Yes, but …: Unraveling Paradoxes in Implementing Artificial Intelligence

Nikola Finze
Neu-Ulm University of Applied Sciences, Germany
nikola.finze@hnu.de

Sina Zimmermann
Neu-Ulm University of Applied Sciences, Technical University of Munich, Germany
sina.zimmermann@hnu.de

Andy Weeger
Neu-Ulm University of Applied Sciences, Germany
andy.weeger@hnu.de

Heinz-Theo Wagner
Neu-Ulm University of Applied Sciences, Germany
heinz-theo.wagner@hnu.de

Abstract

Implementing artificial intelligence (AI) applications in firms promises great potential but poses complex challenges. Especially incumbent firms often struggle to use the full potential of AI, because of paradoxes that arise in the context of implementing AI solutions, such as concerns regarding data privacy but simultaneously sharing personal data excessively. To analyze what paradoxes are caused by the challenge to implement AI in incumbent firms, we draw on the literature on technological paradoxes and followed a qualitative research approach using semi-structured interviews in eight companies on the path to AI implementation. Our results unravel that various mismatches between strategic imperatives and tactical paradigms emerge from three AI paradoxes: the privacy paradox, the potential paradox, and the integration paradox. Our results contribute to the information systems literature on AI and technological paradoxes by providing novel empirical insights on AI paradoxes and practical implications to address these paradoxes in incumbent firms.

Keywords: Artificial Intelligence (AI), AI Implementation Challenges, AI Paradoxes, Digital Transformation.

1. Introduction

Since its first introduction at Dartmouth College in 1956, artificial intelligence (AI) has raised a myriad of diverse reactions spanning from substantial threats to profound opportunities (Dick, 2019). Today, as exemplified by systems such as ChatGPT, the vast potential of AI has become increasingly apparent (Susarla et al., 2023). Although there is no universally valid definition, AI can be described as "a collective term for multiple technologies, such as machine learning, deep learning, computer vision, natural language processing, knowledge-based reasoning, and robotics." (Weber et al., 2022, p.3). The goal of these technologies is to enable machines to conduct tasks that are usually associated with human capabilities, such as problem solving or creativity (Rai et al., 2019).

In the rapidly evolving landscape of information technology (IT) and business, implementing AI has emerged as a critical consideration for incumbent firms (Oberländer et al., 2021; Susarla et al., 2023). While AI holds immense potential to revolutionize industries, transform processes, and unlock new value, its adoption within incumbent firms is often hindered (Frick et al., 2021). For instance, reasons for slow progress in AI implementation are data quality and privacy concerns (Sharma et al., 2022). In that regard, Smith (2019) revealed a paradoxical nature of privacy-related behaviors toward AI implementation. On the one hand, individuals' concern for data privacy is amplified. On the other hand, individuals are found to excessively share personal data with a wide variety of AI applications (Willems et al., 2022). These paradoxical viewpoints such as the paradox of data sharing to enable AI versus privacy concerns when sharing data with other firms create barriers to AI implementations (Smith, 2019).

In general, paradoxes are defined as "contradictory yet interrelated elements that exist simultaneously and persist over time" (Smith & Lewis, 2011, p. 382). The paradoxical nature of technology can lead to reconsidering the introduction of such and can even hinder the implementation process (Mick & Fournier, 1998). While most research focused on general technological paradoxes, initial research has started on paradoxes that arise in the context of AI technology. Besides the aforementioned privacy paradox (Smith, 2019), previous research found paradoxes regarding the liability of AI decisions (Chaudhary, 2020), productivity paradoxes when working with AI systems (Brynjolfsson et al., 2018), or the trade-off regarding sustainability between achieving higher accuracy for AI models while minimizing their carbon footprint (Mill et al., 2022). These paradoxes present complex and contradictory tensions that challenge decision-makers. As the introduction of AI into work processes is indispensable, incumbent firms are required to take on the subject of AI (Zhang et al., 2023). Hence, understanding and effectively managing these

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paradoxes is essential to realize the full potential of AI while minimizing disruptions and maximizing benefits.

