STARTING POINTS FOR BIG DATA ADOPTION

Research paper

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Abstract

As part of an advancing digitization, many enterprises feel the need to explore the possibilities big data may provide for their business. However, only a few companies use big data applications productively, despite its high expected potential. How companies examine the possibilities of big data, is therefore a highly interesting and relevant question. Based on a multiple case study we identify three different approaches and factors that influence the choice of approach: Companies either initially focus entirely on business aspects, or on a systematic build-up of a big data technology and data platform. Innovation adoption research is used as a theoretical basis.

Keywords: big data, digitization, innovation adoption.

1 Introduction

The potential benefits and challenges associated with big data are an important topic for companies in all industries. Big data promises new data-driven services to improve processes and enable innovative products and business models (Sivarajah et al., 2017). Against this background, a growing number of companies are investing in big data looking for competitive advantages (Constantiou and Kallinikos, 2015). Nevertheless, companies seem to have difficulties with the productive implementation of big data applications. According to a Gartner study, only 14% of enterprises have put big data projects into production (Kart, 2015). Therefore research on the adoption of big data applications is important and of scientific and practical interest.

The introduction of new technologies is described by innovation adoption theories. The process of innovation adoption typically involves two phases (Rogers, 2003): initiation and implementation. Within these phases, new technologies have to overcome several hurdles before being used productively, i.e. being integrated into an existing IT landscape and deployed at full-scale (Fichman, 2000). For technology-driven innovations, like big data (Nam et al., 2015), the initiation phase, where companies search for valuable use cases for different big data technologies, poses a first serious obstacle. This initial step towards the exploration of big data potentials is the focus of our study. In particular we address the following research question:

What approaches can be identified when companies explore the potentials of big data in the initiation phase of innovation adoption and what factors influence the choice of approach?

Despite its high relevance, there are no specific studies on the initiation phase of big data adoption. Current research mainly investigates general influencing factors and hurdles during the implementation of big data technologies. In contrast, this paper analyses current approaches for the exploration of new big data potentials in the initiation phase and factors that influence the choice of approach. For this purpose, a multiple case study with ten companies from different industries was conducted. The organizational adoption process of Rogers (2003) in combination with the Technology-Organization-Environment framework (TOE) (Tornatzky et al., 1990) has been used as a theoretical starting point.

This report is organized as follows: The current research on big data adoption is summarized in the next section. Section 3 presents our conceptual framework. Section 4 introduces the research design. Section 5 presents the findings from our cases. A discussion of the results in section 6 and a summary of the main points in section 7 complete this work.

2 Current Research on Big Data Adoption

Big data is defined by the TechAmerica Foundation (2012) as "a term that describes large volumes of high velocity, complex and variable data that require advanced techniques and technologies to enable the capture, storage, distribution, management, and analysis of the information." Obviously, big data is a bundle of new technological and methodological possibilities that allow to process and analyse large, complex and rapidly growing data sets (e.g. stream analytics, in-memory data processing, NoSQL databases). In this respect, companies are challenged to identify the technologies and methodologies which are most beneficial to them. This distinguishes big data from the adoption of previous technology trends, such as ERP or CRM, where individual technologies and use cases were considered.

Enterprises want to take advantage of the opportunities big data success stories promise and expect a wide range of benefits through the introduction of big data applications (see, for example, (Brown et al., 2011; Davenport et al., 2012; Kiron et al., 2014)). In order to unlock this potential, companies have to acquire big data resources and develop capabilities to leverage their possibilities (Mikalef et al., 2016). The literature defines three key typologies of big data capabilities (see e.g. (Akter et al., 2016)): management capabilities (e.g. data governance), technology capabilities (e.g. integrating and operating Hadoop components) and talent capabilities (e.g. data science knowledge).

The development and deployment of corresponding capabilities starts with the introduction of technology innovations (Mikalef et al., 2017). Latter can be described by innovation adoption theory. On

the one hand, this theory covers the identification of factors that influence the decision-making process of innovation adoption (Rogers, 2003). On the other hand, it describes the process which innovations have to go through, ranging from an initial awareness in companies to its productive use (Fichman, 2000).

