# USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN BUSINESS-TO-BUSINESS SALES OF INDUSTRIAL SERVICES IN THE MACHINERY MANUFACTURING INDUSTRY

Case studies from various machinery manufacturing industries

Lappeenranta–Lahti University of Technology LUT

Master's Programme in Global Management of Innovation and Technology

Master's thesis

2024

Otto Heiska

Examiner(s):

Associate Professor, Lea Hannola D.Sc. (Tech.)

Post-doctoral researcher, Ilkka Donoghue D.Sc. (Tech.)

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT School of Engineering Sciences

Industrial Engineering and Management

Otto Heiska

**Use of Generative Artificial Intelligence In Business-to-Business sales of industrial services in the Machinery Manufacturing Industry: Case studies from various machinery manufacturing industries**

Master's thesis
2024

85 pages, 7 figures, 4 tables and 1 appendix

Examiner(s): Associate Professor, Lea Hannola D.Sc. (Tech.) and Post-doctoral researcher,

Ilkka Donoghue D.Sc. (Tech.)

Keywords: Generative Artificial Intelligence, Industrial Services, Business-to-Business Sales, Machinery Manufacturing Industry

The industrial machinery manufacturing industry, which has traditionally relied on equipment sales, is facing declining profit margins due to fierce competition, and changing customer needs. As a result, companies are increasingly focusing on developing service business models that include predictive maintenance and performance-based services that foster stronger customer relationships and higher satisfaction by focusing on delivering customer value rather than just tangible products. While digitalization and connectivity enable new service models and data-driven strategies, they also present challenges in terms of data management and its efficient use in business processes. At the same time, the recent growth of generative artificial intelligence promises significant productivity leaps and transformative effects on business-to-business sales and customer operations.

Against this backdrop, this thesis explores the potential of generative artificial intelligence as an enabler for productivity, efficiency, and new ways of working in business-to-business sales of industrial services in the industrial machinery manufacturing industry. In detail, the research focuses on understanding the capabilities needed to use generative artificial intelligence to support sales, the potential challenges in doing so, and sheds light on the potential benefits of doing so. The literature review examines a wide range of academic literature and industry reports to provide a theoretical background to the issues, while the empirical part presents findings from three interviews conducted with global machinery manufacturers. Finally, this thesis proposes a model for building generative artificial intelligence capability within an organization and presents a thorough analysis of the challenges of generative artificial intelligence and its potential benefits for the sale of industrial services in the machine manufacturing industry.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUTin insinööritieteiden tiedekunta

Tuotantotalous

Otto Heiska

**Generatiivisen tekoälyn hyödyntäminen konepajateollisuuden palveluliiketoiminnan myynnin tukena: case-tutkimuksia konepajateollisuudesta**

Tuotantotalouden diplomityö

2024

85 sivua, 7 kuvaa, 4 taulukkoa ja 1 liite

Tarkastaja(t): Tutkijaopettaja Lea Hannola ja Tutkijatohtori Ilkka Donoghue

Avainsanat: generatiivinen tekoäly, konepajateollisuus, business-to-business -myynti, palveluliiketoiminta

Konepajateollisuus, jonka liiketoiminta on perinteisesti perustunut laitemyyntiin, on kovan kilpailun ja muuttuvien asiakastarpeiden vuoksi joutunut kärsimään liikevoittomarginaalien pienenemisestä. Tämän seurauksena yritykset keskittyvät yhä enemmän kehittämään palveluliiketoimintamalleja, joihin kuuluvat ennakoiva kunnossapito ja suorituskykyyn perustuvat palvelut, jotka edistävät vahvempia asiakassuhteita ja suurempaa tyytyväisyyttä keskittymällä tuottamaan asiakkaalle arvoa pelkkien konkreettisten tuotteiden sijaan. Vaikka digitalisaatio ja laitteiden laaja liitettävyys internet-verkkoon mahdollistavat uudet palvelumallit ja datalähtöiset strategiat, ne asettavat myös haasteita datanhallinnalle ja sen tehokkaalle käytölle liiketoimintaprosesseissa. Viimeaikainen generatiivisen tekoälyn kasvu lupaa samaan aikaan merkittäviä tuottavuushyppäyksiä ja mullistavia vaikutuksia business-to-business-myyntiin ja asiakastyöhön.

