbaz *et al.*, 2019; Verma *et al.*, 2018). Without a deeper understanding of the behavioral and psychological factors motivating human behavior, it remains unclear how wide usage of BA in organizations can be achieved.

Given the complexity of big data processed with BA technology, there is a need to address managerial challenges of interpreting data for decision-making (Bumblauskas *et al.*, 2017). Although prior research has demonstrated the importance of using BA data for decision-making (Al-Kassab *et al.*, 2014; Li *et al.*, 2016), there is little research on how data interpretation quality influences data-driven decision-making. Despite an increasing number of studies highlighting such new jobs as data scientists (Costa and Santos, 2017; Davenport and Patil, 2012; Harris and Mehrotra, 2014) and data translators (Brady *et al.*, 2017), extant research neglects how organizations can improve *existing* employees' skills in data interpretation to enable better decision-making. The lack of this knowledge is an obstacle that prevents organizations from successfully integrating and using BA on a daily basis.

With the emerging role of storytelling in the information systems literature (Davison, 2016) and operational research (OR) (Klein, 2009; Klein *et al.*, 2007; White and Taket, 2000), this study utilizes a storytelling lens to explore its role in BA data interpretation and decision-making. While prior literature has examined storytelling in creative problem solving (Klein, 2009), in technology adoption (Boldosova, 2019) and in change management (Klein *et al.*, 2007), it remains unclear what implications storytelling has for BA-driven decision making in organizations. In contrast to extant research that concentrates on storytelling as a visualization tool (Gershon and Page, 2001; Kosara and Mackinlay, 2013), we conducted a comprehensive interdisciplinary literature review to explore storytelling as a verbal narrative technique generating memorable knowledge from big data.

Focusing on the abovementioned research gaps, this conceptual study is motivated by two research questions. First, how can BA data-driven storytelling improve individual data interpretation and decision-making quality? Second, building on the first question, how can organizations using BA data-driven storytelling improve an individual's *intention* to use BA and, subsequently, an individual's *actual* BA use? Guided by theory-building methodology (Corley and Gioia, 2011; Whetten, 1989), we focus on mapping the

conceptual landscape of the studied phenomena, identifying gaps in the literature and proposing new connections among established concepts to advance theory on this emerging topic. Drawing on multiple styles of theorizing (Cornelissen, 2017), this study adopts the propositional style of introducing theoretical ideas and arguments. One of the main contributions of this study is a unique synthesis of insights from OR, BA, storytelling, linguistics, psychology and neuroscience to theorize the way in which storytelling affects BA use in organizations.

As a result of extensive literature review, the present study introduces the concept of *BA data-driven storytelling* as a novel strategic narrative technique that supports employees in interpreting BA data and in making better and faster decisions. This review indicates that storytelling positively influences human behavior toward BA use in organizations. We encourage organizations that wish to facilitate effective BA use in daily decision-making to concentrate on dissemination of stories among employees to fully maximize the value of BA.

2 Methodology

We searched several databases (e.g. Scopus, Emerald, EBSCO, Wiley) for journals in management, information systems, operations, psychology, neuroscience and linguistics to retrieve the relevant research for this cross-disciplinary literature review. This process involved the identification of the keywords, extraction of articles, assessment of the article quality, content analysis, theory synthesis and, finally, new theory building. After mapping out the conceptual landscape of the studied phenomena, we identified research gaps in the literature which we subsequently addressed by introducing a novel conceptual framework and propositions (Figure 2).

The key scientific fields and concepts that were analyzed to develop the model and propositions are illustrated in Figure 1. A detailed discussion of these constructs and corresponding research gaps is provided in the subsequent sections of this study.

3 Literature review

3.1 Adoption of analytics in organizations

An increased focus on analytics has led to a growing interest among researchers in the adoption of big data analytics (BDA)[14] from organizational and individual perspectives. Researchers have highlighted the importance of big data and predictive analytics acceptance, routinization and assimilation in improving supply chain and organizational performance (Gunasekaran *et al.*, 2017). Prior research has also explored how data quality and data usage experience influence the acquisition intention of BDA in organizations (Kwon *et al.*, 2014). Moktadir *et al.* (2019) identified the key technology-, expertise-, investment-, data-related and organizational barriers preventing BDA adoption in manufacturing supply chains. Resistance to BDA adoption has been studied to improve the adoption of analytics at the organizational level (Caesarius and Hohenthal, 2018).

[14] Despite the main focus of this study being on business analytics, it is important to include prior research on big data analytics into the literature review. Given the similar nature of these concepts and the interchangeable use of these terms in the literature (Chen *et al*., 2012), the incorporation of extant BDA research increases the breadth of the literature review and provides additional insights into BA within the context of this study.

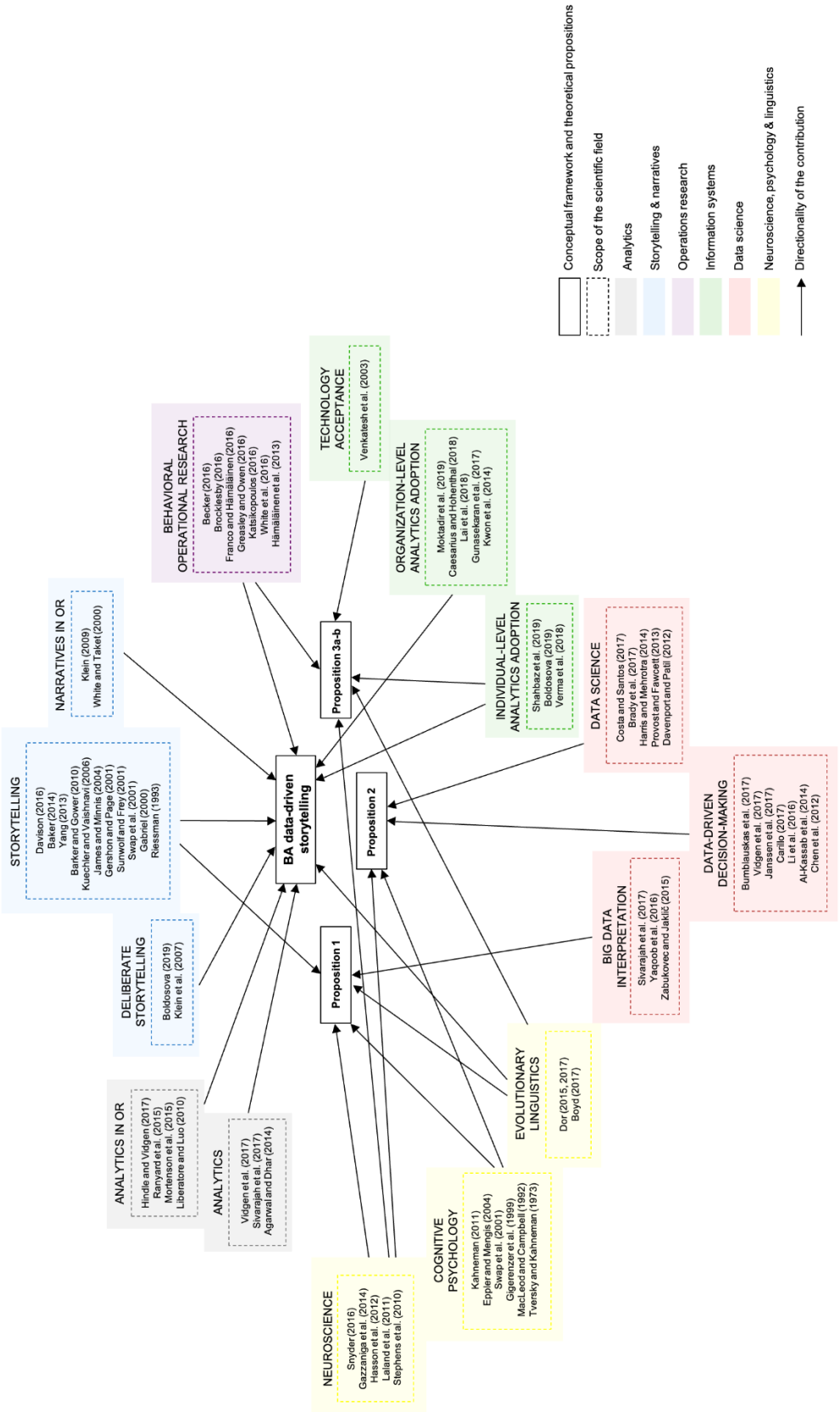

Figure 1. An overview of theoretical constructs with central references given for each field.

Finally, existing research highlights the usefulness of analytics and top management support as the key factors in organizational intention to adopt BDA (Lai *et al.*, 2018). However, despite a number of studies on organizational BDA adoption, there is limited research on individual-level adoption of analytics. For example, Verma *et al.* (2018) contribute to knowledge on individual-level BDA adoption by focusing only on system and information quality of BDA, while neglecting other underlying factors. Although Shahbaz *et al.* (2019) suggest that resistance to change prevents employees from adopting BDA in health care, there is limited discussion on how to avoid and overcome resistance to change at the individual level in organizations. The lack of research on the factors facilitating individual-level analytics adoption remains an obstacle and obstructs successful use of BA on a daily basis in organizations.

Although several scholars have focused on the drivers, challenges, opportunities and implications of BA in OR practice (Hindle and Vidgen, 2017; Liberatore and Luo, 2010; Ranyard *et al.*, 2015; Vidgen *et al.*, 2017; White *et al.*, 2016), there is a lack of behavioral studies exploring BA use with individuals as the unit of analysis. While analytics is positioned in the intersection of such research disciplines as information systems, OR and artificial intelligence, there is limited interaction among BA, psychology and behavioral science (Mortenson *et al.*, 2015). Correspondingly, these gaps in the literature suggest the need to further address the concept of BA in behavioral operational research (BOR) (Hämäläinen *et al.*, 2013; White *et al.*, 2016) and to deepen the understanding of behavioral and psychological factors underlying individual BA adoption in organizations.

3.2 Business analytics in behavioral operational research

A growing community of researchers has been engaged in shifting the research focus from traditional OR towards a new, emerging subdiscipline of BOR (Franco and Hämäläinen, 2016). An increased interest in the behavioral aspects of OR has been driven by the highlighted relevance of modeling human behavior, problem solving and decision support (Hämäläinen *et al.*, 2013). Acknowledging the importance of BOR in explaining human behavior with *models* (Greasley and Owen, 2016; Katsikopoulos, 2016), we use a theoretical modeling approach in this study to describe the behavior(s) of individuals interacting with BA.

The emergence of BA has led to a growing interest among researchers and practitioners in exploring the behavioral challenges that organizations face when trying to adopt BA into daily operations (Agarwal and Dhar, 2014; Sivarajah *et al.*, 2017). Organizations struggle with a lack of knowledge, experience and confidence in their efforts to reap the benefits of analytics in daily operations (Caesarius and Hohenthal, 2018; Kwon *et al.*, 2014). Individuals hesitate to accept unfamiliar technology and resist changing their analytical problem-solving skills (Vidgen *et al.*, 2017). The use of big data for decision-making poses a number of behavioral challenges as it requires a shift from traditional decision-making processes (White *et al.*, 2016). Decision-makers encounter information ambiguity, complexity and overload, which result in difficulties with identifying relevant information, recognizing patterns and making accurate decisions. These behavioral impediments fundamentally constrain individual-level BA adoption and usage, thereby limiting organizations in unlocking the full potential of BA (Bose, 2009; Davenport *et al.*, 2012; Sivarajah *et al.*, 2017).

Following recommendations from BOR to expand interdisciplinary research (Brocklesby, 2016; Franco and Hämäläinen, 2016; Ranyard *et al.*, 2015; Royston, 2013), this article

focuses on strengthening bridges between academics and practitioners by extending BOR to practical BA challenges. Drawing upon an extensive review of literature related to BA, and given the lack of BOR studies on BA (White *et al.*, 2016), this article contributes to incorporating BA into BOR while deepening our understanding of the behavioral factors that facilitate BA-driven decision-making.

3.3 Big data interpretation and decision-making

Prior research demonstrates the challenge for practitioners in managing the complexity of big data and BA technology to interpret findings and use them for strategic decision-making (Bumblauskas *et al.*, 2017; Calvard, 2016). In striving for simplicity, companies face the emerging paradox of *simplexity* (Cunha and Rego, 2010): the need to balance managing vast amounts of complex data and applying data interpretation techniques to simplify findings for decision-making.

Researchers from multiple disciplines have observed how BA has become a trending practice for organizations seeking to use big data for informed decision-making (Bumblauskas *et al.*, 2017; Janssen *et al.*, 2017; Wamba *et al.*, 2015). To ensure high-quality decision-making, it is crucial for BA users to understand both business and technical data if they seek to turn raw data into actionable knowledge (Li *et al.*, 2016). Despite the variety of existing big data analytical methods and visualization tools (Yaqoob *et al.*, 2016), individuals must give data meaning by putting it into context, thus maximizing the value of data (Carillo, 2017).

Numerous researchers have highlighted the need to understand how to translate big data into valuable insights, which in turn, can lead to improved decision-making and problem solving (Brady *et al.*, 2017; Bumblauskas *et al.*, 2017). The emergence of data science as a discipline (Provost and Fawcett, 2013) has encouraged researchers to concentrate on examining the underlying principles of extracting knowledge from data. While some prior research has focused on the importance of data scientists (Costa and Santos, 2017; Davenport and Patil, 2012; Harris and Mehrotra, 2014; Provost and Fawcett, 2013), relying mainly on data-analytic thinking, other research has criticized the role of data scientists for their lack of business orientation, thus emphasizing the relevance of data translators (Brady *et al.*, 2017). To harness the power of data, data translators need to speak the same language as that of data scientists and executive decision makers (Brady *et al.*, 2017).

Despite the diversity of phenomena addressed in prior research, many studies lack an explanation of how organizations should extract business meaning from complex data and embed analytics into decision-making – assuming that hiring expensive data scientists or data translators is not an option. Prior research suggests that a number of factors influence decision-making quality in big data technologies, including people analytics skills, data quality and information visualization quality (Bose, 2009; Janssen *et al.*, 2017; Zabukovec and Jaklic, 2015). Nevertheless, existing studies lack extensive discussions of other potential factors facilitating the relationship between data interpretation and data-driven decision-making. However, understanding how to improve interpretation of complex BA data will provide useful insights for practitioners who aim to successfully integrate and use BA in organizations. The present study therefore contributes to filling the abovementioned research gaps by theorizing storytelling as an alternative strategy that improves quality in BA data interpretation and subsequent decision-making.

3.4 Storytelling from big data in operational research

A growing number of researchers has examined the role of storytelling and narratives as powerful management tools in OR (Klein, 2009; Klein *et al.*, 2007; White and Taket, 2000), information systems literature (Davison, 2016) and psychology (Yang, 2013).

Given the amount of information and the complexity of numerical data, storytelling is seen as a sensemaking tool (Yang, 2013) for further data processing from charts and bars; storytelling transforms raw data into memorable visual insights easily understood by non-analytical people (Gershon and Page, 2001). The use of narrative visualization and the generation of "data stories" are challenging processes requiring both technical and business knowledge (Segel and Heer, 2010). The ability to tell a compelling story with data is considered to be one of the most relevant skills in the current age of digital analytics (Brady *et al.*, 2017; Costa and Santos, 2017).

OR has addressed the role of storytelling in creative problem solving (Klein, 2009) and introduced the concept of *narrative engineering* (Klein *et al.*, 2007). OR scholars encourage managers to become narrative engineers who should systematically and deliberately use storytelling to facilitate and make sense of organizational change (Klein *et al.*, 2007).

While some of the research has focused on exploring storytelling in OR interventions (Klein *et al.*, 2007), deliberate storytelling in managing technological change (Boldosova, 2019), scientific storytelling as a process of telling stories from scientific data (Ma *et al.*, 2012) and the effects of information presentation on decision-making (Kuechler and Vaishnavi, 2006), other researchers have primarily addressed storytelling as an effective data visualization technique supporting decision-making (Gershon and Page, 2001; Kosara and Mackinlay, 2013). Although Boldosova (2019) demonstrates the importance of deliberate storytelling in facilitating individual-level BDA adoption, prior research does not offer insights on how storytelling supports employees' big data interpretation and decision making. Nevertheless, extant research has highlighted the relevance of complementing data visualization with storytelling to maximize the value of BA data for decision-making (Al-Kassab *et al.*, 2014; Vidgen *et al.*, 2017).

Despite the growing interest in the concept of storytelling, scholars in the Information Systems (IS) and OR literatures have neglected the role of storytelling as a verbal narrative technique generating business insights from data. Moreover, prior research largely overlooks the way in which storytelling affects the human mind and human behavior in big data interpretation. This study therefore explores storytelling as the process of generating verbal stories from BA data to improve decision-making quality. This study is built upon extant research recommendations (Costa and Santos, 2017; Klein *et al.*, 2007; Vidgen *et al.*, 2017) to explore the implications of storytelling in BA and OR.