However, despite several decades of research dedicated to AI, the precise nature of the paradoxical tensions that companies will encounter when implementing AI systems in practice remains unclear. Furthermore, although prior research has provided valuable insights into the identification of technology paradoxes and the corresponding coping mechanisms, in general, there is a noticeable absence of research focusing specifically on the paradoxes associated with the challenges of AI implementation as perceived by experts from practice as opposed to the theoretical view that paradoxes are inherent to, e.g., an IT artifact. In that regard, we follow the argumentation that paradoxes are perceived differently by individuals and are socially constructed (Hahn and Knight 2021), which consequently needs coping strategies catered to the perception of a paradox. Therefore, we aim to answer the following research question:

RQ: What paradoxes are caused by AI implementing in incumbent firms?

To address this research question, we follow a qualitative approach using semi-structured interviews. We aim to shed light on practical paradoxes of AI implementation in incumbent firms. This research investigates the underlying paradoxical tensions incumbent firms face in their pursuit of implementing AI technologies. By exploring these paradoxes, we seek to provide valuable insights that enable firms to make informed decisions, develop effective strategies, and capitalize on the transformative potential of AI.

2. Theoretical Background

2.1. Technological Paradoxes

The fact that technology brings up paradoxes was found already in early literature (Mulgan, 1998; Poole & Van de Ven, 1989). Originating from research by Poole and Van de Ven (1989), Smith and Lewis (2011) define paradoxes as "contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time" (Smith & Lewis, 2011, p. 387). Thereby, on the one hand, paradoxes appear logical individually, however, incompatible when juxtaposed, and, on the other hand, contain tensions (Smith & Lewis, 2011). They constitute an inseparable facet of technology in the overall user interaction process (Lang & Jarvenpaa, 2005).

The utilization of technology introduces a paradoxical nature that compels technology users to confront a spectrum of both favorable and unfavorable outcomes (Park & Zhang, 2022). Previous research in the realm of technological paradoxes identified several fundamental paradoxes of technology (Lang & Jarvenpaa, 2005; Mazmanian et al., 2006; Mick & Fournier, 1998). For instance, users of mobile technologies were found to have more abilities as they could do things they were not before, creating new competencies for them (Lang & Jarvenpaa, 2005). However, while acquiring such new competencies by, for instance, using new application services or device functions on their mobile technology, the users started feeling incompetent (Lang & Jarvenpaa, 2005). Another salient paradox emerging throughout various technologies is freedom versus enslavement (Lang & Jarvenpaa, 2005; Mick & Fournier, 1998). For example, users of telephone machines, on the one hand, found great freedom in deciding whether or not to answer the phone while not missing any calls or essential information (Mick & Fournier, 1998). However, on the other hand, the users came to the point where they felt like they had to check the tape of the machine every day (Mick & Fournier, 1998). Other users even mentioned that they had decided against using the machine as they did not want to be forced to answer a missed call (Mick & Fournier, 1998).

As the pervasive integration of IT in personal and professional domains continues unabated, contemporary scholarly investigations have increasingly focused their attention on the intricate web of paradoxes that materialize concomitant to the deployment and adoption of digital technologies. For instance, Schneider and Kokshagina (2020) researched what paradoxes occur due to the increasing diffusion of digital technologies in the workplace. By interviewing managers, they found evidence for autonomy, information, interaction, opportunity, and engagement paradoxes (Schneider & Kokshagina, 2020).

2.2. Artificial Intelligence Paradoxes

Early research has already emphasized paradoxes occurring in the context of AI usage (Neufeld, 1995). To be more precise, the study informs about the occurrence of the Simpson's Paradox, which is a statistical phenomenon where trends or relationships observed within different groups of data can reverse or disappear when the groups are combined (Hernán et al., 2011; Neufeld, 1995; Wagner, 1982). The study emphasizes that AI algorithms can exhibit Simpson's Paradox due to the biases in the data used for training (Neufeld, 1995).

