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Master Thesis

# Artificial Intelligence: From Data to Insights

## Artificial Intelligence in Digital Transformation Strategies in the Semiconductor Industry


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# Abstract

Emerging technologies are reshaping the digital landscape and competitive environment of highly technological companies with the introduction of artificial intelligence (AI). Firms are reacting by implementing digital transformation (DT) strategies aligning the organizational and technological factors towards leveraging AI-generated information. This thesis sheds new light on the topics of knowledge management (KM), DT, and AI in organizational practices with an emphasis on AI-enhanced software-as-a-service (SaaS). The research results in a conceptual framework, designed from the literature on AI, DT, KM, and dynamic capability view (DCV) uncovering three overarching concepts (internal capabilities, absorptive capacity, and technological competitiveness). This conceptual framework was then complemented by empirical data featuring primary data gathered from a single case study and secondary data from an internet-mediated data collection. The interviews in the case study were focused on managers with extensive experience in the semiconductor industry and operators working with the AI-enhanced SaaS tool. The analysis concludes in an updated conceptual framework, highlighting the interplay of a firm's internal capabilities and an AI-enhanced absorptive capacity indicating three pathways toward achieving technological competitiveness in a highly technological environment. Additionally, a proposed solution is presented featuring an AI-enhanced tool operator as a new role, responsible for supporting organization-wide activities with AI-generated information.

# Keywords

Innovative technologies, Artificial intelligence, Digital transformation, Software-as-a-Service, Absorptive capacity, Environmental scanning, Knowledge management



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# List of abbreviations

| **Abbreviation** | **Definition** |
|---|---|
| AI | Artificial Intelligence |
| CDTO | Chief Digital Transformation Officer |
| DC | Dynamic Capabilities |
| DCV | Dynamic Capability View |
| DT | Digital Transformation |
| DV | Dynamic View |
| KM | Knowledge Management |
| NDA | Non-Disclosure Agreement |
| NLP | Natural Language Processing |
| SaaS | Software-as-a-Service |

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# 1. Introduction

## 1.1. Background

In the 1990's the value of knowledge as a strategic resource under the term knowledge management (KM) was introduced. The concept developed into a strategic process for achieving competitive advantage and improving organizational performance. KM has later been elaborated on by researchers and its main focus is now on creating, sharing, leveraging knowledge, improving sustainability, innovativeness, and resilience to changes in the surrounding environment (Alavi and Leidner, 2001; Santoro et al., 2018). Furthermore, modern KM has introduced a new mindset for managers. This means shifting focus from traditional value-creation activities such as developing infrastructure, products, and equipment to developing the organizational culture. With the purpose of asserting value in the retention of intellectual property, the identification of strategic partnerships, and the internal creativity & skill of employees (Lam et al., 2021). KM can then be used in identifying emerging technologies in the early stages of their technology readiness level (Bai et al., 2020), realizing potentials in strategic partnerships, and be used in conjunction with artificial intelligence (AI) for open innovation (Santoro et al. 2018; Tiwari, 2022). Its relationship to open innovation becomes apparent in implementing external expertise to improve internal innovation processes (Lam et al., 2021).

*Artificial Intelligence*

AI is used in different applications to process data and evaluate it with regard to patterns, correlations, and similarities in various ways. It operates in a repetitive loop of 'sense-think-and-act'. An emerging application of AI is the broad area of text analysis where high-quality information is extracted from different text inputs (Soni et al., 2020). One of its main applications is its ability to assist corporations in big data analytics to develop organizational systems to produce new strategic decision-making models (Kim and Kim,

2022). Machine learning in AI was specifically developed to tackle the issue of information and label correlation as they rarely go one-to-one (Masuyama et al., 2023). AI presents technical solutions and potential for improvements in the flexibility, efficiency, and productivity of organizational practices (Bai et al., 2020).

Mikalef, Conboy, and Krogstie (2021) underlined the potential of AI in identifying trends, assessing situations, forming judgments, and consequently making informed decisions, based on the availability of big data and sophisticated technologies to use it. These developments in AI hold a lot of hope for companies to improve their use of data, investment of resources, and implementation of new ways of working (Nishant, Kennedy, and Corbett, 2020). Moreover, AI can be implemented as process automation in human tasks avoiding knowledge loss due to illness or retirement, and will certainly impact the job market in the future by replacing certain tasks and introducing new job profiles (Mendling et al., 2018).

*Artificial Intelligence in Digital Transformation*

The implementation of AI requires traditional companies to propose digital transformation (DT) strategies which introduce various challenges in the organization (Kraus et al., 2022). DT can be understood as the integration of a new digital technology in an organization, that has influences on operations (Kim and Kim, 2022). A previous technology that required DT was for example the shift from paper-based to computer-based systems of operation. Nowadays those technologies are mostly on a software level, such as AI, cloud computing, or the Internet of Things (IoT). The integration of new workplace technologies is depending on how these are received by employees, communicated by the CEO, top-level interactions, and internal skills & knowledge in digital literacy (Kraus et al., 2022).

Organizations are adopting digitalization trends to accelerate production & processes and better adapt to their target demographic (Dubey et al., 2020).

Top firms are most frequently opting for big data analytics to perform market orientation research with AI and market research as secondary foundations for decision-making (Zhang and Song, 2022). Companies undergoing DT exceed product and service innovation activities by applying a holistic view of the organization through the implementation of AI (Kim and Kim, 2022). Open innovation is derived through collaboration and inter-organizational partnerships which can be instigated by the possession of attractive technologies (Chesbrough, 2003; Lee et al., 2010; Parida, Westerberg, and Frishammar, 2012).

*Dynamic capability view*

In particular, the technology sector has an amplified need for dynamic capability view (DCV) as it is prone to rapid changes and new developments (Lee et al. 2010; Parida, Westerberg, and Frishammar, 2012; Wilhelm, Schlömer, and Maurer, 2015). The DCV relates to sensing opportunities & threats, seizing opportunities, and reconfiguring resources & capabilities (Teece, 2017). The availability of information has made the process of sustaining competitive advantage increasingly difficult, emphasizing the relevance of the dynamic capability (DC) of a firm (Barreto, 2010).

## 1.2. Problem Discussion

According to Di Vaio et al. (2021), the amounts of data and information streaming into organizations make it increasingly difficult to manage and utilize information effectively. Digital innovation exceeds humans in optimizing this process (ibid.). For this theoretical field, it is important to consider both organizational and technological implications when researching information management and KM (Nobre, Tobias, and Walker, 2009).

External expertise facilitates the implementation of the internal aspects of DT (Lam et al., 2021; Lee et al., 2010). This can be amplified by strategic KM practices (Alavi and Leidner, 2001; Santoro et al., 2018). Moreover, the transformation has repercussions on the employee's roles themselves, as the redesign of processes will make some tasks redundant and increase the importance of intangible assets. These include talent acquisition and internal training for handling the new organizational requirements (Bertani, Raberto, and Teglio, 2020; Darmawan et al., 2023).

The integration of DT-oriented activities is facilitated internally and externally. The internal aspect is instigated by leadership, the IT department, and employees as these are either responsible or exposed to changes derived from new technologies. These changes require digital capabilities, and new business processes to analyze the AI-generated results (Bertani, Raberto, and Teglio, 2020). The external partner can assist the organization with the necessary expertise, tools, or software adapted to the specific needs of the organization, emulating a supplier and beneficiary co-creative relationship (Parida, Westerberg, and Frishammar, 2012).

The failure to initiate or delay in implementing internal DT capabilities in the business model can lead to various pitfalls and risks (Kim and Kim, 2022). These include (1) reduced competitiveness: companies that lag behind in DT may struggle to keep up with competitors who have embraced digital technologies. This can result in a loss of market share and revenue (Alvarez-Aros and Bernal-Torres, 2021). (2) Cybersecurity threats: with increasing digitization comes the risk of cyber attacks, and businesses that are slow to adopt digital security measures may be vulnerable to data breaches and other cyber threats (ibid.). (3) Inefficient operations: without DT, a company may continue to rely on outdated and inefficient processes, resulting in stagnating productivity and high costs (ibid.). (4) Obsolete Business Models: DT has disrupted traditional business models, and failure to adapt can render a company's operations obsolete (Kim and Kim, 2022). For example, in the bankruptcy of traditional retailers, with rapidly growing

companies such as Amazon and Alibaba utilizing their digital capabilities to now threaten previously unrelated markets. This is causing concern in the banking sector and logistics companies (Verhoef et al., 2021).

Modern KM practices in large successful organizations are most frequently used in big data analytics, while this doesn't exclude the presence of an AI the difficulties in its utilization make it an expensive and time-consuming investment (Zhang and Song, 2022). The problem of sustaining long-term competitive advantage with access to information is then negated through a cost-efficient KM strategy (Barreto, 2010; Santoro et al., 2018). Companies relying on traditional methods are then faced with a problem that can be addressed by applying DCV to their organizational strategy to spot business opportunities and reconfigure existing resources towards adopting new technologies (Teece, 2017).

AI-enhanced Software-as-a-Service (SaaS) is gaining momentum when companies are confronted with DT-oriented challenges and are tiptoeing into the field of AI. SaaS then enables the advantage of the software's features without having to handle the task of installing and administering the service (Kumar, 2017). SaaS vendors incorporate AI into their solutions to provide customers with enhanced capabilities (Gill et al., 2022). They enable a fast assessment and proof of concept through accelerated software development without many resources bound to development and functionality tests (Kumar, 2017). This consequently leads to lower up-front costs, whilst offering a higher return on investment and a lower total cost of ownership. These benefits derived from SaaS incorporate external expertise for internal training to efficiently work with AI, as the employees are guided by the service providers (Sestino and De Mauro, 2021).

Besides those advantages, AI-enhanced SaaS in market research also needs to be critically evaluated. Challenges such as data security, integration in existing systems, the redesign of processes, as well as the risk of vendor lock-in situations, should be considered by organizations (Kumar, 2017). For

the operating customer, the AI is like a black-box, where there is no explanation for results or traceability, providing the beneficiary with a knowledge advantage (Uliasz, 2020). Another problem is represented in possible biases in the AI's data set. If there are biases in the data, especially if the algorithms are trained with historical data, the results can be misleading with inaccurate predictions (Cheatham, Javanmardian and Samandari, 2019).

Practical implications of AI and DT on organizations emerge as technological competitiveness, which is a crucial factor in differentiation, anticipating the entry of new markets, gaining competitive edges, and enhancing their performance & sustainability (Alvarez-Aros and Bernal-Torres, 2021). AI can be used as a modern tool in structuring this information as well as analyzing the current overload of information available, surpassing previous organizational barriers with the ability to process all types of data (Castillo and Taherdoost, 2023). Boudreau, Serrano, and Larson (2014), introduce the concern of deskilling of professionals as a consequence of overreliance on AI-based systems. Moreover, the issue with this method remains as analytical fluency can make human resources overlook great, but incomprehensible solutions (Sestino and De Mauro, 2021). Furthermore, the information collected by the AI itself can be unethical in nature by gathering private customer data (Castillo and Taherdoost, 2023). To cope with these issues companies must then become agile to increase resilience against changes and threats in their industry. This could be addressed by developing their dynamic capabilities (DC) regarding data security, ethical concerns, and a clear exit strategy to avoid crises and backlash (Teece, 2017; Wilhelm, Schlömer and Maurer, 2015).

## 1.3. Research Gap

Despite increased research attention in AI, recent publications have identified several research gaps. Kim and Kim (2022) highlight the need for further empirical research in the AI-enhanced digital decision-making strategy, in consideration of their identified SERM factors. Furthermore, whether these factors affect the success of firms' DT strategies. Another researcher who appeared in two different papers was Sasha Kraus. In his paper published in 2022 he pointed out the need for researching *"the hindering and supportive internal and external factors that different organizations face when developing dynamic DT capabilities."* (Kraus et al., 2022) As well as the impact of technologies, such as AI among others, on DT-related efforts, such as process improvement, operations and business model innovation. Kraus is also contributing to Hock-Doepgen et al. (2021) where network collaborations and partnerships are recognized as a potentially valuable source of information as an additional information stream to internal and external KM capabilities (Hock-Doepgen et al., 2021).

Darmawan et al. (2023) identified the need for future research on the role of culture, structure, leadership, and technology among others that affect KM capabilities through human capital as a means for improving organizational performance. Sestino and De Mauro identified promising research directions that *"should be prominent in the future research agenda"* (2021, p.24). Namely, human implications, industrial application, and recognition methods. The *human implications* present the required skills of employees to leverage AI effectively, and the required organizational processes and structure. The *industrial application* describes the need for research to investigate how to facilitate AI to achieve a competitive advantage. Thirdly, the *recognition methods* in order to examine the organizational implications of *"adopting black-box models (...) for decision making*." (Sestino and De Mauro, 2021, p.26). The overarching concept remains as DT is recognized as an initiator of a fundamental paradigm shift that extends beyond individual

companies towards the societal impact of new technologies, programs, and projects (Kraus et al., 2022).

## 1.4. Research Purpose and Questions

This thesis sheds new light on the topics of KM, DT, and AI in organizational practices. The purpose of this study is to examine the effectiveness of AI-enhanced SaaS to improve a firm's internal capabilities, absorptive capacity, and technological competitiveness. This includes its ability to scan its surrounding dynamic environment. In accordance with Kraus et al. (2022) and Darmanwan et al. (2023) it extends to the human factor in how AI can be implemented in KM capabilities, through a DT strategy of innovation-oriented market operations is also taken into consideration.

The following research questions were formulated.

> *How do external and internal factors affect the successful adoption of AI in organizational practices?*
>
> *How can AI as SaaS impact innovation activities, and identify new markets and applications in the technology industry?*

These research questions were evaluated in the context of a global semiconductor manufacturing company. The global semiconductor industry is subject to rapid changes due to a lack of standardization. This is providing opportunities for startups offering innovative solutions to establish themselves as key players or disrupt existing supply chains (YOLE, 2020a). Therefore, research and development investments, joint ventures, partnerships, and access to essential knowledge become vital to remain competitive in this turbulent industry (YOLE, 2020b). Moreover, Zhang and Song (2022) highlight the importance of focusing on AI in the semiconductor industry to create better, faster, smaller, and cheaper products. According to

Kraus et al. (2022) the influences of DT, if considered holistically, outperform the individual benefits on a company level but result in societal impacts. These, in the semiconductor industry, present the acceleration of technological innovation to cope with the climate crisis.

## 1.5. Thesis Outline

***Chapter 1, Introduction:*** provides background and context for the research problem, states the research questions, and shows the significance and contribution of the study.

***Chapter 2, Theoretical Framework:*** presents the theoretical foundation used in the study.

***Chapter 3, Methodology:*** gives an overview of the followed research philosophy, the used research design and approach, the introduction of the case study, the data collection by semi-structured interviews, and the data analysis method.

***Chapter 4, Empirical Data:*** sets out the qualitative data and content collected and forms the basis for the following analysis.

***Chapter 5, Analysis:*** connects the empirical findings to the theoretical framework in order to answer the research questions. This includes the derivation of theoretical and practical implications as well as introducing the proposed solution.

***Chapter 6, Conclusion:*** summarizes the study and the key findings, directs the theoretical contribution of the study, and the practical implications for practitioners.

# 2. Theoretical Framework

## 2.1. Digital Transformation

When undergoing DT the changes implied extend beyond digitization and digitalization. This is because DT is affecting all parts of an organization potentially leading to the implementation of an entirely new business model (Kraus et al. 2022). Digitization as a technical process refers to using information technology such as coding and programming to transform physical, analog tools into digital formats (Bican, Brem, 2020; Kraus et al. 2022; Tronvoll et al. 2020). Digitalization is recognized as societal technologies enhanced through digitization endeavors in social and institutional applications facilitated by digital infrastructure (Bican and Brem, 2020; Kraus et al. 2022). Kraus et al. (2022) extend the definition of digitalization to also feature the use of digital technologies in firms in process automation to increase resource efficiency and create revenue.

When the digitization of an organization is so far-reaching, that the operations over the whole organization are influenced, resulting in infrastructural adaptations, this is referred to as a DT. In literature, DT is defined as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Hinterhuber, Tiziano Vescovi and Checchinato, 2021, p.15). DT, as previously mentioned, takes a more holistic approach to transform an organization on every level and when successfully implemented can lead to increased productivity, sales, the identification of innovation opportunities, and enhanced consumer interactions by machine learning and analytics of behavior, trends, and needs of the market (Kim and Kim, 2022; Kraus et al. 2022). Table 1 illustrates the research scope and key findings of the most relevant articles featuring DT.

*Table 1: Most relevant articles on Digital Transformation*

| Authors | Research scope | Key findings |
|---|---|---|
| Kraus / Durst / João / Ferreira / Veiga / Kailer / Weinmann (2022) | This article maps the thematic evolution of current research on digital transformation in business and management. | DT research is still in an early stage. The main themes identified in DT research currently relate to; structural changes and changes in value creation, use of digital technologies, dynamic capabilities, strategic responses, and influences on consumer behavior. |
| Kim / Kim (2022) | This study aims to define the factors affecting digital transformation strategies and present a decision-making model required for digital transformation strategies based on the definition. | The study emphasizes the crucial role of CEOs in driving digital transformation within organizations. Moreover, highlights the importance of managing the internal environment alongside external factors. Lastly, the study identifies key factor mechanisms that influence digital transformation, particularly change management capabilities and learning capabilities. |
| Bican / Brem (2020) | Aims to provide a common understanding of the most prevalent terms of the digital environment and their relations. | Digital Transformation - Outcome of Digital interplay as an underlying process, contingent internally (organization) and externally (cooperation), while embracing profound change and implications. |
| Tronvoll / Sklyar / Sörhammar / Kowalkowski (2020) | The study analyzes how manufacturers can harness digital technologies to shift from a product-centric to a service-centric business. | The article discusses three fundamental shifts necessary for a successful digital servitization transformation, which are moving from planning to discovery, scarcity to abundance, and hierarchy to partnership. Organizational identity, dematerialization, and collaboration play a central role in this transformation. |

### 2.1.1. Organizational culture in DT

As human societies are comprised of various cultural systems, organizations are perceived as miniature societies that require their own distinct culture (Mawere, 2011; Tran, 2017). Organizational culture is defined as a tool for guiding individuals in recognizing the values and beliefs overarching an organization to facilitate desired behaviors (Hasan and Nikmah, 2020). An essential aspect of the successful implementation of DT is the human factor. For leaders striving to integrate DT initiatives, a crucial aspect is transparency through the embodiment of the strategic vision employed by the CEO. Moreover, the active participation of the leader in internal communication allows for the establishment of this vision to lead by example and facilitate open-mindedness in the employees to better adapt to the changes (Abbu et al. 2022). Therefore, DT while being technology-centric at its core indicates an equal need for changes in leadership, culture, and mindset of the organization, to increase the acceptance level of employees when faced with ambiguity and recurring challenges and changes (Kraus et

al. 2022). These initiatives often fail when attempting to override existing mindsets, practices, and structures (Tronvoll et al. 2020).