4. Conceptual framework: BA data-driven storytelling

Thus far, we have focused on synthesizing prior research and identifying current research gaps. We now turn our attention to extending existing BOR knowledge and advancing theory on the role of storytelling in BA data interpretation. This section introduces the concept of *BA data-driven storytelling* and reveals new ways of 1) improving BA data interpretation quality, 2) enhancing decision-making quality from BA and 3) facilitating individual intention to use BA in organizations, which 4) results in increased actual use of

BA. We develop propositions (P1-P3b) about the relationship between BA data-driven storytelling and the intention to use BA (Figure 2). This framework and set of propositions are then elaborated on using theoretical arguments from existing literature.

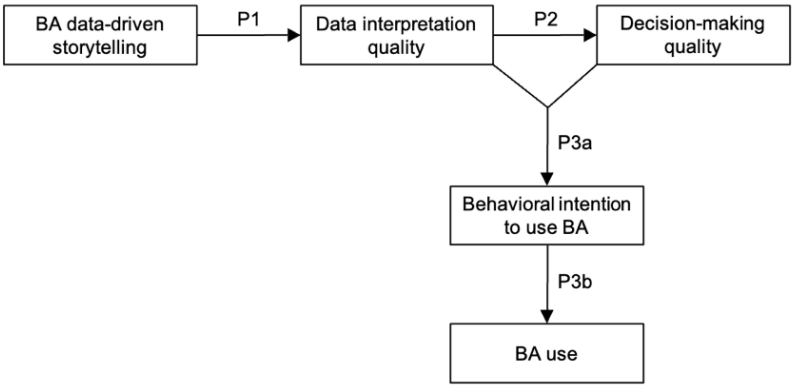

Figure 2. The relationship between BA data-driven storytelling and BA use.

4.1 Definition

This article focuses on an underresearched form of storytelling in BOR—*BA data-driven storytelling*—a term that we coin to describe a narrative sensemaking heuristic. Building upon the definition of storytelling used by Gabriel (2000), BA data-driven stories consist of a plot that narrates about 1) interpreting raw technical data, 2) incorporating that data into a particular business context and 3) identifying solution(s) to previously identified business challenge(s).

Given the growth of unstructured data and evolving needs in processing and interpreting knowledge (Sivarajah *et al.*, 2017; White *et al.*, 2016), we suggest BA data-driven storytelling as a novel method of interpreting patterns and trends for improved decision-making, thus contributing to an organization's big data-driven decision-making culture. We propose that organizations that deliberately harness the power of storytelling over time will be able to reach high levels of daily BA use and BA-driven decision-making among employees; thus, they should be able to build a data-driven decision-making mindset in the long term. In an organizational context, storytelling has been widely used as a strategic business narrative technique for aligning human behavior with an organization's business goals (Baker, 2014; Barker and Gower, 2010). Building on existing insights into storytelling (James and Minnis, 2004; SunWolf and Frey, 2001), we propose that BA data-driven storytelling is able to trigger emotions and cognitive patterns regarding improved data interpretation and decision-making, ultimately transforming employees' views regarding BA use.

4.2 Story development and dissemination

As a standardized tutorial for BA data-driven storytelling, we recommend that organizations follow certain guidelines when developing and disseminating BA data-driven stories. We suggest that the process of storytelling begins with the development of deliberate stories by an organizational department, depending on where BA will be incorporated into daily activities. Given the complexity of BA content, we suggest that the number and/or complexity of disseminated stories be proportional to the number of data visualization tools and types of analytics (descriptive, predictive, prescriptive analytics)

comprising BA. Thus, every new type of data visualization tool and every new type of analytical approach should be accompanied by a discrete data-driven story.

Prior to the development of stories, it is crucial to assign a corresponding business challenge to each type of BA functionality. This approach ensures that while hearing stories, employees will vividly remember which business purpose different visualizations and analytics can be used for. When preparing a simple, compelling and engaging BA data-driven story, it is important to start the story with a description of what kind of knowledge the visualized data conveys and continue the story by contextualizing it in a business setting, thus exemplifying the customer problem(s) that these data solve and the operational decision(s) that the story triggers.

Next, stories should be consistently disseminated through different channels (e.g. training workshops, online training platforms) that enable employees to interact with BA. The context where deliberate stories are disseminated should provide a positive learning environment where employees are able to learn, collaborate and reflect upon BA use. To maximize the value of storytelling, the deliberate dissemination of stories should be carried out by business experts at the department where BA is introduced (e.g. Service, Sales, Marketing) in cooperation with the technical development team building the BA technical infrastructure.

The difference between a traditional data interpretation approach and data interpretation supported by BA data-driven storytelling is reflected in the experience that the user has while interpreting data and making decisions. Additionally, the intention to regularly use BA depends on the positive or negative experiences that users have while interacting with it (Figure 3).

Our example describes how storytelling can be utilized in operations and maintenance (O&M) analytics for remote machine diagnostics and maintenance in the sheet metal working industry, which is characterized by a frequent use of BA by the Service unit (Figure 3).

The example story in Figure 3 can be explicitly divided into several interrelated clauses. First, the story starts with visual data interpretation: *"The Trigger Graph illustrates a customer's machine performance and utilization rate over the period of 2 months."* Then, the story continues by putting these data into a business context, illustrating what value the data have to customers: *"These data can be used to determine what causes machine interruption and how we can improve the customer's machine performance."* Prior to providing a solution to the problem and encouraging a particular decision, the story narrates a more in-depth interpretation of the data: *"Data show repeating trigger clusters (process interruption, sheet out of clamps, sheet distortion) between 10:00-12:00. Clusters represent the areas where the machine's automatic operations are continuously interrupted."* Finally, based on an in-depth analysis of the data, the story suggests further steps that should be taken regarding the customer case: *"After checking which manual machine operations (e.g., wrong placement of the sheet on the loading table) cause machine interruption and decline of productivity, we should contact the customer and help to correctly perform the sheet loading".*

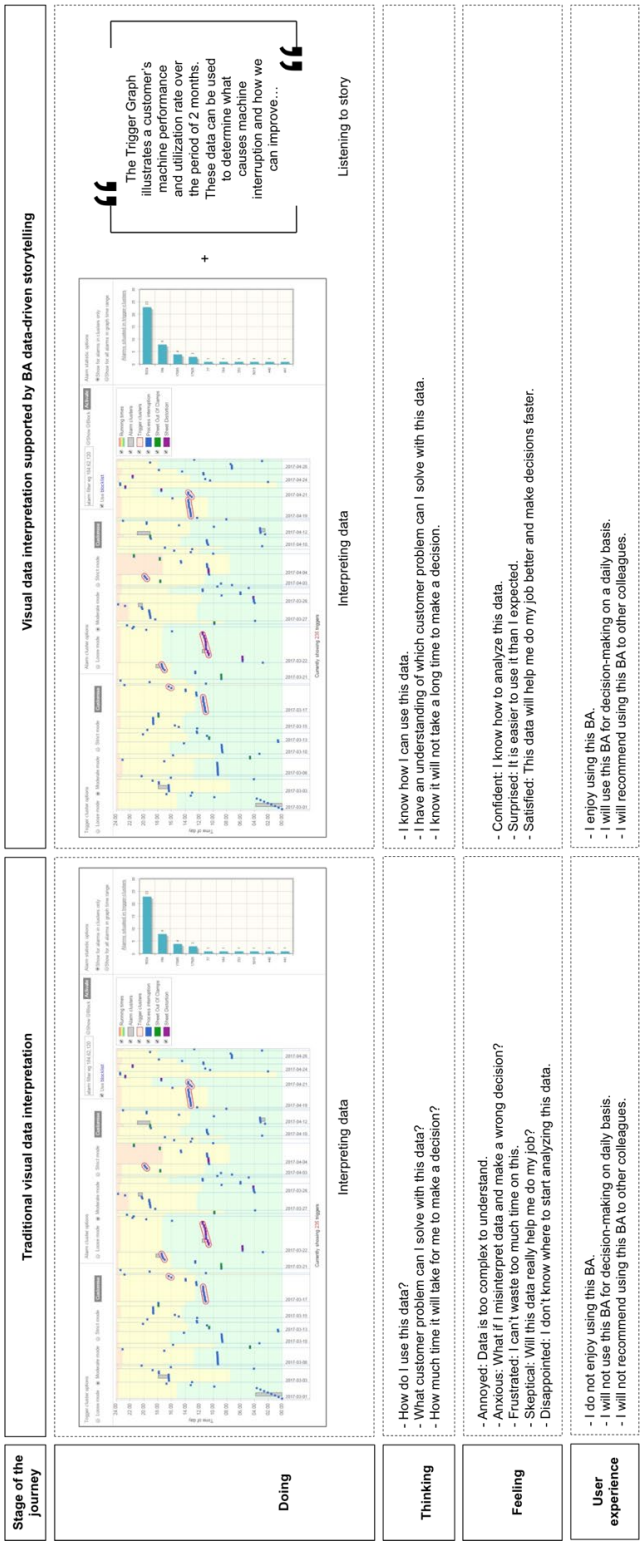

Figure 3. BA user experience map: A comparison of data interpretation approaches. Traditional (left) and data-driven storytelling (right).[15]

[15] The screenshot of a BA software was kindly provided by an international sheet metal processing organization, which is facing the challenges of complex data interpretation and decision-making. The organization preferred to remain anonymous.

In conclusion, the story repeats the value of these data in a business setting and specifically to customers, thus capturing the lessons learned from BA data interpretation: *"When a customer regularly wastes 4 hours of production time per week – it costs money. Fixing this problem can help improve the customer's production efficiency and increase machine performance by 7-10%".* Through this somewhat simplified example of deliberate data-driven storytelling (models are only approximations of reality, after all), we hope to have illustrated the nature of a symbolically charged narrative with a plot that translates data into business insights, supports employees' visual data interpretation and facilitates employees' decision-making.

4.3 Research propositions

While prior research highlights the importance of hiring data scientists (Costa and Santos, 2017; Davenport and Patil, 2012; Harris and Mehrotra, 2014; Provost and Fawcett, 2013) or data translators (Brady *et al.*, 2017), we believe that deliberate dissemination of data-driven stories can enhance *existing employees'* skills in translating BA data into valuable business insights. Thus, extensive and correct use of storytelling eliminates the need to hire new expensive labor. Instead, company experts in R&D, Service or Sales can be trained to give meaning to raw data and deliberately disseminate data interpretation stories to colleagues who are dealing with BA-driven decision-making on a daily basis.

Data-driven stories connect data science, analytics and business problems with the target audience by adding easily interpretable business meaning to raw data. Building on prior research (Chen *et al.*, 2012; Li *et al.*, 2016), we suggest that stories should explicitly reflect on how data help to solve specific customer-related business problems, thus enhancing decision-making quality. As prior research on big data analytics in BOR suggests (White *et al.*, 2016), to reap the full benefits of BA data, employees should not only possess technical skills but also have knowledge of the economic value of data for decision-making.

Raw data presented with BA visualization tools is too numerical and complex to process and interpret for efficient decision-making. While some organizations may acquire BA software from a third party, others with strong R&D expertise develop BA internally within an organization. In the latter case, a BA tool developed by R&D can be excessively technical or analytical, making it difficult to communicate the meaning of data to nontechnical users. Hence, storytelling provides a common sensemaking instrument (Yang, 2013) that translates data into business insights. By incorporating data into the business context, BA data-driven stories reduce the ambiguity and uncertainty caused by big data and make it easier to understand the meaning and practical implications of data. For maximum efficacy, such stories should also be *memorable.*

Data-driven storytelling simplifies the complex nature of technical data and provides cognitive linearity for the human mind by narrating key memorable data insights. Human interaction and human understanding are crucial to interpreting data (Yaqoob *et al.*, 2016), which is why we argue that data visualization techniques *in combination with* data-driven storytelling provide a powerful means for improving decision-making quality. The purpose of data-driven stories is to take the BA user on an interpretive journey through the data. The intention of stories is to illustrate, step-by-step, the use of BA by guiding the user through the process of 1) interpreting data, 2) grasping the business challenge(s) it solves and 3) making the right decision, thus providing a solution to the problem.

This process of illustrating how BA data can be used for problem solving and decision-making provides a precise data interpretation journey map instead of mere coordinates. It is easier for BA users to bridge the gap between raw data and business insights when organizations provide narratives about the BA data interpretation journey and what should be done to reach the final destination. Summarizing our arguments (Figure 2), we propose the following:

> ***Proposition 1.*** The use of BA data-driven storytelling in organizations enhances the quality of individual employees' data interpretation.
>
> ***Proposition 2.*** The improvement in an individual's BA data interpretation quality improves the quality of that individual's decision-making.

Given the complexity of the information overload that employees face, it is challenging to comprehend and recall all structured and unstructured data. Organizations that aim to adopt BA on an individual level should not overburden employees attending BA training with complex time-consuming descriptions of BA functionalities. Instead, deliberate use of storytelling helps BA users relate to the stories and remember the key takeaways after leaving the training session. Individuals can subsequently use these story-driven takeaways for real-time problem solving and decision-making. Data-driven storytelling creates a connection between technical data and a business case, and it provides a clearer mental map for a user than mere data or data visualization would. Stories serve as an explanatory tool for understanding and interpreting how BA data works as well as how to derive useful insights and make decisions based on data. Hence, BA data-driven storytelling should be viewed as a way to help employees make sense of BA and facilitate individual-level BA adoption in organizations.

Supported by behavioral theories on the acceptance and use of technology (Venkatesh *et al.*, 2003), we further propose that as storytelling leads to improvements in both data interpretation quality and decision-making quality, employees become more willing to accept and use BA on a daily basis. Accordingly, we posit the following:

> ***Proposition 3a and Proposition 3b.*** In organizations that place a relatively greater emphasis on data-driven storytelling, the improvement in data interpretation quality and decision-making quality positively enhances individual intention to use BA and actual use of BA.

4.4 Microfoundations from linguistics, psychology and neuroscience

Further insight into BA data-driven storytelling can be gleaned from linguistics, psychology and neuroscience. How the human brain operates during storytelling is the neuropsychological *proximate mechanism* (Laland *et al.*, 2011) that enables the effectiveness of data-driven storytelling. That is why an improved understanding of the neuropsychology underlying storytelling sheds light on the effectiveness of storytelling as a sensemaking OR heuristic.

Synthesizing insights from neurolinguistics (Dor, 2015, 2017) and deliberate storytelling research (Boldosova, 2019; Klein *et al.*, 2007), we propose that organizations should use deliberate data-driven storytelling as an internal communication heuristic that aims to bridge the experiential gap between the storyteller and the audience by activating the recipients' imagination. *Experiential gaps* within the context of this study refer to the different knowledge gaps that employees have in comprehending and interpreting BA data. Given that organizations introduce data-driven stories to employees during the BA adoption process, deliberate storytelling creates a shared cognitive basis among employees

regarding the perceived ease-of-use and usefulness of BA. As in the evolutionary history of human language (Boyd, 2017; Dor, 2015, 2017), storytelling fills in the experiential gaps between the storyteller and the audience by instructing the audience's imagination in the manner that the storyteller intends.

From an evolutionary psychological perspective, storytelling is a more powerful cognitive device compared with abstract images, simple gestures or sounds (Yang, 2013). The human mind finds stories appealing because a story with a clear plot enhances the audience's ability to make sense of unstructured scattered information (Yang, 2013). BA data-driven storytelling is a communicative sensemaking heuristic that helps employees to better understand the data interpretation process by connecting different data patterns into meaningful insights with *coherence* and *sequence* (Riessman, 1993). As a cognitive heuristic, data-driven storytelling helps employees to make sense of BA and assists them in BA-driven decision-making during organizational adoption of BA.

Prior research on cognitive mechanisms that promote learning through storytelling (Swap *et al.*, 2001) highlights the importance of an *availability heuristic* (MacLeod and Campbell, 1992; Tversky and Kahneman, 1973), a mental shortcut that helps employees interpret data and make decisions based on the latest important information that can be recalled. During data-driven storytelling, BA users begin to associate visualizations and analytics with particular business cases, which positively affects their availability heuristics during real-time decision-making or problem solving. It is easier to make a decision based on a story associated with specific business knowledge as opposed to complex technical data. Storytelling acts as an enabling factor that facilitates the ease with which BA users recall from memory past events associated with big data interpretation, thus reducing the likelihood of forgetting relevant information. Under uncertainty during data interpretation and decision-making, availability heuristics provided by stories support BA users in avoiding complex and time-consuming in-depth judgment. Instead, the human mind uses mental shortcuts for faster decision-making operations (Kahneman, 2011) that are enabled by data-driven storytelling.