More recent research has elaborated on paradoxes occurring in the development process (Angelucci et al., 2022), implementation (Raisch & Krakowski, 2021), and usage of AI (Brynjolfsson et al., 2018), as well as sustainability (Mill et al., 2022) and societal (Raisch & Krakowski, 2021) outcomes. Until now, several AI

paradoxes have been found. For instance, Chaudhary (2020) identified the liability paradox within English law as AI is capable of making its own decisions and is therefore responsible for the factual causation as a consequence of the decision. However, legal causation only covers the logical chain of the action and its respective consequences (Chaudhary, 2020). Following these tests, the defendants would never have to explain why they acted that way, and no national or international law regulates responsibilities (Chaudhary, 2020). Another paradox resides in implementing AI as either automating tasks previously performed by humans or augmenting tasks involving close collaboration between humans and machines (Raisch & Krakowski, 2021). To navigate tensions between this automation and augmentation paradox, Raisch and Krakowski (2021) emphasize the interdependencies and necessity to adopt broader perspectives that encompass both approaches. Mill et al. (2022) emphasize the underlying sustainability paradox of simultaneously achieving higher accuracy while minimizing carbon emissions due to necessary computational power. Further, Smith (2019) elaborated on how privacy concerns arise with utilizing individual data while AI is accessing more data. Thereby, perceived usefulness significantly influences the willingness to download an AI-driven application (Willems et al., 2022).

Finally, paradoxical observations regarding productivity were found when comparing the expectations of AI to leverage productivity significantly with actual statistical developments (Brynjolfsson, 1993; Brynjolfsson et al., 2018). While AI is considered a promising technology to significantly increase productivity and economic welfare, statistics show that overall productivity growth has been slowing down throughout the past decade (Brynjolfsson et al., 2018). In their study, Brynjolfsson et al. (2018) find that the impact of AI technologies is still limited but has further potential to grow by distributing across sectors. To further elaborate on challenges impeding the implementation and distribution of AI, it is important to research paradoxes that influence the implementation of AI in incumbent firms. The subsequent section will introduce the chosen methodology to address this objective, providing a framework for the study.

3. Methodology

Our study aimed at unraveling what paradoxes exist when incumbent firms implement AI applications in their organization. To gain in-depth insights into the plethora of possible tensions, we followed a qualitative study approach with semi-structured interviews and a workshop to discuss the opposing viewpoints of the interviewees.

3.1. Data Collection

For the data collection, we contacted the person in charge of introducing and/or managing AI applications in incumbent companies in Germany. Germany, like most other industrialized countries, faces a shortage of skilled workers in the IT sector, which is why AI applications are becoming more relevant not only for technology-oriented but all different kinds of companies. Moreover, a broad range of different industries and a large number of incumbent firms characterize the market structure of Germany. Last, Germany, as part of the European Union, faces different obstacles when it comes to implementing and managing AI applications due to restrictions of the General Data Protection Regulation (GDPR) guideline.

We requested interviews at ten suitable firms and received eight positive responses. Overall, we conducted interviews with nine representatives, which lasted 30 minutes on average. The interviews were conducted from January – March 2023 via Zoom. All interviews were recorded and transcribed afterward. Table 1 provides an overview of the interview participants, their roles, and their respective firms.

The interviews followed a semi-structured guideline. Semi-structured interviews offer a high degree of flexibility, making it possible to address issues that arise during the interviews (Flick, 2009; Myers & Newman, 2007). The interview guideline contained two blocks of questions: The first block included questions regarding current or planned AI initiatives in the firm, which obstacles regarding AI implementation the firm is facing, and what potentials they see in implementing AI (details can be found in the Appendix). The second block aimed at understanding the role and tasks of the interviewee and, for instance, contained questions about how long the person was already in the firm, how their role developed or changed due to the implementation of AI, and how they managed the changes in their department.

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ID	Role	Firm Information
I1	Head of IT Organization, includes the head of digitization and innovation	Automotive, 8700 employees
I2	Stakeholder Manager Commercial IT / in-house consultant for commercial IT processes	Pharmacy, 56.900 employees
I3	Head of IT Applications	Aviation, 5.300 employees
I4	Vice President Digital Transformation, in charge of digitalization strategies	Metal processing, around 8.800 employees
I5	Head of IT Infrastructure	Construction industry, 1.400 employees
I6	In charge of digitalization strategies	Automotive supplier, mechanical engineering, around 4.100 employees
I7	Director Corporate IT	Manufacturing industry, around 3.000 employees
I8	Head of Group IT	Construction industry, 9500 employees
I9	Head of Business Solutions, in charge of external applications	

Table 1: Interviewee and company information

After collecting all interview data, we presented and discussed the preliminary findings in a workshop on AI use in incumbent firms with all interview participants. The workshop results were collected on notecards during the meeting and written down in a memory protocol afterward. The workshop took place in May and unraveled contradicting viewpoints between and within the different companies, which will be further discussed in the following.