The concept of organizational learning is built on three pillars, namely; creating, maintaining, and knowledge transfer (Hasan and Nikmah, 2020). In turn, organizational learning can be viewed as a subtopic of organizational culture when connecting it to organizational performance (Mohammed, Bin Taib, and Nadarajan, 2016). Additionally, employee performance is improved through organizational learning which is integrated through organizational culture (Hasan and Nikmah, 2020) However, organizational learning by itself was deemed insignificant in improving employee performance, further emphasizing the importance of a strong organizational culture (Hendri, 2022)

### 2.1.2. Emerging Technologies

Taking a look back at the digitalization process during the last decades shows a disruptive technological development. The introduction of emerging technologies is compressed in a short period of time and are driven by technology push (Berman and Marshall, 2014; Verhoef et al., 2021). The introduction of the World Wide Web drove accompanying technology developments, such as broadband internet, smartphones, cloud computing, speech recognition, and online payment systems (Verhoef et al., 2021). Currently, the emerging technologies that get a lot of attention and are foreseen as business-transforming technologies are AI, blockchain, internet-of-things, and robotics (Bai et al., 2020). This paper is focusing on the emerging technology AI.

*Artificial Intelligence*

The idea of machines and systems behaving in an intelligent human-like manner was followed by researchers for centuries. The idea became a reality with achieving milestones in the development in the second half of the twentieth century. Nowadays, AI is a settled subtopic in computer science

and information technologies (Bainbridge, 2011). Nevertheless, the full potential of AI applications is not yet exploited. According to Pitt et al. (2021), AI can be separated into three stages: (1) Artificial Narrow Intelligence, (2) Artificial General Intelligence, and (3) Artificial Super Intelligence. The three stages differentiate by cognitive abilities, focus, and impact, which are displayed in Figure 1. The AI that is currently used is stage one. Therefore, every time that AI is mentioned in this paper it refers to the first stage, Artificial Narrow Intelligence.

| Type of AI | Artificial Narrow Intelligence | Artificial General Intelligence | Artificial Super Intelligence |
|---|---|---|---|
| Cognitive Abilities | Singular subset of human cognitive abilities. | Wide range of human cognitive abilities. | Exceeding human cognitive abilities. |
| Focus | Learns specific tasks and solves problems without being instructed on every detail. | Understands or learns any intellectual task that a human being can. | Upgrades itself, learns new tasks and advances at an incomprehensible rate. |
| Impact | Replaces old, routine tasks and manages new, complex tasks. | Becomes innovative, imaginative and creative. | Performs tasks previously unimaginable. |
| Timing | Today | Not quite tomorrow (2040) | Highly speculative |

*Fig. 1: Types of AI based on the graphic of Pitt et al. (2021)*

Due to the logic rule-based functionality, AI still lacks the flexibility that human intelligence is offering (Ameen et al., 2022). Nevertheless, mechanical and analytical intelligence can still be used to carry out simple cognitive tasks (Davenport et al., 2019). This could lead to a shift of working routines, so repetitive tasks are obsolete, which consequently leads to changing requirements for employees' skills (Kraus et al., 2022; Mendling et al., 2018; Su, Togay, and Côté, 2020).

Natural language processing (NLP) is facilitating text mining and consequently AI. It combines computational linguistics, meaning the rule-based structure of human language, with machine learning (Kang et al.,

2020). NLP can be seen as a mediator between human (or natural) language and computers, by translating words into commands that can be utilized by the computer to provide valuable information. One phenomenon that has gained notoriety this year is the tool ChatGPT, developed by Open AI (Lund and Wang, 2023). The tool uses NLP, as used in the AI-enhanced SaaS tested within the case study, for understanding and generating natural text. It explains this as follows: *"My training data includes a vast amount of text from various sources, which I use to learn patterns and relationships between words and phrases, allowing me to generate responses to questions and prompts in a natural-sounding way. In short, NLP is at the core of my functionality as a language model."* (ChatGPT, 2023)

The applications of AI are of a wide variety. The extraction of document information and information management is needed in different disciplines. In the field of business and economics it is used in Marketing (Ameen et al., 2022), trend identification, and managerial and strategic decision-making (Gupta et al., 2019; Mikalef, Conboy, and Krogstie, 2021). All activities strive for effective design of processes and working modes to enhance the efficiency and accuracy of work (Bai et al., 2020). Especially by augmenting and expanding the capabilities of all ecosystem participants, including insights such as competitors' activities, governmental legislations, patents, and research, a foundation, and basis for innovation initiatives can be built (Marshall, Dencik and Singh, 2021).

## 2.2. Knowledge Management

The nature of business includes dealing with competition and environmental changes (Santoro et al., 2018). Thus, extracting knowledge related to upcoming trends, technologies, opportunities, and the ability to leverage this information is essential to modern firms (Hock-Doepgen et al., 2021). While KM was introduced in the 1990s, its relevance is increasing with the emergence of new technologies. With larger quantities of data being

available and decreased significance of previous barriers, access to this information is now attainable (Tiwari, 2022). This is, in turn, introducing new ways for firms in creating, sharing, and leveraging information for improving innovativeness, sustainability, and facilitate long-term competitive advantage & business model innovation (Alavi and Leidner, 2001; Hock-Doepgen et al., 2021; Santoro et al., 2018). The transformation of KM becoming an integral part of innovation processes also means that organizations in the future might be prone to ethical dilemmas impacting the use of these new technologies (Tiwari, 2022).

Knowledge is regarded as the core and most significant asset to any organization and the value of this asset then is dependent on the capabilities to utilize the knowledge available and maximize its extraction (Darmawan et al., 2023; Li, Zhang, and Zhang, 2013 ). KM can be separated into two main dimensions, namely, enablers and processes. Both dimensions are rooted in the organization itself with processes being the creation, sharing, storage, and application of knowledge and enablers focused on employee collaboration, sharing, and ideating within the organization (Santoro et al., 2018).

For these dimensions to succeed in their respective functions to increase organizational performance, KM infrastructure needs to support them, for example, organizational culture, information technology, structure, the physical environment, and common knowledge (Darmawan et al., 2023). While the implementation of new KM technologies in the organization will have repercussions on the employees' role in the company, altering tasks and initiating new requirements on competence (Bertani, Raberto, and Teglio, 2020).

Therein the relationship between organizational culture and KM becomes apparent as KM is built on human interactions and organizational culture affects how humans interact (Li, Zhang, and Zhang, 2013). Specifically, organizational culture affects the employee's willingness to share knowledge with colleagues, as knowledge is regarded as a power that will fade as

individuals' skills become a standard (Darmawan et al., 2023). The importance of intangible investments in KM technology utilization in DT such as talent acquisition, employee skills development, and internal creativity further emphasizes the importance of trust within the organizational culture and leadership in the organization. This can mainly be derived from the CEO or executives through motivating employees towards sharing knowledge internally and integrating rewarding initiatives (Darmawan et al., 2023; Kraus et al., 2022; Lam et al., 2021).

*External knowledge management and open innovation*

Applying KM internally has been the main focus of most research with recent research also hinting towards external capabilities (Santoro et al., 2018). External KM capabilities become increasingly important as environmental changes, emerging technologies, and competition is growing in complexity there are difficulties in the utilization of these within the company (Darmawan et al., 2023; Tiwari, 2022). This resonates with the findings of Hock-Doepgen et al. (2021) highlighting the importance of continuous development in a firm's knowledge base for increasing its absorptive capacity, meaning its capability to sensemaking of environmental changes and abilities for new knowledge extraction and internal application.

The organization’s absorptive capacity is derived from three processes, the *acquisition-oriented process,* the *conversion of knowledge,* and the *application-oriented process* (Hock-Doepgen et al., 2021). The *acquisition-oriented process* refers to the procurement of knowledge through social interaction or inter-organizational collaboration, the purchase of knowledge assets, or environmental scanning. The *conversion-oriented* or transformative and connectivity process refers to the firm's ability to derive or assign value to the knowledge extracted in the absorptive or inventive processes (Hock-Doepgen et al., 2021; Santoro et al., 2018). The conversion of knowledge is mainly performed by identifying intelligent individuals within the organization to handle the systems in place (Darmwan et al.,

2023). This depends on the organizational culture in terms of developing the language and skills of employees to understandably absorb and convert knowledge (Li, Zhang, and Zhang, 2013). The final stage is referred to as the *application-oriented process* by Hock-Doepgen et al. (2021), where the converted information is applied to organizational operations and strategic activities. This includes an additional step, namely 'desorptive' capacity where knowledge is conveyed outwards to initiate new partnerships by outward knowledge transfer (Hock-Doepgen et al. 2021; Santoro et al., 2018)

The research conducted on external KM practices proposes the applicability of open innovation processes as companies adopt internal and external resources to enhance their service and product offerings (Santoro et al., 2018). Through combinations with DC there are external KM resources applicable to internal innovativeness and in conjunction with external parties, open innovation activities (Hock-Doepgen et al., 2021). By facilitating processes and enablers, KM can be applied in identifying emerging technologies & potential strategic partnerships and be used in AI technologies as a source of information (Santoro et al. 2018; Tiwari, 2022).

The implementation of the external information flows is grounded in the open innovation process where the transformation of knowledge as intangible value results in new products, processes, or even business model innovation (Chesbrough, 2003; Hock-Doepgen et al., 2021; Lam et al., 2021). This requires human capital, which in KM can be regarded as intellectual capital, referring to the capabilities, skills, and knowledge possessed by employees in the organization (Darmawan et al., 2023). By distinguishing between radical innovation, which implies the introduction of a product or process new to both the industry and the firm, and incremental or imitative innovation which is established on the market and only applies to the firm and its operations. Organizations can then better assess the impact of innovation on the market and on organizational operations (Ietto-Gillies, 2019). Table 2 illustrates the research scope and key findings of the most relevant articles presented in this chapter.

*Table 2: Most relevant articles on Knowledge Management*

| Authors | Research scope | Key findings |
|---|---|---|
| Hock-Doepgen / Clauss / Kraus / Cheng (2021) | This study examines the impact of internal and external KM capabilities on business model innovation by empirically analyzing a sample of 197 small to medium-sized enterprises. | The findings confirm that external KM capabilities represent core conditions in achieving high business model innovation. However, the results also demonstrate a conditional relationship between internal KM culture, structure and technology, and business model innovation in the presence of external KM capabilities. |
| Tiwari (2022) | This study explores the role of knowledge management in organizations, the impact of emerging technologies on knowledge management practices, and the challenges associated with implementing knowledge management in the context of emerging technologies. | Emerging technologies support an organizational knowledge management to improve responsiveness to partners and customers, enhance the ability to solve problems, and develop individual competencies. Increasing the accuracy of decision-making through the use of knowledge management and emerging technologies is crucial for an organization's success. |
| Darmawan / Agusvina / Lusa / Sensuse (2023) | This study was conducted to determine how the human capital role mediates the impact of knowledge management on organizational performance and determine another factor that affects knowledge management, which can impact organizational performance. | Effective knowledge management practices positively impact organizational performance indicators such as innovation, productivity, and competitiveness. Additionally, factors such as knowledge sharing, knowledge creation, organizational culture, and technology infrastructure play vital roles in facilitating successful knowledge management and driving organizational performance. |
| Santoro / Vrontis / Thrassou / Dezi (2018) | This study carries out a structural equation modelling investigate the relationship among knowledge management system, open innovation, knowledge management capacity and innovation capacity | The findings indicate that knowledge management system facilitates the creation of open and collaborative ecosystems, and the exploitation of internal and external flows of knowledge, through the development of internal knowledge management capacity, which in turn increases innovation capacity. |

## 2.3. The SERM Model

The researchers Kim and Kim (2022) used the SERM model in their research for developing a decision-making framework in order to reinforce DT strategies based on AI. SERM is the short form for the four containing factors (1) Subject, (2) Environment, (3) Resource, and (4) Mechanism. It is originated in the theoretical framework of DCV.

*(1) Subject* can be seen as the variable with effects on organizational strategy establishment and implementation, as well as the design of the organizational structure. Kim and Kim (2022) are putting a special emphasis on the role of the CEO. This is parallel to the success of DT, as how the strategy is communicated by the CEO and the top-level interactions are crucial (Kraus

et al., 2022). Teece (2017) elaborated on the role of the organizational strategy in identifying new business opportunities.

*(2) Environment* describes external factors, such as industrial structure, customer & market changes, competitors, and governmental & societal constraints. In the DCV context, Wilhelm, Schlömer and Maurer (2015) stressed the importance of DC in environmental dynamism. As the aforementioned developments in the field of emerging technologies have shown, the external influences accrued by accelerated technological inventions are growing (Berman and Marshall, 2014). Especially in the semiconductor industry, governmental actions also play a crucial role (Zetterberg, Johnsson, and Elkerbout, 2022). As Marshall, Dencik, and Singh (2021) found, AI software can be used to monitor developments such as competitor activities, new governmental legislation or policies, patents, and publications in research.

*(3) Resources* can be of tangible and intangible nature. Including corporate culture but also resources such as technology, capital, knowledge, and skills (Kim and Kim, 2022). This is closely related to KM since knowledge is one of the intangible yet most important values of a company (Hock-Doepgen et al., 2021). The resource of human and intellectual capital is facilitating innovation (Darmawan et al., 2023). Furthermore, technology-supported KM through DT can play an important role in the resource factor (Westerberg, and Frishammar, 2012). (4) *Mechanism* was defined by Kim and Kim as a*"factor complexly affecting management strategies and activities through organic interactions between subject, environment and resource"* (2022, p.5). This factor also exhibits a clear connection to DCV in scanning the environment and reconfiguring the organization (Mendling et al., 2018). The model for reinforcing the digital transformation strategy (see Figure 2) was developed by Kim and Kim (2022) based on SERM to fit the requirements for their research.

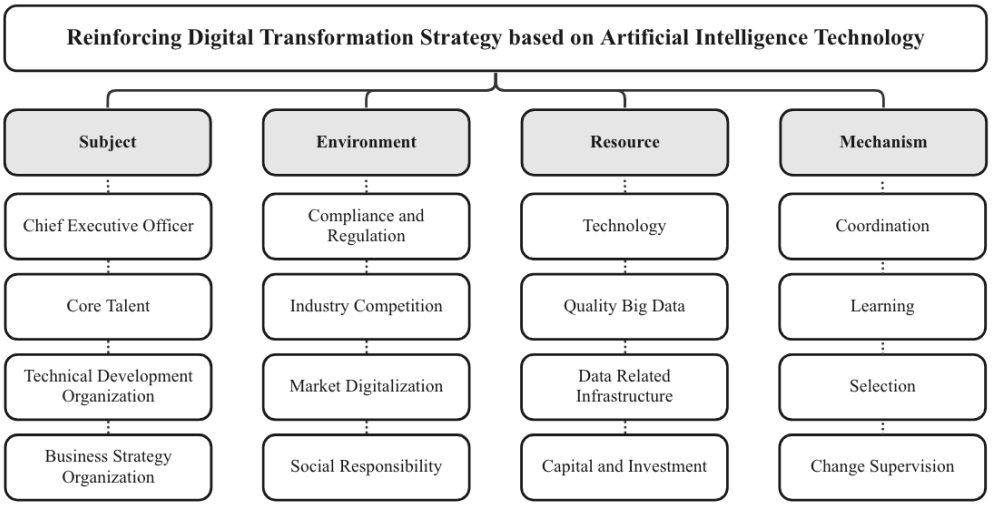


*Fig. 2: SERM Model developed by Kim and Kim (2022)*

## 2.4. Dynamic Capability View

The theory of DCV is addressing the determinants for an organization to assure long-term success. The theory gained attention after the publication of David Teece, Gary Pisano and Amy Shuen in 1997 and was further elaborated on by different researchers in the following years (Barreto, 2010). It can be traced back as being a reaction to the static nature of the resource-based view because it was seen as not applicable to explain an organization's competitive advantage in dynamic and changing environments (Priem and Butler, 2001).

Teece, Pisano and Shuen (1997) saw the key to long-term success as grounded in an organization's innovation and adaption capabilities to react to changing markets. They defined DC as *"the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments"* (p.516). According to this theory, a firm's DC are rooted in its resources, processes, and routines that allow it to sense and respond to changes in its environment.

Two decades later Teece (2017) published another article, where he further elaborated on dynamic view (DV) and formulated three key components: (1) *sensing* opportunities and threats, (2) *seizing* opportunities, and (3) *reconfiguring* resources and capabilities. Similarly, Wilhelm, Schlömer and Maurer (2015) defined activities in those three stages. (1) *Sensing***,** which is facilitated by scanning the environment to identify potential changes and opportunities. (2) *Learning*, which involves the conceptualization and development of reactions to meet these changing environments. And (3) *Reconfiguration*, which is the activity of reorganizing and redesigning existing processes and operating routines.

In their work, Wilhelm, Schlömer and Maurer (2015) also put a special focus on DC in connection with environmental dynamism. Different organizations see themselves confronted with different external environmental influences. They summarized, that industries driven by technology are often influenced by turbulent environments with high rates of innovations apparent in frequent changes in the products. These industries identified the need for DV and heavily invest in research and development, aligned to the ongoing changes in technology that drive innovation.

As DCV emphasizes the importance of a firm's ability to innovate and adapt to changing market conditions, emerging technologies like AI can play a crucial role in enabling firms to develop new DC and enhance their existing ones (Gupta et al., 2019; Mikalef, Conboy and Krogstie, 2021). According to the study by Hercheui (2020), AI can have a big impact on the DC of a company. Especially in the first stage, *sensing*, AI can support identifying opportunities and threats through predictive analytics and pattern identification. Furthermore, AI can support companies' KM capabilities, by capturing information to support market intelligence and propel internal knowledge generation and distribution. The article also highlighted the potential of AI to identify automatization potentials in human workflows, thus avoiding knowledge loss caused by fluctuation, illness, or retirement of workers. This impact of emerging technologies on business processes will

also influence employment and job profiles of the future (Mendling et al., 2018).

Some researchers criticize the DCV model for lacking empirical evidence, having an unclear definition, and focusing too much on the internal factors of an organization (Easterby-Smith, Lyles and Peteraf, 2009). These critical points were evaluated by the authors, and it was decided to use the model. Firstly, it is not the only theoretical model used in this research and is supported by the SERM model and KM literature. Secondly, the DCV critique is not widely agreed on, since researchers are still using and modifying the model in peer-reviewed work, which is proof of academic relevance (Gupta et al., 2019; Irfan, Wang, and Akhtar, 2019). Table 3 illustrates the research scope and key findings of the most relevant articles presented in this chapter.