Tätä taustaa vasten tässä opinnäytetyössä tutkitaan generatiivisen tekoälyn mahdollisuuksia tuottavuuden, tehokkuuden ja uusien toimintatapojen mahdollistajana konepajateollisuuden teollisten palvelujen business-to-business -myynnissä. Tarkemmin tutkimuksessa keskitytään ymmärtämään valmiuksia, joita tarvitaan generatiivisen tekoälyn käyttämiseen myynnin tukena, ja sen mahdollisia haasteita sekä tarkastellaan sen mahdollisia hyötyjä. Kirjallisuuskatsauksessa tarkastellaan laajasti akateemista kirjallisuutta ja alan raportteja teoreettisen viitekehyksen luomiseksi, kun taas empiirisessä osassa esitellään havainnot useista haastattelusta, jotka on tehty konepajateollisuuden yritysten kanssa. Lopuksi tutkielmassa ehdotetaan mallia generatiivisen tekoälyn valmiuksien rakentamiseksi organisaatioon ja esitetään kattava analyysi generatiivisen tekoälyn haasteista ja sen mahdollisista hyödyistä teollisten palveluiden myynnille konepajateollisuudessa.

ACKNOWLEDGEMENTS

This thesis is the final step of a long and sometimes challenging, but also rewarding learning path that began in the spring of 2018, when I received a letter of acceptance to study Industrial Engineering and Management at LUT University. During my first master's degree at LUT Business School, the idea of studying engineering had already grown on me, and I made the decision to apply the year after I graduated from Business School, even though I was already working full-time.

Along the way, I grew both professionally and personally. When I started my second master's degree, I was a recent graduate working in my first real job, and now I am a husband, a father of two, and my career has taken me into a leadership role. In that sense, I can say that this journey has been one of new learning and insights, but also of many doubts about whether I would be able to reach this point.

I would not have been able to reach this point without the support of my wife Charlotta, who has pushed and challenged me to take the extra steps and leaps to find the time and will to push myself further towards my goal.

Finally, I would like to thank all the great people who have contributed to this thesis by sharing their insights on the topic and allowing me to complete this work with high standards and valuable contributions.

ABBREVIATIONS

| | |
|---|---|
| AGI | Artificial General Intelligence |
| AI | Artificial Intelligence |
| ANN | Artificial Neural Networks |
| B2B | Business-to-Business |
| B2C | Business-to-Consumer |
| BDA | Big Data Analytics |
| BERT | Bidirectional Encoder Representations from Transformers |
| DL | Deep learning |
| DNN | Deep Neural Networks |
| FN | Foundation Model |
| GAI | Generative Artificial Intelligence |
| GAN | Generative Adversarial Networks |
| GMM | Gaussian Mixture Models |
| GPT | Generative Pre-trained Transformer |
| HMM | Hidden Markov Models |
| IoT | Internet of Things |
| LLM | Large Language Model |
| ML | Machine Learning |
| NLP | Natural Language Processing |
| OEM | Original Equipment Manufacturers |
| ROI | Return on Investment |
| SEO | Search Engine Optimization |
| VAE | Variational Autoencoders |

**Table of contents**

Figures



Tables

# 1 Introduction

The significance of service businesses within the industrial machinery manufacturing sector has increased and the change has been driven by evolving market dynamics and technological advancement. As traditional product-centric business models face challenges, companies are leaning towards service-oriented businesses, emphasizing solutions that focus on customer value over mere product value. A key enabler of this shift is digitalization, which through enhanced connectivity and big data is reshaping business practices.

The shift towards selling solutions and services rather than just products significantly change the sales approach. Business-to-business (B2B) sales of services often focuses on the outcomes achieved, the return on investment, and the fulfilment of specific customer goals. Success in this field requires sales teams to focus primarily on building long-term relationships, rooted in collaboration and building a profound understanding of the client's business landscape and operations. Gaining such understanding requires the processing of large quantities of internal and external data that is often very time-consuming and challenging for the sales teams.

Generative artificial intelligence (GAI) emerges as a new transformative technology with the potential to greatly impact B2B sales productivity. This thesis explores the role of GAI in enhancing service business sales within the industrial machinery manufacturing sector, which today is still an area which is largely uncovered by academic research. Furthermore, this thesis will focus on pinpointing the essential organizational capabilities for harnessing GAI, while also highlighting potential challenges. Insights from existing literature on service business, B2B sales, and GAI is used to construct a theoretical framework. The empirical part of this study will be based on interviews from three different industrial machinery manufacturing companies with significant service businesses.