3.2. Data Analysis

For the data analysis, we followed an inductive coding approach following the guidelines of grounded theory according to Gioia et al. (2013). The guidelines include a first-order and second-order analysis of the underlying data (Gioia et al., 2013). The first-order analysis consists of open coding of first-order concepts from the interviews that describe the phenomenon of interest (Gioia et al., 2013), for instance, which challenges and opportunities the interviewees face when implementing AI in their firms. Subsequently, we conducted a second-order analysis to develop overarching themes by seeking similarities and differences between first-order concepts, which resulted in three second-order themes reflecting internal and external paradoxes when implementing AI in incumbent firms.

For instance, we found that one challenge of AI implementation is to ensure privacy regarding client data use. At the same time, an opportunity to exploit AI potential is pointed out using client data to automatize standard client requests on the level of first-order concepts. This combination leads to a paradox regarding data privacy and information sharing on the second-order level. While conducting the coding, we iterated between the underlying data and the developed first- and second-order codes until we reached a point where none of the codes and the underlying data fit one of the categories or two categories were overlapping. To ensure the quality of the data analysis, we coded the interviews in MaxQDA and iteratively compared and contrasted the results with the author team until a consensus was reached.

4. Results

Our interviews brought up three main paradoxical challenges concerning the implementation of AI: privacy paradox, potential paradox, and integration paradox (see Figure 1). In addition, we identified tactical paradigms and strategic imperatives to underlie these paradoxes. Details will be provided in the following subsections.

4.1. Privacy Paradox

The first paradox emerged when reflecting on the data necessary for the development of AI. Since AI heavily relies on large amounts of data and computing power, information must be shared internally and with other companies. However, for instance, production and customer data must be secured to protect privacy and technological advances. The interview partners mentioned the importance of partnerships for information sharing as well as common standards and governance: "*I think governance and communication are essential because we want standardized projects from the always standardized processes from outside into the organizations, and how do we manage what comes from outside in terms of ideas for the processes. So that we can then also scale them and go out and to adopt such a solution in our standard process so that everyone benefits from it*." (I8). Also, it is necessary to

consolidate and connect the data in one system and move away from heterogeneous data landscapes: "*So we have a department in IT that can connect all systems with each other and make the data available. That means you could set this up every time based on use cases. Thus, we avoid a bit of the technology discussion and also the discussion about whether we first have to collect all the data and simply store it in a data lake*" (I4).

While information sharing is necessary to establish and improve AI, incumbent firms face a lot of challenges to ensure data security and privacy: "*With […] data, it's an absolute legal drama, so it's no longer about the technology and what the thing can do, it's really just about the framework conditions*" (I2). Hence, even though AI oftentimes benefits from AI due to higher computing power, some companies decided to stay with on-premise solutions over cloud solutions: "W*hat I'm more skeptical of is these cloud developments, it's also going back [...] I'm still critical of these because I'm just still not convinced of the security*" (I5). Overall: "*A large part is for security reasons. Of course, you must look very critically at what data you are sending in the direction of AI if you don't want to operate it on-premise solutions*" (I3).

Overall, although information sharing is necessary for the development of AI systems, privacy concerns often slow information sharing down. Therefore, leveraging data to unlock AI's full potential while securing privacy rights is necessary.

4.2. Potential Paradox

The abstract versus specific paradox in AI development processes refers to the tension between the abstract understanding of AI's potential and the specific challenges faced when implementing AI in practical use cases. On the one hand, there is a widespread recognition across various industries that AI technologies have the potential to drive significant advancements, improve efficiency, and unlock new opportunities: "*Everyone has to get through the topic anyway, and everyone can achieve great added value at this point, and we have to get there, and that actually runs through all the buzzwords. Whether you talk about the shortage of skilled workers again, yes, quality control sooner or later, there is no way around it. I must automate it or digitalize it, yes, that this happens automatically and where there are many, many topics*" (I6). This abstract perspective acknowledges the transformative power of AI but also the rather abstract challenge without a clear goal of how to implement AI into current work processes: "*Sure, there are one or the other initiative [...] that does not mean that we already work out concepts and only miss the implementation. What is missing is a strategy and the concepts to go with it. That's where it's still lacking for the time being*" (I6).