In addition to the availability heuristic, *elaboration* is another cognitive mechanism (Swap *et al.*, 2001) that explains why storytelling in combination with BA visualizations enhances an individual's ability to interpret data and make decisions. BA data-driven stories comprise both technical data and business knowledge that employees can relate to based on their personal experience. Employees will remember these stories because elaborating on visual technical data with verbal business information stimulates the development of *conceptually* coherent mental images. Correspondingly, during real-time data interpretation and decision-making, stories provide a way to recall meaningful information that is associated with these vivid mental images (Swap *et al.*, 2001). Finally, when BA users hear stories, the received knowledge from this experience is stored immediately in episodic memory (Swap *et al.*, 2001), and it is easily retrievable when needed during later data interpretation and decision-making.

Cognitive psychologists have found that problem solving and decision-making quality decrease with information overload (Eppler and Mengis, 2004). To decrease the information overload that BA users encounter when interpreting data and making decisions, storytelling provides a heuristic that helps to process large amounts of raw data by compressing it into precise, valuable business insights. Data-driven storytelling therefore provides a convenient format for dealing with big data, reducing a large set of data alternatives to simpler heuristics (Gigerenzer *et al.*, 1999) that aid decision-making.

When BA users hear a story, that experience activates Broca's and Wernicke's areas – regions of the brain responsible for processing linguistic information; other brain regions are also activated, including the sensory, visual, motor and frontal cortices (Gazzaniga *et al.*, 2014; Snyder, 2016). Storytelling activates the human brain in such a way that listeners respond and relate to the information being told on a deeper level, hence retaining this knowledge in long-term memory (Snyder, 2016). Storytelling creates a *neural coupling effect* (Hasson *et al.*, 2012; Stephens *et al.*, 2010) that activates similar patterns in the brain of the storyteller and the listener, thus enabling the listener to connect to the storyteller and relate to the story both mentally and emotionally. During storytelling, listeners' brain activity mirrors the storyteller's brain activity, which, under optimal circumstances, leads to improved perception of BA data ease-of-use and usefulness. Correspondingly, BA data-driven stories are more effective in enhancing data interpretation and decision-making compared with reading a written technical document or following a technical BA demonstration.

5 Discussion

5.1 Theoretical implications

Synthesizing theoretical insights from BA, storytelling, behavioral research, linguistics, psychology and neuroscience, the present article introduces the new concept of *BA data-driven storytelling* and developed a model with propositions for future research. The study's theoretical contribution is threefold.

First, this study extends existing BA literature on *individual*-level adoption (Shahbaz *et al.*, 2019; Verma *et al.*, 2018) by illustrating how data-driven storytelling can facilitate BA use in organizations. While extant research has focused mainly on *organization*-level adoption of analytics (Caesarius and Hohenthal, 2018; Gunasekaran *et al.*, 2017; Kwon *et al.*, 2014; Lai *et al.*, 2018; Moktadir *et al.*, 2019), this study takes an opposite approach by exploring factors facilitating BA use at the *individual* level. Drawing on the increasing role of psychology in existing behavioral research (Abraham *et al.*, 2013; Bettiga and Lamberti, 2017; Kroenung *et al.*, 2017), this study is an attempt to stimulate further research on the psychological microfoundations of technology adoption, whether approached from a cognitive, an evolutionary or a behavioral neuroscience point of view.

Second, the present article contributes to extant BOR studies on BA (Hämäläinen *et al.*, 2013; White *et al.*, 2016) with a novel behavioral theory of the relationship between BA data-driven storytelling and BA use (Figure 2). Given the increasing importance of BA and challenges organizations face when integrating BA into daily operations (Agarwal and Dhar, 2014; Sivarajah *et al.*, 2017), this study responds to research calls for interdisciplinary OR studies (Becker, 2016; Brocklesby, 2016; Franco and Hämäläinen, 2016) by using linguistics, psychology and neuroscience to explain how storytelling improves data interpretation and decision-making quality. Contributing to the discussion on the challenges of BA-driven decision-making (Al-Kassab *et al.*, 2014; Kuechler and Vaishnavi, 2006; Vidgen *et al.*, 2017), this study enriches existing knowledge (Bumblauskas *et al.*, 2017; Li *et al.*, 2016) on the importance of improving data interpretation quality for decision-making. Whereas previously scholars have addressed the impact of information visualization (Zabukovec and Jaklic, 2015), data quality and people skills (Bose, 2009; Janssen *et al.*, 2017) on decision-making, we draw attention to storytelling as an alternative factor affecting BA data interpretation and decision-making

quality. Although we acknowledge the importance of data scientists (Costa and Santos, 2017; Harris and Mehrotra, 2014; Provost and Fawcett, 2013) and data translators (Brady *et al.*, 2017), we suggest that BA data-driven storytelling is an *alternative* approach that can be used to improve current employees' skills in turning data into business insights, hence reducing the need to hire new labor.

Third, our study extends the current state of storytelling literature in OR (Klein, 2009; Klein *et al.*, 2007; White *et al.*, 2016) by proposing and defining *BA data-driven storytelling* as a strategic sensemaking OR heuristic. The present study goes beyond the earlier understanding of storytelling as a creative problem-solving tool (Klein, 2009) or a narrative engineering tool (Klein *et al.*, 2007). Instead, we introduce a new implication of storytelling in supporting employees in BA data interpretation and data-driven decision-making. While prior studies have primarily explored storytelling as a visualization instrument (Gershon and Page, 2001; Kosara and Mackinlay, 2013; Ma *et al.*, 2012), this study extends the literature by taking the opposite approach, highlighting the importance of storytelling as a social communication technology (Dor, 2017) and as a verbal narrative heuristic that facilitates the transfer of technology as human social tradition (Boyd, 2017). As a result, this study increases the research field's attention to diverse implications of storytelling, and it encourages future research to continue exploring storytelling in an interdisciplinary OR context.

5.2 Managerial implications

To become successful in the digital age and to maximize the business potential of BA, managers should aim to understand behavioral and psychological factors influencing individual-level BA adoption. This article recommends that BA data-driven stories be disseminated within an organization to help BA users better interpret data and make informed decisions. We argue that deliberate storytelling can influence individuals' intentions to use BA daily in their jobs. The storytelling instructions and example of the BA data-driven story provided in the study should support and encourage managers in their own storytelling activities.

5.3 Limitations and future research directions

Although this article has provided preliminary insights into the role of storytelling in BA use and decision-making quality, it has a number of limitations. First, given the theoretical nature of this study, rigorous empirical research is needed to test the model and better understand the role of BA data-driven storytelling. Second, modeling human behavior is a challenging process involving unpredictable human behavior (Greasley and Owen, 2016). As a result, the behavioral model proposed in this study necessarily simplifies reality. Finally, we suggest that further BOR on BA is important not only for building theory on this emerging phenomenon but also for increasing this research field's attention to the practical challenges that practitioners face. We hope the present article stimulates new discussions and encourages scholars to invest further efforts into cross-disciplinary BA research.

6 Conclusion

The current synthesis of insights from OR, behavioral studies, linguistics, psychology, neuroscience, BA and storytelling has formed a theoretical framework on the basis of

which we introduced the concept of BA data-driven storytelling. We suggest that organizations using BA data-driven storytelling as a narrative sensemaking heuristic are able to support employees in BA data interpretation and data-driven decision-making, with the additional benefit of positively influencing employees in adopting BA and using it on a daily basis.

References

Abraham, C., Boudreau, M.-C., Junglas, I. and Watson, R. (2013), "Enriching our theoretical repertoire: the role of evolutionary psychology in technology acceptance", *European Journal of Information Systems,* Vol. 22 No. 1, pp. 56-75.

Agarwal, R. and Dhar, V. (2014), "Editorial—big data, data science, and analytics: the opportunity and challenge for IS research", *Information Systems Research,* Vol. 25 No. 3, pp. 443-448.

Al-Kassab, J., Ouertani, Z.M., Schiuma, G. and Neely, A. (2014), "Information visualization to support management decisions", *International Journal of Information Technology & Decision Making,* Vol. 13 No. 2, pp. 407-428.

Aydiner, A. S., Tatoglu, E., Bayraktar, E., Zaim, S. and Delen, D. (2019), "Business analytics and firm performance: the mediating role of business process performance", *Journal of Business Research*, Vol. 96, pp. 228-237.

Baker, B. (2014), "Use storytelling to engage and align employees around your strategic plans", *Industrial and Commercial Training,* Vol. 46 No. 1, pp. 25-28.

Barker, R.T. and Gower, K. (2010), "Strategic application of storytelling in organizations: toward effective communication in a diverse world", *Journal of Business Communication,* Vol. 47 No. 3, pp. 295-312.

Becker, K.H. (2016), "An outlook on behavioural OR – Three tasks, three pitfalls, one definition", *European Journal of Operational Research,* Vol. 249 No. 3, pp. 806-815.

Bettiga, D. and Lamberti, L. (2017), "Exploring the adoption process of personal technologies: a cognitive-affective approach", *The Journal of High Technology Management Research,* Vol. 28 No. 2, pp. 179-187.

Boldosova, V. (2019), "Deliberate storytelling in big data analytics adoption", *Information Systems Journal*, pp. 1-27.

Bose, R. (2009), "Advanced analytics: opportunities and challenges", *Industrial Management & Data Systems,* Vol. 109 No. 2, pp. 155-172.

Boyd, B. (2017), "The evolution of stories: from mimesis to language, from fact to fiction", *Wiley Interdisciplinary Reviews: Cognitive Science,* Vol. 9 No. 1, pp. 1-16.

Brady, C., Forde, M. and Chadwick, S. (2017), "Why your company needs data translators", *MIT Sloan Management Review,* Vol. 58 No. 2, pp. 14-16.

Brocklesby, J. (2016), "The what, the why and the how of behavioural operational research—an invitation to potential sceptics", *European Journal of Operational Research,* Vol. 249 No. 3, pp. 796-805.

Bumblauskas, D., Nold, H., Bumblauskas, P. and Igou, A. (2017), "Big data analytics: transforming data to action", *Business Process Management Journal,* Vol. 23 No. 3, pp. 703-720.

Caesarius, L.M. and Hohenthal, J. (2018), "Searching for big data", *Scandinavian Journal of Management,* Vol. 34 No. 2, pp. 129-140.

Calvard, T.S. (2016), "Big data, organizational learning, and sensemaking: theorizing interpretive challenges under conditions of dynamic complexity", *Management Learning,* Vol. 47 No. 1, pp. 65-82.

Carillo, K.D.A. (2017), "Let's stop trying to be "sexy" – preparing managers for the (big) data-driven business era", *Business Process Management Journal,* Vol. 23 No. 3, pp. 598-622.

Chen, H., Chiang, R.H.L. and Storey, V.C. (2012), "Business intelligence and analytics: from big data to big impact", *MIS Quarterly,* Vol. 36 No. 4, pp. 1165-1188.

Corley, K.G. and Gioia, D.A. (2011), "Building theory about theory building: what constitutes a theoretical contribution?", *Academy of Management Review,* Vol. 36 No. 1, pp. 12-32.

Cornelissen, J. (2017), "Editor's comments: developing propositions, a process model, or a typology? Addressing the challenges of writing theory without a boilerplate", *Academy of Management Review,* Vol. 42 No. 1, pp. 1-9.

Costa, C. and Santos, M.Y. (2017), "The data scientist profile and its representativeness in the European E-competence framework and the skills framework for the information age", *International Journal of Information Management,* Vol. 37 No. 6, pp. 726-734.

Cunha, M.P. and Rego, A. (2010), "Complexity, simplicity, simplexity", *European Management Journal,* Vol. 28 No. 2, pp. 85-94.

Davenport, T.H., Barth, P. and Bean, R. (2012), "How 'big data' is different", *MIT Sloan Management Review,* Vol. 54 No. 1, pp. 43-46.

Davenport, T.H. and Harris, J.G. (2007), *Competing on Analytics: The New Science of Winning,* Harvard Business School Press, Boston, MA.

Davenport, T.H. and Patil, D.J. (2012), "Data scientist: the sexiest job of the 21st century", *Harvard Business Review,* Vol. 90 No. 10, pp. 70-76.

Davison, R.M. (2016), "The art of storytelling", *Information Systems Journal,* Vol. 26 No. 3, pp. 191-194.

Dor, D. (2015), *The Instruction of Imagination: Language as a Social Communication Technology,* Oxford University Press, Oxford, UK.

Dor, D. (2017), "From experience to imagination: language and its evolution as a social communication technology", *Journal of Neurolinguistics,* Vol. 43, pp. 107-119.

Eppler, M.J. and Mengis, J. (2004), "The concept of information overload: a review of literature from organization science, accounting, marketing, MIS, and related disciplines", *The Information Society,* Vol. 20 No. 5, pp. 325-344.

Franco, L.A. and Hämäläinen, R.P. (2016), "Behavioural operational research: returning to the roots of the OR profession", *European Journal of Operational Research,* Vol. 249 No. 3, pp. 791-795.

Gabriel, Y. (2000), *Storytelling in Organizations: Facts, Fictions, and Fantasies,* Oxford University Press, Oxford, UK.

Gazzaniga, M., Ivry, R.B. and Mangun, G.R. (2014), *Cognitive Neuroscience: The Biology of the Mind,* W.W. Norton & Company, New York, NY.

Gershon, N. and Page, W. (2001), "What storytelling can do for information visualization", *Communications of the ACM,* Vol. 44 No. 8, pp. 31-37.

Gigerenzer, G., Todd, P.M. and ABC Research Group (1999), *Simple Heuristics that Make Us Smart,* Oxford University Press, Oxford, UK.

Greasley, A. and Owen, C. (2016), "Behavior in models: a framework for representing human behavior", in Kunc, M., Malpass, J. and White, L. (Eds.), *Behavioral Operational Research: Theory, Methodology and Practice,* Palgrave Macmillan, London, UK, pp. 47-63.

Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S.F., Childe, S.J., Hazen, B. and Akter, S. (2017), "Big data and predictive analytics for supply chain and organizational performance", *Journal of Business Research,* Vol. 70, pp. 308-317.

Hämäläinen, R.P., Luoma, J. and Saarinen, E. (2013), "On the importance of behavioral operational research: the case of understanding and communicating about dynamic systems", *European Journal of Operational Research,* Vol. 228 No. 3, pp. 623-634.

Harris, J.G. and Mehrotra, V. (2014), "Getting value from your data scientists", *MIT Sloan Management Review,* Vol. 56 No. 1, pp. 15-18.

Hasson, U., Ghazanfar, A.A., Galantucci, B., Garrod, S. and Keysers, C. (2012), "Brain-to-brain coupling: a mechanism for creating and sharing a social world", *Trends in Cognitive Sciences,* Vol. 16 No. 2, pp. 114-121.

Hindle, G.A. and Vidgen, R. (2017), "Developing a business analytics methodology: a case study in the foodbank sector", *European Journal of Operational Research,* Vol. 268 No. 3, pp. 836-851.

James, C.H. and Minnis, W.C. (2004), "Organizational storytelling: it makes sense", *Business Horizons,* Vol. 47 No. 4, pp. 23-32.

Janssen, M., van der Voort, H. and Wahyudi, A. (2017), "Factors influencing big data decision-making quality", *Journal of Business Research,* Vol. 70, pp. 338-345.

Kahneman, D. (2011), *Thinking, Fast and Slow,* Farrar, Straus and Giroux, New York, NY.

Katsikopoulos, K.V. (2016), "Behavior with models: the role of psychological heuristics in operational research", in Kunc, M., Malpass, J. and White, L. (Eds.), *Behavioral Operational Research: Theory, Methodology and Practice,* Palgrave Macmillan, London, UK, pp. 27-45.

Klein, J. (2009), "Ackoff's Fables revisited: stories to inform operational research practice", *Omega,* Vol. 37 No. 3, pp. 615-623.

Klein, J.H., Connell, N.A.D. and Meyer, E. (2007), "Operational research practice as storytelling", *Journal of the Operational Research Society,* Vol. 58 No. 12, pp. 1535-1542.

Kosara, R. and Mackinlay, J. (2013), "Storytelling: the next step for visualization", *Computer,* Vol. 46 No. 5, pp. 44-50.

Kroenung, J., Eckhardt, A. and Kuhlenkasper, T. (2017), "Conflicting behavioral paradigms and predicting IS adoption and non-adoption – the importance of group-based analysis", *Computers in Human Behavior,* Vol. 67, pp. 10-22.

Kuechler, W.L. and Vaishnavi, V. (2006), "So, talk to me: the effect of explicit goals on the comprehension of business process narratives", *MIS Quarterly,* Vol. 30 No. 4, pp. 961-979.