*Table 3: Most relevant articles on DCV*

| Authors | Research scope | Key findings |
|---|---|---|
| Teece (2017) | This study complies research to provide a better understanding of business model innovation, implementation, and change will also shed light on important aspects of dynamic capabilities. | Strong dynamic capabilities enable the creation and implementation of effective business models. The study also identified how the design of the organization influences its dynamic capabilities, thus its business model competencies. It was found that skills in aligning assets are essential to effectively manage new strategies that coincide with established operations. |
| Wilhelm, Schlömer and Maurer (2015) | This study analyzed the data of 200 SMEs to understand the impact of DCV on operational performance. | Dynamic capabilities can enhance overall organizational effectiveness by either improving goal achievement in operating routines or reducing the costs associated with operating routines. Moreover, greater opportunities for redesigning operating routines and achieving cost savings exist in highly dynamic environments. Similarly, in environments with high dynamism, greater maneuverability, and adaptability are necessary. |
| Mendling (2018) | This research paper is centered around the extent to which recent technologies such as machine learning, robotic process automation, and blockchain will reduce the human factor in business process management. | The factors identified as affected by the aforementioned technologies are employment, technology acceptance, ethics, customer experience, job design, social integration, and regulation. The authors suggest further that all these seven aspects require the research efforts of interdisciplinary teams. |
| Mikalef / Conboy / Krogstie (2021) | This study draws on the dynamic capabilities view of the firm and builds on three selected case studies of large organizations in Norway that use AI for B2B marketing purposes. | This study explores AI-specific micro-foundations of dynamic capabilities and their application in managing B2B marketing operations in dynamic and uncertain environments, while also identifying key interrelated concepts that influence overall business value. |

## 2.5. Theoretical Synthesis and Conceptual Framework

Based on the reviewed theories the authors synthesized the main findings and illustrate their relationship in a conceptual framework based on three overarching themes. In order to increase resilience to new entrants, and environmental changes and identify emerging technologies, trends, and opportunities, firms need to develop abilities to leverage available knowledge and incorporate this into innovation processes (Alavi and Leidner, 2001; Hock-Doepgen et al., 2021; Santoro et al., 2018; Tiwari, 2022). In order to leverage the essential asset of knowledge, DT aims to improve organizations by incorporating information technology in innovation processes such as AI in KM practices (Bican, Brem, 2020; Kraus et al. 2022; Tiwari, 2022; Tronvoll et al. 2020).

Successful implementation depends on various factors such as KM infrastructure facilitating internal knowledge sharing including organizational culture (Darmawan et al., 2023). This is also prevalent in DT where leadership and mindset are essential in addressing the human factor driving organizational performance (Kraus et al., 2022), and when overlapping with existing norms and values (Abbu et al. 2022; Hasan and Nikmah, 2020).

This rift in organizational change is facing increasing challenges following the emergence of AI in business practices, even though AI is in its ‘narrow state’ (Pitt et al., 2021) it is still projected to replace mechanical and analytical tasks (Davenport et al., 2019). Consequently, leading to new employee requirements in facilitating its use (Mendling et al., 2018; Su, Togay and Côté, 2020) and specialists within the company to analyze AI-generated information in internal KM practices (Bertani, Raberto, and Teglio, 2020; Darmawan et al., 2023; Lam et al., 2021; Tiwari, 2022) and in DT undertakings (Abbu et al., 2022; Kraus et al., 2022).

AI already has a wide variety of applications in terms of trend identification, marketing, managerial & strategic decision-making, optimizing processes, tasks, and accuracy of work (Bai et al., 2020; Gupta, 2019; Mikalef, Conboy, and Krogstie, 2021; Ameen et al., 2022). Therefore its role in DCV and developing DC to sensing, seizing, and reconfiguring can be assisted by AI in scanning the environment, learning from the scanned information, and reconfiguring by optimizing processes (Teece, 2017; Wilhelm, Schlömer, and Maurer, 2015). Because of the increasing complexity of maintaining a competitive advantage, in a constantly changing environment, and the emergence of new technologies (Darmawan et al., 2023; Tiwari, 2022), firms must integrate external KM capabilities to increase their absorptive capacity (Hock-Doepgen et al., 2021; Santoro et al., 2018). The absorptive capacity is divided into (1) the acquisition-oriented process referring to environmental scanning, and knowledge exchange. (2) The conversion-oriented process which is deriving value from the extracted knowledge. (3) The application-oriented process where knowledge is applied to improve internal processes and activity outputs (Hock-Doepgen et al., 2021; Santoro et al., 2018).

The application-oriented process (Hock-Doepgen et al., 2021) is also referred to as a firm's innovative capacity (Santoro et al., 2018). Open innovation requires external expertise in the process such as consultancy firms or software providers, inter-organizational partnerships, and the possession of attractive technologies facilitating these relationships (Lee et al., 2010; Parida, Westerberg, and Frishammar, 2012). This resonates with the ‘desorptive’ capacity of a firm referring to its ability to utilize internal knowledge to outsource it as an instigator for strategic partnerships (Hock-Doepgen et al., 2021; Santoro et al., 2018).

The technology sector is explicitly prone to rapid changes and developments (Lee et al. 2010; Parida, Westerberg, and Frishammar, 2012), making external KM capabilities (Darmawan et al., 2023; Hock-Doepgen et al., 2021; Santoro et al., 2018) and DCV (Teece, 2017; Wilhelm, Schlömer, and

Maurer, 2015) an essential part in the alignment of technical and organizational factors facilitating successful open innovation processes (Lee et al. 2010; Parida, Westerberg, and Frishammar, 2012). Consequently, firms must then as a prerequisite develop their internal capabilities through DT and the implementation of innovative technologies such as AI to sustain technological competitiveness as a means of augmenting the capacity of all actors in the ecosystem (Alvarez-Aros and Bernal-Torres, 2021; Kim and Kim, 2022; Kraus et al., 2022; Marshall, Dencik and Singh, 2021).

By analyzing the theoretical synthesis, overarching themes were identified. These include the process of improving KM capabilities, the value-generating activities of knowledge, and how these are mediated by DT and enhanced by DCV. The conceptual framework thus illustrates the factors leading toward technological competitiveness in the integration of AI in organizations, as shown in Figure 3.

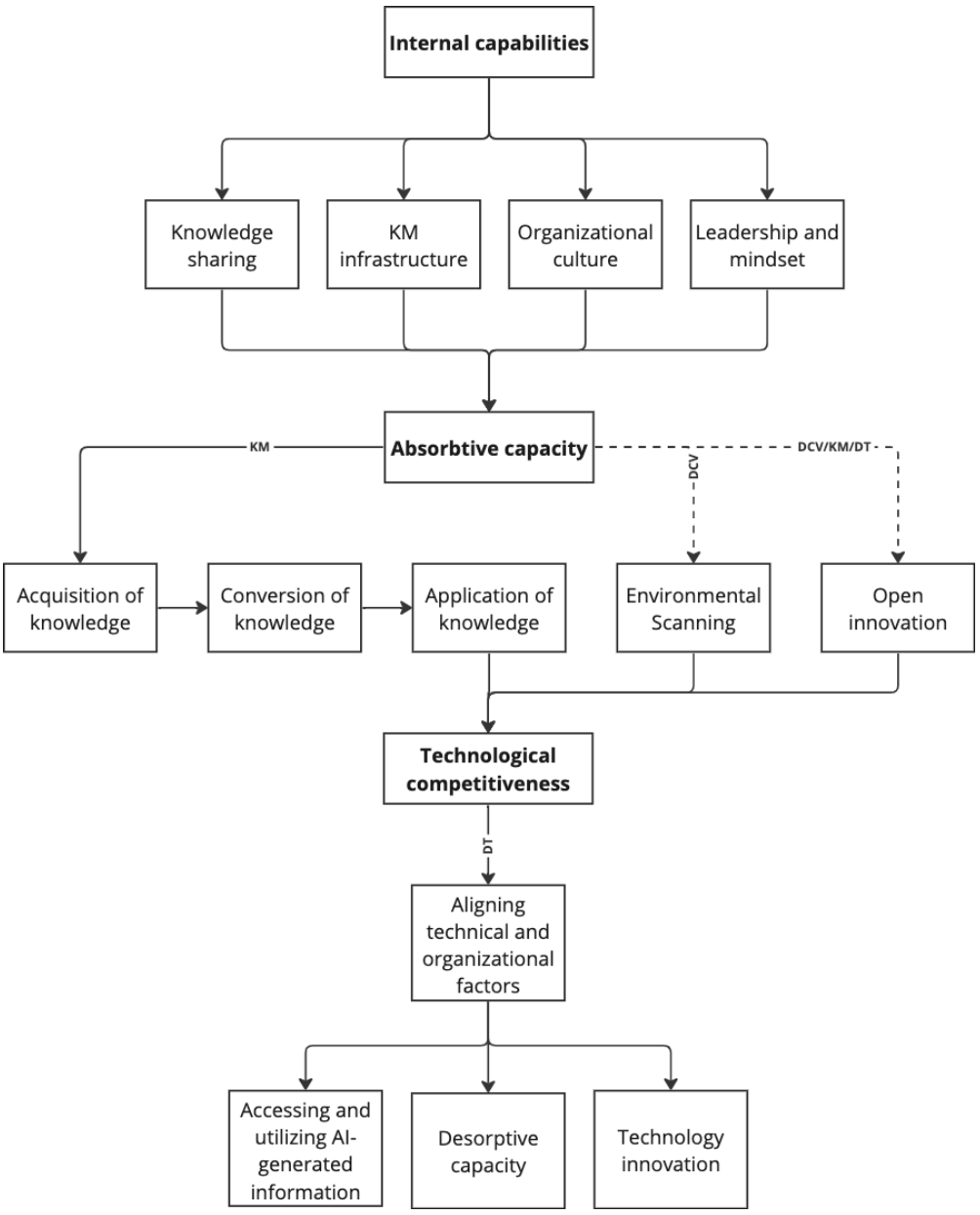


*Fig. 3: Conceptual framework*

This framework highlights the internal capabilities required in integrating KM and DT practices to develop and maintain a competitive advantage in dynamic environments. Leadership and mindset are essential when introducing new tools to the organization to make adaptations to existing processes ingrained in the organizational culture. The interplay between KM infrastructure facilitating knowledge sharing within the organization is another aspect under internal capabilities that then create a foundation for the

absorptive capacity of a firm. The role of a company's absorptive capacity refers to the acquisition, conversion, and application of knowledge into consideration alongside environmental scanning and open innovation to include external actors in knowledge-generating activities. This facilitates future external KM capabilities and DC in terms of remaining technologically competitive through identifying opportunities by accessing and utilizing AI-generated information in the desorptive capacity.

# 3. Methodology

The following sections seek to elaborate on the procedures and methodologies of this qualitative research. Exploratory research is used to understand how AI-enhanced SaaS can be used in DT and KM by exploring and elaborating on the DC of a firm. The research approach is deductive with a theoretical foundation for formulating questions for the semi-structured interviews with employees of the case study and secondary data published by and around the case company and SaaS provider.

## 3.1. Research Philosophy and Approach

To validate the research philosophy and develop a consistent mindset between the two authors a HARP (heightening awareness of research philosophy) survey, designed by Bristow and Saunders, was carried out internally (Saunders, Lewis and Thornhill, 2019). This led to two prominent philosophies, namely positivism and pragmatism with the latter being deemed more in line with the author's general assumptions on the nature of reality, knowledge, data, structure, and agency. Pragmatism refers to the ability to apply knowledge as solutions or enablers of practical actions with regard to reality as a construct of practical effects on ideas (Saunders, Lewis and Thornhill, 2019). As the main focus of this research lies in the applicability of AI-enhanced SaaS and organizational implications, pragmatism can be used to apply the proposed theoretical framework as both contextual and generalizable by assessing its transferability to different situations (Tran, 2017).

*Epistemology, Ontology and Axiology*

As business activities thrive in a multidisciplinary context the validity and legitimacy of knowledge are difficult to assess as the type of data generated in the field range from numerical to visual and textual, facts and opinions, and narratives or stories all have the potential to be considered as legitimate (Saunders, Lewis and Thornhill, 2019). This is also apparent in this research

as the authors both originate from a business background with the intention of combining technology with business, making the epistemological considerations of the gathered data essential in the analysis of the empirical findings.

Ontology is seen as *"refers to assumptions about the nature of reality"* (Saunders, Lewis and Thornhill, 2019). The reality in research can often change in light of new discoveries as apparent in organizational change and deemed resistance to change as destructive to an organization based on ontological assumptions (Saunders, Lewis and Thornhill, 2019). However, more recent research has identified resistance to change as an inevitable phenomenon, the focus is then put on developing problematic aspects of change processes instead of focusing on resistant individuals (Thomas and Hardy, 2011).

For axiology, the authors were striving to be as objective as possible in this research, however, as in all human beings the presence of values and ethics is inevitable. For this reason, as pragmatic researchers, the authors' doubts and beliefs were used and appear in the analysis in attempting to create valuable insights for the readers while referring to 'true' theories and knowledge as epistemological considerations (Saunders, Lewis and Thornhill, 2019). Furthermore, as AI in business practices is an emerging technology its ontological assumption might exceed the actual value it can provide to an organization. This resonates with the findings of Zhang and Song (2022) as big data analytics is still the dominant form of knowledge absorption by organizations. This allows the epistemological considerations of AI-generated information to be questioned in terms of validity, relevance, reliability, and legitimacy as AI generates data in a subjective form based on its 'training' (Kang et al., 2020; Lund and Wang, 2023).

## 3.2. Research Design

As the research gap and research purpose already indicated, this study requires an in-depth understanding of the occurring contemporary

phenomenon of AI in KM. Qualitative research suits complex and multifaceted problems in not sufficiently researched topics (Creswell and Poth, 2017). To achieve a deep understanding the authors decided to carry out a single-case study, which will be further explained in the next subchapters.

*Exploratory Single-Case Study*

The exploratory case study was seen as the most applicable method in order to answer the research questions. A case study is applied as an empirical inquiry with the aim of investigating a contemporary phenomenon within a real-life context (Yin, 2018). According to Bell, Bryman and Harley (2022), it is a research design that implies a *"detailed and intensive analysis of a single case. The term is sometimes extended to include the study of just two or three cases for comparative purposes."* (p. 587) Therefore, Knights and McCabe (1997, cited in Bell, Bryman and Harley, 2022, p. 65) suggest a combination of several qualitative methods to minimize reliance on one and increase reliability. The case study is often used in exploratory research to build a foundation for other researchers to generalize the findings in a larger context (Yin, 2018).

For researching AI-enhanced process innovation the authors decided to focus on one case company instead of taking a comparative approach. Even though the consideration of multiple cases could be beneficial and valuable, it would also limit the feasibility of this study. As already mentioned in the problem discussion and theoretical framework, information and knowledge are key elements in gaining a competitive advantage (Alavi and Leidner, 2001; Santoro et al., 2018). Therefore, the willingness to share information and put DT activities in comparison with other competitors is low. By focusing on a single case, the authors have the possibility to gain results through rich data and practical insights. The intense analysis of a single case was viewed as superior to a shallow analysis of a larger sample. Methodologically, the case study was supported by semi-structured interviews and internet-mediated secondary data. The methods will be further explained in the next sections.

### 3.2.1. Introduction of the case

As previously introduced, the presented problem is examined on the basis of a single-case study. Therefore, the authors searched for an organization that is considering including AI in their DT strategy. An organization that worked with a SaaS provider was identified to carry out this single case study.

*Description of the case company*

The classification of the case company, in terms of industry and external factors, is made to give the reader context and transparency. The case company is one of the leading enterprises in the semiconductor industry. As the company is represented on the stock market, the role of shareholders should be kept in mind. With voting rights on important decisions during the annual meetings, dominant shareholders might be able to influence strategic and operational decisions (Young et al., 2008). The main interest of investors and shareholders is the maximization of their assets and extract private benefits. Therefore, their behavior is putting pressure on the company to maximize economic growth for the highest possible payout of dividends.

The semiconductor industry is working with key technologies in the transition to renewable energy systems to prevent climate change. The renewable energy systems industry is currently bolstered by increasing amounts of government funding in light of recent energy shortages. For example, in Europe following the Russian invasion of Ukraine, the dependency on fossil fuels from Russia and in general became evident, instigating the transition to renewable energy systems (Zetterberg, Johnsson, and Elkerbout, 2022). Therefore, technological innovation in renewable energy with prospects in emerging AI-enhanced software, machine learning, and big data analytics could play a decisive role in stopping the climate crisis (Hatti and Denai, 2020).

*Description of the Service Provider*

The case company worked with a service provider based in Germany, that is claiming to enable informed strategic decision-making in innovation and technology. The startup was founded in 2012. The product is an end-to-end data intelligence platform working with recent data and displaying the results in visualizations, tables, and diagrams. The data warehouse contains data from the last 10 years and is daily updated. The contents are publicly available publications, such as news, websites, scientific articles, podcasts, and projects, organizations (companies, universities, and startups) and experts (researchers, managers, and inventors).

### 3.2.2. Data Collection Method

#### 3.2.2.1. Semi-structured interview

As pointed out in the problem discussion DT in the form of AI-enhanced market research is relying on technical and organizational factors. Therefore, the primary data collection is facilitated by semi-structured interviews. This qualitative research method was chosen since it is suited to research, attitudes, beliefs, and experiences (Adams, 2015). It was then chosen to conduct exploratory research as it relies on understanding participants' values and behavioral perceptions (Hutton, 1990).

Kvale (2004) developed seven steps for the interviewing process, namely *(1) thematizing, (2) designing, (3) interviewing, (4) transcribing, (5) analyzing, (6) verifying,* and *(7) reporting.* This process was carried out until the authors sensed that a level of saturation was reached (Vasileiou et al., 2018). To prepare the transcripts for further analysis the personal information was anonymized in order to meet the research ethics. The analysis was executed by reviewing the transcripts multiple times and by organizing the information into codes a thematic clusterization was carried out (Braun and Clarke, 2006)

*Interview Guide*

In semi-structured interviews the interview guide is an important part. It can be seen as a list of questions, covering all research objectives and giving the researcher a path and prepared storyline for the interview (Bell, Bryman and Harley, 2022). Even though it is not a static concept that needs to be strictly followed, it is rather flexible and can be modified by probing questions if a statement catches the researcher's interest (Kvale and Brinkmann, 2018). An interview guide enables comparability of different interviews due to its structure (Bell, Bryman and Harley, 2022). It is important for researchers to use comprehensible language, clear questions that are open-ended, and avoid leading questions to receive unbiased answers (ibid.).