Even though it is imperative for organizations to incorporate AI into their operations when it comes to specific use cases, organizations often encounter hurdles that make the implementation of AI challenging and less convincing: "*We had a pilot which failed miserably, but I think that was just too early*" (I2). "*So, I would say that we have approaches, we are also trying to work with different technologies and applications, but we are not really doing AI with them yet, so I think in many areas, the application can do much more than what we are currently using."* (I2). As many are starting smaller projects with the abstract idea of doing AI in very specific use cases, interviewers mentioned this to be too much in a nutshell: "*Only based on use cases is too short-sighted, everything in the Big Data Lake or so is probably also initially possibly wasted money and far too much effort. We need to find a middle ground*" (I4).

4.3. Integration Paradox

The bottom-up versus top-down paradox entails the challenge of reconciling the need for IT departments to establish and implement the infrastructure in a top-down manner while simultaneously incorporating AI initiatives driven by business departments. Bottom-up initiatives are characterized by a change started by either lower management or even employees without any management duties in an organization. Such initiatives usually start from a specific use case identified by employees in their daily work, and later on transferred to top management to include the initiative on a strategic level. In contrast, top-down initiatives are initiated by the top management or the executive board based on strategic elaborations, and then distributed into the responsible departments in an organization (Zimmermann et al., 2015). It involves the challenge of balancing the centralized control and strategic planning typically associated with top-down approaches led by IT departments and the need for domain-specific expertise and input from business departments to drive AI initiatives.

On the one hand, it is crucial to find business units that are willing to do AI: "*To find that out [how to include new technologies], we always try to find a business unit that is also interested in it and also has an expectation of benefits from the technology and says okay, let's try it out together in a pilot project. If the pilot is successful, then it is usually a topic that we then hand over to the service organizations, be it IT or Global Engineering, at least then, again at a point in time, in order to then scale it further in this way*" (I4). It is especially important to not start bottom-up at the business units but with the respective experts: "*The*

supervisor decides everything, the employee decides nothing. That doesn't work but should go there; everyone has a responsibility for his subject area, so he should actively co-design it. I would then like to go in with flat hierarchies and say, okay, I now form expert teams depending on the task and put there, for example, also certain freedom of decision and competence with pure and say, hey, this is your challenge, and you may implement it now, and in fact, as you hold so right that the right result comes out" (I6). However, this creates a dependency on the respective business units. If a business unit does not know what AI is and how it can be deployed, they might be left behind.

Additionally, as of now, AI is mainly driven by a few individuals from the departments: "*But there are also the departments that have absolutely no idea what to do with it, and what has somewhat emerged is that these departments, which are very close to IT, have meetings with them once a quarter, once a month, to really brainstorm and actually form more like a small, separate department, you almost have to say, that simply drive the whole topic forward in the name of the department and in the name of IT, and that's how I would describe it in our company at the moment. It's not so much that it's IT or the specialist department; it's really individual people who have an affinity for technology, who are creative, who also have the freedom to go out a bit, who are perhaps not too involved in day-to-day business. It is precisely from them that ideas and approaches are developed in the first place. In fact, we have noticed that it is extremely difficult to come up with ideas outside of our day-to-day work. So, there are relatively few impulses*" (I2).

On the other hand, the top-down approach recognizes the importance of establishing a solid infrastructure for AI implementation. IT departments play a crucial role in providing the necessary technical foundations, such as hardware, software, data storage, security measures, and integration capabilities: "*To have an alignment in IT, which is that we have a philosophy of being a business enabler, so customer-focused with what I meant before, with the strategic building of the system landscape, harmonization, standardization, also group-wide in the system landscape*" (I7) / "*We operate the computers by ourselves, we operate the storage facilities by ourselves. We have realized that especially with this data lake, big data, massive resources are required, and I believe that will be the bottleneck. That we either have to invest in hardware, stay true to our concept and say, no, we'll do everything ourselves, keep everything ourselves, or we have to make ourselves cloud-ready, that we'll outsource part of it at some point.*" (I4).

Like the above-mentioned middle ground, it is also important here to reconcile these two perspectives: "*It only works together […] it won't happen on its own, but I can't do it on my own, and the others can't do it on their own either, but we have to, we are a bit the initiators with this matter, yes." (I6) / "We have to integrate the systems better, […] and, on the other hand, we are naturally also dependent on suggestions for improvements of all sizes from the business departments, which can start with a small, small idea."* (I7).