Previous work in the context of big data adoption mainly focuses on the investigation of general influencing factors through the TOE (see, for example, (Agrawal, 2015; Malaka and Brown, 2015; Sun et al., 2016)). The TOE describes the impact of technological, organizational and environmental aspects on organizational decision-making with respect to technology innovations (Tornatzky et al., 1990). As a result, it has been shown that the protection and integration of data are considered as important technological challenges (Agrawal, 2015; Malaka and Brown, 2015; Sun et al., 2016). Organizational aspects, such as unclear processes, lack of analytical skills or indistinct prioritization of use cases are further obstacles to the successful adoption of big data. However, the adoption is most often positively influenced by company size and competition intensity. Nam et al. (2015) have investigated the change of influencing factors during the adoption process. As a result, they show that existing IS competence has a positive impact in the beginning of the adoption process, while competitive intensity and financial readiness significantly support the successful implementation of big data. Bremser et al. (2017) have used the TOE to identify factors that drive the approaches companies use to explore big data potentials. IS competence, perceived complexity of the big data technologies, as well as the financial and strategic readiness of companies were found to have major impact.

So far an investigation of the big data adoption process has been carried out only by Chen et al. (2015). They use a multiple case study to describe the implementation phase and corresponding influencing factors. For this purpose, they build upon TOE (Tornatzky et al., 1990), diffusion of innovation (Rogers, 2003) and the IT fashion theory (Wang, 2010). The diffusion theory describes the spreading of an innovation among members of a social system (Rogers, 2003). The IT fashion theory highlight the social settings of emerging IT trends, e.g. the influence of consultants and technology analysts (Wang, 2010). According to Chen et al. the implementation phase involves far-reaching organizational changes that are necessary for the productive implementation of big data applications. As a result, they present a "limbo stage", where companies continuously experiment with big data technologies for a long time and do not proceed to deployment, despite their intent to adopt.

In comparison to existing studies our research focuses on the initial phase of big data adoption. We investigate the approaches companies use in the initiation phase and factors that influence their choice of approach.

3 Conceptual Framework

For our study, we use the innovation adoption process of Rogers (2003) and the TOE framework (Tornatzky et al., 1990).

According to Rogers (2003), the process of innovation adoption is described by two major phases: initiation and implementation, with both phases being separated by an adoption decision. The initiation phase consists of the stages agenda-setting and matching. The agenda-setting is triggered by an organizational problem or by the perception of an innovation. Both force companies to weigh up possible reactions and evaluate the potentials of an innovation. This evaluation is typically undertaken in the matching stage, where organizational members explore the capabilities of an innovation to predict its potential for specific application scenarios. If advantages are expected, the implementation phase is triggered and all activities and decisions necessary to put the innovation into production are carried out. The decision on how to evaluate the potentials of an innovation is determined by an agenda which results from the agenda-setting (Rogers, 2003). To investigate the factors that influence this decision, the TOE provides a good theoretical foundation.

The TOE describes the factors influencing the adoption of technology innovations. These factors are clustered into three dimensions: technology, organization and environment (Tornatzky et al., 1990). The technology dimension encompasses the characteristics of available technologies which are rele-

vant to a company. The organizational dimension covers company attributes, such as size, formal and informal linking structures, competencies and the amount of slack resources. The company's environment and its influence are described in the environmental dimension. It includes competitors, industry specifics and governmental regulation.

In conclusion, the conceptual framework used in this research combines the innovation adoption process of Rogers (2003) with the TOE (Tornatzky et al., 1990), as shown in figure 1.

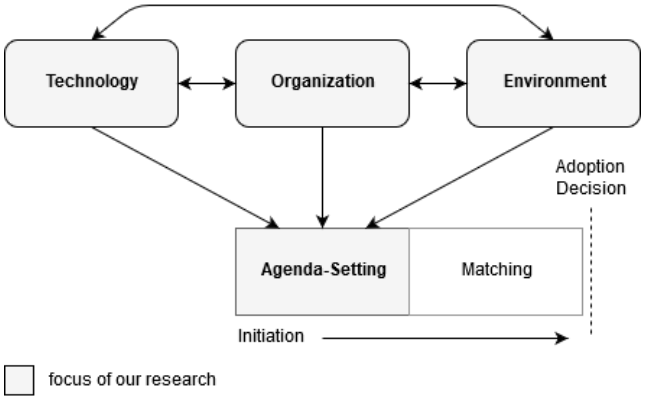

Figure 1. Conceptual Framework

4 Research Design

Phenomena around big data adoption are complex and certainly not well understood so far. For this reason, a case study approach is suitable (Dubé and Paré, 2003; Yin, 2003). Our main information sources are in-depth expert interviews with key-informants. Interviewees were heads of business and IT divisions, chief architects and chief strategist.