## 1.1 Background of thesis

The industrial machinery manufacturing sector has faced stagnant or even falling profits of their traditional new equipment sales that has been the backbone of their business for decades. It has become harder than ever to remain competitive with product innovation alone. This heightened competition is driven by Original Equipment Manufacturers (OEM) competitors that sell high quality products with lower prices, new market entrants that focus on digital solutions, aftermarket services and rental business as well as changing customer requirements that go beyond the traditional product-based offering. Consequently, the risk of declining margins and product commoditization has driven companies to seek out new revenue streams that bring higher profits. (Fischer et al., 2012) Simultaneously, the digitalization megatrend has brought connectivity to all types of machines and made equipment "smart" and capable of generating data that is accessible through sensors that monitor every move. This has the potential to revolutionize the industrial machinery manufacturing sector. (Myerholtz et al., 2020)

These advances have accelerated the development and introduction of various types of service businesses and new service business models that appear on the agenda of many companies in the industrial machinery manufacturing sector. (Myerholtz et al., 2020) Service business is not a new venture for machine manufactures as maintenance, various repair services, and the sales of spare parts have long been a natural part of their business operations. However, the market and technological advances have clearly pushed companies to innovate and provide new types of services. No longer is the service just the sales of spare parts or a maintenance technician visiting customer sites to provide maintenance on broken equipment. Today many machine manufacturers offer predictive maintenance, optimized asset management and even equipment performance-based services where the customer pays only for the service and receive the equipment as-a-service. Such solutions are focused on integrating the machine manufacturer into customer operations by providing increased value, building a strong relationship, sharing risk and higher customer satisfaction beyond the sales of the equipment or traditional aftermarket services. (Staebe and Lustgarten, 2022) This seems to be the winning recipe. A recent study by Myerholtz et al. (2019) for Boston Consulting Group Insights highlights that the companies which have embraced the

possibilities of digitalization in their service operations are delivering above market shareholder returns and gaining competitive advantage against their competition.

Service business dynamics are different from product business as there is over time always a need for maintenance, spare parts, or varying extents of upgrades or modernizations. There is, thus, always a market demand, and proactive actions can also create sales opportunities. Therefore, sales of industrial services require a profoundly different approach compared to product sales. Product sales cycles are often shorter as well as more transactional in nature and the value for customer is realized through the features of the product. In service sales the sales cycles are longer and rely on longer term relationships and profound knowledge of the customer's equipment and business operations to be successful. Pricing is more flexible and often reflects the scope and complexity of the service delivered. In service sales, the engagement is often continuous, and the delivered value is therefore constantly evaluated post-sale by the customer and adjusted by the company delivering the service based on this evaluation. (West et al., 2022)

Digitalization that is a driving force for service business growth within the machinery manufacturing sector and the enabler for various new data-driven service business model also creates challenges. On one hand the data generated by connected and “smart” machines becomes exceedingly valuable for service business sales when integrated with other product-related information held by the company. However, often leveraging large data sets with varying quality can pose practical challenges as the data is scattered across different systems or it requires extensive processing, quality checks and analysis before it can be utilized. (Lapo et al., 2023) In such cases, the collected data can lose some of its value if it cannot be utilized timely in sales support. This situation might lead to a failure in recognizing what would be the best and most value-adding service for the customer, resulting in various challenges that could have been avoided if all existing information had been available at the right time. (Gerry, 2021)

The use of GAI has seen a rapid growth over the last year. GAI refers to AI systems designed to generate content like text or images based on deep learning (DL) models and neural networks. By analysing data, these applications learn to model, for example, human-written text. (Cao et al., 2023) According to a recent report by Cui et al. (2023) for McKinsey Digital, generative AI is expected to revolutionize many current business operations in the coming years. Sales, marketing, and many customer interface functions are highlighted in the report

as areas where the impact of generative AI will be significant from both productivity growth and value creation perspectives (Chui et al., 2023).

## 1.2 Research gap

The research landscape within the domain of B2B services sales is generally mature and even the industrial manufacturing sector has gathered the attention of peer-reviewed scholarly articles. Similarly, the rise of Artificial Intelligence (AI) in industrial manufacturing sector has been the subject of extensive research, reflecting the sector's ongoing transformation through technological advancement. This is highlighted well, e.g., in a Boston Consulting Group report from 2020 that brings forth the ongoing disruption in the industrial manufacturing sector (Myerholtz et al., 2020)

However, GAI as an emerging, yet rapidly evolving, subfield within AI, has not been as widely investigated in terms of the impact and organizational prerequisites in the industrial manufacturing sector. Moreover, the impact on B2B service sales in the industrial manufacturing sector, is still largely uncovered. Simultaneously, sales and marketing are recognized as areas where GAI is likely to exert a significant influence, reshaping strategies, and customer engagement (Chui et al., 2023). This presents a very interesting research gap, as B2B service sales in the industrial machinery manufacturing sector may offer unique insights on the needed capabilities and challenges that are not addressed in existing GAI industry application literature.