4.4. Strategic Imperative versus Tactical Paradigms

During our analysis of the paradox categories, we recognized an additional underlying pattern in the data. On the one hand, the interviewees acknowledged the **strategic imperative** to engage with AI and create fundamental conditions for future AI implementations. On the other hand, we observed relatively targeted and operationally focused AI endeavors as underlying **tactical paradigms**: "*We have to integrate the systems better, and so on. We are, of course, highly interested in driving this forward and, on the other hand, we are also dependent on suggestions for improvement of all sizes from the departments, so this can start with a small, small idea*" (I7).

Interviewees mentioned that the strategic imperative could slow down AI endeavors by creating a sense of paralysis preventing them from even starting: "*The hurdle to start there will certainly be even greater*" (I4) / "*Where do we go? What platform do you do it with? Who is really responsible? When we get out of the shed, that we really start to structure ourselves, which also has ways because, at the moment, just insanely much time is lost on it, especially in the AI environment; if you have an idea, what do you do with the idea? Who cares? Who can you approach? Is there enough capacity in the experimental team?*" (I2).

The tactical paradigms were found to serve as a driving force behind effective AI implementation. However, based on paradox theory, leveraging both sides of the paradoxical tensions is necessary to resolve tensions: "*Remote service, for example, is where the worlds merge a bit, because of course, I need a component, hardware, software, somewhere in our products. However, I also need applications in our network in to be able to access them remotely afterward, and everything must be secure, and so on and so forth. So here we have a direct bridge, and then it is, of course, the case that it is a joint area of responsibility where you also must coordinate. But that is never 100% clear-cut, and there is just a bit of an overlap." (I7).*

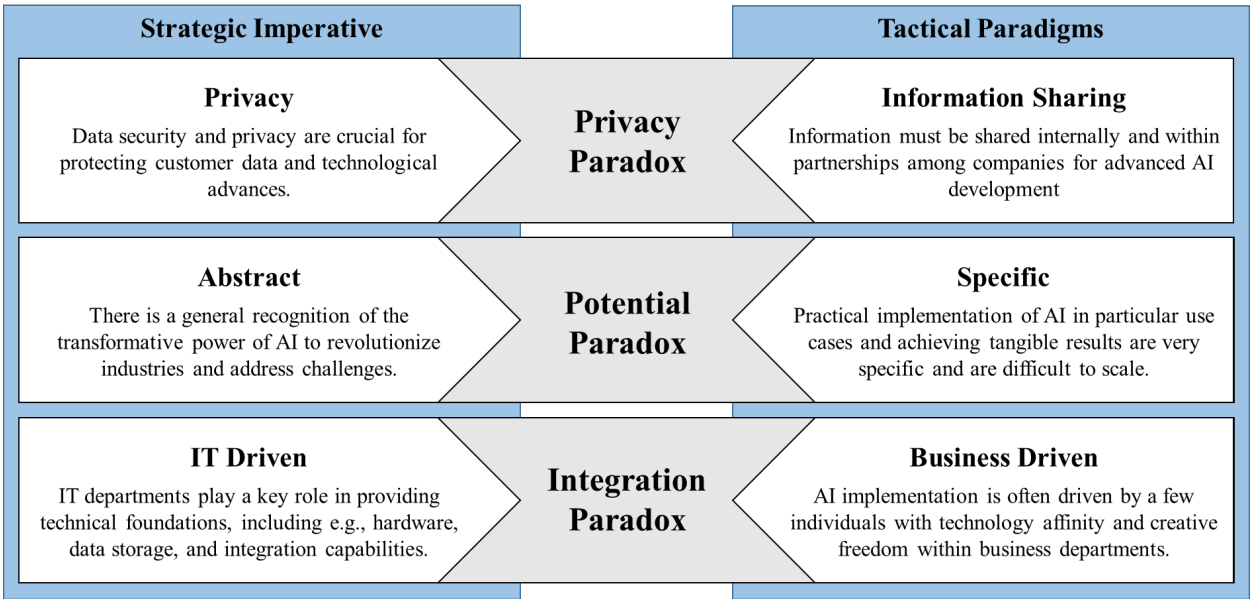

Figure 1. AI Implementation Paradoxes

Therefore, while technical foundations for AI must be created from a strategic AI perspective, also the understanding of AI opportunities must be explained to operative divisions to drive tactical paradigms: "*And let me put it this way, the best technology and the best systems are worth nothing if the people in the specialist area can't do anything with them*" (I7).