For this study, an interview guide was designed based on the conceptual framework (see Appendix 1). It is structured in three main parts. (1) Demographic information, (2) current processes and personal experiences in KM, and (3) mindset towards DT and AI. The designed interview guide consisted of 33 questions and was tested and validated with colleagues and the supervisor. Additionally, visualizations of the service providers' tool were incorporated into the interview. According to Saunders, Lewis and Thornhill (2019), this visual support generates context for interviewees, displays the tool's function, leading to richer data . The first AI-generated visualization is the so-called topic map which displays recurring topics clustered by themes (see Appendix 2). The relevance is indicated by the size of the data points. The second visualization is called visual explorer (see Appendix 3). It is a multi-layered pie chart illustrating the relevance of the topics by their share of the pie chart. The third visualization is the radar, which is putting different projects and searches into relation (see Appendix 4). By different indicators the user can design the analysis and visualization based on the reviewed topics.

*Interview Procedures*

Due to geographical distance the authors chose online interviews, in the form of synchronous video interviews. This method comes closest to the face-to-face interview and therefore enables the evaluation of emotions, facial expressions, and gestures (Saarijärvi and Bratt, 2021). With the help of audio recordings, the authors were able to create transcripts. (Saarijärvi and Bratt, 2021). However, the risk of errors and disruptions was considered low since the Covid crisis has made online appointments part of everyday professional life (de Villiers, Farooq, and Molinari, 2021).

Since the research team consisted of two researchers the interviews were also carried out in pairs. One was moderating the interview and one was taking notes about observations. The interviews were mainly held in English. Only one interview was held in German and was translated while transcribing. The authors tried to create a safe environment without stress or pressure to create trust and provocate honest answers.

*Sampling*

As a sample, diverse perspectives throughout the company's innovation process were collected. Interviews were conducted with employees who are operating with the AI-enhanced software, internal customers who evaluate results, as well as the project manager holding all the strings together. This is displayed in Figure 4. As Bell, et al. (2019) pointed out, there is a disunity of researchers regarding the sample size, to reach theoretical saturation, but a clear definition could not be found. For this study five interviews were determined as appropriate since they cover different hierarchical levels, roles, and experience in the industry. Moreover, since the semi-structured interviews are are supported by internet-mediated observations it is regarded as sufficient for this thesis.

*Table 4: Overview of Participant and Interview Details*

| **Partici-pant No.** | **Position** | **Major** | **Interview duration (in minutes)** | **Years of experience in the industry** |
|---|---|---|---|---|
| 1 | Dual student in economics | Economics | 52 | 1 year |
| 2 | Working student | Economics | 45 | 1 year |
| 3 | Innovation manager | Industrial chemistry | 39 | 3.5 years (+ Ph.D.) |
| 4 | Director Market & Business Intelligence | Industrial engineering | 62 | > 20 years |
| 5 | Head of Application Management | Electrical engineering | 59 | ~ 30 years |

#### 3.2.2.2. Internet-mediated data collection

Additional to the primary data, internet-mediated data collection was chosen as a secondary data source for complementing the research. Internet-mediated methods obtain data from various digital computing technologies, such as websites, web searches, and other publications (Saunders, Lewis and Thornhill, 2019). This secondary data was seen as valuable for verifying and supporting the information extracted from the primary data collection. Additionally, it is seen as a possibility to get information for complementing other parts of the conceptual framework. Especially regarding the organizational culture, environmental scanning, open innovation, and technological competitiveness of the organization.

In order to create a holistic picture, the authors included information published by the case company, such as annual reports, press releases, content from their official website, and information published about the case

company & SaaS provider. As Saunders, Lewis and Thornhill (2019) express, reliability and validity are of high importance. Therefore, the authors considered various information sources.

### 3.2.3. Data Analysis Method

The different data analysis methods applied in this research are explained in the following paragraphs.

*Open coding*

Open or first-cycle coding is a technique employed by qualitative researchers for analyzing textual data. Its usefulness is derived as a KM practice where longer documents and complex data can be summarized as important themes and keywords (Easterby-Smith et al., 2018). Furthermore, the applicability of open coding in marketing communication analysis was used by Billore, Kobayashi, and Wang (2021) as an initial analytical step to lay the foundation for a thematic clusterization of prominent keywords and themes for assessing business and consumer interactions.

*Thematic Clusterization*

The thematic clusterization, also known as thematic analysis, is a well-established method for extracting and structuring relevant information from interviews (Cassell, Cunliffe and Grandy, 2018). It is a versatile method that is used in different fields, such as psychology, business, social science, and health sciences (Braun and Clarke, 2006; Vaismoradi, Turunen and Bondas, 2013).

According to Saunders, Lewis and Thornhill (2019), thematic clusterization follows a linear procedure with the steps (1) becoming familiar with the data, (2) coding the data, (3) searching for themes and recognizing relationships, and (4) refining themes and testing propositions. In the following, each step will be briefly described.

*Becoming familiar with the data*

Already by transcribing the interviews, documenting observations, and reflecting on the interviews the authors gain an impression of the data. During the analysis process the transcripts are read and re-read several times (Saunders, Lewis and Thornhill, 2019). Creating familiarity was achieved through the reflection of the discussion of the data by the two researchers (Easterby-Smith, Lyles and Peteraf, 2009).

*Coding the data*

For coding the data the authors followed a traditional working mode by printing all transcripts and coding recurring topics and highlights. This enables the identification of patterns & recurring topics and helps with clustering & coding the data. In the next step, findings were discussed to identify patterns and identify relationships among themes and categories. A special focus is on the factors *"similarity, difference, frequency, sequence, correspondence or causation"* (Saldana, 2009, cited in Easterby-Smith, Lyles and Peteraf, 2009, p. 244).

*Refining themes and testing propositions*

In the last step of the thematic clusterization, the data is reviewed another time to secure a well-structured analytical result. Therefore, the topics and codes were reorganized for making final adjustments. Additionally, this step was used to test contradicting statements and discuss possible explanations (Easterby-Smith, Lyles, and Peteraf, 2009).

*Pattern-Matching*

The method of pattern-matching, as described by Donald Campbell (1975), is matching observed patterns with theoretical propositions. Therefore pattern-matching is used as a further development of the thematic clusterization to link the collected data to the theoretical framework.

### 3.2.4. Quality criteria

As participant observation involves studying social actors and social phenomena (i.e. informants and their activities) in their natural setting, research findings usually exhibit high ecological validity because of their relevance to the situation. However, using participant observation may lead to a number of threats to reliability/dependability and validity/credibility. This is rooted in if the setting is unknown to the observer and they need to understand the cultural and interpersonal nuances that characterize it in order to interpret it.

# 4. Empirical Data

## 4.1. Primary Data

This chapter summarizes the interviews to provide context for the analysis in the following chapter. As introduced in the methodology section all interviewees were employees of the case company with different positions, different experience levels, and also different roles within the AI-enhanced market research project. Nevertheless, their self-introduction will be briefly presented to provide context and background information which will be taken into account in the analysis section.

Participant One (P1) is a dual Bachelor student in the field of economics. This means his study combines academic and practical education and is structured in blocks. Three months of work at the company and three months of studying at university per semester. P1 has experience in different departments and currently writes their thesis in the marketing department on the topic of emerging applications. Since they write their thesis on a topic related to market research they observed the activities but did not experience working with the AI-enhanced data intelligence tool themselves.

Participant Two (P2) has worked in the case company for around one year and is currently writing their Bachelor thesis with a focus on usage and evaluating AI-powered market research tools from an operator perspective. Their education is in the field of economics with a technical background.

Participant Three (P3) works as an innovation manager in the case company. In this position, they do not have a typical day, because it comes with many different tasks, such as project management for technical projects, and management of the public funding project portfolio, but is mainly focused on managing the whole innovation process. Their industry experience consists of a Ph.D. in innovation management and three and a half years in the case company. The interviewees' educational background is in *"industrial*

*chemistry, which is a combination of an MBA and chemistry"* (P3), and within that field P3 specialized in innovation and technology management. In their role as an innovation manager, they identified the service provider, initiated contact, and manages the pilot projects.

Participant Four (P4) expressed enthusiasm in their participation in the study indicating that *"... it's important"* (P4) and was thorough in their response to the questions and allowed the authors to extend the interview by 15 minutes to include all questions. The interviewee then goes on to describe their role in the company as part of the markets and business intelligence team. They explain that their primary responsibilities involve researching and analyzing the markets that are relevant to the division's products, including application markets and competitors. Working with external sources is then essential to dig deeper into certain topics to keep their eyes and ears open for new questions or topics that arise within the organization. Moreover, P4 highlights the importance of having a good understanding of market dynamics in the short and long term to shape the division's strategy. Their typical day at work involves a lot of reading and mapping information to data points. The interviewee has been with the case company since their student days and has been employed since 2002. They hold a bachelor's degree in industrial engineering with a major in electronics and digitalization. As an internal stakeholder in the project, to who the results of the AI-enhanced tool are presented, they assist the project with insights on the data quality and the industrial applicability.

Participant Five (P5) is the head of a team in the industrial power business unit, that focuses on application management and marketing. Their team works on increasing business and profits for dedicated applications in decarbonization such as photovoltaic, electric vehicle charging, and industrial systems. They also identify trends and recommend new products to improve the product portfolio. The interviewee has been with the case company for 15 years and has around 30 years of business experience in the semiconductor industry. Their educational background is in electrical

engineering with a major in energy and power electronics. They were also an internal stakeholder in the project on AI-enhanced market research with the SaaS vendor. Among other interviewees, P5 stresses the importance of first-mover advantage in the technology sector as the market is rapidly developing and is continuously striving for innovation. This is describing the environment of the case companies industry, characterized by a very high pace and high importance of qualitative and up-to-date information for decision-making.

### 4.1.1. Internal Capabilities

This subchapter presents the empirical answers regarding internal capabilities, with a focus on the topics of knowledge sharing, the KM infrastructure, organizational culture, as well as leadership and mindset.

Regarding knowledge sharing P1 is not aware of a systematic solution within the company but refers to cross-functional and cross-divisional projects. P1 expresses the concern that "*if you do it into like a process (...) maybe it would lose creativity"* (P1). While creativity is important in this process P1 also gave an example of a missed business opportunity and traces this back to weak knowledge sharing, *"because some employees knew about that topic before but it (...) didn't get enough attention"* (P1). Therefore, there is potential in the internal knowledge of the company if it is facilitated the right way: *"I think we need to find a way through to gather this information, which is in the heads of the employees. Because we have a lot of sales and marketing employees who have knowledge about many topics in the industry. But I think the challenge is to get this information together and to evaluate if this information is relevant for us as the case company and if this can be used to go into new markets, find new business opportunities or not"* (P1).

In terms of knowledge sharing there is according to P3 none or a very fragmented structure. There are internal conferences or platforms enabling internal knowledge sharing, but this is a problem that needs to be worked

on.*"But it's not all connected, let's say, all the different information which [is] saved somewhere, in the company network are all not really connected. And that, I would say, is a problem. In particular, when we are growing a lot right now."* (P3) This was also identified by P5, especially for younger employees efficiently collecting data via a database is seen as *"Mission Impossible"* (P5). As a solution, P3 is picturing an internal type of search engine, that also helps visualize content, comparable to the way the AI-enhanced tool is doing it (see Appendix 2-4).

When asked about the role of innovation and KM in the company, P2 answered that innovation is important for future development. Whereas P2 defines innovation on one side as new products, but on the other hand also processes, so *"the ways to do things"* (P2). They see KM being influenced by internal experts in a certain field, who are able to *"evaluate and assess information"* (P2). For generating knowledge P2 referred to digital tools, such as LinkedIn learning, personal interaction, such as a company tour, conversations with cross-departmental colleagues, as well as literature and web research. With the help of the different knowledge streams they *"received information which in the end added up to a whole picture"* (P2).

P2 mentioned different possibilities throughout the KM questions for facilitating knowledge sharing in the organization. They pointed out an internal digital database where market reports and other literature that is classified as relevant for the organization are stored. According to P2 this platform is accessible to every employee. Additionally, P2 mentioned email newsletters as means of knowledge management in the organization, that contain PowerPoint presentations for knowledge transfer. For common information and knowledge sharing the intranet is used as a tool for knowledge sharing among certain groups of employees. However, there is restricted accessibility, which enhances confidentiality by deciding who the information is shared with, but loses some reach to other employees. The information is found as video, excel, word, or PowerPoint files.

On the question to describe the ideal situation for knowledge sharing among employees P2 refers to the internal knowledge hub as being a good solution, but criticizes the barrier of getting access and user rights. Furthermore, a problem P2 faces is quickly finding the right information. P2 states "*it takes ages to open everything to find the relevant file you actually need"* (P2). Therefore, P2 would add a filter option or keyword searches to precisely access information.

On the question about knowing who to approach and where to go in case of needed information or questions on a topic, the interviewee expressed this to be very challenging. This was underlined by a recent example, where P2 *"talked to six different people to find out who actually was responsible. And I don't know how to look up responsibilities besides the organization chart that is provided in the intranet"* (P2). In terms of data reliability P2 has a high level of trust for internal information, whereas external data is critically evaluated and validated before usage. *"So 100% reliability exists for no data source, except [if] you evaluated the data yourself."* (P2) *"If there is written in a market report this is the newest material, but the experts say it doesn't work the way it was written in the report, I would rather trust the internal expert with knowledge in that field."* (P2). According to P3 when evaluating the gathered information internally there is no standardized process set, but an established process. In this, the interviewee identifies the right internal expert and then lets them evaluate information and give feedback on it.

P2 sees the future work and tasks highly influenced by AI-enhanced data intelligence tools. The tasks of data and research analysts will shift to a higher focus on interpreting & analyzing with AI replacing the manual part of the research such as gathering & preparing information for analysis. P3 attributes a major role to the area of innovation and KM, which increases in importance as the company grows. P3 uses *"nearly all available [information] streams"* (P3), including public information and knowledge generated by direct communication, that is just in the head of external partners and not written down or publicly communicated.

On the question of how implemented changes are evaluated as successful or failed, P3 has a clear opinion. If a party outside of the line organization is still involved it is not seen as a successful implementation. Only if the process is implemented in daily working life by the line organization without the influence of the initiator, it can be classified as a success. For improving change implementations P3 annotates that it is essential to include the *"most important or nearly all relevant stakeholder (...) from the beginning into the pilot project"* (P3). With this strategy the important decision-makers are included from an early stage, introduced to the topic, and part of the project throughout. P3 states that an early introduction to the process facilitates an easy change process.

For P4 innovation and KM are both regarded as essential aspects for the organization and a challenge that the company is struggling with. The strengths of the company lie in its broad in-house expertise but the challenge lies in synchronizing the separate departments and divisions through knowledge sharing. The problem that occurs then is that the information is isolated into separate groups, which can cause separate teams or individuals to work simultaneously, unknowingly on the same topic without sharing this information with each other. P4 however mentions that one of the strengths of having changed roles and being in the company for many years has laid the foundation for many inter-departmental relationships which makes it easier to make the link between what information exists and relevant stakeholders. Moreover, P4 leads an interdisciplinary team and assigns value to the broad expertise this offers but the main issue remains since *"it's a tricky thing because it's not just about the technology it's also about making things linked… and you have terms and then everyone has a different understanding of the same term"* (P4) making clustering information difficult. *"It's a challenge that many companies are facing. And it's along those lines of size of company"* (P4)

In the division, the four departments also host quarterly meetings where they cycle between different representatives to provide updates on their respective departments and progress. The department includes procurement or purchasing which looks at competitors and market situations and then the central strategy department is also present. There are also a lot of ad hoc things going on where the departments interact in an informal setting. The information generated is then also stored internally in a data archive which currently is not perfected, as the information there is clustered in a way that it can get lost over time. This hub does, however, feature monthly and quarterly updates as well as ad hoc things like when a sponsored report is published and it has a large following, the success is still difficult to assess as it is not measurable by any KPI. Moreover, the sharing of certain information pieces is covered by some licensing issues tying it to a specific team or division.

When reviewing the current KM system in place P4 compares it to an onion as there are layers to the success of its applicability as it can be viewed as a success in the team but not cross-departmentally or organization-wide. This has to do with the aforementioned limitations in licensing issues, time constraints, established mindsets and behavior for senior employees as new hires are seemingly using it more often. Similarly, P4 has an ideal version that would work as well as it does within the smaller team but applied on a larger scale. Internally in the small team, there are continuous meetings where routines and methods are shared in an attempt to share information consistently but this is still under development. Moreover, it's held back by time constraints and ongoing projects.

With digitalization constantly introducing new opportunities innovation is defined by P5 as *"a push and pull… and innovation is not only for me finding new markets or new applications… It's also to innovate the organization itself"* (P5). For internal knowledge sharing, there are still some hurdles to overcome when it comes to clustering data and making information visible to other employees of the company. There are existing internal knowledge hubs where employees can access information but to

derive valuable information and make comprehensible inputs to the hub itself is very time-consuming as it stands. Moreover, reasons for withholding information and knowledge, they see as *"not [being] their main responsibility"* (P1), and feeling *"no pressure"* (ibid.), as well as the lack of incentives.

*Table 5: Overview Internal Capabilities*

| Topic | Key-Takeaways | Statements |
|---|---|---|
| Knowledge Sharing | Complex Information Overload<br>Time constraints & Incentitives | "The different information which [is] saved somewhere, in the company network are all not really connected" **(P3)**<br>"[Knowledge sharing] not [being] their main responsibility (...) focus on their own topics (...). So there's not the enough incentives to share this information." (P1)<br>"Because they have to find, to search and finally define the right people. It takes maybe a few days or whatever. And with that experience what I have, is I have the answer within some minutes, I would say." **(P5)** |
| KM infrastructure | Personal Interaction<br>Internal platform & innovation hub<br>Intranet<br>External cooperation | "I think we need to find a way through to gather this information, which is in the heads of the employees. (...) But I think the challenge is to get this information together and to evaluate if this information is relevant for us as the case company and if this can be used to go into new markets, find new business opportunities or not" **(P1)**<br>"If you do it into like a process (...) maybe it would lose creativity" **(P1)**<br>"It takes ages to open everything to find the relevant file you actually need" **(P2)**<br>"An internal database where you have many different market reports and other literature which are seen as relevant by the organization." **(P2)**<br>"All the different information which [is] saved somewhere, in the company network are all not really connected." **(P3)**<br>"So in a huge company, or a big company, you have many different areas and a lot of very smart people a lot of good understanding and thoughts, and the knowledge we put together. But (...) it's still somehow isolated, (...) sometimes actually two parts work on the same thing, and they don't know of each other." **(P4)**<br>"it's a tricky thing because it's not just about the technology it's also about making things linked…" **(P4)** |
| Organizational culture | High value of employers skills (Expert-culture)<br>Innovation overarching goal (Innovation-culture)<br>Size of the organization | "Because we have a lot of sales and marketing employees who have knowledge about many topics in the industry. " **(P1)**<br>"Innovation is not only for me finding new markets or new applications… It's also to innovate the organization itself" **(P5)**<br>"[KM] is a problem. In particular, when we are growing a lot right now." **(P3)**<br>"It's a challenge that many companies are facing. And it's along those lines of size of company" **(P4)** |
| Leadership and Mindset | *Covered by secondary data.* | |

### 4.1.2. Absorptive Capacity

P1 attributes great relevance to the topic of innovation and sees it as an essential component for future growth and suggest that there is a relationship between innovation and KM. For their information sources, P1 uses books and the internet, but also personal interaction and expert consultation within the company and evaluates the credibility of information by confirming sources. The benefits of using AI were seen as having a neutral perspective through a *"fresh eye"* (P1) and an *"instrument to evaluate if you are on the right path"* (ibid.). Whereas a threat using external software was seen by P1 in the fact that *"the competition can use the same instrument"* (P1). Moreover, the interviewee has participated in inter-organizational partnerships or collaborations on certain projects, facilitating knowledge exchange, such as exchanging information with the provider of the AI tools they are testing and funding project X. The knowledge transfer was carried out in workshops, working sessions, mail, or conferences.