Although manufacturing may not be the first sector to fully deploy GAI, the trend towards data-intensive business models suggests its adoption is imminent. This assumption is further amplified by the transformational nature of GAI that will accelerate the automation of tasks by significantly improving operational efficiency, generating ideas, fostering creativity and in addition, it has the potential to redefine business models. (Ooi et al., 2023) This thesis aims to bridge the identified research gap by delving into the theoretical and empirical implications of employing GAI in service sales within the manufacturing industry.

## 1.3 Research objectives and scope

As already identified in the research gap, the main aim of this thesis is to explore the use of GAI as a catalyst for enhancing productivity and creating new ways of working within B2B service sales in the industrial machinery manufacturing sector. To base the study in robust academic discourse, a comprehensive review of relevant literature is conducted, covering the topics of service business within industrial manufacturing, B2B service sales, artificial intelligence, with a specific emphasis on GAI and its application. Specifically focusing on identifying the most significant prerequisite capabilities, challenges, and potential benefits of the application of GAI with a focus on the sales of industrial services.

The empirical section of the thesis will analyse the potential benefits of GAI, the capabilities needed to utilize it and foreseeable challenges in doing so in three global machinery manufacturing companies. All of the companies operate in distinct sectors within the manufacturing machinery industry offering products that range from smaller consumer used equipment to large scale and very complex production machinery. Each company is heavily investing in digitalization and maintaining a substantial service business segment.

The validity of the identified prerequisite capabilities is then assessed in relation to the findings gathered from the interviews with the help of the Likert scale, which is among the most and frequently used assessment tools in educational and social sciences to measuring attitudes, perceptions, and opinions across various fields. (Joshi et al., 2015) Additionally, the aim is to build a comprehensive understanding of the currently identified challenges that may arise during its implementation and the potential benefits in the above-mentioned field.

The research concludes in a discussion that is based on both gathered theoretical insights and empirical findings, aiming to elaborate on the critical capabilities for leveraging GAI effectively within the industrial manufacturing sector, to identify the challenges that companies could face with the utilization of GAI and what the potential benefits could be.

## 1.4 Research questions

As described in the previous sections, this thesis focuses on understanding how GAI can be used to support B2B sales of industrial services. Furthermore, this research is focusing on

understanding how GAI can change the way service businesses' B2B sales operates and increasing productivity. This is thought-provoking as the services business segment within the industrial manufacturing sector is increasingly driven by digitalization and transforming manufacturers away from traditional product sales to solution and services sales on its own right. To understand the implications of GAI, the research will focus on understanding the key capabilities needed from an organization to utilize GAI. Here capabilities refer to the combination of skills, resources, and processes needed. While looking at the capabilities, it is critical to understand the challenges that may arise when pursuing the use of GAI. GAI as any other technology is unlikely to deliver to its full potential if not considered holistically. Lastly, to satisfy the aim of the research, the potential benefits GAI can have for B2B sales of industrial services will be analysed based on the empirical study conducted with the selected case companies. The main and supportive research questions are listed in Table 1.

Table 1 Main and supportive research questions.

| | |
|---|---|
| How can GAI be used to support B2B sales of industrial services in the machinery manufacturing industry? | What are the key capabilities required from an organization to use GAI in service business B2B sales within the machinery manufacturing industry? |
| | What are the main challenges for the utilization of GAI in service business B2B sales within the machinery manufacturing industry? |
| | What are the potential benefits of using GAI in service business B2B sales within the machinery manufacturing industry? |

## 1.5 Research methodology

The research adopts an exploratory approach, aiming to understand the practical application potential of GAI in the B2B sales of industrial services within the industrial manufacturing

sector. As an exploratory study, the intent is to understand the potential of GAI as a supportive tool in enhancing developing B2B sales in this specific sector. The research is grounded on academic literature and industry reports, which position GAI as a potentially transformative technology with significant impacts across various industries corporate functions like sales and marketing.

The research is structured around three empirical case interviews that cover global machinery manufacturers, each providing a distinct perspective on the potential use of GAI in the B2B sales of industrial services. These case studies are designed to capture practical insights of how GAI is currently perceived and utilized within the industry. Data for these case studies is collected through qualitative, semi-structured interviews that are organized with in total eight service business executives and senior managers representing three global machinery manufacturers with 2 to 3 individuals being interviewed from each company. These interviews are designed to encourage open discussion while covering a set of predetermined topics and questions, ensuring both depth and breadth in the data gathered. This qualitative approach aligns with the definition of qualitative research as a mode of inquiry focusing on understanding meaning in context, requiring sensitive data collection methods that can capture underlying meanings. (Merriam and Tisdell, 2015)

Each case study within this research is treated with confidentiality and anonymity as requested by the participating companies. This consideration not only adheres to ethical research practices but also enables less restricted discussions with the interviewees. These case studies are centred around providing a detailed analysis and description of the current applications and perceptions of GAI potential in industrial services' B2B sales. This methodology supports the overall exploratory nature of the study, which is not commissioned by any of the participating companies but is conducted independently to address the identified research gap in the application of GAI in B2B sales.