5. Discussion

The following subchapters discuss the theoretical contributions, practical implications, as well as limitations and opportunities for future research endeavors.

5.1 Theoretical Contributions

This study makes a valuable contribution by identifying and exploring paradoxes of AI implementations depicted in Figure 2.

A key finding of this research are two main underlying problems across all paradoxes: strategic imperative and tactical paradigms. While the strategic imperative to engage with AI and create necessary technological foundations for AI was generally acknowledged by our interviewees, the tactical paradigms were described as targeted and operationally focused AI endeavors. However, the paradox arises as, on the one hand, the tactical paradigms are hindered if the strategic imperative is not fully established and, on the other hand, a strategic imperative without tactical paradigms leads nowhere. To tackle this paradox, van Giffen and Ludwig (2023) found that starting with tactical, individually developed AI pilots and projects before scaling those pilots helped to launch transformative AI applications successfully. This aligns with the data from our interviews, where tactical paradigms were mentioned as driving forces of AI implementation.

Furthermore, we elaborate on three particular paradoxes within our study. First, we add to existing literature on the prevailing privacy paradox (Smith, 2019), which is a crucial aspect of AI development. By delving deeper into this paradox, the study enhances the understanding of the complex interplay between information sharing and data security. While it is unchallenged that data security and privacy must be complied with, AI holds great potential for network effects when sharing information to leverage customer value (Gregory et al., 2021). Overall, the study highlights the importance of addressing this paradox to ensure effective AI deployment while safeguarding privacy rights. Former literature has also recognized the privacy problem for implementing AI in organizations, especially when data-sharing with third parties are imperative. For instance, the studies by Prabhu et al. (2021); Zhang et al. (2018) provide guidelines for deploying machine-learning algorithms that control for privacy issues, that could be adapted by incumbent firms starting with AI implementations. Moreover, Hittmeir et al. (2019) elaborate on the use of synthetic data use to overcome privacy issues. However, our insights show that there is a knowledge gap between the scientific

literature and the know-how applied in practice on navigating the privacy paradox in AI implementation.

Further, we add two paradoxes to the literature: potential and integration. The potential paradox encompasses the general, abstract recognition of the transformative power of AI in existing business challenges, while specific practical implementations are necessary – however, as of now lack of convincing and are too much in a nutshell. Finally, the integration paradox has brought up the tensions of the general necessity for IT departments to provide technical foundations for AI and integrate this into the overall IT strategy. In contrast, the business departments must drive the AI implementation use cases as separate use-cases. It was mentioned that none of the sides is the perfect way for all paradoxes. Instead, there is a need to leverage either side to overcome any potential barriers.

5.2 Practical Implications

By unraveling different paradoxes caused by the challenges of AI, we provide practical implications based on our findings. First, we provide an empirical overview of common AI paradoxes as one type of digital innovation paradoxes (Hund et al., 2021). By recognizing the paradoxical nature of any digital innovation, specifically AI innovation, the first steps can be taken to overcome these hindrances compared to unconscious or fuzzy burdens in existing AI projects. Regarding the paradox of information sharing versus privacy, for instance, concerns can be formalized and transformed into an explicit AI data strategy. This way, firms can evaluate which risks regarding the use and sharing of data they are willing to take, while certain types of data (e.g., certain production data) stay off limits for future AI projects due to strategic evaluations. Consequently, relationships with complementary firms or providers of AI solutions can be built with less critical data and might be extended based on positive experiences in the future.

Second, we detected a mismatch between the evaluation of abstract versus specific potential in AI development processes. As our results show, there is a general acknowledgment of AI potential, however, many incumbent firms struggle to deduct business value from specific use cases. To overcome this paradox, firms should integrate their AI initiatives into strategic decisions after an initial pilot phase to gain first insights. Comparable to van Giffen and Ludwig (2023), who describe the process of AI democratization at a large, incumbent automotive manufacturer in Germany, firms can integrate AI projects in corporate or digitalization strategies, including business evaluation plans of promising projects. Moreover, successful pilots can be democratized for a large user basis to leverage their potential and transform it into value-added AI innovation projects.