Kunc, M. and O'Brien, F. A. (2019), "The role of business analytics in supporting strategy processes: opportunities and limitations", *Journal of the Operational Research Society*, Vol. 70 No. 6, pp. 974-985.

Kwon, O., Lee, N. and Shin, B. (2014), "Data quality management, data usage experience and acquisition intention of big data analytics", *International Journal of Information Management,* Vol. 34 No. 3, pp. 387-394.

Lai, Y., Sun, H. and Ren, J. (2018), "Understanding the determinants of big data analytics (BDA) adoption in logistics and supply chain management: an empirical investigation", *The International Journal of Logistics Management,* Vol. 29 No. 2, pp. 676-703.

Laland, K.N., Sterelny, K., Odling-Smee, J., Hoppitt, W. and Uller, T. (2011), "Cause and effect in biology revisited: is Mayr's proximate-ultimate dichotomy still useful?", *Science,* Vol. 334 No. 6062, pp. 1512-1516.

Li, Y., Thomas, M.A. and Osei-Bryson, K.-M. (2016), "A snail shell process model for knowledge discovery via data analytics", *Decision Support Systems,* Vol. 91, pp. 1-12.

Liberatore, M.J. and Luo, W. (2010), "The analytics movement: implications for operations research", *Interfaces,* Vol. 40 No. 4, pp. 313-324.

Ma, K.-L., Liao, I., Frazier, J., Hauser, H. and Kostis, H.N. (2012), "Scientific storytelling using visualization", *IEEE Computer Graphics and Applications,* Vol. 32 No. 1, pp. 12-19.

MacLeod, C. and Campbell, L. (1992), "Memory accessibility and probability judgments: an experimental evaluation of the availability heuristic", *Journal of Personality and Social Psychology,* Vol. 63 No. 6, pp. 890-902.

Moktadir, M. A., Ali, S. M., Paul, S. K. and Shukla, N. (2019), "Barriers to big data analytics in manufacturing supply chains: a case study from Bangladesh", *Computers and Industrial Engineering*, Vol. 128, pp. 1063-1075.

Mortenson, M.J., Doherty, N.F. and Robinson, S. (2015), "Operational research from taylorism to terabytes: a research agenda for the analytics age", *European Journal of Operational Research,* Vol. 241 No. 3, pp. 583-595.

Provost, F. and Fawcett, T. (2013), "Data science and its relationship to big data and data-driven decision making", *Big Data,* Vol. 1 No. 1, pp. 51-59.

Ranyard, J.C., Fildes, R. and Hu, T.-I. (2015), "Reassessing the scope of OR practice: the influences of problem structuring methods and the analytics movement", *European Journal of Operational Research,* Vol. 245 No. 1, pp. 1-13.

Riessman, C.K. (1993), *Narrative Analysis,* Sage, Thousand Oaks, CA.

Royston, G. (2013), "Operational research for the real world: big questions from a small island", *Journal of the Operational Research Society,* Vol. 64 No. 6, pp. 793-804.

Seddon, P.B., Constantinidis, D., Tamm, T. and Dod, H. (2017), "How does business analytics contribute to business value?", *Information Systems Journal,* Vol. 27 No. 3, pp. 237-269.

Segel, E. and Heer, J. (2010), "Narrative visualization: telling stories with data", *IEEE Transactions on Visualization and Computer Graphics,* Vol. 16 No. 6, pp. 1139-1148.

Shahbaz, M., Gao, C., Zhai, L., Shahzad, F. and Hu, Y. (2019), "Investigating the adoption of big data analytics in healthcare: the moderating role of resistance to change", *Journal of Big Data,* Vol. 6 No. 6, pp. 1-20.

Sivarajah, U., Kamal, M.M., Irani, Z. and Weerakkody, V. (2017), "Critical analysis of big data challenges and analytical methods", *Journal of Business Research,* Vol. 70, pp. 263-286.

Snyder, R.A. (2016), *The Social Cognitive Neuroscience of Leading Organizational Change: TiER1 Performance Solutions' Guide for Managers and Consultants,* Routledge, New York, NY.

Stephens, G.J., Silbert, L.J. and Hasson, U. (2010), "Speaker-listener neural coupling underlies successful communication", *Proceedings of the National Academy of Sciences,* Vol. 107 No. 32, pp. 14425-14430.

Sunwolf and Frey, L.R. (2001), "Storytelling: the power of narrative communication and interpretation", in Robinson, W.P. and Giles, H. (Eds.), *The New Handbook of Language and Social Psychology,* Wiley, New York, NY, pp. 119-135.

Swap, W., Leonard, D., Shields, M. and Abrams, L. (2001), "Using mentoring and storytelling to transfer knowledge in the workplace", *Journal of Management Information Systems,* Vol. 18 No. 1, pp. 95-114.

Tversky, A. and Kahneman, D. (1973), "Availability: a heuristic for judging frequency and probability", *Cognitive Psychology,* Vol. 5 No. 2, pp. 207-232.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly,* Vol. 27 No. 3, pp. 425-478.

Verma, S., Bhattacharyya, S.S. and Kumar, S. (2018), "An extension of the technology acceptance model in the big data analytics system implementation environment", *Information Processing & Management,* Vol. 54 No. 5, pp. 791-806.

Vidgen, R., Shaw, S. and Grant, D.B. (2017), "Management challenges in creating value from business analytics", *European Journal of Operational Research,* Vol. 261 No. 2, pp. 626-639.

Wamba, S.F., Akter, S., Edwards, A., Chopin, G. and Gnanzou, D. (2015), "How 'big data' can make big impact: findings from a systematic review and a longitudinal case study", *International Journal of Production Economics,* Vol. 165, pp. 234-246.

Whetten, D.A. (1989), "What constitutes a theoretical contribution?", *Academy of Management Review,* Vol. 14 No. 4, pp. 490-495.

White, L., Burger, K. and Yearworth, M. (2016), "Big data and behavior in operational research: towards a "Smart OR"", in Kunc, M., Malpass, J. and White, L. (Eds.), *Behavioral Operational Research: Theory, Methodology and Practice,* Palgrave Macmillan, London, UK, pp. 177-193.

White, L. and Taket, A. (2000), "Exploring the use of narrative analysis as an operational research method: a case study in voluntary sector evaluation", *Journal of the Operational Research Society,* Vol. 51 No. 6, pp. 700-711.

Yang, C. (2013), "Telling tales at work", *Business Communication Quarterly,* Vol. 76 No. 2, pp. 132-154.

Yaqoob, I., Hashem, I.A.T., Gani, A., Mokhtar, S., Ahmed, E., Anuar, N.B. and Vasilakos, A.V. (2016), "Big data: from beginning to future", *International Journal of Information Management,* Vol. 36 No. 6, pp. 1231-1247.

Zabukovec, A. and Jaklič, J. (2015), "The impact of information visualisation on the quality of information in business decision-making", *International Journal of Technology and Human Interaction,* Vol. 11 No. 2, pp. 61-79.

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Research paper

Telling stories that sell: The role of storytelling and big data analytics in smart service sales

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ABSTRACT

The emergence of digitally connected products and big data analytics (BDA) in industrial marketing has attracted academic and managerial interest in smart services. However, suppliers' provision of smart services and customers' adoption of these services have received scarce attention in the literature, demonstrating the need to address the changing nature of customer-supplier interactions in the digital era. Responding to prior research calls, this study utilizes ethnographic research and a storytelling lens to advance our knowledge of how stories and BDA can enhance customers' attitudes toward suppliers' smart services, their behavioral intentions and their actual adoption of smart services. The study's findings demonstrate that storytelling is a collective sensemaking and sensegiving process that occurs in interactions between customers and suppliers in which both parties contribute to the story development. The use of BDA in storytelling enhances customer sensemaking of smart services by highlighting the business value extracted from the digitized data of a reference customer. By synthesizing insights from servitization, storytelling, BDA and the customer reference literature, this study offers managers practical guidance regarding how to increase smart service sales. An example of a story used to facilitate customer adoption of a supplier's smart services in the manufacturing sector is provided.

1. Introduction

The increasing importance of digital transformation has led to a shift in the focus of industrial marketing research toward digital servitization (Coreynen, Matthyssens, & van Bockhaven, 2017; Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019) and smart servitization (Kamp, Ochoa, & Diaz, 2017). These two servitization substreams are characterized by the transition of firms from manufacturing products to providing product-service offerings that generate value through embedded digital and smart technologies (Kohtamäki, Parida, Oghazi, Gebauer, & Baines, 2019). With the rapid emergence of new digitalization trends, large manufacturers, such as Rolls-Royce, Caterpillar, and Xerox, are continuously innovating their servitization business models and moving toward autonomous systems to remain competitive in the digital era (Baines & Lightfoot, 2013).

The interest of scholars and practitioners in big data (Sivarajah, Kamal, Irani, & Weerakkody, 2017; Yaqoob et al., 2016) and connected products (Porter & Heppelmann, 2014) has contributed to fundamental changes in the nature of industrial service offerings and the proliferation of research concerning smart services (Beverungen, Müller, Matzner, Mendling, & vom Brocke, 2017). Smart services continuously monitor and analyze remotely collected data and interact with smart connected products, thereby creating new preemptive value for customers (Porter & Heppelmann, 2014). For example, in the electronics sector, Hewlett-Packard offers customers a smart printing service that automatically detects a low toner level and makes a just-in-time order for a new cartridge to keep printers running cost-effectively (Allmendinger & Lombreglia, 2005). In the commercial vehicle industry, MAN Truck and Bus UK offer a fleet management service that detects unsafe driving styles and provides real-time feedback to drivers regarding hard braking, engine idling or excess speed, thus reducing maintenance costs and accidents (Baines & Lightfoot, 2013).

Over the past decade, numerous industrial marketing studies have attempted to bridge the service and behavioral sciences (Obal & Lancioni, 2013; Vaittinen, Martinsuo, & Ortt, 2018; Wünderlich, Wangenheim, & Bitner, 2012). However, the servitization field lacks research that improves our understanding of the behavioral issues underlying customer adoption of smart industrial services. This lack of knowledge of the mechanisms facilitating the adoption of smart services during customer-supplier interactions remains an obstacle that impedes successful smart servitization in organizations. To facilitate progress in industrial marketing and smart service sciences, this study addresses prior research calls for interdisciplinary studies and adopts a human-centered perspective to examine smart services and the

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transformed customer-supplier interaction in the digital era (Maglio, Kwan, & Spohrer, 2015; Medina-Borja, 2015; Wünderlich et al., 2015). From a managerial perspective, practitioners can gain new insight from the present study into how to overcome customers' behavioral barriers to smart services.

Due to the intangible nature of smart services, it is difficult for customers to perceive the value of the service offerings prior to their adoption, thereby making the process of service sales challenging for suppliers (Klein, Biehl, & Friedli, 2018). To facilitate the selling performance and reduce customers' uncertainty, suppliers tend to utilize customer reference marketing (Jaakkola & Aarikka-Stenroos, 2018; Ruokolainen & Aarikka-Stenroos, 2016; Terho & Jalkala, 2017). However, the existing literature lacks in-depth discussions of the practical and effective methods applied by firms in a B2B context when using existing customer relationships to target prospective customers. This study aims to fill this research gap by suggesting how managers can incorporate stories as organizational narratives in reference marketing to influence customer attitudes and behavior toward smart services.

Building upon the increasing role of storytelling in industrial marketing (Anaza, Kemp, Briggs, & Borders, 2019; Gilliam & Flaherty, 2015; Lacoste & La Rocca, 2015), this study utilizes a storytelling lens to explain how deliberate stories support smart service sales in a business-to-business (B2B) environment. In the context of this study, storytelling is a process of using compelling stories to persuade people to act in certain ways (Denning, 2006). For example, to influence internal technology adoption (Boldosova, 2019), stories can be distributed within an organization in a written form through internal marketing channels (e.g., e-mail newsletters and the Intranet) or verbally through in-person presentations (e.g., trainings and management meetings). Although previous research has explored how firms apply lessons learned from customer stories (Gorry & Westbrook, 2011), less research has investigated how suppliers create and disseminate stories to customers. By fulfilling this gap and unpacking supplier storytelling, this study enriches our understanding of the factors facilitating a supplier's performance in selling smart services. New knowledge regarding how to improve smart service sales may be of interest to practitioners aiming to increase their business revenue. Given the limited insight into collective storytelling in industrial marketing research (Lacoste & La Rocca, 2015), the present study advances the field by addressing the contribution of both customers and suppliers to storytelling.

The recent interest in data-driven connected products resulted in the emergence of big data analytics (BDA), i.e., technologies characterized by the utilization and processing of large data sets and the generation of predictive and prescriptive insight for informed decision-making (Delen & Zolbanin, 2018). In the healthcare industry, BDA can analyze patients' clinical records, lifestyles and habits to predict potential illness and reduce healthcare costs (Wang & Hajli, 2017). The use of BDA in e-commerce enables companies to track users' purchasing behavior, tastes and preferences and recommend products to consumers that they will be willing to buy (Akter & Wamba, 2016). Despite the emerging research illustrating the value of BDA to scholars and practitioners (Côrte-Real, Oliveira, & Ruivo, 2017; Côrte-Real, Ruivo, Oliveira, & Popovič, 2019; Wamba et al., 2017), studies addressing the enabling role of BDA in smart services are lacking. Fulfilling this research gap could advance suppliers' knowledge of new ways to exploit customer data from BDA in selling industrial smart services. This study could be useful to practitioners striving to build a data-driven organization by integrating big data and analytics into internal processes.

In response to the aforementioned research calls, the present study synthesizes insights from the industrial marketing, behavioral, narrative and information systems literature to explain the role of storytelling in customer adoption of suppliers' smart services. Building upon the ethnographic case study (ECS) methodology, this study is motivated by one overarching research question and two subquestions. First, why does storytelling facilitate customer adoption of suppliers' smart services in customer-supplier interactions? Second, building upon the first question, why are both customers and suppliers involved in storytelling? Third, why does BDA enhance storytelling?

The present study proposes a holistic approach toward storytelling as a collective sensemaking and sensegiving instrument by mapping key processes in customer-supplier interactions that underlie successful smart service sales. The proposed framework incorporates the roles of both customers and suppliers in storytelling and outlines how storytelling enhances customers' attitudes toward smart services, their behavioral intentions and actual smart service adoption. The study's findings provide useful and timely implications for practitioners working with smart services by revealing a novel way of utilizing BDA and storytelling in B2B sales.

2. Theoretical background

2.1. Customer adoption of smart services in the B2B context

An emerging community of researchers has engaged in applying a digitalization lens to explore servitization in manufacturing (Coreynen et al., 2017; Lenka, Parida, & Wincent, 2017) and the changing nature of customer-supplier relationships in the digital era (Obal & Lancioni, 2013). Servitization (Vandermerwe & Rada, 1988) is the transition of manufacturing firms from solely product-centered to providing integrated solutions comprising products and services (e.g., repair, maintenance, training, and consultancy). The focus on connected products and services has led to increasing scholarly interest in the research substream *digital servitization* (Kohtamäki et al., 2019; Sklyar et al., 2019; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017), which is defined as the integration of digital components into physical products and the provision of digitally enabled service offerings. In response to the digitization of industrial products transforming competition (Henfridsson, Mathiassen, & Svahn, 2014; Porter & Heppelmann, 2014), the service sciences have also witnessed a proliferation of research concerning *smart servitization* (Kamp et al., 2017) and *smart services* (Beverungen et al., 2017). Smart servitization refers to a traditional product provider's transition to offering a bundle of smart connected products with smart services (Kamp et al., 2017). In contrast to traditional or digital service offerings, smart services are preemptive service offerings enabled by connected devices self-generating, -diagnosing, -monitoring and -analyzing large volumes of field data in real time (Allmendinger & Lombreglia, 2005; Beverungen et al., 2017). For example, smart remote support and monitoring services independently collect product data through sensors and enable the monitoring of a product's condition, performance and usage to optimize product performance and enhance customer experience with the physical product (Porter & Heppelmann, 2014).