In the sense of a strict implementation of the research design, four established quality criteria were used (Yin, 2003): external validity, internal validity, construct validity and reliability. The external validity focusses on the generalizability of the results. This is ensured by replicating the case studies. In the context of big data adoption, it was decided to conduct a multiple case study. The case studies were selected according to the "literal replication logic" (Dubé and Paré, 2003). In order to ensure a comparable organizational and technological context pure internet companies were excluded and traditional companies with existing IT infrastructure and application landscapes were in focus. In addition, the reference of selected cases to big data has been validated by scientific big data taxonomies (see, e.g. (Kune et al., 2016)). They represent a classification scheme for technologies, methods and data typically used in the context of big data.

In order to ensure internal validity, an interview guide was developed on the basis of the conceptual framework described in section 3 of this paper. The expert interviews were semi-structured and we kept our questions open to allow interviewees freely to speak. The first part contained general questions about the role and responsibility of the interviewee, the current strategic and tactical challenges of the company and their influence upon dealing with new possibilities of big data. The second part of our questions concentrated on the current use of data, methods and technologies for data-driven decision making as well as corresponding organizational structures and processes. For example, we asked about the relevance of data and data-driven decision making in different organizations and inquired which kind of analytical applications were currently in use. The third and most extensive set of questions was directed upon "why" and "how" organizations explore the potentials of big data. These questions concerned the trigger of big data initiatives, their focus and their organizational setup. Also we inquired the process for the evaluation of big data potentials and the criteria applied therein.

Yin (2003) suggests triangulation to ensure construct validity. Within the case studies, different data sources were therefore used. In addition to the key-informant interviews, public and - if available -

internal documents of big data initiatives and strategies of the investigated companies were analysed. Furthermore, interviews with other organizational members, consultants and software vendors specialized on big data adoption were conducted.

In order to minimize errors and biases, the reliability of the case study analysis was ensured by establishing a case study database. There, we stored all information about the data collection process, the data itself and the case study results. According to Yin (Yin, 2003), this helps to provide the same results in repeated trials.

The data collection started in June 2016 and stretched over a period of seven months. Each interview lasted approximately 90 minutes and was conducted on site or by telephone conference. The conversations were recorded and transcribed. Shortly after each interview, the main points and key findings were recapitulated in a contact summary sheet (Miles et al., 2013). The interviews were then analysed and coded. We used first-level coding (Miles et al., 2013) to identify in particular all statements related to company's procedures for the initiation phase of big data adoption.

Table 1 presents an overview of the participants of the case study. In the case selection, we focused on companies with more than 10,000 employees and headquarters in Germany. The investigated companies operate in business-to-consumer as well as in business-to-business segments and have successfully launched first big data initiatives. The interviewees were responsible for big data activities within their organizations and had roles in business and IT.

	Industry	**# of employees**	**Business segment**	**Role of Interviewee**
1	Transport	>50,000	B2C, B2B	Head of Domain Architecture
2	Banking	>50,000	B2C, B2B	Head of IT Architecture
3	Insurance	>10,000	B2C, B2B	Head of Group strategy
4	Manufacturing Vehicle	>50,000	B2B	IS Chief-Architect
5	Retail Trade	>50,000	B2C	Head of Business Intelligence
6	Utilities	>50,000	B2C, B2B	Chief Digital IT Strategist
7	Manufacturing Vehicle	>50,000	B2B	Head of Analytics Lab
8	Manufacturing Apparel	>50,000	B2C	Head of Data Analytics Lab
9	Manufacturing CPG	>10,000	B2C	Head of Marketing & Analytics
10	Manufacturing Chem.	>10,000	B2B	Head of BI Architecture

Table 1. Participating companies

The analysis of these cases was carried out in a twofold way. First, we have used a within-case analysis (Yin, 2003) to extract all characteristic content and influencing factors related to the agenda-setting of individual cases. In the second step, a cross-case analysis (Yin, 2003) was conducted and the cases were compared to each other. The results of these analyses are shown in chapter 5 and discussed in chapter 6.