On the question, of whether they have been in a situation of a missed business opportunity caused by a lack of information or knowledge, P2 talked about an indirect experience. Projects in funding project X failed, which might have succeeded if the team would have taken external information and knowledge consultation. Successful projects with external actors have been built on formulating requirements and laying a common ground for how to collect and assess information presented within the partnership (P4). When a partner fails to deliver the desired information P4 presents two options *"stop it, or invest, invest in sharing knowledge… in many cases it's worth to do this first step, and share information and share knowledge. Because it really puts them into the right position"* (P4).

P3 remembers a specific case in which the market was not entered in time because the *"momentum happening in the specific market"* (P3) was not identified at the right time. Thus, the first-mover advantage was missed. And P3 traces this back to external information, that failed to be processed

correctly. Therefore, based on the available information, wrong decisions or assessments were made. As a possible preventive activity, the interviewee points out the importance of a process or roles identifying emerging applications and technologies. Additionally, P3 sees data intelligence tools as supportive tools to process the available information.

When questioned if there are changes in the means of information, P3 answers with a rising relevance of publicly available information pieces. At the same time, they identify the challenge of finding and processing the information. P3 roots this back to digitalization, but digitalization is also seen as the solution to that problem. *"Because there's so much and here digitalization can basically help to structure it and to find the right information pieces for people"* (P3).

In his role as an innovation manager, P3 has a lot of insights into inter-organizational collaboration activities. In the following statement, they summarized that they *"have really a lot of projects with external partners, mainly via public funding organizations. When we have a publicly funded project, like for example, research institutes, or universities, that's quite common, but also small and medium enterprises(...). Another way is that we privately fund research at universities in different ways. Either it's a service research contract, let's say to our university, our research institutes perform certain analysis or developments for us or we pay, let's say, Ph.D. students at a university, who's then working on a topic for us. But I think those are the main points."*

On the question of how P3 knows who to approach and where to go for inter-organizational partnerships or collaborations, P3 refers to the existing network. Mostly they use connections from the past. But P3 also sees a change in that. There are new approaches, such as the AI-enhanced tool, to uncover experts on a specific topic. Regarding how partner information is evaluated, P3 summarized it with *"gut feeling and past results"* (P3). If partners in the past did not perform up to the company's expectations, the

trust and desire to continue future collaboration shrink, but value is mainly derived from an interactive process. So it is essential when approaching an external partner to *"form a so-called win-win situation"* (P5).

According to P5, it would not work without exchanging knowledge because if you only ask for something *"we get some answers. But not… the secret behind the answer"* (P5). A successful example of this was when P5 shared his view on market forecasts and development with senior partners of another company and this triggered a link where the partner then *"even started an open discussion… about what will change with this product in five years"* (P5). On the other hand, there have also been some missed opportunities due to missing essential information or there being too much information causing the right signal to be completely missed or overlooked. The reason for missing essential pieces of information is then traced back to time constraints.

Regarding knowledge sharing and sharing of sensitive information with external partners, P3 mentioned a standard procedure of having an non-disclosure agreement (NDA). Whenever there is an initial meeting without a set NDA, the communication is kept on a shallow level. The communication of sensitive information, in general, is according to P3 generally carried out verbally, *"it is not common that we share written sensitive knowledge with external partners"* (P3). In general, P3 always keeps the scope of information on the necessary parts. No irrelevant or not immediately connected sensitive knowledge is shared. P3 makes the impression of not being worried about sharing sensitive information because *"there will be legal actions if someone fails to keep things a secret"* (P3).

When asked which streams of information P4 uses they instantly mention external sources such as external analysts, specializing in market research for standard work usually under NDAs. The knowledge can then sometimes be just pure data that is interpreted internally or an interactive process between the analyst and P4 or even in a workshop style. In this process, P4 places an

emphasis on understanding the methodology of the analyst to understand the rationale behind the conclusions or the origin of the information provided. P4 underlines the importance of external experts, especially in regard to new topics or emerging technologies. Other than external sources acquisition of knowledge also includes screening all kinds of publicly available data which also works complementary to follow up on information provided by external parties.

The choice of external actors is decided in a meeting with the central strategy department. There they review the budget for the coming year and decide which reports to purchase based on what the company already has access to as complementary information, or related to an emerging technology. P4 regards this meeting as not only choosing external information sources but also as a chance to learn about what the other divisions are working on or need for their projects.

When asked about information streams P5 highlights the importance of conferences featuring universities, various institutions and thesis work in order to see which are the main topics discussed and forecast market developments. There is a lot of emphasis on experts, people, and the value of relationships in conjunction with geographic data, so understanding where developments are happening and who is behind them. With digitalization's continuous influence on information, P5 is concerned with finding *"an intelligent way to take this big data"* (P5) as *"data is a new kind of oil for the industry"* (ibid.). But the problem is that this information is accessible to everyone. Finding new ways to derive value from information is a way to differentiate themselves from the competition. *"Thanks to digitalization many, many new companies and industries are jumping on a topic and are very fast in developing and digitalization is an enabler to play faster, to be more efficient"* (P5).

While information is very valuable when assigned the right conclusion with the right data, there is an information overload and *"at the end of the day, no*

*human being can handle this information anymore"* (P5). For example, when assessing the success of a new implementation to the organization it's all about evaluating it over time. So does this change allow *"new decisions or [us] to give a tool another flavor, another direction (...) new insights or new business aspects"* (P5). The ideal way of doing this would be to cluster everything in the same space in a comprehensible style to save valuable time and stay ahead of the rapidly developing market.

External partners are an integral part of P5's internal knowledge sharing as information generated from external sources has input on requirement engineering in the company's production line. It's a time-consuming process but provides a lot of value to decision-makers. P5 acts as a hub offering their expertise stemming from extensive experience in the industry and personal relationships. Thus, employees approach P5 and are then provided with the corresponding expert on the topic. Another aspect is that in P5's department, there is an appointed system architect assigned with the responsibility of only working with clustering information and identifying its proof point. Including where the information originates, the publisher, and because the information in this industry has a timestamp they also map out when this information will be most valuable.

In the three consecutive questions on the concept DCV (sensing, seizing, reconfiguring), P1 currently sees a greater potential of AI in the first two areas. For reconfiguring, P1 sees AI as a contribution in the long term since that step requires creativity. In this field, P1 sees AI as "*not yet ready to be better than the human brain"* (P1). Whereas P2 expressed a lot of potential for AI in the sensing stage, since it is presenting the relevant information, whereas in the seizing and reconfiguring stage they see the need for human intelligence in order to interpret and take that information further. In their bachelor thesis P2 pointed this out as the *"gap of skills [of AI] - to conclude the right behavior and strategy from the data"* (P2).

P3 sees the potential of AI in sensing opportunities and threats in the processing of publicly available information pieces, *"seeing connections where humans are overwhelmed with information"* (P3). In the stage of seizing opportunities, P3 sees potential in the presentation of information in the form of visualizations to enable decision-making. For the third stage, reconfiguring resources, their answer is more abstract without mentioning concrete application potentials. But they still picture that an AI solution could be helping indirectly throughout the initial two stages.

*Table 6: Overview Absorptive Capacity*

| **Theoretical concept** | | **Key Takeaways** | **Statements** |
|---|---|---|---|
| KM | Acquisition of knowledge<br>KM Process Step 1 | Multiple information sources:<br>- Personal Interaction<br>- Scanning of publicly available information<br>- Market reports<br>- Collaboration & Partnerships<br>DT to improve knowledge acquisition | "Because there's so much and here digitalization can basically help to structure it and to find the right information pieces for people" **(P3)**<br>"an intelligent way to take this big data" **(P5)**<br>"data is a new kind of oil for the industry" **(P5)** |
| | Conversion of knowledge<br>KM Process Step 2 | Evaluation & Validation of information is important | "at the end of the day, no human being can handle this information anymore" **(P5)**<br>"the competition can use the same instrument" **(P1)**<br>"gut feeling and past results" **(P3)**<br>"I'm long in this industry and I can assess information. I can say well, guides of where you're right or wrong." **(P5)**<br>"So we need then really one dedicated person who's doing let's say, 30 / 40% of this daily work in order to collect, to cluster, to structure it. And that information, it's worse that we're doing it. And at the end of the day, it's the only little part of our whole journey. But it gives big values to decision-makers." **(P5)** |
| | Application of knowledge<br>KM Process Step 3 | Decision-making | "digitalization is an enabler to play faster, to be more efficient" **(P5)**<br>"to make new decisions or to give a tool another flavor, another direction… new insights or new business aspects" **(P5)** |
| DCV | Environmental Scanning | Monitoring developments in the market | "We missed to enter a specific market because we didn't see the momentum happening in the specific market" **(P3)**<br>"So there's also people looking at market and competitive information." **(P4)** |
| DCV / KM / DT | Open Innovation | Collaboration & Partnerships<br>Share sensitive knowledge to improve results | "have really a lot of projects with external partners, mainly via public funding organizations. When we have a publicly funded project, like for example, research institutes, or universities, that's quite common, but also SMEs, small and medium enterprises(…). Another way is that we privately fund research at universities in different ways." **(P3)**<br>"in many cases it's worth to do this first step, and share information and share knowledge. Because it really puts them into the right position" **(P4)** |

### 4.1.3. Technological Competitiveness

When questioned about their views on AI-enhanced market research, P1 said that while it would be a good addition, they would not advise depending only on AI, but rather use it complementary. Problems that were mentioned by P1 were identifying topics and copyright. They answered with three words describing AI with the words *"complexity, insecurity, intransparency"* (P1). Furthermore, P1 mentioned that *"it sounds very complicated"* (ibid.). For the three connotations P3 mentioned the terms *"fast, smart, cool"* (P3). This positive attitude reflects also in the other answers. P3 sees the potential application of AI in both outside-in information flows but also in internal information and KM. Whereas they repeatedly emphasized that this technology is having a supportive and complementary role. But the value and possibilities AI comes with are acknowledged by P3 as well, as the following statement shows: *"Let's say where a human being will be overwhelmed because of the different or all the different information sources. But where a human being is still superior is, to have the newest information sources, let's say, based on other humans currently working on a specific topic"* (P3). They highlighted, that there is a time gap until the information is publicly available and can be analyzed by a tool. Therefore, they conclude that human interactions are still needed for the latest innovation topics.

P2 sees AI as partly helping with information and knowledge management, depending on the tool and algorithms used. But P2 could see this especially *"in the gathering of information… [as being] super important"* (P2). This is reasoned by P2 in the aspect of time-saving, information gathering, and information overview or summary. This is reflected in their answer on the three intuitive words crossing the mind when hearing the term AI, which were *"speed, structure, computer"* (P2).

The three words used by P4 to describe AI were *"Big Data, Efficiency, and Consistency"* (P4) which have positive connotations. Moreover, they express a desire for AI in the future to help streamline processes and work as a

supportive tool that will reduce a lot of the groundwork in information gathering. The general desire is for an AI to provide a "*holistic picture done much more efficiently, smarter, and quicker so that we can force the resources that we have now into (...) applying this information and making it a benefit for the company"* (P4). This is something that is already done today but the balance between time spent collecting data and analyzing it for relevant information is off. P4 also feels confident that their role will not be replaced by an AI but rather optimize resources. P5 doesn't think AI will replace their job either but views it as an enabler and as an educative tool for younger employees to reach a higher level of expertise in a field faster. This is reflected in the three words chosen by P5 to describe AI, namely, *"Information management, finding information, and clustering"* (P5) which describes current tasks for employees in their division.

On the question about using external software for AI-enhanced market research, P1 answers it can be used additionally, with limitations since they *"would not rely on that 100%. Because you don't know where they get the information from (...), which algorithms are in it. So there are a lot of interests, [but] there is a lot of intransparency, which I would not trust completely"* (P1). The benefits of using AI were seen as having a neutral perspective through a *"fresh eye"* (P1) and an *"instrument to evaluate if you are on the right path"* (ibid.). Whereas a threat using external software was seen by P1 in the fact that *"the competition can use the same instrument"* (P1). For the evaluation and assessment of gathered information, P1 sees potential in AI, as they state: *"It is in the DNA of artificial intelligence that it can prioritize various information. So I think in the future it will more and more be working for itself"* (P1).

AI-enhanced market research was seen as playing a big role in the future. According to P2's experience it already now *"offers many new insights that are... displayed by the tool that otherwise would be just apparent through months of research"* (P2). Especially, the connection, that can be uncovered by the tools analysis functions, is seen as a huge time-saving opportunity. P2

currently sees AI SaaS as a supportive and complementary tool to make daily work easier, by cutting unnecessary manual tasks to focus on the more important decision-making process (strategical and analytical tasks). This was indicated by statements like AI can *"[replace] the need to read thousands of news and patents."* (P2).

P2 as one of the users of the AI-enhanced software, assesses the tools as not yet 100 percent mature. Especially for using external software in market research P2 requires a thorough test to understand the underlying software to trace back where the data originates. Moreover, regarding sharing sensitive information P2 identified risks, since *"in the system [there] are some cues on what we currently work on or research in detail. When you additionally upload internal files to present out of the system (...) the software contains much information that makes it attractive for industrial espionage or hacking"* (P2). On the other hand, P2 also identified the advantages of working with an external vendor, since it comes with flexibility and service aspects. The organization can work with mature software by buying a license, and if the expectations are not met "*it can just be canceled"* (P2). Furthermore, the provider includes *"customer demands into the user interface"* (P2).

P3 considers AI to be superior in data interpretation and analysis due to its ability to process large amounts of data. Especially, the possibility of *"tracking and analyzing, and visualizing a lot of different publicly available data and connecting them"* (P3). However, when it comes to personal direct exchange and valuable knowledge that is not yet publicly available, human intelligence and skills are seen as strengths. Their answer on the role and change of future work is going hand in hand with these answers. They do not feel a threat of being replaced by an AI, just being replaced in certain tasks enabling resources for work on other topics. It's enabling easier working processes, but will not replace their role in the company. But they also have critical thoughts towards AI. These are that *"people shouldn't see those tools as a single source of truth"* (P3). Other information streams need to be

considered to represent the right holistic picture. Similarly, P2 stated that they *"would never rely completely on it"* (P2). But P2 also limits this to the current capabilities of AI software and annotates *"who knows how that looks in twenty years?"* (P2). They remark that many jobs might be replaced by AI in the future and takes accounting as an example. In this they see AI having a lower error ratio, *"because humans [make] mistakes and have subjective influences, emotional influences that a machine doesn't have"* (P2).

On the question covering the risks and benefits of external software, P3 expresses the security concern. Even if the provider is not implicitly sharing sensitive information, this can be done *"between the lines"* (P3). Whereas the benefit mentioned refers to the dependency. The provider is a startup, so keeping customers is their highest goal. Therefore, they improve the software according to the customer's demands. The tool in use is accordingly designed and can be used intuitively. According to P3, training is required regarding the search performance and tool utilization.

When exposed to the questions surrounding the usage of AI in market research and KM, P4 expresses caution about the topic. This is rooted in a lack of expertise in the area. Simultaneously P4 also recognizes the potential of its application and how it can add value to the information-generating process. As a way to integrate it, P4 is considering changes such as implementing a new team member with a sole focus on developing AI-based solutions for their area. When asked about internal training offered for analyzing AI-generated knowledge P4 replied that training is applicable to all types of information interpretation. *"The way we share information, the receiving party doesn't know how to work with it… so there is definitely a need for it but we don't have any structure or systematic training on that"* (P4).

When asked about the potential for AI in knowledge management and market research P5 hopes that it will streamline the information generation, clustering, and conversion process. But they also express concerns facing this

next generation of digital tools. Because *"what I see at the moment is that digitalization forces new headcounts and new teams"* (P5). Moreover, AI-generated knowledge is difficult to assess and you can't take all the information for granted, therefore, it also requires a human brain behind it. *"We use it to get information but…we have to bring it together in a right manner"* (P5). In the future P5 sees AI as being a team member, *"it will be a tool which is an integral part of our work in order to get the most correct and broad picture about every topic"* (P5) and essentially saves time. Currently, there is no internal training offered in this department regarding analyzing AI-generated data but P5 offers coaching in projects run by less experienced employees.

*Table 7: Overview Technological Competitiveness*

| **Theoretical concept** | | **Key Takeaways** | **Statements** |
|---|---|---|---|
| Aligning technical and organizational factors | Accessing and utilizing AI-generated information | Critical assesment<br>Training of employees | "would not rely on that 100%. Because you don't know where they get the information from where the database is like, which algorithms are in it. So there are a lot of interests, [but] there is a lot of intransparency, which I would not trust completely" **(P1)**<br>"would never rely completely on it" **(P2)**<br>"people shouldn't see those tools as a single source of truth" **(P3)** |
| | Desorptive capacity | Higher efficiency & time savings<br>Influence innovation activities<br>Still offset time | "It is in the DNA of artificial intelligence that it can prioritize various information. So I think in the future it will more and more be working for itself" **(P1)**<br>"offers many new insights that are... displayed by the tool that otherwise would be just apparent through months of research." **(P2)**<br>But where a human being is still superior is, to have the newest information sources, let's say, based on other humans currently working on a specific topic" **(P3)**<br>"holistic picture done much more efficiently, smarter, and quicker so that we can force the resources that we have now into (…) applying this information and making it a benefit for the company" **(P4)**<br>"it will be a tool which is an integral part of our work in order to get the most correct and broad picture about every topic" **(P5)** |
| | Technology innovation | DT & AI force new roles | "what I see at the moment is that digitalization forces new headcounts and new teams" **(P5)**<br>"it will be a tool which is an integral part of our work in order to get the most correct and broad picture about every topic" **(P5)** |

### 4.1.4. Visualizations

The reactions to the visualizations were varying among the interviewees. For P1 and P4 the visualizations were unknown. P2 and P3 have previously worked with these visualizations, and P5 already saw them in one presentation.