While numerous studies have examined digital transformation in servitization (Cenamor, Sjödin, & Parida, 2017; Holmström & Partanen, 2014; Pagani & Pardo, 2017; Vendrell-Herrero et al., 2017) and the role of smart services (Bello & Zeadally, 2019; Geum, Jeon, & Lee, 2016; Kamp et al., 2017), less attention has been paid to how the digital era has changed the nature of smart service adoption in B2B contexts. Beverungen et al. (2017) suggested that the provision of smart services transforms customer-supplier relationships as data exchange over the product lifetime creates continuous customer-supplier service interactions. Nevertheless, prior research has scarcely examined the transformed provision and adoption of industrial smart services in customer-supplier relationships (Wünderlich et al., 2012, 2015). Although prior research has explored the factors affecting the adoption of manufacturers' basic services (Vaittinen et al., 2018) and investigated the challenges in user perceptions of interactive service encounters (Wünderlich et al., 2012), there is a lack of studies on customer attitudes and adoption behavior toward suppliers' new *smart services* (Obal & Lancioni, 2013). By focusing on the barriers to the adoption of smart services, prior research (Klein et al., 2018; Töytäri et al., 2018) has

demonstrated that customers are not receptive to new services and fear granting digital access to their fleet. Customers tend to underestimate the value and intangible nature of smart services due to suppliers' ineffective communication and inability to convey a clear value proposition to customers (Klein et al., 2018; Töytäri et al., 2018). As a result, to enable successful servitization (Vaittinen et al., 2018), a further understanding of how to overcome customers' behavioral barriers in relation to suppliers' digitally enabled smart services is needed.

Kamp et al. (2017) highlighted that to unlock the full potential of smart servitization, it is necessary to build bridges between customers and suppliers to overcome cognitive barriers and improve customers' attitudes toward remote data collection and smart services. To further understand the implications of smart services, there is a need to unpack the human-centered perspective (Maglio et al., 2015) and advance our knowledge of how to influence human behavior, attitudes and perceptions in relation to smart service offerings. Therefore, following the recommendations of prior research (Lilien, 2016; Medina-Borja, 2015; Wiersema, 2013; Wünderlich et al., 2015), this interdisciplinary study aims to contribute to the discussion regarding customer adoption of suppliers' smart services and B2B interactions in the digital age.

2.2. Storytelling in customer-supplier interactions

Studies performed in various organizational contexts have demonstrated the powerful role of storytelling in management (Denning, 2006; James & Minnis, 2004), marketing (Spear & Roper, 2013), operations (Klein, Connell, & Meyer, 2007), information systems (Boldosova, 2019), and psychology (Yang, 2013). Frequently used as an equivalent to a narrative (Brown & Jones, 1998; Humphreys & Brown, 2002), storytelling refers to the use of stories with a plot and characters (Gabriel, 2000) or a "sequence of actions and experiences done or undergone by a certain number of people, whether real or imaginary" (Ricoeur, 1984, p. 150).

Extant research (Boje, 1991, 2008) has viewed storytelling in organizations as a *sensemaking instrument* that supports individual interpretations of past, present and future events and communicates socially constructed meanings to others through stories. Sensemaking is often combined with an interrelated concept, i.e., *sensegiving,* which is defined as an interpretive process (Bartunek, Krim, Necochea, & Humphries, 1999) of "attempting to influence the sensemaking and meaning construction of others toward a preferred redefinition of organizational reality" (Gioia & Chittipeddi, 1991, p. 442). For example, middle and senior management engages in sensegiving when attempting to influence the construction of meanings in organizations through stories in times of strategic change management (Dunford & Jones, 2000; Snell, 2002). Correspondingly, extant research concerning storytelling activities in organizations has been approached from both the sensemaking and sensegiving perspectives, providing multiple insights into how stories can be used for the purposes of interpreting, influencing and persuading in organizations (Maitlis & Lawrence, 2007).

Despite the wide acknowledgment of the importance of storytelling, limited studies in the literature have attempted to understand storytelling in B2B interactions. Industrial marketing scholars (Gilliam & Flaherty, 2015) introduced the role of storytelling in the field and suggested that storytelling plays an informing, persuading and bonding role in buyer-seller exchange interactions. In contrast, Lacoste and La Rocca (2015) proposed that storytelling in B2B selling is not performed solely by suppliers; instead, buyers play an active role in storytelling and value cocreation. Additionally, Anaza et al. (2019) suggested that stories in B2B advertisements are positively related to customer trust in the supplier, personal connection, and advocacy. Prior research has also explored the use of narratives when advertising a service brand image (Padgett & Allen, 1997) and customer storytelling as qualitative feedback absorbed and exploited by companies to improve customer relations (Gorry & Westbrook, 2011).

While existing research has focused on customer storytelling (Gorry & Westbrook, 2011), our present understanding of *supplier storytelling* implications in B2B services sales remains narrow. Gilliam and Flaherty (2015) suggested that future research should devote more attention to the implications of storytelling for selling services and the role of reference customers in storytelling. Given the intangible nature of service offerings, investigating suppliers' use of storytelling with customers can provide new insight into how to improve service sales. Additionally, prior industrial marketing research has called for more studies addressing storytelling in B2B markets as a collective sensemaking process (Dawson & McLean, 2013; Lacoste & La Rocca, 2015). As a result, building upon prior research suggestions (Gilliam & Flaherty, 2015; Lacoste & La Rocca, 2015) and the increasing importance of smart services (Wünderlich et al., 2015), this ethnographic study aims to deepen our knowledge of the facilitating role of storytelling in customer-supplier interactions in smart service sales.

2.3. Big data analytics, customer references and storytelling

The digitization of industrial products and the emergence of digital data streams (Piccoli & Pigni, 2013) have led to a growing interest among researchers in data-driven service offerings (Herterich, Uebernickel, & Brenner, 2016). An increasing number of servitizing original equipment manufacturers (OEMs) are utilizing installed base equipment (or fleet) information to gain a better understanding of customers and drive industrial service sales (Stormi, Laine, Suomala, & Elomaa, 2017). By digitizing the installed product base, OEMs can compare operational customer data and use these data as leverage for new reactive and proactive service offerings (Herterich et al., 2016).

However, big data are not self-explanatory in nature, and traditional data processing applications (e.g., relational databases) are not capable of deriving useful insights from large and complex data sets (Müller, Junglas, Brocke, & Debortoli, 2016). Hence, new BDA techniques with advanced computational logic are needed to understand customers' equipment usage and their potential needs (Müller et al., 2016). BDA is a new generation of advanced technologies used to collect, process and visualize large volumes of data to generate descriptive, predictive and prescriptive insights and support decision-making in organizations (Davenport & Harris, 2007; Delen & Zolbanin, 2018; Mortenson, Doherty, & Robinson, 2015). The use of BDA supports service providers in the process of deriving business value from digitized industrial data and utilize meaningful insights for data-driven services (Ehret & Wirtz, 2017). Despite the relevance of BDA in the digital era, there is a lack of research explaining how suppliers can further utilize BDA in smart services, which are driven by large volumes of product-related data collected through sensors. Fulfilling this research gap and generating new knowledge on how customer data extracted from BDA can be exploited during the smart service selling process could provide researchers and practitioners new perspectives regarding the value of BDA in B2B sales (Côrte-Real et al., 2017, 2019; Wamba et al., 2017).

Given the intangible nature of services and unfamiliarity with their value, prospective customers tend to demonstrate interest in word-of-mouth recommendations and seek to hear about the successful service experiences of other customers (Solnet & Kandampully, 2008). Customer referencing reduces prospective customers' perceived risk of the service based on evidence of operational functionality (Jaakkola & Aarikka-Stenroos, 2018) and decreases customers' uncertainty (Hada, Grewal, & Lilien, 2014). Additionally, customer references support sales processes by increasing customers' purchase intentions (Anderson & Wynstra, 2010) and facilitating suppliers' selling performance (Terho & Jalkala, 2017). Despite the variety of studies concerning customer referencing in industrial marketing, the practical and effective means of customer reference marketing in smart service sales remain unclear. Because BDA provides tangible digitized data as evidence of customers' experience with smart services, this explanatory study aims to reveal a new application of BDA in reference customer stories to facilitate

service sales. Building upon existing research addressing customers' contributions to the customer reference-building process (Ruokolainen & Aarikka-Stenroos, 2016), the present study aims to further delineate the practice of using customer references in B2B interactions in which both the suppliers' and customers' input is considered in developing reference storytelling material. In light of the increasing but limited research concerning storytelling opportunities due to big data and analytics (Boldosova & Luoto, 2019), this study aims to further advance this literature by explaining how storytelling from BDA can facilitate customers' sensemaking of suppliers' smart service offerings.

3. Methodology

3.1. Research approach

This study is explanatory (Yin, 1994) in nature because it aims to answer 'why' questions regarding the role of storytelling and BDA in customer adoption of suppliers' smart services. Although the existing literature provides some evidence on the theoretical constructs discussed in this study (e.g., smart services, storytelling, BDA, and customer referencing), the cause-and-effect relationships among storytelling, BDA and smart service sales remain unclear. As a result, this study seeks to explain why and how these relationships exist.

The underlying philosophical paradigm guiding the methodology of this study is interpretivism, which aims to understand the studied phenomenon through an interpretation of the meanings people assign to it (Gummesson, 2003; Walsham, 1995). Driven by the need to observe, interpret and explicate customer-supplier interactions, this study adopts an ECS as the methodological approach (Visconti, 2010). The use of a single ECS is favored here because it allows researchers to be immersed in the studied business context, collect rich data, and observe and interpret everyday behaviors and processes in organizational reality. Abductive reasoning (Dubois & Gadde, 2002; Van Maanen, Sorensen, & Mitchell, 2007) enables an interplay between theoretical knowledge and empirical data, leading to theory building and bridging the gap between academic and managerial communities. This study follows the recommendations of prior research regarding the methodological choices to be used in the industrial marketing literature (Beverland & Lindgreen, 2010; Visconti, 2010; Wagner, Lukassen, & Mahlendorf, 2010) and extends the use of interpretative methods in contemporary business contexts.

Following the ECS model (Visconti, 2010), the research process started with the goal-setting phase, which was followed by the sampling, immersion, data collection, data interpretation, and reporting phases. The purpose of undertaking this organizational ethnographic study over a period of two and a half years (September 2015–February 2018) was to gain an understanding of the role of storytelling and BDA in customers' adoption of suppliers' smart services by 1) mapping the processes of collecting and disseminating deliberate stories from the customer-supplier perspective and 2) exploring the content of smart service stories enhanced with BDA.

3.2. Case selection and description

During the sampling phase of this ethnographic research (Visconti, 2010), theoretical selection (Eisenhardt, 1989) and purposeful sampling (Eisenhardt & Graebner, 2007) approaches were utilized to identify and choose an information-rich case with unique circumstances. To be selected for inclusion, first, the case company needed to belong to a B2B industrial setting characterized by the provision of smart services. Second, the company needed to be involved in deliberate storytelling or undergoing a transformation into a storytelling organization. Third, the company needed to provide access to rich empirical data.

Based on these criteria, an organization referred to here as 'Steel Co.' (a pseudonym) was selected as a suitable case study. Steel Co. provides an appropriate context for addressing the research questions of this ethnographic study because it represents a unique, timely setting and provided rich research access to its people and resources. Steel Co. is a large international OEM operating in the sheet metal manufacturing industry that provides laser processing, punching, shearing and bending solutions supplemented with services. As a part of an ongoing servitization transformation, Steel Co. introduced a new smart service, i.e., 'Remote Monitoring and Diagnostics' (RM&D), to its existing service business portfolio, which previously comprised field service, spare parts, consultation and retrofit solutions. Focusing on a smart service-oriented business model in the B2B context, Steel Co. began integrating the RM&D service into the existing product portfolio and selling integrated sheet metal working technology with the smart service.

The RM&D smart service is a real-time remote monitoring service based on online machine usage data collected through sensors, controls, software and cameras installed in the Steel Co. machinery. The purpose of the RM&D service is to support customers' industrial assets by maximizing the machine uptime, improving productivity, and predicting and preventing potential failures. The RM&D service is based on proprietary cloud-based BDA software, i.e., 'Fleet Management', used internally by Steel Co. to obtain an overview of the entire fleet, support customers in real time in cases when unscheduled machine intervention is needed, and prescribe repairs based on analytical periodic reports. The use of BDA by the service and R&D departments allows significant reductions in field-service and spare-part management costs while enhancing future product innovation. The additional transparency created by the collection of machine usage and performance data supports warranty claims and service agreement discussions.

The RM&D service was introduced to the market in June 2015; faced with customer resistance to adopting a digitally powered service and the need to increase smart service sales, Steel Co. gradually began engaging in deliberate storytelling to customers. In particular, in August–September 2015, Steel Co. started intensively collecting customer success stories based on BDA fleet data and customer discussions, integrating storytelling into the smart service sales process, and disseminating stories to customers. During the research process, statistics related to customer adoption of the RM&D service were used to determine the increasing role of storytelling in Steel Co. (Fig. 1).

3.3. Ethnographic immersion

To enable the researcher's gradual immersion (Harrington, 2003; Visconti, 2010) in the Steel Co. environment, a desk in the open-plan office of the Steel Co. headquarters was provided to the researcher during the research period. The processes of increasing access to data and developing relationships in the field were supported by a gradual increase in field visits and participation in meetings and international trade events. The timespan of this study, i.e., two and a half years, facilitated in-depth longitudinal immersion in the setting, and the researcher's prior knowledge of the industry helped blur the boundary between the researcher and informants.

3.4. Data collection

The data collection and analysis were performed over a 30-month period from September 2015 to February 2018. The secondary and primary data were continuously collected throughout the duration of the research project and comprised participant observations, interviews, field notes and secondary archival data. All collected data were carefully analyzed, and relevant issues were selected to develop a new theory and report the study findings. An overview of the data collection process covering the research goals is provided in Table 1.

Participant observations (Delamont, 2004) were the primary source of data and were performed during field visits to Steel Co. headquarters, exhibition premises, and customers' production facilities. During the data collection period, the researcher participated in 22 service

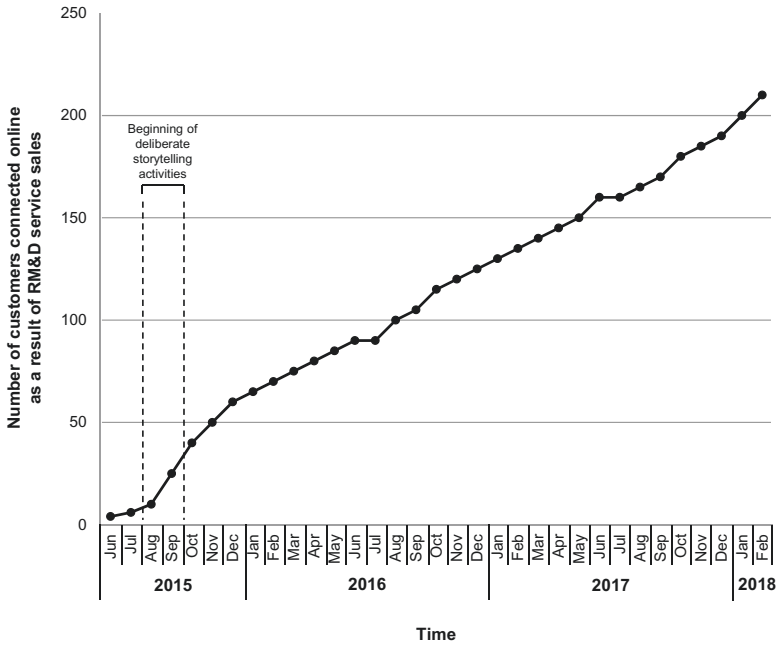

Fig. 1. Customer adoption of the RM&D service from June 2015 to February 2018.

meetings, 6 service trainings, 16 R&D project meetings, 9 customer meetings, and 2 international trade events. The ability to gain access to natural organizational settings and obtain a rich understanding of the complex organizational reality is considered an advantage of this ethnographic study.

Additional primary data were derived from 32 formal face-to-face interviews. The sample size was not predetermined, and the interview data collection continued until theoretical saturation (Corbin & Strauss, 1990; Saunders et al., 2017), i.e., a point after which no new data emerge to support data interpretation and the number of recurrences in the responses is high, was reached. The sample size requirements in qualitative research have been a subject of continuous scholarly discussions (Boddy, 2016). Prior research (Guest, Bunce, & Johnson, 2006) suggested that 12 interviews are sufficient to reach the saturation point, while Marshall, Cardon, Poddar, and Fontenot (2013) argued that the minimum number of interviews in a qualitative study should be between 20 and 30. Other researchers (Gerson & Horowitz, 2002) have claimed that the sample size should be between 60 and 150. Based on the diversity of findings in the extant literature, the sample size utilized in this study (32 interviews) is considered appropriate since the main goal, i.e., theoretical saturation, was reached. To enable access to the most valuable and reliable data, key competent informants in Steel Co. were identified by means of purposeful and snowball sampling (Eisenhardt, 1989; Yin, 1994).