5 Results from Case Studies

Having identified the importance of the initiation phase of the big data adoption process, we now analyse this phase in detail, based on the evidence from our ten cases. In section 5.1 we outline the different approaches companies chose, while the factors that influence this choice are discussed in section 5.2.

5.1 The Initiation of the Innovation Adoption Process

The agenda-setting is, according to Rogers (2003), triggered by a performance gap or the perception of new possibilities. Both triggers force enterprises to consider the potentials of an innovation. In the case of technology-driven innovations, like big data, companies examine how they would leverage new

technologies. Within agenda-setting a so-called agenda is defined determining the goals for the next steps in the adoption process.

Our analysis shows that in all cases, the hype surrounding big data was decisive to the initiation of the big data adoption process. An interviewee from case 8 described this as follows:

"It was our former CIO [...], who said that big data is a megatrend, which we definitely should not miss."

Pushed by the hype, companies hope to open up valuable possibilities through big data that range from improvements of existing business processes to entirely new business services or business models. This is confirmed by a quote from case 5:

"... [we hope to use big data] either for rationalization or for other value-creation opportunities, which are not necessarily connected to rationalization, but where really new fields are opened up."

Due to the manifold expectations, the topic was discussed at senior management level in all companies. There, next activities were defined and first big data initiatives were launched. Project teams were staffed and first objectives were set. Although expectations of long term benefits were similar in all cases, short term goals of big data initiatives differ.

In the cases 1, 6, 8 and 9, senior management asked for big data application scenarios. A quote from case 1 confirms this:

"In the business departments, innovation workshops or design thinking, or other methods are used to create a portfolio of ideas and use cases."

Table 2 details the goals of the respective big data initiatives.

1	Portfolio for innovative data-driven products, services, business models
6	Portfolio of innovative digital products for public, commercial and private customers
8	Potentials for innovative products and process optimizations along existing value chains
9	Possibilities of data analyses to increase the efficiency of existing processes with focus on marketing and sales

Table 2. Goals of companies searching for business potentials

In the cases 2, 3, 5 and 7, the search for a good technological starting point was in the centre of first activities. Table 3 shows the respective goals.

2	Possibilities for a cost-neutral reduction of technological hurdles for future big data applications
3	Roadmap for a systematic development of internal capabilities to use big data technologies and to provide data appropriately
5	Opportunities for a future-oriented development of a data and technology platform for analytical applications
7	List of requirements with respect to technologies and organizations for future data-driven product innovations as well as a consistent data base

Table 3. Goals of companies looking for a technological starting point

In the remaining cases, the set-up of a central and company-wide data basis was in focus as summarized in table 4 and illustrated by a quote from case 10:

„That's our goal, to have a central data basis in the company, which I can use for data science and analytical use cases."

4	Consistent data basis for company-wide analyses, initially for the identification of potential efficiency enhancements within the existing value chain
10	Data basis out of existing and new data for future data-driven services

Table 4. Goals of companies aiming for a central data basis

The different agendas that have been presented complete the agenda-setting stage and initiate the subsequent matching stage. Based on different agendas, companies carried out three distinct approaches: *Business First*, *Platform Building* and *Data Integration*.

In the approach *Business First*, enterprises explore big data potentials entirely from a business perspective. They search for use cases with high expected business value. Companies with this approach can be found in cases 1, 6, 8 and 9. The search for use cases is typically carried out by the business departments using methods like design thinking. The interviewee from case 6 confirms this:

"What we are currently using as a methodology for developing products, but also for optimizing processes, is design thinking. Here, we try to identify "need-driven", what does the customer really need for products."

The proposals from the business departments are then developed in lab environments as prototypes or proof of concepts. Subsequently, the prototypes are tested in market segments to evaluate their business potentials. For example, case 6 states:

"[the goal is to] test use cases in 6-12 months with several thousands, maybe even ten thousands of customers in real use. And then there's the decision: go or no-go."