P1 shows a negative attitude, whereas all others react positively. The interviewer probes P1 about their initial thoughts and their trust in the visualizations. P1 answered, that *"at first glance [the visualization seems] very complex and seems complicated"* (P1). The respondent thinks they are trustworthy, but that in order to utilize them effectively, one must receive training. The respondent feels that while the visualizations may be useful for presentations and as a foundation for future study, they are not immediately useful for day-to-day tasks. P1 underlines that *"with this graphic only, the research is not done"* (P1). P2 finds the topic map practical but sometimes confusing and would use it for an initial assessment but not for deeper research or decision-making. Visualization 2, the visual explorer, is their *"favorite visualization from the tool. Because I think that you can really gain a lot of information and data. And it is the easiest to work with. To quickly collect the needed information."* (P3) Whereas the third visualization, the radar, is liked least. This can be mainly caused by the threat P3 sees in the risk of user mistakes, by the *"manual choice of indicators important variables could be left out. That should be done by the AI"* (P2). They trust the content and think it is reliable. This was proven by their validity tests. Overall the whole context of AI-enhanced tools needs to be critically evaluated and that includes the visualizations (P3).

P4 suggests that the visualizations have the potential for aiding in trend analysis, but may require some training for users to fully comprehend and use them effectively. For all visualizations, they concluded that *"I would need to familiarise myself with it"* (P4) in order to discover the possibilities for application. P3 also reacts positively to the presented visualizations and

believes they could be beneficial for their daily working life. However, they do not necessarily trust the information presented and view it as a starting point for further investigation. They emphasize the importance of validating information with other sources and finding proof points before making decisions. *"First of all, I'm open and trust. Is it reliable? We have to learn it to see"* (P5). They believe the visualizations provide a direction for decision-making but are not a substitute for thorough research and analysis.

### 4.1.5. Description of the 'Perfect' AI-enhanced Tool

In order to answer the research question, the authors aimed to define requirements that an AI-enhanced tool would need to fulfill in order to improve the innovation activities and working life of the employees. P1 focused on the characteristics of the tool, such as transparency, traceability of the data, understanding the algorithm, and easy and understandable communication of contents. P1 sums it up *"For me it would be important to understand how the AI is actually working."* (P1)

Both P2 and P3 connected this question to the tested tool and view its structure and functionality as already close to the ideal tool. Both express additional functions they wish for. P2 and P3 for example expressed the need for the visualization to include developments over time and the functionality of displaying the whole supply chain. This information is *"most wanted and hard to gather. So the company can identify potential customers for strategic sales"* (P2). Moreover, an extension of the database *"to find all publicly available information, plus show some aspects also over time, based on specific search queries you saved"* (P3). A strength of the tool underlined by P2 is the possibility of knowledge sharing with the help of the tool, by sharing interactive visualizations.

The ideal AI-enhanced tool was described by P4 as something that is challenging and they express that their expectations are *"not too crazy"* (P4). They describe a desire for a tool that can challenge their current way of

filtering and monitoring information. Starting broad to identify new topics and then going through an intuitive process of narrowing down information, without missing information due to human limitations and information overload. Also, customizing plays an important role for P4 represented in adapting and modifying the filtering methods. Another function P4 wants in the ideal tool is the possibility of automatic monitoring of information and an interface that notifies them of significant changes in the information without having to look at everything. P5 answered short but concisely that their ideal AI-enhanced tool should *"offer an interface where we could put very easily information inside"* with a *"lot of interfaces to the world wide web"* (P5) with intuitive handling and utilization.

### 4.1.6. Identified Themes and Keywords

The first three themes are related to knowledge, namely *internal knowledge*, *collaboration and partnership,* and *external knowledge*. These themes were mentioned a lot in different contexts throughout primary and secondary empirical research. *Internal knowledge* was referred to as all internal resources, mostly in connection to experts and human resources of the organization. One statement in connection with this theme that stands out concerns *isolated knowledge* within the different departments in the organization.

*Collaboration and partnerships* was another theme referred to by all interviewees. This includes cooperation with various institutions and other companies from the industry, which was further highlighted in the secondary data. Collaborations require *knowledge exchange*, as the management-level interviewees (P3, P4, and P5) confirmed, this external sharing of information is essential to the process.

The theme of *external knowledge* was also prominent. It includes market reports, conferences, and all publicly available information. P2 and P4

referred to the internal platform where external reports are stored. The knowledge-related themes are summarized in Figure 4.

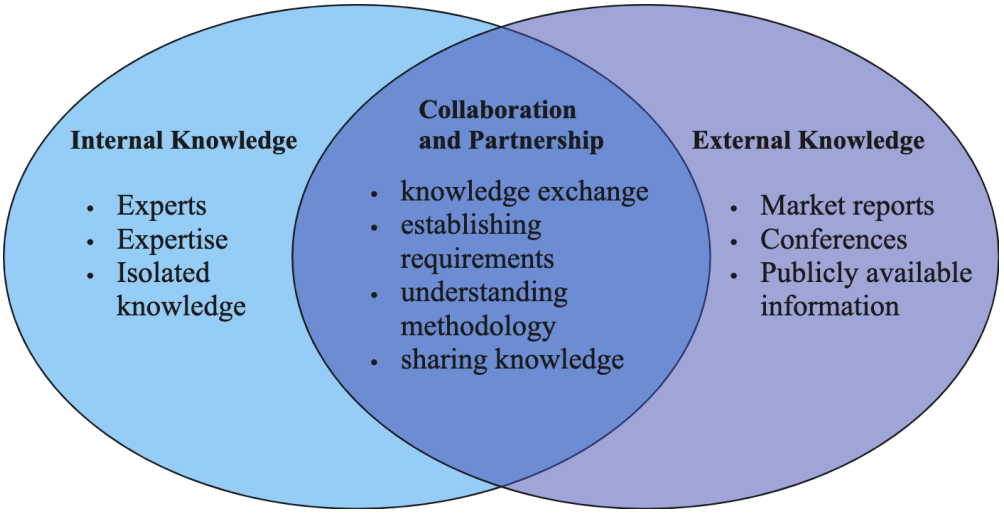


*Fig. 4: Knowledge-related themes*

Other themes identified were *information overload, time and resources, technology*, *assessment of AI-generated data,* and *solutions*. Information overload was mentioned in all interviews. Digitalization offered access to a larger amount of publicly available data, which is not processable anymore by humans. This then leads to the fourth theme: *time and resources.* P5 pointed out that finding the right information is very time-consuming, especially for new employees. According to P5 this is already *"recognized by the senior management"* (P5). This is validated by the statements of P2 who is facing the problem of finding the right information and the right person to contact. These time constraints were also pointed out by P1 as a knowledge sharing obstacle. Therefore, the next apparent theme was *technology*, including digitalization technologies with a strong focus on AI. The last theme was the *assessment of AI-generated data* and included the required skill set and training for successful use.

These themes of problem identification were supplemented by themes of problem-solving, namely *solutions*. This was represented in different attempts, such as process design, systematic solutions, or the usage of SaaS

or new technologies. Whereas P1 was seeing a process as a loss of creativity, the other interviewees found process management as a solution. It was also apparent that the interviewees were aware of the human limitations of manually gathering information. Digitalization offered access to plenty of data, but also *"digitalization is an enabler to play faster"* (P5)

## 4.2. Secondary Data

This chapter aims to introduce the internet-mediated data collection of information published around the case company, by the case company, and by and around the service provider. This complements the primary data with a more holistic view to provide context for the analysis.

### 4.2.1. Information published around the case company

The case company is working within semiconductor design solutions and reference schematics used in automotive, green industrial power, power management, sensing solutions, and security in IoT applications. In these applications, entry barriers are created by technology and manufacturing expertise. Competitors and potential market entries are attempting to solve this through joint ventures. (YOLE, 2020a). In order to stay ahead of the curve it is essential to search for innovations and new discoveries in terms of designs and materials. This can be accomplished by research and development investments to tap into a larger share of the estimated $7,68 Billion power supply industry of 2025 (YOLE, 2020a).

The power module market is reshaping with the entry of big players competing through innovation, and accelerated implementation of new technologies which means that new players may opt for different suppliers. "Over the last years, small-size modules have been identified as one of the new trends (...) On the other hand, other power module players have different proprietary approaches and there is still no standardization in module

packaging as of 2020. Thus, module packaging opens new business opportunities for newcomers with innovative technologies." - (YOLE, 2020a)

The case company is highlighted throughout the YOLE report, mentioning their involvement in multiple areas of the industry in the substrate, metal oxide semiconductor field effect transistor, and module applications. These applications are found in a range of products including electric vehicles (EV) and hybrid electric vehicles (HEV), residential, commercial, and industrial photovoltaics, power supplies, uninterruptable power supplies, and others. While many top power semiconductor companies are involved in SiC activities, including research and development, the progress of the sales in SiC varies between them. For instance, company XY has made significant progress by becoming part of a leading automotive manufacturer's supply chain (YOLE, 2020b).

The industry is embossed with a "good enough" mentality for pushing products out into the market at a lower cost and faster pace. This has emerged as a solution to the rapid development of market conditions. This further emphasizes that "Innovations in packaging are needed and business opportunities are available" (YOLE, 2020b). Moreover, there is a booming demand for power module packaging solutions in the electric and hybrid electric vehicle market, further arguing for a need in offering innovative solutions for manufacturers and suppliers of power module packaging materials (YOLE, 2020b).

Accessing innovative technologies or hindering them from leaking to or being adopted by competitors in global markets requires monitoring and security of intellectual property. This relates to strengthening a competitive position by adopting innovative solutions early and keeping them in-house to remain a technology leader (YOLE, 2020b).

### 4.2.2. Information published by the case company

The case company uses different internet channels for publishing information. This thesis considered annual reports, press releases, and social media (LinkedIn) postings.

In the preface of the 2021 annual report, the CEO emphasizes digitalization challenges. They underline their conviction in innovative technologies in solving major problems such as decarbonization strategies and digitalization. The application of digital solutions is seen as a solution for changing environments, accelerated by growth and globalization. *"The digital transformation also offers great opportunities for enhancing our internal processes and working practices."* (CEO case company, 2021) In the same report, the activities in the field of AI are also presented. Since 2017 the company has had local initiatives to optimize manufacturing with the help of AI. Additionally, there is a team of experts working on implementing AI solutions into the products. The case company is developing hardware and software solutions to enable the integration of AI algorithms into systems. This includes the creation of AI accelerators, with the ultimate goal of developing comprehensive solutions encompassing sensors, microcontrollers, and software.

The annual report of 2022 has a strong focus on DT. On the one hand, DT is in the company's processes, but on the other hand also in the product range. The semiconductor modules are seen as having a big share in facilitating DT by providing technological infrastructure.

*Press*

The press releases represent a variety of topics. These represent collaborations and partnerships, portfolio and product information, as well as organizational developments and stakeholder information. The collaborative information contains releases, such as a project where the case company coordinates a funding project with 62 research partners. Another example is the collaboration in the form of a *"long-term partnership"* with a competitor

to accelerate electromobility development. Technological research and development are strongly focused on in the releases, so different research initiatives are introduced and displayed. New product developments are also published, therefore also portfolio-related releases can be found.

Lastly, organizational information are published. In 2021 the case company announced the expansion of the management board by introducing the position of the Chief Digital Transformation Officer (CDTO). The CDTO aims to *"get the best out of the huge potential offered by the digital transformation"*. This role is responsible for the fields of information technology, business continuity, business excellence, sales & marketing transformation, and cross-functional digitalization and data architecture. Furthermore, entails coordinating initiatives for sustainability, such as rainforest initiatives or green energy use in production sites, public relations, such as politicians visiting the production sites, or shareholder information, such as annual and quarterly meetings and dividend decisions.

*Social Media*

Social media channels are used to inform employees, customers, and other stakeholders about the company's activities. On LinkedIn, the posts concern technology and innovation updates to product-related information, general information, and employer branding stories. Also, topics regarding DT are brought up. For example in a recent post, the collaboration with an external partner to enhance the AI potential. AI is there described as "*one of the most disruptive technologies of our times (...) [and the] key to digital future.*" Another recurring topic on their LinkedIn is IoT. Also, a platform for general knowledge sharing is promoted by the company as they offer customers a 'Developer Community'. A platform where knowledge is gathered and problems can be discussed. The topics and the wording of the annual reports can also be found in the posts, such as "*address the biggest challenges of our time*", "*key to a sustainable future lies in new technologies*", and *"co-innovating with startups, corporate innovators and other partners"*. Another post concerning this topic claims *"powerful knowledge (...) at our*

*headquarters today"* promoting cooperation with other companies and research institutions to accelerate technology development.

On their Facebook page, many posts contain the same information as on LinkedIn. Additionally, more cooperations are communicated on this channel, such as university cooperation, where the case company founded a research competition *"to contribute to the education of our emerging talents"*. Also, they communicate their partaking in the *"alliance for digital competencies by the Bavarian State Ministry for Digital Affairs"*. As on LinkedIn they also use employer branding for storytelling. One employee working in the field of digital design engineering was interviewed and presented their KM-related experiences as it *"felt like I learned the knowledge of years in one day. It was (...) the best one (...), because the feedback I received would shape me for years to come. As a newbie, the best thing you can get is feedback. It's helpful when it is without judgment, and this is what I meant by support from colleagues."*

### 4.2.3. Secondary Data Concerning the Service Provider

In a whitepaper published by the service provider additional background information could be extracted. The provider works in the SaaS business model. This means that their product is a software that can be used by companies if a license is bought. The rights and ownership of the software remain with the provider. The software represents an end-to-end data intelligence platform that works with the support of AI. The core value they offer companies is the scanning of external factors, such as competitors' activities, patents, research, and funding projects. In consequence, it supports identifying opportunities and risks for innovation activities. Both, for creating a broad overview, but also for deep dives and detailed narrow projects.

The software is data science-oriented, which means *"the structured study of data for the purpose of producing knowledge"* (Martinez, 2022). They have a high prioritization of data quality and claim to align their standards according to the framework of the Data Management Association. Furthermore, the projects created can be used for knowledge sharing and collaboration within the team. The automatically created visualizations and analyses can be used for reports and can be shared internally and externally with the help of a link. Access can be additionally restricted by using a password and a limited duration of accessibility of the link. The special characteristic the tool offers is that the projects shared remain interactive and are updated as progress is made throughout the collaboration.

# 5. Analysis

In the following sections, the primary and secondary data will be analyzed to explore how internal capabilities and absorptive capacity are utilized by the case company to reach technological competitiveness. Consequently, through the secondary data examine how this relates to their industry and how the AI-based SaaS provider can help tackle existing challenges. The chapter concludes with an updated conceptual framework based on a theoretical and practical foundation.

## 5.1. Internal Capabilities

Internal capabilities refer to the starting point of DT & AI in KM practices and developing DC. The interviewees and secondary data have provided insights into the knowledge sharing, KM infrastructure, organizational culture, and leadership & mindset of the case company. Leveraging knowledge to innovate products & processes will ensure that a company remains competitive, aware of developments and surrounding actors in their market (Alavi and Leidner, 2001; Hock-Doepgen et al., 2021; Santoro et al., 2018; Tiwari, 2022). All participants attribute a major role to the area of innovation and KM, which increases in importance as the company grows and is a phenomenon present in most large organizations as stated by P4.

With emerging technologies, DT aims to improve organizations by incorporating information technology in innovation processes such as AI in KM practices (Bican and Brem, 2020; Kraus et al. 2022; Tiwari, 2022; Tronvoll et al. 2020). With digitalization constantly introducing new opportunities, innovation is defined by P5 and P2 respectively as "*not only for (...) finding new markets or new applications… It's also to innovate the organization itself"* (P5) and not only as new products but *"ways to do things"* (P2). For example, finding new ways to share information internally. This resonates with Ietto-Gillies' (2019) definition of radical and incremental

innovation where innovation is recognized as a means of introducing something new to the market or simply adopted into the organization itself.

Successful implementation depends on various factors such as KM infrastructure, facilitating internal knowledge sharing including organizational culture (Darmawan et al., 2023). This resonates with P4's analogy of knowledge sharing as an onion, meaning it has layers to it's applicability within the organization. P1 also gave an example of a missed business opportunity and traces this back to weak knowledge sharing. Moreover, P4 and P5 mention existing knowledge hubs where employees can access information, albeit it takes a long time. However, when information is exchanged, while protected under an NDA, the information streaming in is sometimes restricted to certain people or departments under licenses. This is causing challenges in the *knowledge-sharing* process in the *internal capabilities* of the firm.

The information is then either isolated to specific groups due to ambiguous coding of the knowledge, licensing issues, or seen as a time-consuming process, and resources are invested elsewhere. This can be traced back to the core reason being a lacking KM infrastructure hindering knowledge sharing. In the product development department, P5 acts as a mediator, offering his expertise based on the extensive expertise gathered from years in the industry, people can then approach him to receive directions towards experts or relevant information. Similarly to P4's onion analogy this results in *isolated knowledge* which again, while valuable, restricts access to information pieces to other departments. This is resulting in knowledge sharing on a personal level but is not applicable organization-wide.

In DT leadership and mindset are essential in addressing the human factor driving organizational performance and when overlapping with existing norms and values (Abbu et al. 2022; Hasan and Nikmah, 2020; Kraus et al., 2022). Concerning these theoretical requirements presented by the aforementioned researchers, the case company has introduced the position of

CDTO in the management board. Moreover, the CEO has stated that "The digital transformation also offers great opportunities for enhancing our internal processes and working practices." (CEO case company, 2021) While the CEO is regarded as an integral part of integrating new workplace technologies (Kraus et al., 2022) the introduction of a CDTO would serve as an extension of this need. Furthermore, considering that the case company is very large, this is recognized by the authors as an integral step towards facilitating successful implementations of emerging technologies in the organization.

## 5.2. Absorptive Capacity

The authors found that absorptive capacity can be improved after internal capabilities are sufficiently developed. The following sections present the acquisition-oriented process, conversion of data, application-oriented process, environmental scanning, and open innovation of the case company.