To explore and capture the complexity of the studied phenomenon, interviews were conducted with members at different organizational levels, including Service Managers, a Global Support and Spare Parts Support Manager, an O&M Maintenance Coordinator, the Vice President of Service, Software Managers, Training Managers, Software Engineers, Sales Managers, Senior Managers, Marketing Managers, and the Vice President of Sales and Marketing (Table 2). The heterogeneity of the sample maximized the generation of theoretical constructs from diverse and thick data. Each interview lasted between 39 and 75 min and was recorded and transcribed verbatim. All interviewees were guaranteed anonymity. The interview data were collected using in-depth semistructured interviews (Yin, 1994) during which the respondents were given an opportunity to share their attitudes and experiences with internal storytelling practices. The interview guide was developed a priori and comprised open-ended questions. An outline of the topics discussed during the interviews is illustrated in the Appendix. The interview questions and the purpose of the interviews varied depending on the respondent's organizational background and experience with storytelling.

The data collection process was complemented by 92 field notes (1–2 pages per interview or meeting) continuously recorded by the researcher to support the data interpretation process and identify relevant patterns. The field notes comprised both descriptive and reflective content to record a factual description of the setting and the researcher's interpretations as they emerged during the observations. From a methodological standpoint, an ECS is rooted in observations of activities, events, people, behavior, and reflections during fieldwork with the aim of becoming immersed in the organizational culture being studied (Visconti, 2010). Although field notes are not a prevalent data collection technique in a traditional ECS, observation notes are central to qualitative research, such as ethnography (Creese, Bhatt, Bhojani, & Martin, 2008; Walford, 2009) and case studies (Yin, 1994). Hence, given the research timespan of two and half years, the recording of field notes helped track the accumulating insights and strengthen theory building.

Finally, the primary data were validated and supplemented with an extensive number of secondary documentary data provided by Steel Co. comprising RM&D service adoption statistics, RM&D training material, BDA project reporting, product sales and service sales presentations, marketing material and meeting minutes.

3.5. Data interpretation

Following ECS research guidelines (Van Maanen, 1979; Visconti, 2010), the data interpretation process was iterative and comprised a continuous interplay among emerging theory, empirical data,

Table 1
Data collection.

Type	Data source	Description	Duration/Quantity	Research purpose
Primary data	Participant observations	22 service meetings	90–240 min per meeting	Immersion into RM&D service development and commercialization processes. Understand organizational practices in the collection and dissemination of stories.
		6 service trainings	2 full working days per training	
		16 R&D project meetings	60–180 min per meeting	Become familiar with BDA functionalities, BDA software development and integration processes.
		9 customer meetings	60–90 min per meeting	Recognize the role of BDA in storytelling.
		2 international trade events	4 full working days per event	Explore the role of storytelling in customer discussions and RM&D service sales. Understand the role of customers in storytelling. Collect examples of success stories and identify story patterns.
	Interview	32 face-to-face semistructured and open-ended interviews with key respondents from the service, R&D, marketing and sales departments	39–75 min per interview	Gain insights from the service, R&D, marketing and sales departments into storytelling practices and RM&D service adoption behavior.
	Field notes	92 pages of field notes from interviews, meetings and site visits	1–2 pages per interview/meeting	Strengthen data collection and interpretation.
Secondary data	Archival data	RM&D service adoption statistics, product sales and service sales presentations, marketing material and meeting minutes	Over 300 items	Become familiar with the organizational setting. Support and validate findings through data triangulation.

Table 2
Data description.

Organizational function	Job title	Number of respondents	Identification code	Duration in min
Service	Service Manager	13	S1	49
			S2	66
			S3	40
			S4	45
			S5	52
			S6	48
			S7	50
			S8	58
			S9	70
			S10	41
			S11	62
			S12	67
			S13	60
	Global Support and Spare Parts Support Manager	1	S14	49
	O&M Maintenance Coordinator	1	S15	56
	Vice President of Service	1	S16	61
R&D	Software Manager	2	RD1	75
			RD2	46
	Training Manager	1	RD3	58
	Software Engineer	2	RD4	41
			RD5	40
Marketing and Sales	Sales Manager	6	MS1	42
			MS2	54
			MS3	58
			MS4	47
			MS5	63
			MS6	39
	Senior Manager	2	MS7	72
			MS8	50
	Marketing Manager	2	MS9	45
			MS10	53
	Vice President of Sales and Marketing	1	MS11	40
Total:		32		1697

secondary data and the prior literature. The data were categorized using a three-stage approach, and the purpose of the data interpretation was to identify constructs, relationships, and patterns of storytelling practices in Steel Co. that enabled customer adoption of the smart service. The data structure and coding procedure are summarized in Fig. 2. The first-order codes were derived from the interviews and observational data by means of a thorough qualitative content analysis of the interview transcripts and field notes for internal consistency. The second-order constructs were generated by the researcher's interpretation of the patterns observed in the first-order data. Finally, the refinement of the second-order theoretical explanations resulted in the emergence of aggregate theoretical dimensions. During the final stage of the data analysis procedure, the preliminary results were discussed with key respondents in Steel Co. to verify the quality and validity of the findings.

3.6. Data quality

To ensure rigor during the data collection and interpretation, the research process incorporated several measures to ensure credibility,

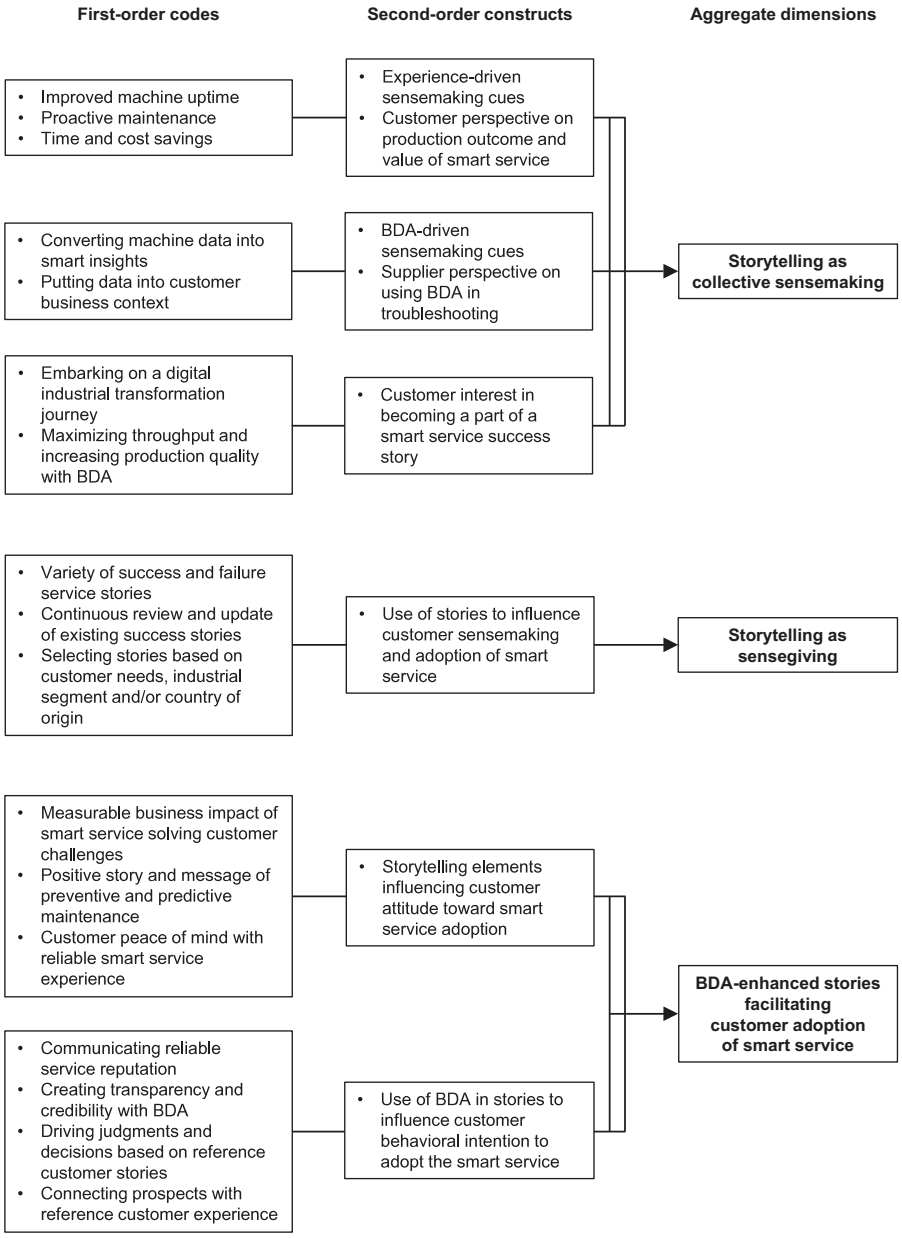

Fig. 2. Data structure.

transferability, dependability, and confirmability (Guba, 1981). Research credibility was achieved by triangulating the participant observation data, individual interviews, field notes, and secondary documentary data. The use of different data collection methods and a wide range of respondents enhanced the data quality and verified the data accuracy. During the research process, the respondents were encouraged to provide feedback regarding the discussed topics, and an iterative questioning technique was utilized to address data discrepancies. To ensure the transferability of the research findings, a detailed description of the studied phenomenon and research setting was provided. Nevertheless, the unique illustrative nature of this study suggests difficulty in extrapolating the findings to other research contexts. In addressing dependability, the interview data were recorded following a thorough explanation of the research design. Data confirmability was achieved by the use of illustrative quotations to support the research claims and accurately portray the respondents' view of the organizational reality.

4. Results

The findings from the data analysis provide insight into how the case company employed storytelling as a collective sensemaking and

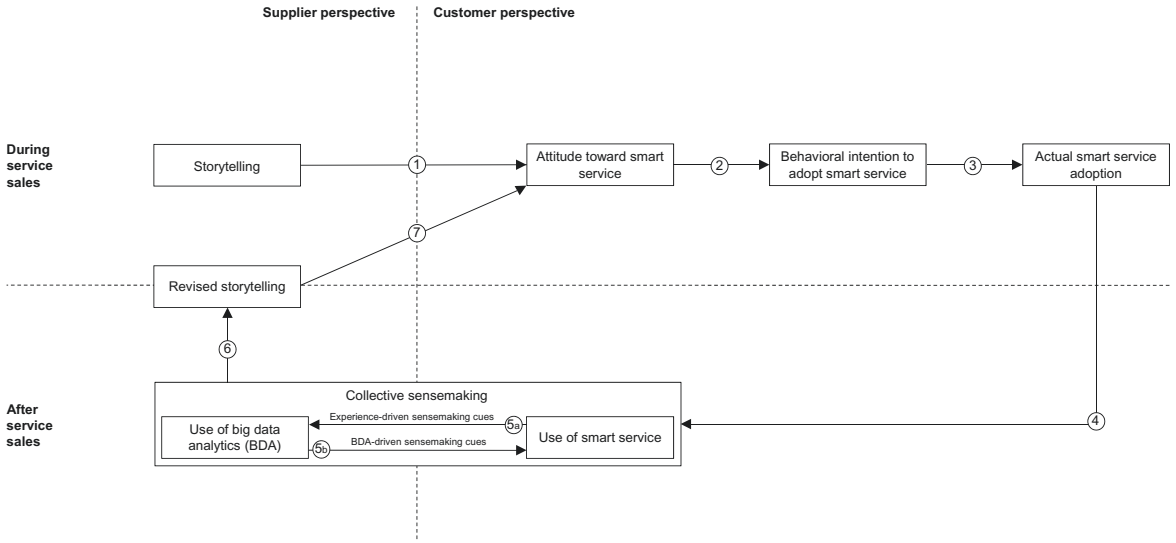

Fig. 3. Storytelling in smart service sales.

sensegiving instrument to improve customers' adoption of a smart service. The findings highlight the importance of BDA in storytelling, and an illustrative example of a smart service story utilized by the case company is provided. Drawing upon the dyadic relationship between suppliers and customers, Fig. 3 summarizes the observations from the empirical study, which are further discussed in detail in the remainder of this section.

The reporting of the study findings is supported with illustrative interview quotations to explain human behavior through the individuals' own words. Despite the extensive observations during the research period, the observational data do not directly disclose the respondents' personal experiences and opinions. Hence, the researcher's interpretations in this section are complemented with verbal accounts produced by the interviewees to ensure transparency, minimize researcher bias and demonstrate to the readers how the researcher arrived at the research findings.

4.1. Role of storytelling in smart service sales

Based on the evidence gathered and interpreted, storytelling is a collective sensemaking process involving both suppliers and customers during the exchange of sensemaking cues (see Fig. 3 arrows 5a and 5b) after customers adopt the smart service (arrow 4). The smart service story development begins when a customer and the supplier attempt to make sense of an unexpected event caused by a machine malfunction and aim to jointly construct a course of further actions. During the processes of real-time troubleshooting and predictive or preventive maintenance, the customer uses *experience-driven sensemaking cues* acquired from the factory (arrow 5a), while the supplier utilizes *data-driven cues* derived with the help of BDA (arrow 5b) to reach the desired service outcome:

"Storytelling is all about listening to the customer needs and experiences and interacting accordingly. A lot of story content comes from the customer. On our behalf, BDA provides the rest of the story. At the end of the day, there is always our and a customer perspective in the story." (S7).

Storytelling is a collective sensemaking process that comprises collective interpretive efforts to improve machine uptime remotely and contribute to a smart service success story from both the customer and supplier perspectives. Supplier storytelling is dynamic in nature and is continuously revised and modified in light of new sensemaking cues emerging from the increasing installed base of customers who adopted the smart service (arrow 6):

"The storytelling quality grows with experience. Now, we have many more success stories to choose from than ever before." (S14).

Storytelling is produced in a communicative interaction between customers and suppliers during which both develop a shared meaning of the story. The suppliers' process of identifying customer references for service stories is enhanced by customers' willingness to cooperate to be publicly associated with Industry 4.0 and the digitalization hype:

"Customers nowadays are very interested in digitalization and Industry 4.0 solutions. Everyone wants to become a digital industrial leader. Basically, customers get some free marketing for their company because they can write their own story about connectivity and production analytics in our story." (M3).

The dissemination of smart service success stories occurs through internal channels (e.g., customer presentations during service sales) and external channels (e.g., customer magazines, newsletters, and website) that are continuously monitored for content coherence by the marketing department:

"Customers are much more interested in reading these stories than some technical update that we publish in the magazine. Customers want to learn about production challenges that other customers were able to solve with our service and how they can improve their own production efficiency." (MS11).

The sales managers are responsible for consulting the reference customer regarding the storyline, recording customers' answers to specific questions, drafting a story, and asking the reference customer to review the story before publishing:

"We have a few standard questions that we go through with a customer. Usually, we discuss the impact of the service and BDA software on the customers'production." (S10).

The marketing department provides additional support by generating an engaging headline and arranging a proper layout (e.g., pictures and bullet points) to highlight the important facts and attract customers' attention. To ensure the reference customers' privacy and data confidentiality, smart service stories are supported with BDA screenshots that conceal the customers' critical production details:

"New customers should not investigate too deeply how other customers are organizing their production. We always have to think how much we tell in our stories and what pictures we show." (S15).

The process of collective sensemaking in smart services generates

both *success* stories and *failure* stories; remote machine diagnostics and troubleshooting can be rapid or time consuming, resulting in satisfied and unsatisfied customers:

"Pilot customers get frequent machine alarms in the first couple of months. Then, we use BDA software to find solutions, spare parts arrive on time, and machine downtime is reduced. Even though the story started in a negative tone, the final result was successful. This shows that we take good care of our customers." (S1).

The service managers and sales managers use storytelling as a sensegiving instrument (arrows 1 and 7) that allows them to choose the stories to tell prospective customers to deliberately influence their attitude, behavioral intention to adopt the smart service and actual smart service adoption (arrows 2 and 3). Storytelling occurs throughout the entire service sales process following the identification of customer challenges and BDA software simulation:

"Telling stories is the best way to have a mutual understanding with the customer. After I tell a story, I see that customers better understand our complex processes. If you show them a service software demo, then the customers can see how well the software works, but customers still do not entirely understand what it means for their production." (S5).

To enhance customers' attitude toward and behavioral intention to adopt the smart service, suppliers' act of sensegiving (arrows 1 and 7) involves selecting appropriate stories tailored to prospective customers' country of origin, industrial segment and/or service needs:

"Speaking about a particular industrial segment or a market is a very good way to grab customers'attention. Whether it is an elevator company or a steel door manufacturer, you should speak the same language as the customer." (M6).

When building a relationship with a new industrial customer, a carefully selected service success story demonstrates the supplier's competence and reassures the customers of the supplier's brand credibility and reputation:

"Steel manufacturing companies tend to know each other very well, and they know what machinery, software and services everyone is using. In a new country or industrial segment where we are not so well known, the only way to convince the customer that we will fulfill our service promises is to provide success stories about local customers." (MS2).

The customers' attitude toward the smart service improves as the stories yield real, measurable value in the eyes of the prospective customers:

"Customers are not buying just the service – they are buying production efficiency." (MS5).