Third, our results show that the paradoxes when implementing AI have different origins, including the organizational structures of the firms. The bottom-up versus top-down paradox constitutes one of the prevailing burdens in incumbent firms that face the merit of challenges when trying to balance the high quality of existing operating processes and utilize new opportunities from quick, agile developments in promising technological innovations simultaneously. Organizational adaptions to bridge these contradictions should be considered where possible to overcome this challenge. For instance, citizen developments from different departments (i.e., business and IT) can be recruited to initiate AI pilots without adhering to existing organizational structures. Moreover, so-called innovation labs or centers of excellence can be formed to regroup IT and business representatives into project-specific units to include guidelines in AI projects at an early stage from all relevant departments at once.

5.3 Limitations and Future Research

Our study is subject to certain limitations, which should be addressed by future research. First, we have limited our data collection to Germany. The German market structure is characterized by a broad range of different industries and a large number of incumbent firms, which provides the opportunity for a wide variety of different viewpoints on AI. However, the existing market structure also limits the generalizability of the study, as the potential and hazards of AI may be assessed differently in other countries. Moreover, countries that are situated outside the European Union do not have to follow the GDPR guidelines, which will most likely lead to less problematic situations regarding the privacy versus information sharing paradox.

Second, we only interviewed our participants at one specific point in the introductory process of AI projects. As pointed out before (Raisch & Krakowski, 2021), some paradoxes might also evolve or dissolve over time, leading to other obstacles that might not be recognized upfront. Therefore, future studies should evaluate how paradoxes evolve over time and deduct possible solutions from these dynamic findings. Third, we limited our analysis to employees of IT departments. Although all our interviewees are involved in different kinds of AI or digitization projects, there might be other viewpoints from business employees or members of the board. Such insights can be used in future research to juxtapose different roles in the organization for a deeper understanding of the origin and emergence of different AI paradoxes.

6. Conclusion

In this study, we analyzed the paradoxical challenges caused by the implementation of AI in incumbent firms. To approach this research question, we drew on the literature on technological paradoxes and followed a qualitative research approach using semi-structured interviews in eight incumbent firms. By inquiring about current challenges and the expected potential of AI implementation, we unraveled different conflicting views based on the underlying paradox of strategic imperative versus tactical paradigms, based on three AI paradoxes. First, we find the *privacy paradox*, which includes the simultaneous occurrence of privacy concerns while realizing the necessity to share information for AI solutions. Second, we find the *potential paradox*, which encompasses the rather abstract recognition of the transformative power of AI juxtaposed against the imperative recognition of its purposeful deployment in specific contexts. Last, we unraveled the integration paradox, which shows the general necessity for IT departments to provide technical foundations for AI. In contrast, the business departments must drive the AI implementation use cases. Overall, we conclude that different mismatches exist between existing strategic imperatives and tactical paradigms regarding AI potentials in incumbent firms, hindering AI exploitation. As none of the sides is a perfect way, instead, there is a need to leverage either side to overcome any potential barriers. Our results contribute to the information systems literature on AI and technological paradoxes by providing novel empirical insights on AI paradoxes and practical implications to overcome the paradoxical nature of AI challenges in incumbent firms.

7. References

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Appendix

Interview Guideline
Are you already operating AI applications in your company? (If yes: briefly describe)
Do you have (further) AI applications that are currently in the concrete planning phase? (If yes: briefly describe)
What is the biggest challenge(s) in your company using, planning, and designing AI applications?
Compared to large, international corporations: In which areas do you consider mid-sized companies to be leaders or better positioned in terms of AI? Where do you currently see a need for SMEs to catch up?
Who is responsible for digitization in your company? Does your company have an (additional) CDO?
How would you currently describe the role of your IT department in the use of AI applications in your company? What are the biggest challenges in this?
How has the role of your IT department changed due to the use of AI applications (or expanded digitization)?
What are your expectations for the future role of IT at your company?
Take a look at the last few years in the company: How has your role (as CIO) changed in the company?
Considering planning for the next years: What are your expectations for your future role?
What AI applications would you like to see in your company in the medium or long term?
What potential do you see in them, or what do you hope to gain from them? (For example, cost savings, personnel savings, better quality, etc. ...).
What new competencies are you looking for in IT in the medium or long term with regard to AI applications? How do you prepare your employees for this change?
What adaptation needs do you see outside of IT?