The absorptive capacity of a firm is initiated by the acquisition-oriented process and refers to the procurement of knowledge through social interaction, inter-organizational collaboration, the purchase of knowledge assets, or environmental scanning (Hock-Doepgen et al., 2021; Santoro et al., 2018). Similarly, environmental scanning transpires through publicly available information and personal interactions with consultants, customers, and key partners or competitors. This is highlighting a relationship between the two factors as the procured knowledge decides which parts of the competitive landscape are scanned. However, as information streams change and become more accessible, the risk of information overload also increases, making finding the right information and converting it more difficult (Castillo and Taherdoost, 2023).

Aside from tangible information sources, external actors are seen as key information sources. This is also referred to as *network collaborations and*

*partnerships* by Hock-Doepgen et al. (2021), which is recognized as a potentially valuable source of information, as an additional information stream to internal and external KM capabilities. In terms of network collaborations and partnerships for the interviewees, the importance of conferences featuring universities, various institutions, and thesis work was described as important *knowledge exchange* activities.

Existing collaborations and partnerships are an integral part of complementing information needs and providing value to decision-makers (P3, P4, and P5). This argues for the practical applicability of network *collaboration and partnerships* (Hock-Doepgen et al. (2021). In identifying new promising partnerships the interviewees also see a change. This is on account of new approaches such as using AI-enhanced tools to identify proof points in information and trace them back to experts and sources behind certain information pieces. External partners are currently evaluated based on gut feeling, experience in the industry, and past results in collaborations. AI can therefore, by linking information pieces and projects to people or organizations, offer new ways of identifying who to approach.

The value of these knowledge exchange activities is made apparent in the practical examples of missed business opportunities. While they can be caused by both internal capabilities and absorptive capacity, implementing external actors in knowledge exchange was regarded as a potential solution to avoid future problems. The issue however remains, as information needs to be processed and not overlooked or missed (P3) as the first mover advantage can be lost, which is an integral part of the semiconductor industry (YOLE, 2020b). This resonates with the findings of Bican and Brem (2020), Kraus et al. (2022), Tiwari (2022), and Tronvoll et al. (2020) as DT with innovative solutions such as AI in KM practices can enhance the absorptive capacity of a firm.

Implementing AI successfully as a solution to information processing, clustering, and mapping depends on the evaluation of the change over time. To determine if it is a success it would need to provide support for decision-making and offer new opportunities in the *absorptive capacity* of a firm. This resonates with Kim and Kim's (2022) SERM model with AI as the *mechanism* meaning that the change needs to be assessed from the perspective of the *subject* (organizational structure), the *environment*, and the *resources*. Nonetheless, the interviewees were unanimous in AI offering new ways of increasing efficiency, by using a tool for tracking, analyzing, and visualizing data in quantities that humans no longer can. The threat however of relying on a SaaS provider was according to P1 that the competition can use the same tool. This means that until companies either sign exclusive contracts with SaaS vendors or develop private software, the differentiating factors will still be the human behind the machine. This further emphasizes the value of intangible assets such as talent acquisition, and internal training & creativity for technology utilization in the DT of KM activities (Bertani, Raberto, and Teglio, 2020; Kraus et al., 2022; Darmawan et al., 2023).

While digitalization of information processing is seen as a solution, P5 also raises concerns about the effects this has on companies forcing new headcounts and teams. This is in accordance with researchers' findings, that there are challenges following the emergence of AI in business practices which will lead to new employee requirements and specialists to analyze AI-generated information (Bertani, Raberto, and Teglio, 2020; Darmawan et al., 2023; Lam et al., 2021; Mendling et al., 2018; Su, Togayand Côté, 2020; Tiwari, 2022) and in DT undertakings (Abbu et al., 2022; Kraus et al., 2022).

## 5.3. Technological Competitiveness

This section focuses on technological competitiveness. This component refers to sustaining technological competitiveness by aligning technical and

organizational factors through the use of DT and the implementation of innovative technologies such as AI. This is essential for augmenting the capability of all actors in the ecosystem, including employees, partners, and customers.

The *absorptive capacity* of a firm must be expanded with external KM technologies (Hock-Doepgen et al., 2021; Santoro et al., 2018), to achieve *technological competitiveness.* This is increasing in difficulty due to the increasing complexity of maintaining a competitive advantage (Darmawan et al., 2023; Tiwari, 2022), in the continuously changing, highly technological, semiconductor industry (YOLE, 2020b). AI-enhanced SaaS already offers applications in terms of trend identification, marketing, managerial & strategic decision-making, optimizing processes, tasks, and accuracy of work (Ameen et al., 2022; Bai et al., 2020; Gupta, 2019; Mikalef Conboy, and Krogstie 2021).

Interviewees raised concerns about copyrighted information presented by AI and applying this information to the company could create infringement issues, as mentioned by Castillo and Taherdoost (2023). This issue is negated by offering training and increasing the analytical fluency of employees (Sestino and De Mauro, 2021) or by developing DC to address data security and ethical concerns (Teece, 2017; Wilhelm, Schlömer, and Maurer, 2015). Analytical fluency in the case company is not only connected to AI-generated information but all types of information. Since the interviewees assign value to experts, people, and relationships as means of understanding which topics are the focus of the future and market forecasting. Internal expertise then becomes crucial in the evaluation of the information gathered from external actors as information can be very valuable when assigned the right conclusion.

The key in these relationships was according to senior employees derived from an interactive relationship, communicating the requirements and sharing internal information to generate valuable end results. Initiating these

relationships can be done via the possession of attractive technologies facilitating *knowledge exchange* in the *desorptive capacity* for initiating strategic partnerships (Chesbrough, 2003; Hock-Doepgen et al., 2021; Parida, Westerberg, and Frishammar, 2012; Santoro et al., 2018). This is important as entry barriers in the semiconductor industry are controlled by technological and manufacturing know-how and are most often solved through joint ventures (YOLE, 2020a). This further highlights the need for *knowledge exchange* in the *desorptive capacity* of a firm. Even though AI is in a narrow state, it still surpasses humans in collecting and analyzing information (Pitt et al., 2021) making it an essential part of firms' future *absorptive capacity* facilitating *technological competitiveness*.

The applicability of AI was seen in both incoming and outgoing information optimization. However, since publicly available information generally becomes available after events have transpired, a human was regarded as superior still with the ability to attend conferences and receive first-hand information from other professionals in the industry. Moreover, as innovations and DT also applies to processes, AI was also recognized as a solution to optimizing *knowledge acquisition, knowledge conversion, and knowledge application*. Thus, reducing the imbalance between gathering and analyzing information to extract only the most valuable information and sharing it internally. These benefits resonate with the findings of Zhang and Song (2022) as they highlight the importance of focusing on AI in the semiconductor industry to improve products.

While the potential and willingness to adapt is there, there is still a lacking understanding and in-house expertise in this area which makes it somewhat difficult to assess currently. A response to this uncertainty meant considering expanding teams to feature a position with an expert dedicated to developing AI-enhanced solutions to their specific needs (P4 and P5). AI is also regarded as a means of offering opportunities for younger employees to reach a higher level of expertise faster. AI-enhanced SaaS as a solution to this uncertainty is developed to provide enhanced capabilities with a fast

assessment and proof of concept (Gill et al., 2022; Kumar, 2017). Throughout this relationship with the vendor, there is typically training involved by the software provider to facilitate efficient usage by the service beneficiary (Sestino De Mauro, 2021).

## 5.4. Updated conceptual framework

The updated conceptual framework features implementations of the empirical data. These are aimed at clarifying the relationships between the variables in the internal capabilities and absorptive capacity. Furthermore, it results in laying the foundation for achieving technological competitiveness with the expansion of the absorptive capacity. Internal capabilities now feature the relationship between KM infrastructure & organizational culture and knowledge sharing & leadership and the mindset of employees. The absorptive capacity now includes AI-generated information as complementary to the acquisition and conversion of knowledge. Moreover, environmental scanning and open innovation were identified as initial steps to facilitate the desorptive capacity and knowledge exchange in successful partnerships and collaborations. These factors then coincide in contributing to achieving technological competitiveness in a rapidly changing environment (see Figure 5).

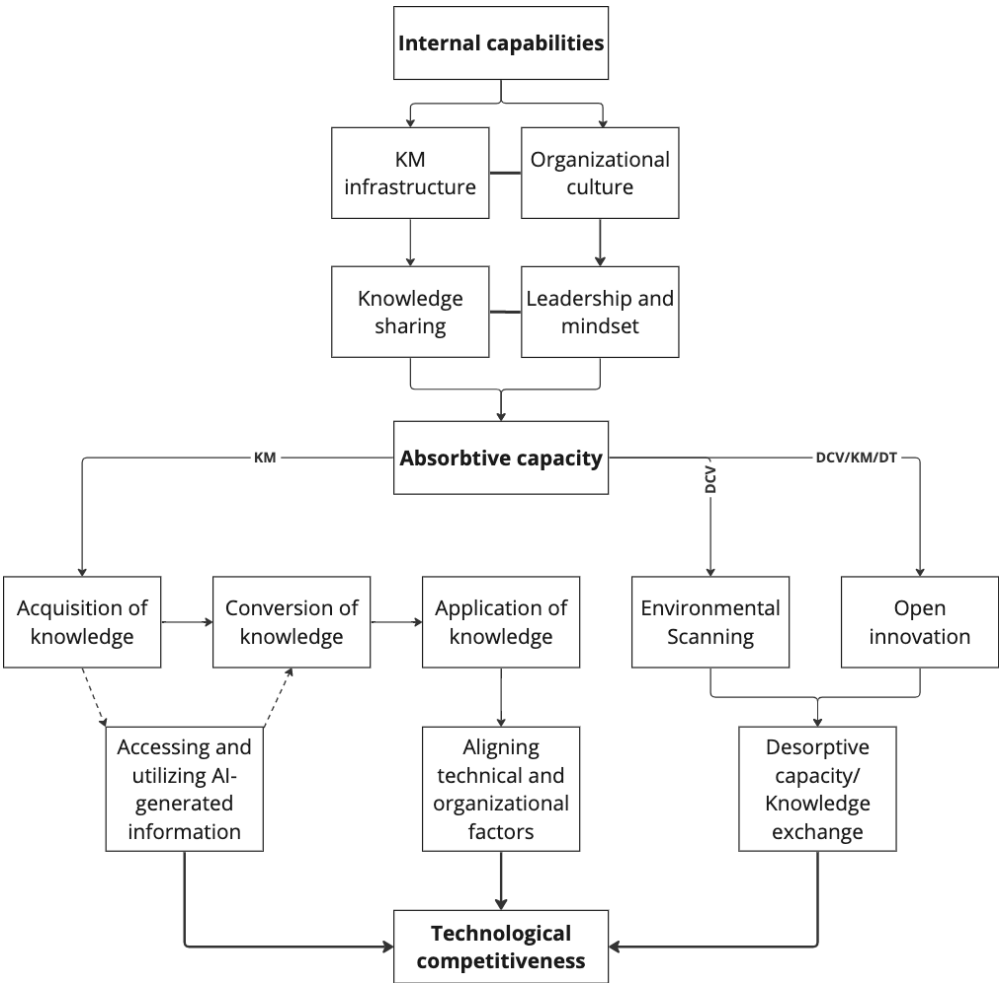


*Fig. 5: Updated conceptual framework*

The participants along with the theory mention the importance of knowledge management and innovation within organizations but highlighted some concerns. These concerns might interfere with creating a functioning knowledge infrastructure facilitated by the organizational culture or internal knowledge sharing hindered by existing mindsets, that could be augmented by leadership stemming from the new CDTO or organizational restructuring.

The absorptive capacity of a firm features potential improvements to the acquisition and conversion of knowledge by implementing AI-enhanced SaaS to efficiently procure knowledge and validate or complement existing and traditionally acquired information pieces. Open innovation and environmental scanning can also be used to identify potential collaborations

or partnerships to utilize desorptive capacity and knowledge exchange. These can, by themselves, or in conjunction with other aspects of the absorptive capacity contribute to technological competitiveness by illustrating multiple possibilities. Another one of these possibilities is the application of knowledge to align technological and organizational factors to streamline processes and reduce the imbalance between resources spent gathering information to validate findings and achieve incremental or radical innovations. Furthermore, by regarding AI as the mechanism in the SERM model presented by Kim and Kim (2022), this updated conceptual framework visualizes how AI can reinforce the DT of an organization.

## 5.5. Proposed Solution

Based on the empirical data, analysis, and derived practical implications, the authors have developed a proposed solution for implementing AI-supported SaaS solutions into the organizational structure. This solution is to a high extent influenced by the statements of the interviewees, stating that the value of the technologies can only be generated if operated correctly. This was supported by several statements demanding training of employers in both, operating but also analyzing, and evaluating the AI-generated findings. Thus, skilled human resources are the key to enhancing the absorptive capacity and technological competitiveness of a firm. Another variable influencing knowledge sharing in the company was the time constraints mentioned by the participants. Time, as an employee resource, is already needed for other projects and tasks. Therefore, there is limited capacity for exploring new possibilities with new technologies.

Because of these influencing variables, the authors proposed solution is a new role within the organization. The *'AI-enhanced Tool Operator'*. This role is not subordinate to a specific department, but acts as a kind of internal service point. As an internal service provider the *'AI-enhanced Tool Operator'* is not influenced by inner-departmental sentiments and also offers

a neutral perspective and evaluation to minimize subjective biases in the market research process. As a service provider, the role is of operational characteristics. This role's purpose is to summarize and prepare AI-generated information, which subsequently is evaluated in the departments for managerial decision-making. An example of how an organizational chart could look is proposed in Figure 5. It works as an umbrella, being available for all departments involved in the innovation process.

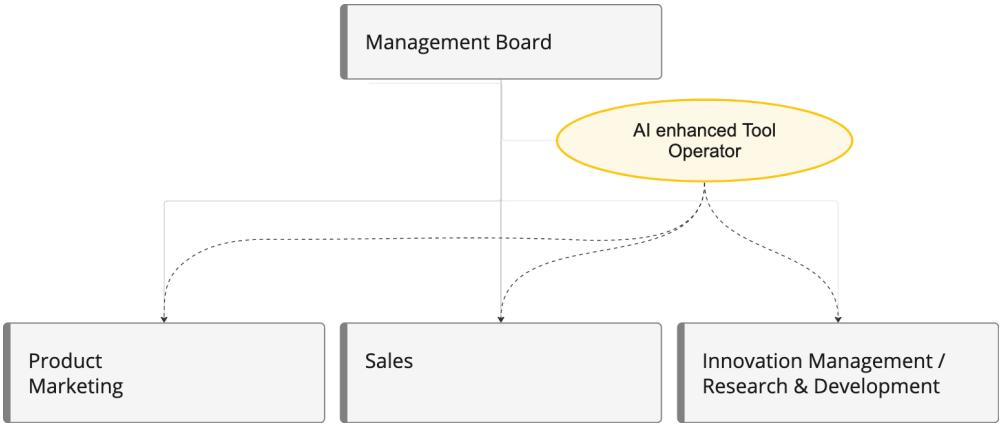


*Fig. 6: Proposed Organization Chart*

The profile for this role includes mainly strong analytical skills in order to interpret and analyze the generated data. Furthermore, a technical understanding and fast learning abilities are required due to the diverse tasks that might be presented. Market research in the semiconductor industry is very technical by nature. In order to extract relevant information a certain technical understanding needs to be granted. This does not require an engineering background, since the requests come from different departments and for different topics. The main requirement is that the person has to be adaptable to changing investigation focuses. Furthermore, the tasks are designed in a project management manner. This requires communication skills for stakeholder management, as well as presentation skills. As this thesis underlined AI is a constantly evolving field, and therefore this role is also connected to researching new possibilities within AI market research and facilitating DT in the organization.

The establishment of this new role would also introduce a new process. Previously, all departments did their own market research using traditional information streams, resulting in tied-up resources in a time-consuming process. The new process starts with a question or topic of interest raised by one of the stakeholders. The different departments and interest groups can follow a non-bureaucratic process to request a report on their desired topic. This can be addressed to the 'AI-enhanced Tool Operator' with the help of a form to submit the required information to carry out an AI-enhanced search. The request is then checked by the operator regarding comprehensiveness and feasibility. If the request is feasible it gets approved and the research process starts. The operator designs a project in the software and carries out an initial search based on the requirement form. The information is initially assessed by the operator and a report is created. In the next step, this report is sent to the stakeholder to evaluate the findings. If the results are satisfactory, the process ends and the information is applied to the innovation activities. If it is not yet satisfactory, the requirements are reworked by the stakeholder and submitted to the operator. Based on these changes another search is carried out. This is an iterative process until the reported information is sufficient for the stakeholders. The developed process map is displayed in Figure 7.

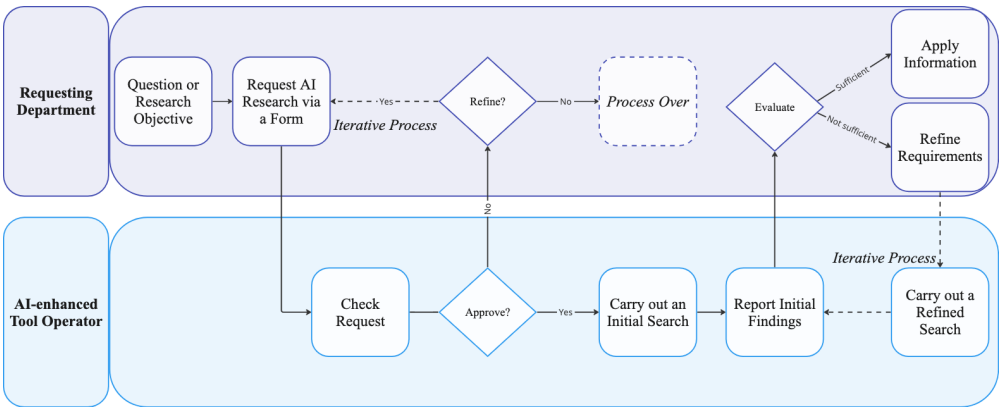


*Fig. 7: Proposed Process Map*

The authors see this proposed solution as helping with several points. First, improving the data *acquisition process* by enabling the collection of larger

data quantities and multiple different information streams. Secondly, *knowledge sharing*. With this service role creating market reports a common understanding of certain topics can be achieved. And thirdly, this common understanding presents a basis for external collaboration. As presented the quality of the outcomes of *knowledge exchange* activities is influenced by the shared information. The overall information generation process can be improved by generating AI-enhanced reports for market research.