"Traveling to the customer and fixing a machine on-site takes two days, while fixing a machine remotely takes two hours. It is all about highlighting the real business impact on the customers." (S2).

When a reference customer's experience with the smart service is showcased, the behavior of prospective customers changes favorably, and such customers become more inclined to adopt the smart service (arrows 2 and 3):

"They [new customers] see that there are real customers that are making more money with our service. Customers become more convinced that we can do what we promise. When I tell them that we can predict the wearing out of the components or temperature overheating, customers often say: 'Oh yes, I didn't think about it before! It would be definitely an added value for us.' Usually, we sign the contract with the customer the same day." (S13).

Storytelling focusing on predictive or preventive maintenance enhances customers' attitude toward the smart service as the stories emphasize proactive problem detection rather than the negative aspects of real-time troubleshooting:

"Typically, customers see service in a negative light because of machine downtime, declined production and complaints. Now, we focus more on stories that send positive proactive messages. We emphasize remote connectivity, preventive support and collaboration with customers." (S6).

Stories highlighting continuous equipment monitoring and the reliability of smart services in the long term sell prospects peace of mind regarding their own production:

"Customers have their own business to take care of. What they need from us is peace of mind, reliability and trust." (MS8).

4.2. Big data analytics in smart service storytelling

Thus far, the study findings concentrated largely on illustrating the role of storytelling as a collective sensemaking and sensegiving instrument used to facilitate smart service sales (as reviewed in the previous section). In this section, the advantages of using BDA-enhanced stories are discussed, and an example of a smart service success story is provided to illustrate compelling storytelling.

The findings suggest that smart service storytelling revolves around machine usage data collected and processed by BDA. Drawing upon the supplier's challenge in selling an intangible service, the use of stories enhanced by a reference customer's online data blurs the line between physical equipment and digitized data value:

"The problem with selling a remote service to customers is that you cannot see or touch it. We use stories and BDA as flesh and bones to prove to customers what we are capable of. Customers tend to believe stories when they see that the story is complemented with real data automatically collected through machine controls." (S9).

BDA enables the supplier to psychologically influence customers' attitude toward the smart service by providing a visual overview of the globally connected installed base using these services:

"We have to remember how the human mind works. When customers need to enter a new area, such as a remote service, they step out of their comfort zone, but they try to return as quickly as possible. When you have a very well-known name as your reference customer, it is easier for other companies to make the same decision." (MS4).

To facilitate customers' sensemaking of the smart service, the success stories are enhanced with BDA visualizations highlighting business insights extracted from data:

"One of the best aspects of BDA is that even though we and the customers might not speak the same language, we have good visualizations of machine data. Numbers and graphs are an easy way to digest information." (S12).

The incorporation of BDA into a business setting helps prospective customers draw parallels between the reference customers' case and their own production. Customers' attitude and behavioral intention to adopt the smart service improve as they begin to consider how the smart service enabled by BDA could provide new unexpected insights and optimize their production:

"Just recently, I had a customer who complained about frequent machine stops during a specific time period of the day. I gave him an example of our customer who couldn't figure out why the setup of their machine took twice as much time as needed. I explained that we used BDA software to rewind to the setup process phase, and we discovered that a truck driver did not place sheet metal into the loading table correctly. The sheet clams couldn't reach for it, and it delayed the process. The customer immediately bought the idea because he realized that we have this remote service tool showing what is invisible to the naked human eye." (S8).

The example story frequently disseminated during service sales in Steel Co. is demonstrated in Fig. 4 to extend the reader's understanding of how storytelling is used to improve customer adoption of the smart service. During the interviews with Steel Co. representatives focused on internal storytelling practices (cf. Appendix), several examples of smart service stories were provided to the researcher, including the story shown in Fig. 4. During the data interpretation phase, several content patterns and characteristics of smart service stories were identified.

The smart service stories in Steel Co. usually begin with an engaging headline and a quotation illustrating a genuine customer experience with the smart service. Each story contains elements of descriptive analytics (what occurred in the customer's production?), diagnostic analytics (why did such an event occur?), predictive analytics (what is likely to occur next?), and prescriptive analytics (what steps should be taken to mitigate future risk?).

First, the story starts with a brief description of the reference

Smart Service – Boosting machine OEE with big data analytics — **Story title**

"In the past, we never thought that remote service could be so smart. Smart service helped us to improve our machine availability by 8% in the blink of an eye. From a relationship standpoint, we are happy to find a partner that assists us in continuous production improvements." (Manufacturing engineering manager, Alpha) — **Reference customer quotation**

Alpha is a large-sized company manufacturing a full line of steel furniture products that can be found in office buildings, schools, hospitals, and nursing and sport facilities. Alpha operates in nine other European locations and has approximately 300 employees. Alpha noticed a declining machine utilization rate and frequent machine stops affecting production performance over time for one of its manufacturing lines. Alpha's service technician examined the machine but could not find the root cause of the problem. As a result, Alpha contacted Steel Co.'s service unit to find the real cause of the machine stops. — **Reference customer background information and description of the problem (What occurred in the customer's production?)**

Steel Co. used big data analytics to access the machine timeline in order to determine what caused the machine to stop and to provide the best solution. Despite the fact that the service technician could not solve the problem, BDA software collects and analyzes alarms and triggers throughout the machine lifetime, which enabled Steel Co. to rewind to the unexpected machine stop. According to big data analytics, Alpha's machine operator was taking actions that were causing the decline in productivity. The machine operator made unplanned machine stops for 10-15 min. by opening the safety door and emptying the laser waste tray 3-4 times per day. Normally, the process of changing a full waste tray with an empty tray takes approximately 1 min. However, Alpha did not have another waste tray available, and as a result, the machine remained idle for at least an hour per day. — **Root cause analysis with big data analytics (Why did such an event occur?)**

Unless these unplanned losses are removed from the production process, Alpha will not be able to maximize its OEE, and it will continue dealing with delayed customer deliveries. To avoid these negative consequences, Steel Co. provided the customer with instructions on optimizing the operator's daily work and recommended the use of a spare waste tray. As a result, machine availability improved by 8%, increasing the manufacturing speed and supporting the customer's production efficiency. — **Solution and outcome (What is likely to occur next? What steps should be taken to mitigate future risk?)**

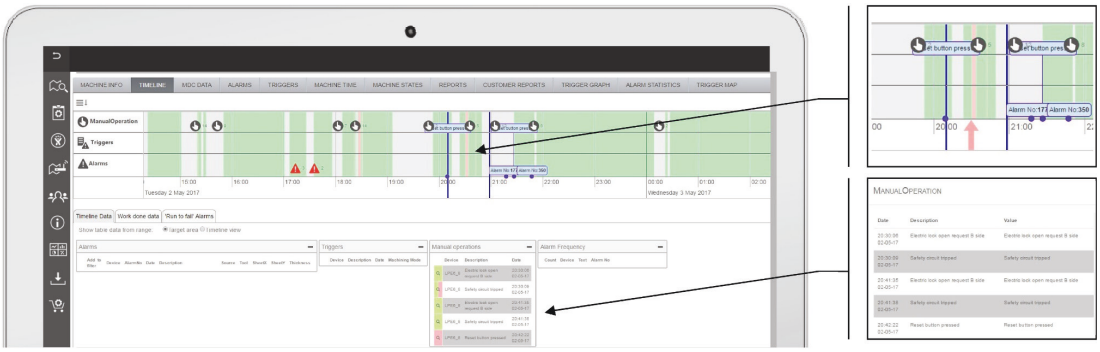

Fig. 4. Example of a smart service success story.

customer's background information. Second, the story describes the key challenge faced by the reference customer. The story continues by contrasting the obstacles encountered in human service diagnostic assessments with the use of BDA for the remote diagnosis of equipment malfunctions. Then, the story describes the potential future consequences of the failure. Finally, the story ends by providing a solution to the customer's challenge with the help of BDA.

Consistent with the earlier discussed interview findings regarding storytelling as a collective sensemaking process, the story example represents a content pattern in which both customer and supplier voices can be distinguished (cf. interviewee quotation by S7). The story comprises the customer's experience-driven sensemaking cues, where the customer makes sense of a declined/improved machine utilization rate (line numbers 6–8 and 19), and the supplier's data-driven cues, which originate from the use of BDA (line numbers 10–15). The illustrated example demonstrates how the story content is collectively produced through the contributions of both customers (line numbers 1–8 and 19) and suppliers (line numbers 10–18). Although this study provides a single example of a smart service story, the story description (Fig. 4) is intended to illustrate the essence of a compelling BDA-enhanced story.

5. Discussion

5.1. Theoretical implications

Drawing upon the industrial marketing, narrative and information systems literature, the present study addresses the existing gaps in the literature by explaining the role of storytelling and BDA in enhancing customer adoption of suppliers' smart services. The study's theoretical contribution is fourfold.

First, this study contributes by broadening the emerging literature on smart servitization (Bello & Zeadally, 2019; Beverungen et al., 2017; Geum et al., 2016) by providing a new perspective regarding the role of storytelling as a facilitating factor in customer adoption of suppliers' smart services. In response to prior research calls for a customer-oriented perspective of behavior and attitudes toward smart services (Kamp et al., 2017; Maglio et al., 2015; Medina-Borja, 2015; Wünderlich et al., 2015), the present study extends this line of research by capturing suppliers' storytelling practices and use of BDA to enhance customers' attitude toward smart services, their behavioral intention to adopt this service and their actual smart service adoption (Fig. 3). To record and explain the behavior of both customers and suppliers, Fig. 3 was constructed through several iterations of interpreting data from different sources. The triangulation of the observational data, interviews and field notes with secondary documentary data helped isolate invalid interpretations and enhance the quality of the findings. Whereas the existing industrial service research has focused on customer adoption of manufacturers' basic services (Vaittinen et al., 2018) and interactive services (Wünderlich et al., 2012), this study contributes to the servitization literature by taking a step forward and addressing the behavioral mechanisms underlying the successful adoption of industrial *smart services*. The present study was able to accomplish this goal by identifying an appropriate context for studying smart services and selecting an information-rich industrial case company in a B2B setting with unique circumstances. This study advances the emerging but limited literature concerning the internal and external barriers to the successful adoption of smart services in industrial marketing (Klein et al., 2018; Töytäri et al., 2018) by offering a novel storytelling solution to suppliers for overcoming customer resistance. As a result, this study expands the research field's consideration of the changing nature of customer-supplier interactions in the digital era, which is a topic previously neglected in the literature.

Second, given that previous research (Dawson & McLean, 2013; Lacoste & La Rocca, 2015) provided limited evidence regarding the relationship between storytelling and collective sensemaking, this study's findings enrich the storytelling literature by introducing storytelling as a *collective sensemaking and sensegiving instrument*. Responding

to the calls for the adoption of storytelling in industrial marketing research (Anaza et al., 2019; Gilliam & Flaherty, 2015), this study advances our understanding of storytelling in the B2B context by mapping the routinized mechanisms through which storytelling is collectively developed and disseminated in customer-supplier interactions (Fig. 3). To achieve this result, the interpretive ECS method supported the researcher in capturing the complexity of customer-supplier interactions through unique access to the case company, longitudinal immersion in the field and observations of everyday behaviors of customers and suppliers in their natural organizational setting. The empirical findings extend the limited discussion provided by Lacoste and La Rocca (2015) regarding the storytelling produced by both suppliers and customers in communicative interaction. In contrast to prior research focusing on the implications of customer stories (Gorry & Westbrook, 2011), this study advances the storytelling literature by exploring the role of *supplier storytelling* (Gilliam & Flaherty, 2015) in smart service sales. In contrast to the previously examined use of deliberate storytelling in *internal* technological change (Boldosova, 2019), the present study advances this research stream with a novel approach to deliberate storytelling *externally* with customers. To understand and explain how suppliers tell stories to existing and prospective customers, the researcher participated in various customer meetings and international trade fairs, where it was possible to observe supplier storytelling during negotiations and sales.

Third, the present study is an important addition to the sparse literature linking storytelling and analytics (Boldosova & Luoto, 2019) because it reveals a new way of utilizing BDA in storytelling and provides an illustrative example of a smart service story (Fig. 4). To ensure that the researcher's interpretations of storytelling are aligned with the organizational reality, respondents from the case company were continuously encouraged to provide feedback and verify the results. The study's findings demonstrate that suppliers can utilize BDA in stories as a novel strategic method to influence customer behavior in relation to smart services and minimize the customer's perceived risk from the hypothesized service value. To accurately illustrate the essence of the BDA-enhanced story shown in Fig. 4, the researcher conducted interviews with members at different organization levels (Service, R&D, and Marketing and Sales) to acquire multiple viewpoints and examples of internal storytelling practices in Steel Co. This study complements the current literature concerning the application of BDA in data-driven services in B2B firms (Ehret & Wirtz, 2017; Kamp et al., 2017) by demonstrating how reference customer data can be extracted from BDA and leveraged as digitized evidence of the smart service value during interactions with prospective customers. As a result, this study enriches research on BDA value (Côrte-Real et al., 2017, 2019; Wamba et al., 2017) by unlocking a new application of BDA in customer-supplier interactions to boost smart service sales. Being a temporary member of the studied organization supported the researcher in gaining knowledge regarding the relationship among BDA (Fleet Management), storytelling and smart service (Remote Monitoring and Diagnostics) in Steel Co., which would not have been possible without the ethnographic immersion.

Finally, to advance the prior literature concerning customer referencing in industrial marketing (Jaakkola & Aarikka-Stenroos, 2018; Ruokolainen & Aarikka-Stenroos, 2016; Terho & Jalkala, 2017), the present study reveals and explains a new way by which the use of stories in references provides a powerful means of highlighting suppliers' trustworthiness and facilitating their sales of smart services. While the existing literature has paid attention to conceptualizing and measuring the impact of customer references on selling performance (Anderson & Wynstra, 2010; Terho & Jalkala, 2017), this study adopts a different approach by showing what practically constitutes an effective *reference* in smart service sales (Fig. 4) and how stories can be incorporated into customer reference marketing. During the field observations, the researcher's prior knowledge of data-driven analytics and the sheet metal processing industry facilitated the process of gaining access to internal data and blurring the boundaries between the researcher and respondents. The present study's findings are aligned with extant research related to customer reference marketing (Terho & Jalkala, 2017) by highlighting the importance of building a balanced customer reference portfolio and collecting customer stories from different customer segments and geographic regions.

5.2. Managerial implications

The present study has several valuable implications for industrial firm managers who are attempting to embark on a digitalization journey or currently struggling with smart service sales. First, this study draws managerial attention to the importance of storytelling in business settings and encourages managers to deliberately create and disseminate stories to improve customers' attitudes toward smart services, behavioral intention to adopt smart services and actual adoption of smart services. In particular, organizations undergoing smart servitization transformation can use storytelling to increase their competitive advantage over other providers in the eyes of prospective customers and increase smart service sales.

Second, the process of smart service sales outlined in this study (Fig. 3) can help managers envision how storytelling is an interactive collective sensemaking process that can be integrated into service sales. An understanding of the factors underlying customers' attitudes and behavior toward smart services could help industrial firms improve their sales and marketing strategies. With the predefined process map (Fig. 3), managers responsible for sales or digital transformation can better familiarize employees with how to integrate stories in daily routines, change mindsets and transform the nature of the sales manager role toward storytelling (e.g., collecting reference customer stories and selecting which stories to disseminate based on customers' geographic region and industrial segment). The current study recommends that practitioners actively engage with customers in the after-service sales stage not only to support their production but also to collect reference customer success stories. Sales managers should continuously revise and systematically expand their portfolios of reference stories assuming that the number of customers adopting smart services increases. Given increasing customer interest in digitalization, to motivate existing customers to act as references, suppliers should highlight that such stories could further improve the customers' reputation by promoting their involvement in Industry 4.0 trends (smart services and BDA).

Third, given the increasing managerial interest in big data in B2B contexts, this study encourages managers to leverage the business potential of BDA in enhancing service operations. For example, prospective customers may be hesitant to invest in smart services because digitally enabled remote support is intangible, and the value of the service is unclear until its adoption. To overcome this challenge and minimize customers' perceived risk, suppliers can demonstrate to prospective customers the fleet data collected and processed by BDA for a reference customer as digitized evidence of the ability to extract business value with RM&D. Organizations considering investing in BDA technologies can use the current study's findings to communicate the potential value of BDA to the executive management team to justify BDA investments.

Finally, this study provides practical insights and guidance by offering a concrete example of a smart service story enhanced with BDA (Fig. 4). The present study encourages managers to utilize the proposed story structure as a template while developing their own stories related to smart services in an organization. According to the study's findings, the story should comprise a title, reference customer quotation, customer background information, description of the customer challenge, root cause analysis with BDA, potential future consequences, and prescribed solution with the help of BDA (Fig. 4). To realize the value of storytelling, sales managers are advised to closely cooperate with marketing departments in storytelling activities, such as creating the

story layout, copywriting and disseminating the stories to customers through different channels.