If the evaluation is positive, a use case is proposed for adoption and the implementation phase of the innovation adoption process is started.

In case 2, 3, 5 and 7, the *Platform Building* approach aims upon the development of a technology and data platform for big data. Typically industry-specific application scenarios are used as an orientation to establish corresponding capabilities (e.g. implement big data technologies; integrate new data sources). Also existing business demands are utilized to introduce new technologies, for example in case 2:

"... it is the strategy [...] to use new technologies for existing demands that we are obliged to do, in order to [...] reduce the hurdle for hardly-calculable [big data] use cases."

The objective of the *Data Integration* approach is to provide a consistent basis of data for future analyses (case 4, 10). For instance, case 10 emphasizes:

"... this is our approach [...], we want to build up an enterprise data repository, [...] step by step, to integrate and organize all data there, to build a semantic network."

The platform resulting from the *Data Integration* approach is first used for traditional analyses and can be seen as an antecedent of the *Platform Building* approach. If the analyses proof successful, the integration of big data technologies is considered as a next step. In both, *Platform Building* and *Data Integration*, the created platform forms the basis for the subsequent identification and evaluation of big data use cases.

5.2 Influencing Factors

Based on our analysis, different factors that influence the choice of approach could be identified. Companies following the approach *Business First* look for new revenue opportunities, typically driven by a strong competition and market uncertainties. The transformation towards an increasingly data-driven business is seen as a strategic task. This is emphasized, e.g. by case 6:

"It was recognized that we will have to become a data-driven company in order to secure our long-term existence in the market."

In order to gain a better understanding of customers and drive the development of new products and services, big data is seen as the most important prerequisite. The unique role of big data is emphasized, e.g. by a quote from case 6:

"Big data is indeed an excessively used term, but for us it is the most important driver for the development of new products"

High financial readiness and substantial senior management support typically enable this approach. For example, the CIO of case 8 placed big data as a megatrend and established corresponding management goals to ensure management support. Their financial readiness allowed them to establish a lab environment and to allocate IS resources. Another example is the company in case 9. Here no appropriate internal IS resources were available. However financial readiness enabled the organization to search for use cases and to commission external partners to carry out proof of concept projects:

"Our IT is a profit center. They do not expose employees to innovative topics [..] Therefore, I have to hire Accenture or any other consultancy; we pay the double day rate, but can realize our use cases in half of the time."

Table 5 shows the decisive influencing factors and example statements for the decision to *Business First* during agenda-setting.

case	case specific influence factors	example statements
1	- strong competition from low cost players - digital strategy supports big data activities - data and analytics plays an important role in service development - good financial situation allows the build-up of dedicated resources, e.g. innovation units, data labs	"To deal with low-cost competitors, we have to focus on data and analytics, in order to generate further business and offer new data-driven services."
6	- transformation towards a data-driven company - changes in energy market causes uncertainties for established business model - expected benefits from new digital services, e.g. smart meters seem promising	"It was recognized that we must become a data-driven company in order to secure our long-term existence in the market. So we have to develop new products, improve internal and external processes and to do the whole thing data-driven."
8	- changing customer expectation - expected unique role of big data in customer understanding - growth-orientated business strategy - the build-up of data analytics team and the recruitment of data scientists is enabled through a good financial situation	"The consumer expects an ever more individualized and personal address. [..] he expects individualized products and brand messages. And you can only get closer to that if you really know the customer and his behaviour. [..] this is only possible with big data."
9	- market is characterized by aggressive trade groups firing up competition - economic uncertainties, e.g. brexit votum - integrated and harmonized data architecture exists - financial resources enable the procurement of external specialists - appointment of a digital transformation officer	"We have an incredibly aggressive competition. There are 'local beauties' that are getting stronger and stronger. [..] Besides, we can't reach people with our classic ads anymore. So we have to be very smart, think about how we advertise and how we can use big data to measure our promotional efficiency."

Table 5. Influence factors and corresponding statements for Business First

Firms that chose *Platform Building* or *Data Integration* are less innovation driven. Some of them are exposed to high cost pressure and did not have additional financial resources at hand to address new topics (case 2, 4 and 10). Instead, they were focusing on internal efficiency and process automation, as stated by case 4:

"In our industry the market segment for highly innovative products is a very limited one [..] So the main focus should be internal efficiency in order to make cost-attractive offers for our standard products."