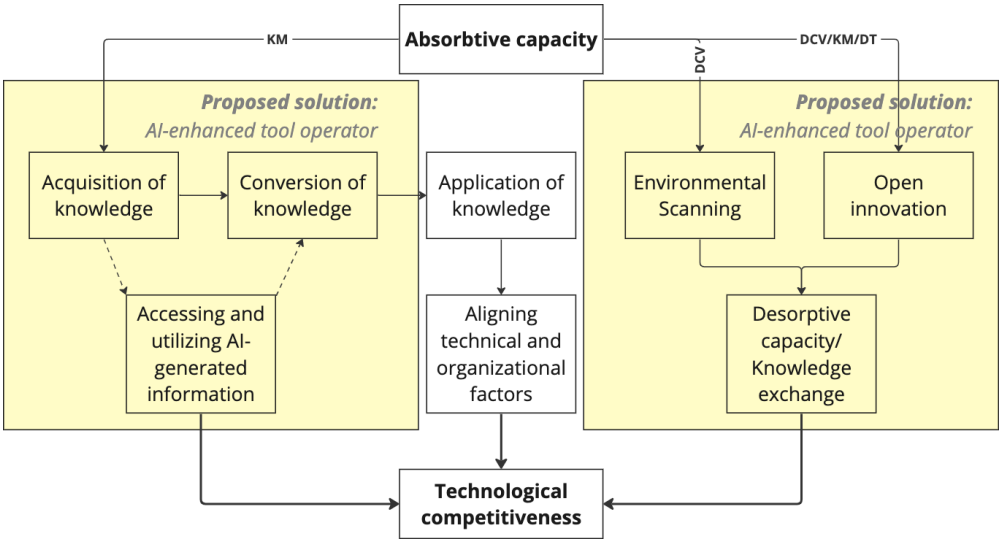


*Fig. 8: Spheres of influence of the new role on the conceptual framework*

This proposed solution is supported by both, empirical findings and theory, which mentioned that DT will lead to new employee requirements and specialists to analyze AI-generated information (Bertano, Raberto, and Teglio, 2020; Darmawan et al., 2023; Lam et al., 2021; Mendling et al., 2018; Su, Togayand Côté, 2020; Tiwari, 2022). The role especially helps in the organization's *absorptive capacity* by facilitating the AI-enhanced knowledge acquisition and conversion process, as well as the environmental scanning and identification of new partners for open innovation activities (see Figure 8).

The impact of this role on the organizational structure, surrounding environment, and organizational resources can be assessed by analyzing the SERM model presented by Kim and Kim (2022). The SERM model aims to reinforce DT strategies based on AI technology. With AI as the *mechanism* "factor complexly affecting management strategies and activities through organic interactions between subject, environment and resource" (Kim and Kim, 2022). The subject, referring to the organizational structure is already undergoing changes in top-level management with the introduction of the CDTO and with this proposed solution, the introduction of new core talent. In the environment with governmental actions influencing the semiconductor industry (Zetterberg, Johnsson, and Elkerbout, 2022) and accelerated technological innovations (YOLE, 2020a), AI can track developments more efficiently than any human (Marshall, Dencik, and Singh, 2021). Lastly, the AI-enhanced tool operator is also alleviating tied-up resources complementing information subsequently providing intangible value to the company. In the interviews, it was also apparent that the AI-generated visualizations presented were not intuitive. Furthermore, all interviews revealed the need for support and training to use AI-generated information. This is validating the necessity of including a trained employee to operate the software.

## 5.6. Theoretical Implications

As the references in this paper indicate, the subject discussed represents an on-the-edge topic with high current interest that is developing rapidly and constantly (Di Vaio et al., 2021). By creating a conceptual framework based on the theoretical concepts of DT, KM, and DCV, the authors chose a new approach to investigate AI in an organizational context. Considering both primary and secondary data in a single-case study, the theoretical concepts were proven and compared to the current organizational practices.

Firstly, concrete theoretical contributions complementing the research gaps are new insights into the hindering and supportive internal and external factors of an organization (Kim and Kim, 2022, Kraus et al., 2022). This thesis shed light on these factors and uncovered that time resources and pressure on other tasks are limiting the capacity to try and explore new technological solutions that would help to design processes and working routines more effectively - a vicious circle hindering innovation.

This circle can only be broken by strategic managerial decisions and behavior (Kraus et al., 2022). Darmawan et al. (2023) highlight the need for further research on the role of culture, structure, leadership, and technology to improve KM capabilities. This thesis underlined the importance of innovation and the value of data for companies in the semiconductor industry to remain competitive. The establishment of a new position in the management board focusing on DT indicated a high priority of the topic within strategic decision-making and the organizational culture. This indicates a will to embrace the requirements of DT and is in line with the employees' attitude towards innovation and emerging technologies.

Secondly, the fear of being replaced or tasks becoming obsolete was not a hindering factor. AI was rather seen as a complementary and supportive technology, to avoid manual work and create more capacity for strategic and creative tasks. This provides insights into the human implications, including requirements for new employee skills and organizational processes & structures of applying black-box models when adopting AI in DT (Sestino and De Mauro, , 2021). Moreover, this thesis addresses the gap presented by Kim and Kim (2022) and provides insights based on empirical data addressing the benefits derived from utilizing AI-enhanced decision-making.

Lastly, network collaborations and partnerships are recognized as a key information source for the interviewees where knowledge exchange is the gateway to market forecasts and first-hand knowledge. This resonates with Hock-Doepgen et al's. (2021) suggestion of considering network

collaborations and partnerships as a vital information stream in external KM practices.

## 5.7. Practical Implications

From the results of this thesis, multiple practical implications can be derived. On a managerial level, the results indicate the need for a clear strategic positioning for DT activities in the organization. With clear communication and a definition of the standing towards emerging technologies and DT, the managerial board is opening innovation processes and changing capacities at different levels of the company. Consequently, the awareness among employees enhances and the risk of missing out on radical innovation disrupting the market is reduced.

Management also has to invest in order to facilitate DT. On the one side, investments in identifying, testing, and implementing new technologies are required. On the other side, investments in training and education of employees to cope with new challenges and tasks arising from these new technologies are necessary. This need for training exists in operational tasks but is also necessary for the evaluation and processing of AI-generated information. The value of new technologies, as well as differentiation and competitive advantage, can only be achieved when operated correctly, as the theory and empirical findings underlined. This indicates the need for specialized employee skills and organizational changes, such as the establishment of new positions or departments. These connected implications were elaborated on in the chapter ‘Proposed Solution’.

# 6. Conclusion

This thesis sheds new light on the topics of KM, DT, and AI in organizational practices. With the help of a single-case study two main research questions were answered. The findings of the first research question, on how external and internal factors affect the successful adoption of AI in organizational practices, provided insights into the second, regarding how AI-enhanced SaaS can impact innovation activities, and identify new markets and applications in the technology industry.

Firms, as a prerequisite to achieving technological competitiveness, can develop their *internal capabilities* through DT and implement innovative technologies such as AI to bolster their *absorptive capacity.* This lays a foundation for aligning technical and organizational factors to sustain *technological competitiveness* in an industry where information and knowledge is the decisive factor.

AI can optimize processes to faster identify emerging technologies & topics and assist in market forecasting. This allows companies to faster respond to changes and increase their knowledge in relevant fields to develop attractive technologies, facilitating knowledge exchange and open innovation. Thus, by utilizing these technologies to facilitate new joint ventures they are able to remain technologically competitive in a highly technological and rapidly changing environment. Moreover, AI plays an important role in developing DC in the absorptive capacity of a firm providing new ways of sensing and seizing opportunities and technological competitiveness for reconfiguring the organization. This organizational reconfiguration featuring the proposed solution of the AI-enhanced tool operator facilitates the expansion of the internal KM capabilities in the absorptive capacity of a firm. Moreover, the role can be used for *environmental scanning* to identify experts and proof points for information in *open innovation* activities facilitating the *desorptive capacity* of a firm (see Figure 8).

AI-enhanced SaaS is gaining momentum as a solution to undergo DT as a safe option for venturing into the field of AI. The service delivery model, installment, and support administrations for the organization's specific needs enable a fast assessment and proof of concept, alleviating resources required in its integration into the company. The utilization of the AI SaaS subsequently depends on external expertise for internal training to effectively work with AI. The concept of AI SaaS in market research is fairly new and therefore surrounded by uncertainties in terms of data security, integration in existing systems, vendor lock-in situations, and redesigning processes. Moreover, bias in the data set is another possibility that further complicates the situation. The proposed solution of the AI-enhanced operator provides some benefits negating the aforementioned uncertainties. By including the manager supervising the role, from the start of the project, there are multiple people trained in the software. This allows for efficient use and more sources of internal knowledge sharing making the integration a smoother process. Moreover, AI SaaS is an independent external software provider meaning that other companies can use the same tool, consequently, the human behind the tool becomes the differentiation between competitors.

## 6.1. Limitations and Delimitations

There are several limiting factors that have to be considered when assessing this thesis. Firstly, the limited generalizability of results. Due to the choice of a single-case study, the sample size is relatively small and is not allowing the comparison of different organizations. This results in limited generalizability to other contexts and industries. Nevertheless, the authors opted not to use a multi-case study, since this would have resulted in a lower willingness of organizations to participate in the case study and a higher prudence in the interviews. The authors were apprehensive about shallow empirical data and therefore accepted the limitation of limited generalizability.

Secondly, digital transformation and AI represent a very complex phenomenon, and can not be fully investigated within the chosen research scope. Therefore, certain perspectives were left out, such as the prominent topics of ethical constraints connected to AI and cyber security. Since this is a new phenomenon in the company it was perceived as more relevant to research KM aspects since it is easier for interviewees to find access to the topic by their daily work experience.

Thirdly, the risk of subjectivity and researcher bias. Some precautions were taken to keep the bias low, such as the strong alignment of the interview guide with the theories, including two interviewers to limit the subjective selection of information, and conducting critical questioning internally.

Fourthly, the dependency on the interviewee's accuracy of answers. Especially the participants in leadership positions were having time constraints caused by following appointments. Therefore, the depth of the answers might be influenced to a certain extent. Nevertheless, this did not appear critical, since all interviewees covered all topics of research interest.

Furthermore, in a theoretical context, only contributions written in English were considered. In consequence, other relevant documents written in other languages could have been overlooked.

## 6.2. Future research

As indicated by the limitations of the study, future research would be beneficial for enhancing the generalizability of the findings. One direction for future research would be to extend the sample size by carrying out a multi-case study, comparing different environments in order to get a deeper understanding of DT and the role of AI in different organizations. This could either consider different organizations within the same industry, which would have the advantage of the same external factors and the same characteristics

in innovation activities. On the other side, the comparison of different industries could also shed light on the broad perspective of DT and AI.

Another possibility would be to examine the perspectives of ethical constraints and cyber security aspects connected to AI and DT, which were left out in this study. These could uncover new barriers for organizations in the implementation of emerging technologies. Since AI in an organizational context is a topic that just recently received more attention, further research in the form of a longitudinal study would be valuable to gain a comprehensive understanding of the influences on organizations, which challenges they face, and how they adapt their processes and organizational structure.

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# Appendix 1 - Interview Guide

Before the interview:

Introducing the researchers, the research topic, and the motivation and purpose of the study. Ask participants if they feel comfortable doing the interview and explaining the research ethics.

Additionally, the authors asked for approval to record the interviews for research purposes.

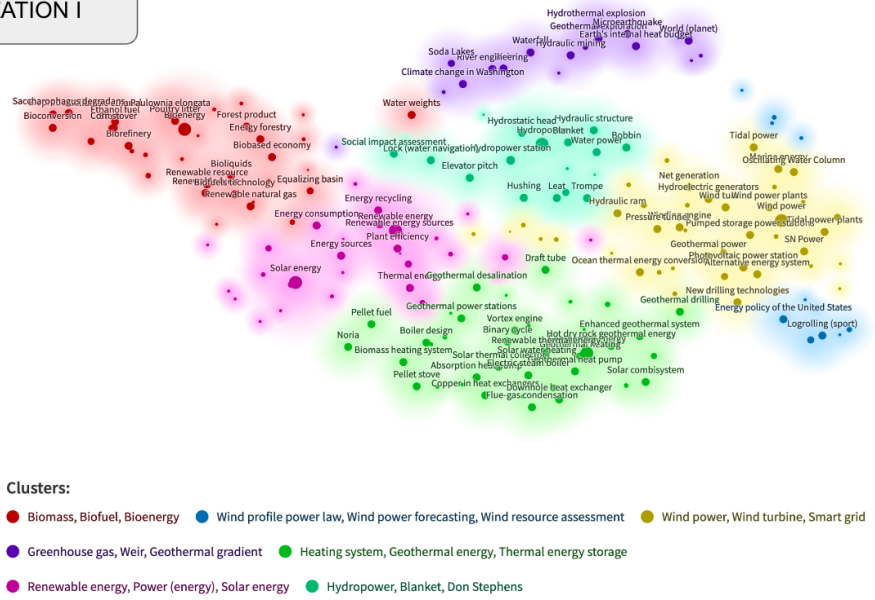
| **Question No.** | **Question** | **Theoretical Concept** |
|---|---|---|
| 1 | What is your position in the company? Can you briefly describe your tasks and what would your typical day at work look like? | - |
| 2 | How long did you work in the company and industry? | - |
| 3 | What is you educational background / major? | - |
| 4 | In your opinion, what is the importance and role of innovation and knowledge management in your company? | - |
| 5 | Which information streams do you use to generate your knowledge?<br>Do you sense changes in the means of information? | acquisition-oriented process KM |
| 6 | How does your organization currently manage or share knowledge within the organization? | acquisition-oriented process KM |
| 7 | Is there a structure or system facilitating knowledge sharing between individuals in your organization? How does it work? If there is none, how would you like it to work? | acquisition-oriented process KM |
| 8 | Do you use any inter-organizational partnerships or collaborations on certain projects (knowledge exchange /product development)?<br>How do you know who to approach and where to go? | Conversion-oriented process KM/DT/DCV |

| | | |
|---|---|---|
| 9 | Do you have a system for appointing individuals with the necessary expertise for evaluating information generated from various sources? | Conversion-oriented process KM/DCV |
| 10 | How do you evaluate the information gathered with partners or other knowledge generating activities?<br>(Probing: Trust level? How do you assess the trustworthiness? | Conversion-oriented process KM/DT/DCV |
| 11 | How do you incorporate this into your products or processes? | Application oriented process KM |
| 12 | How do you evaluate a succesfull/failed attempt at integrating changes into your organization? | Application oriented process KM |
| 13 | In your opinion, is there a more effective strategy that your organization can adopt to enhance its ability to make these implementations in practice? Are there any potential challenges witht your ideal or the current method in place? | Application oriented process KM |
| 14 | Do you share internal knowledge with external companies for knowledge exchange or collaboration in product development? | Desorptive-oriented process KM |
| 15 | How do you do this? If no, can you see a way that your company can do this? | Desorptive-oriented process KM |
| 16 | Can you retrace a project where you did this and the reason for its success or failure? Is there any confidentiality issue with your information that makes you reluctant to do this? | Desorptive-oriented process KM |
| 17 | Have you ever been in a situation of a missed business opportunity because of a lack of information or a successful project where knowledge was essential to its success? | KM practical example |
| 18 | Can you trace back what the reason was? Internal or external / process etc.? | KM practical example |
| 19 | What would have been a way to prevent this? Can you picture possible solutions? | KM practical example |
| 20 | Do you think emerging technologies, such as AI, could help with information and knowledge management? | KM/DT |

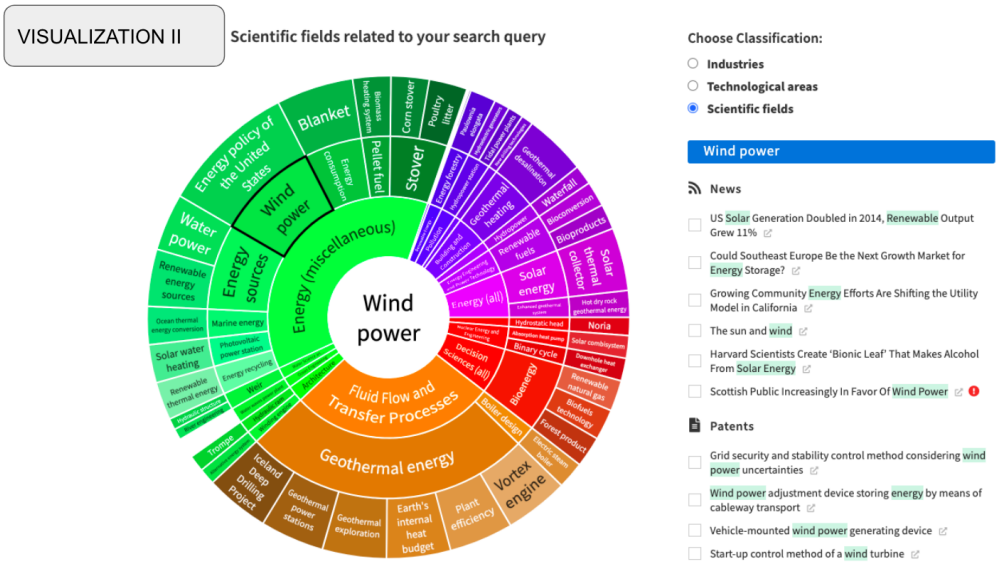
| | | |
|---|---|---|
| 21 | What are the first three words that cross your mind when you hear the term AI? | DT |
| 22 | What is you attitude towards AI enhanced market research? | DT |
| 23 | Which role do you think AI will have in the future? | DT |
| 24 | Do you see your work be changed by AI? | DT |
| 25 | Do you feel a thread by AI?<br>Are you afraid of being replaced by an AI? | DT/SERM |
| 26 | What is your attitude towards using an external software for AI-enhanced market research? | DT/KM |
| 27 | What are the benefits and risks you see in this? | DT/KM |
| 28 | Do you offer internal training in terms of analyzing AI-generated knowledge and how this can be transferred to your core technologies? | KM/DCV/DT |
| 29 | Where do you see the biggest potential for AI (1) in terms of sensing opportunities and threats for your organization? | DCV |
| 30 | Where do you see the biggest potential for AI in (2) seizing opportunities | DCV |
| 31 | Where do you see the biggest potential for AI in regards to (3) reconfiguring resources and capabilities? | DCV |
| 32 | We will now show you example visualizations of the AI-enhanced trend analysis. Please give feedback:<br>- How do you like that visualization?<br>- Would this summary of information help you to make well-informed decisions?<br>- Do you trust the content? Do you think it is reliable?<br>- Is this visualization self-explanatory or would you need training for using it?<br>- Would this benefit your daily working life? | KM/DT/SaaS |
| 33 | For the last question we would ask you to describe the ideal AI-enhanced tool. How would it look like, which functions would it have and how would it be integrated in your daily working life? | KM/DT/SaaS |

# Appendix 2 - Visualization Topic Map

VISUALIZATION I



# Appendix 3 - Visualization Visual Explorer



# Appendix 4 - Visualization Radar

VISUALIZATION III