5.3. Limitations and future research avenues

Although this study offers new insight into the use of BDA and storytelling in smart service sales, it is subject to (at least) two limitations that provide avenues for future research. First, as the present study is qualitative in nature, the results are not generalizable to the population (Eisenhardt & Graebner, 2007); however, the proposed frameworks (Figs. 3 and 4) enhance our understanding of the role of storytelling in customer adoption of suppliers' smart services. Therefore, future research could conduct quantitative studies in different empirical contexts to validate the findings and potentially yield new insights and contributions to the literature. Another limitation of the study is that it mainly conducted research from the supplier perspective of storytelling. Hence, future research could advance our knowledge by exploring customer-oriented attitudes and perceptions and focusing on the enabling and inhibiting factors of smart service adoption. Finally, given the novelty and practical relevance of the studied phenomenon, the present study encourages future research to deepen our knowledge of the behavioral aspects of smart service adoption and the influencing role of BDA in communication among industrial actors.

6. Conclusions

The increasing role of digital transformation in servitization creates new opportunities and challenges for practitioners in exploiting the potential of industrial fleet, BDA and smart services. As customer reluctance to adopt suppliers' digitally enabled smart services remains an obstacle, suppliers are seeking new ways to influence customer behavior and increase service sales. To address this challenge, the present study suggests that practitioners use deliberate storytelling and BDA to improve customers' attitudes toward suppliers' smart services. The results of the study deepen our knowledge of storytelling as a collective sensemaking and sensegiving instrument created and utilized in a dialogue between customers and suppliers. This study is an important addition to the smart servitization, BDA, storytelling and customer referencing literature as it provides a new perspective for B2B firms showing how to succeed in selling smart services.

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Declaration of interest

None.

Appendix. Interview guide

Interview questions (further adapted to respondents from different departments)

- How do you see the role of storytelling in RD&M service sales?
- How does BDA software support the development of customer success stories?
- How do you collect customer success stories?
- How do (reference) customers contribute to story development?
- Under what circumstances do you usually tell stories?
- What is the purpose of using stories in discussions with prospective customers?
- What is the key message of the story?
- What is the usual content of the story?
- Could you give an example of an RD&M service success story?
- How effective is storytelling?
- How successful has storytelling been in RD&M service sales?
- How do prospective customers respond to stories about RD&M service?
- How do customers' attitudes and behaviors change after hearing a story?

References

Akter, S., & Wamba, S. F. (2016). Big data analytics in E-commerce: A systematic review and agenda for future research. *Electronic Markets, 26*(2), 173–194.

Allmendinger, G., & Lombreglia, R. (2005). Four strategies for the age of smart services. *Harvard Business Review, 83*(10), 131–134.

Anaza, N. A., Kemp, E., Briggs, E., & Borders, A. L. (2019). Tell me a story: The role of narrative transportation and the C-suite in B2B advertising. *Industrial Marketing Management.*. https://doi.org/10.1016/j.indmarman.2019.02.002.

Anderson, J. C., & Wynstra, F. (2010). Purchasing higher-value, higher-price offerings in business markets. *Journal of Business-to-Business Marketing, 17*(1), 29–61.

Baines, T., & Lightfoot, H. (2013). *To serve: How manufacturers can compete through servitization and product service systems. Chichester.* UK: John Wiley and Sons.

Bartunek, J., Krim, R., Necochea, R., & Humphries, M. (1999). Sensemaking, sensegiving, and leadership in strategic organizational development. In J. Wagner (Ed.). *Advances in qualitative organizational research* (pp. 37–71). Greenwich, CT: JAI Press.

Bello, O., & Zeadally, S. (2019). Toward efficient smartification of the internet of things (IoT) services. *Future Generation Computer Systems, 92*, 663–673.

Beverland, M., & Lindgreen, A. (2010). What makes a good case study? A positivist review of qualitative case research published in industrial marketing management, 1971–2006. *Industrial Marketing Management, 39*(1), 56–63.

Beverungen, D., Müller, O., Matzner, M., Mendling, J., & vom Brocke, J. (2017). Conceptualizing smart service systems. *Electronic Markets, 29*(1), 7–18.

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative Market Research: An International Journal, 19*(4), 426–432.

Boje, D. M. (1991). The storytelling organization: A study of story performance in an office- supply firm. *Administrative Science Quarterly, 36*(1), 106–126.

Boje, D. M. (2008). *Storytelling organizations.* London, UK: Sage.

Boldosova, V. (2019). Deliberate storytelling in big data analytics adoption. *Information Systems Journal,* 1–27. https://doi.org/10.1111/isj.12244.

Boldosova, V., & Luoto, S. (2019). Storytelling, business analytics and big data interpetation: Literature review and theoretical propositions. *Management Research Review.*. https://doi.org/10.1108/MRR-03-2019-0106.

Brown, A. D., & Jones, M. R. (1998). Doomed to failure: Narratives of inevitability and conspiracy in a failed IS project. *Organization Studies, 19*(1), 73–88.

Cenamor, J., Sjödin, D. R., & Parida, V. (2017). Adopting a platform approach in servitization: Leveraging the value of digitalization. *International Journal of Production Economics, 192*, 54–65.

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology, 13*(1), 3–21.

Coreynen, W., Matthyssens, P., & van Bockhaven, W. (2017). Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. *Industrial Marketing Management, 60*, 42–53.

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of big data analytics in European firms. *Journal of Business Research, 70*, 379–390.

Côrte-Real, N., Ruivo, P., Oliveira, T., & Popovič, A. (2019). Unlocking the drivers of big data analytics value in firms. *Journal of Business Research, 97*, 160–173.

Creese, A., Bhatt, A., Bhojani, N., & Martin, P. (2008). Fieldnotes in team ethnography: Researching complementary schools. *Qualitative Research, 8*(2), 197–215.

Davenport, T. H., & Harris, J. G. (2007). *Competing on analytics: The new science of winning.* Boston, MA: Harvard Business School Press.

Dawson, P., & McLean, P. (2013). Miners' tales: Stories and the storying process for understanding the collective sensemaking of employees during contested change. *Group and Organization Management, 38*(2), 198–229.

Delamont, S. (2004). Ethnography and participant observation. In C. Seale, G. Gobo, J. F. Gubrium, & D. Silverman (Eds.). *Qualitative research practice* (pp. 217–229). London, UK: Sage.

Delen, D., & Zolbanin, H. M. (2018). The analytics paradigm in business research. *Journal of Business Research, 90*, 186–195.

Denning, S. (2006). Effective storytelling: Strategic business narrative techniques. *Strategy & Leadership, 34*(1), 42–48.
Dubois, A., & Gadde, L.-E. (2002). Systematic combining: An abductive approach to case research. *Journal of Business Research, 55*(7), 553–560.
Dunford, R., & Jones, D. (2000). Narrative in strategic change. *Human Relations, 53*(9), 1207–1226.
Ehret, M., & Wirtz, J. (2017). Unlocking value from machines: Business models and the industrial internet of things. *Journal of Marketing Management, 33*(1–2), 111–130.
Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*(4), 532–550.
Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal, 50*(1), 25–32.
Gabriel, Y. (2000). *Storytelling in organizations: Facts, fictions, and fantasies.* Oxford, UK: Oxford University Press.
Gerson, K., & Horowitz, R. (2002). Observation and interviewing: Options and choices. In T. May (Ed.). *Qualitative research in action* (pp. 199–224). London, UK: Sage.
Geum, Y., Jeon, H., & Lee, H. (2016). Developing new smart services using integrated morphological analysis: Integration of the market-pull and technology-push approach. *Service Business, 10*(3), 531–555.
Gilliam, D. A., & Flaherty, K. E. (2015). Storytelling by the sales force and its effect on buyer–seller exchange. *Industrial Marketing Management, 46*, 132–142.
Gioia, D. A., & Chittipeddi, K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal, 12*(6), 433–448.
Gorry, G. A., & Westbrook, R. A. (2011). Can you hear me now? Learning from customer stories. *Business Horizons, 54*(6), 575–584.
Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology Journal, 29*(2), 75–91.
Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59–82.
Gummesson, E. (2003). All research is interpretive!. *Journal of Business & Industrial Marketing, 18*(6/7), 482–492.
Hada, M., Grewal, R., & Lilien, G. L. (2014). Supplier-selected referrals. *Journal of Marketing, 78*(2), 34–51.
Harrington, B. (2003). The social psychology of access in ethnographic research. *Journal of Contemporary Ethnography, 32*(5), 592–625.
Henfridsson, O., Mathiassen, L., & Svahn, F. (2014). Managing technological change in the digital age: The role of architectural frames. *Journal of Information Technology, 29*(1), 27–43.
Herterich, M. M., Uebernickel, F., & Brenner, W. (2016). Stepwise evolution of capabilities for harnessing digital data streams in data-driven industrial services. *MIS Quarterly Executive, 15*(4), 297–318.
Holmström, J., & Partanen, J. (2014). Digital manufacturing-driven transformations of service supply chains for complex products. *Supply Chain Management: An International Journal, 19*(4), 421–430.
Humphreys, M., & Brown, A. D. (2002). Narratives of organizational identity and identification: A case study of hegemony and resistance. *Organization Studies, 23*(3), 421–447.
Jaakkola, E., & Aarikka-Stenroos, L. (2018). Customer referencing as business actor engagement behavior-creating value in and beyond triadic settings. *Industrial Marketing Management, 80*, 27–42.
James, C. H., & Minnis, W. C. (2004). Organizational storytelling: It makes sense. *Business Horizons, 47*(4), 23–32.
Kamp, B., Ochoa, A., & Diaz, J. (2017). Smart servitization within the context of industrial user–supplier relationships: Contingencies according to a machine tool manufacturer. *International Journal on Interactive Design and Manufacturing (IJIDeM), 11*(3), 651–663.
Klein, M. M., Biehl, S. S., & Friedli, T. (2018). Barriers to smart services for manufacturing companies–an exploratory study in the capital goods industry. *Journal of Business & Industrial Marketing, 33*(6), 846–856.
Klein, J. H., Connell, N. A. D., & Meyer, E. (2007). Operational research practice as storytelling. *Journal of the Operational Research Society, 58*(12), 1535–1542.
Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research, 104*, 380–392.
Lacoste, S., & La Rocca, A. (2015). Commentary on "storytelling by the sales force and its effect on buyer–seller exchange" by David Gilliam and Karen Flaherty. *Industrial Marketing Management, 46*, 143–146.
Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & Marketing, 34*(1), 92–100.
Lilien, G. L. (2016). The B2B knowledge gap. *International Journal of Research in Marketing, 33*(3), 543–556.
Maglio, P. P., Kwan, S. K., & Spohrer, J. (2015). Commentary-toward a research agenda for human-centered service system innovation. *Service Science, 7*(1), 1–10.
Maitlis, S., & Lawrence, T. B. (2007). Triggers and enablers of sensegiving in organizations. *Academy of Management Journal, 50*(1), 57–84.
Marshall, B., Cardon, P., Poddar, A., & Fontenot, R. (2013). Does sample size matter in qualitative research? A review of qualitative interviews in IS research. *Journal of Computer Information Systems, 54*(1), 11–22.
Medina-Borja, A. (2015). Editorial column-smart things as service providers: A call for convergence of disciplines to build a research agenda for the service systems of the future. *Service Science, 7*(1), 2–5.
Mortenson, M. J., Doherty, N. F., & Robinson, S. (2015). Operational research from taylorism to terabytes: A research agenda for the analytics age. *European Journal of Operational Research, 241*(3), 583–595.
Müller, O., Junglas, I., Brocke, J. V., & Debortoli, S. (2016). Utilizing big data analytics for information systems research: Challenges, promises and guidelines. *European Journal of Information Systems, 25*(4), 289–302.
Obal, M., & Lancioni, R. A. (2013). Maximizing buyer–supplier relationships in the digital era: Concept and research agenda. *Industrial Marketing Management, 42*(6), 851–854.
Padgett, D., & Allen, D. (1997). Communicating experiences: A narrative approach to creating service brand image. *Journal of Advertising, 26*(4), 49–62.
Pagani, M., & Pardo, C. (2017). The impact of digital technology on relationships in a business network. *Industrial Marketing Management, 67*, 185–192.
Piccoli, G., & Pigni, F. (2013). Harvesting external data: The potential of digital data streams. *MIS Quarterly Executive, 12*(1), 53–64.
Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review, 92*(11), 11–64.
Ricoeur, P. (1984). *Time and narrative.* K. McLaughlin & D. Pellauer, Trans.Chicago, IL: University of Chicago Press.
Ruokolainen, J., & Aarikka-Stenroos, L. (2016). Rhetoric in customer referencing: Fortifying sales arguments in two start-up companies. *Industrial Marketing Management, 54*, 188–202.
Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., & Jinks, C. (2017). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity, 52*(4), 1893–1907.
Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research, 70*, 263–286.
Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research, 104*, 450–460.
Snell, R. S. (2002). The learning organization, sensegiving and psychological contracts: A Hong Kong case. *Organization Studies, 23*(4), 549–569.
Solnet, D., & Kandampully, J. (2008). How some service firms have become part of "service excellence" folklore: An exploratory study. *Managing Service Quality: An International Journal, 18*(2), 179–193.
Spear, S., & Roper, S. (2013). Using corporate stories to build the corporate brand: An impression management perspective. *Journal of Product & Brand Management, 22*(7), 491–501.
Stormi, K., Laine, T., Suomala, P., & Elomaa, T. (2017). Forecasting sales in industrial services: Modeling business potential with installed base information. *Journal of Service Management, 29*(2), 277–300.
Terho, H., & Jalkala, A. (2017). Customer reference marketing: Conceptualization, measurement and link to selling performance. *Industrial Marketing Management, 64*, 175–186.
Töytäri, P., Turunen, T., Klein, M., Eloranta, V., Biehl, S., & Rajala, R. (2018). Aligning the mindset and capabilities within a business network for successful adoption of smart services. *Journal of Product Innovation Management, 35*(5), 763–779.
Vaittinen, E., Martinsuo, M., & Ortt, R. (2018). Business customers' readiness to adopt manufacturer's new services. *Journal of Service Theory and Practice, 28*(1), 52–78.
Van Maanen, J. (1979). The fact of fiction in organizational ethnography. *Administrative Science Quarterly, 24*(4), 539–550.
Van Maanen, J., Sorensen, J. B., & Mitchell, T. R. (2007). The interplay between theory and method. *Academy of Management Review, 32*(4), 1145–1154.
Vandermerwe, S., & Rada, J. (1988). Servitization of business: Adding value by adding services. *European Management Journal, 6*(4), 314–324.
Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. (2017). Servitization, digitization and supply chain interdependency. *Industrial Marketing Management, 60*, 69–81.
Visconti, L. M. (2010). Ethnographic case study (ECS): Abductive modeling of ethnography and improving the relevance in business marketing research. *Industrial Marketing Management, 39*(1), 25–39.
Wagner, S. M., Lukassen, P., & Mahlendorf, M. (2010). Misused and missed use-grounded theory and objective hermeneutics as methods for research in industrial marketing. *Industrial Marketing Management, 39*(1), 5–15.
Walford, G. (2009). The practice of writing ethnographic fieldnotes. *Ethnography and Education, 4*(2), 117–130.
Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems, 4*(2), 74–81.
Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research, 70*, 356–365.
Wang, Y., & Hajli, N. (2017). Exploring the path to big data analytics success in healthcare. *Journal of Business Research, 70*, 287–299.
Wiersema, F. (2013). The B2B agenda: The current state of B2B marketing and a look ahead. *Industrial Marketing Management, 42*(4), 470–488.
Wünderlich, N. V., Heinonen, K., Ostrom, A. L., Patricio, L., Sousa, R., Voss, C., & Lemmink, J. G. A. M. (2015). "Futurizing" smart service: Implications for service researchers and managers. *Journal of Services Marketing, 29*(6/7), 442–447.
Wünderlich, N. V., Wangenheim, F. V., & Bitner, M. J. (2012). High tech and high touch: A framework for understanding user attitudes and behaviors related to smart interactive services. *Journal of Service Research, 16*(1), 3–20.
Yang, C. (2013). Telling tales at work: An evolutionary explanation. *Business Communication Quarterly, 76*(2), 132–154.
Yaqoob, I., Hashem, I. A. T., Gani, A., Mokhtar, S., Ahmed, E., Anuar, N. B., & Vasilakos, A. V. (2016). Big data: From beginning to future. *International Journal of Information Management, 36*(6), 1231–1247.
Yin, R. K. (1994). *Case study research: Design and methods.* London, UK: Sage.