Additionally, we identified companies (case 3, 5 and 7) that, despite their financial readiness, did not see a need to identify concrete big data use cases yet. A lack of strategic orientation towards digitization and no obviously attractive big data use cases were typical reasons for this behavior. However, also in these cases senior management expects big data becoming increasingly relevant. To prepare for the future they therefore decided in the agenda-setting for a systematic build-up of big data capabilities. This is emphasized by a statement from case 7:

"We do not necessarily need to solve the autonomous driving. [..] Our goal is to provide the technical possibilities that this can work in future."

Table 6 shows the different influencing factors and corresponding statements for *Platform Building*.

case	case specific influence factors	example statement
2	- cost pressure through low interest rates and strong regulatory measures - digital transformation strategy - use case-driven implementation of big data is seen as risky	"In banks, income does no longer come from interest rates. [..] So we have to work on our costs by automating back-office processes, [..] collecting and analysing more data. [..] Big data can surely enable that"
3	- healthy financial position - digitization efforts are restrained and not pursued by all management levels - no obvious benefits from big data - focus on traditional measures for business development	"At the moment we are using traditional measures, e.g. portfolio pruning, premium adjustment and process improvement. Perspectively, however, we must initiate new initiatives and open up new business opportunities. Big data is one of the possibilities we need to consider and see if it will create new business opportunities."
5	- big data is seen as just another set of technologies - BI maturity is high and data are seen as an asset - no obvious big data use cases with additional benefits	"[..] we solve issues infrastructural and not application-related. [..] we basically want to analyse and evaluate everything and therefore, we have created a central data platform which we are now systematically developing."
7	- financial resources enable the construction of dedicated resources, e.g. a big data lab - digitization strategy is being developed - benefits from big data are expected but use cases are not obvious	"We appointed a Digital Transformation Officer this year in August. The digitization strategy is also being developed at the moment. So, we are still in a discovery phase [..]"

Table 6. Influence factors and corresponding statements for Platform Building

For the approach *Data Integration* we have observed that companies perceive the integration efforts for big data technologies as high. A fragmented data architecture was the main reason for this, as case 10 confirms:

"One major question in context of big data is how we actually use data. Today our data is stored in various applications. [..] So the problem is, ultimately, if I want to establish a digital business, then we need data in access [..] the different data interfaces make it difficult"

Influencing factors and corresponding example statements for *Data Integration* are summarized in Table 7.

case	case specific influence factors	example statement
4	- competitors from emerging markets cause cost pressure and decreasing profit margins - fragmented data architecture and large number of systems lead to hurdles for performance management - benefits from e.g., process optimization are expected, but the complexity of data integration and harmonization is perceived as high	"We still have many business areas whose data sources have not yet been harmonized in a data warehouse. Therefore we have a huge challenge in data preparation first"
10	- fragmented application and data architecture - transformation towards a data-driven company - increasing regulatory measures in human healthcare causes cost pressure and drives the utilization of IT - data governance in big data environments is perceived as complex	"At the moment, I'm leading a cooperate-wide initiative that focus on how we can use big data to enable the transformation towards a data-driven business"

Table 7. Influence factors and corresponding statements for Data Integration

6 Discussion

Based on the evidence from our ten cases, this study shows how companies proceed in the initiation phase of the big data adoption. During agenda-setting senior management defines the goals of the first activities in the adoption process. As a result, we found agendas describing three different approaches companies use to approach the potentials of big data: *Business First, Platform Building* and *Data Integration*. A comparison shows that *Business First* focuses on the identification of business potentials and initially neglects integration challenges for new technologies and data sources. This is in contrast to *Platform Building* and *Data Integration*. There, the integration of technologies and data is of primary interest and seen as a necessary step towards the successful adoption of big data. Only after that, use cases with high potential value are searched for.

Agenda-setting is the key stage in the innovation adoption process, as it determines all the following steps in the initiation phase. In order to understand the decision-making in this stage, we followed the TOE framework and collected all influencing factors from the investigated cases (table 5, 6 and 7). We then abstracted and assigned them to the different TOE dimensions. Table 8 shows the result.

Technology	Organization	Environment
- expected unique benefits (it is expected that the use of big data supersedes other business development measures [+] or not [-]) - perceived complexity (effort and risk for the use of big data are perceived as high [+] or low [-])	- innovation driven (the business strategy is innovation orientated, e.g. first mover [+] or not [-]) - digital strategy (big data or digitization is part of the strategy and supported by all management levels [+] or not [-]) - financial readiness (sufficient financial resources [+] or not [-]) - maturity of data architecture (harmonized [+] vs. fragmented data architecture [-])	- IS fashion (big data is perceived to be important for the industry [+] or not [-]) - regulatory measures (industry is under strong regulatory pressure [+] or not [-]) - market uncertainties (market is volatile [+] or not [-]) - competitive pressure (competitive pressure is high [+] or moderate [-])

Table 8. Abstracted influencing factors assigned to TOE dimensions

Table 9 visualize the factors which had influence on a company's choice of approach. We found that companies decide for *Business First*, when their business strategy is innovation driven, a digital strategy exists and big data is expected to supersede other measures for business development. Financial readiness empowers them either to establish own lab environments for the investigation of use cases, or to engage external partners to do so.

Companies who follow *Platform Building* are typically less innovation driven, focusing initially other measures for business development. A missing digital strategy also supports the decision. In case 2, the decision towards *Platform Building* is driven by a low financial readiness, although unique benefits from big data are expected. This decision is supported by the perception that a use-case-based approach seems risky.

Firms in *Data Integration* expect unique benefits from big data to the transformation towards a data-driven company. However, a low maturity of data architecture forces them to address basic data management tasks first. Due to a fragmented application and data landscape the efforts for big data are perceived as high. A low financial hinders them to reduce the perceived complexity by e.g. procuring external specialist knowledge.

Additionally, we found IS fashion as a general trigger of the adoption process in all observed companies which reflects the hype that surrounds big data. Other factors from the environment dimension mostly influence aspects within the organization dimension. In our cases, for example, strong competition or high regulatory measures caused cost pressure and a low financial readiness in case 2, 4 or 10.

	Business First				**Platform Building**				**Data Integration**	
	1	6	8	9	2	3	5	7	4	10
expected unique benefits	+	+	+	+	+	-	-	-	+	+
perceived complexity	-	-	-	-	+	-	-	-	+	+
innovation driven	+	+	+	+	-	-	-	-	-	-
digital strategy	+	+	+	+	+	-	-	-	+	+
financial readiness	+	+	+	+	-	+	-	+	-	-
data architecture competence	+	+	+	+	+	+	+	+	-	-
IS fashion	+	+	+	+	+	+	+	+	+	+
regulatory measures	-	+	-	-	+	+	-	-	-	+
market uncertainties	-	+	+	+	+	-	-	-	-	-
competitive pressure	+	-	+	+	+	-	+	-	+	-

Table 9. Approaches and corresponding influencing factors

7 Summary

In this paper we have investigated through an analysis of ten cases how companies start exploring big data potentials. We could identify three different approaches for the initiation phase of big data adoption: *Business First, Platform Building* and *Data Integration.* Which of them to take is decided by senior management during the agenda-setting stage of the innovation adoption process. This choice is influenced by external and internal factors, which could be assigned to the technology, organization and environment dimensions of the TOE.

In particular we found that the technology and organization dimension are most relevant during decision-making. Especially financial readiness, expected unique benefits and the maturity of a companies' data architecture are major influencing factors in agenda-setting.

The theoretical and practical contributions of this research are as follows: While many studies use TOE for technology adoption decisions, we combine it with the process of innovation adoption and describe decision-making in the agenda-setting stage. Our study shows that the innovation adoption

process and TOE can successfully be used to describe and understand the exploration of technological innovations with high diversity. The study further contributes to understand how companies behave in the era of digitization, where technological innovations are surrounded by hype while company specific application scenarios are still unclear.

From a practical point of view, companies can compare their big data activities with the different approaches and drivers identified in this paper, to possibly re-consider their way of action. Providing a method for the identification of suitable platform capabilities and big data use cases is planned as a next step in our research agenda. The corresponding design-oriented approach will benefit from the insights gained in this study.

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