## 1.6 Structure of the thesis

This chapter guides the reader through how the research process of this thesis is organized. The structure is visualized in Figure 1. that presents the chapters in a sequential order but also describes the inputs and outputs of each chapter, detailing how each contributes to the overall study.

The thesis starts with an introduction chapter that sets the stage for the research by explaining the background of the thesis research. It delves into the research scope and identifies the gap the research seeks to fill and thereby establishes the context and significance of the study. Following the introduction, the thesis elaborates on the research methodology and structure. This section is crucial as it outlines the approach and techniques employed in the research.

A substantial part of the thesis is dedicated to the literature review. This chapter is pivotal in reviewing key concepts and the theoretical background relevant to the study. Organized around the key concepts of B2B sales of services, industrial services as well as AI and GAI and the application AI and GAI and challenges of application, the literature review examines each concept in-depth with the thesis scope in mind.

The empirical aspect of the thesis is centred around case interviews conducted with three global machinery manufacturers from different industries. When presenting each company, the aim is to maintain a balance between providing detailed insights into the operations of each company but also secure the anonymity of the companies. The interview process, including the questions posed and the methodology employed, is also discussed in detail. This section also presents the results of the interviews, specifically focusing on how these findings relate to the research questions.

Subsequently, the thesis includes a chapter that synthesizes the findings from the literature review with the results of the empirical study. This chapter is instrumental in highlighting the implications of these findings in relation to the research scope and focus. It serves as a bridge, connecting the theoretical and empirical components of the study. The concluding chapter of the thesis encapsulates the findings of the study, aiming to answer the defined research questions. It acknowledges that, despite the empirical study encompassing several companies across a broad spectrum of industries, there are inherent limitations to the results. These limitations are critically examined, providing a balanced view of the study's outcomes. Furthermore, the chapter also contemplates future research directions, identifying potential areas for further investigation that emerged during the thesis research process.

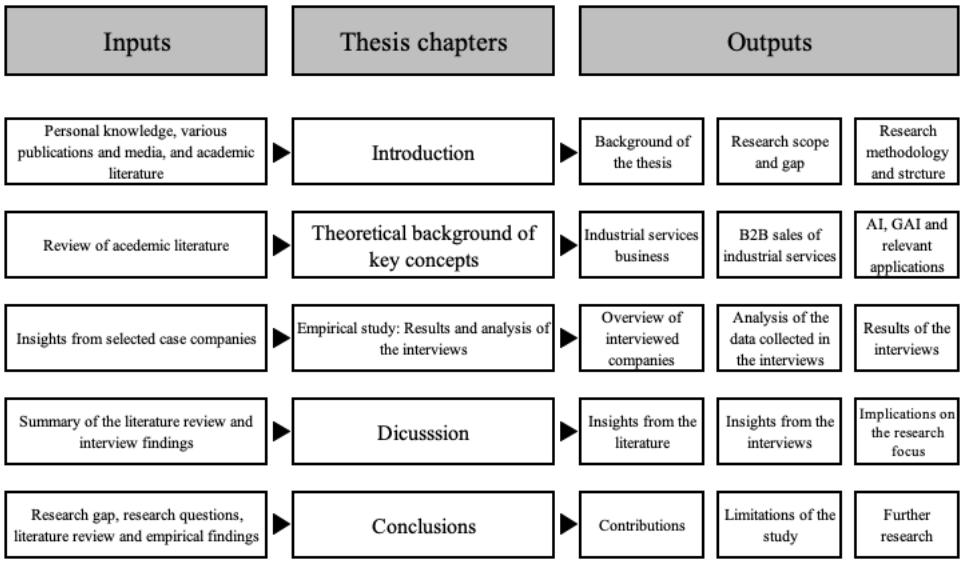



Figure 1 Thesis structure - Inputs, Chapters and Outputs

# 2 Service business in the industrial manufacturing industry

The second part is an in-depth review of relevant literature and expert reports to develop a comprehensive understanding of the service business within the industrial manufacturing sector, with a particular focus on machinery manufacturers. It also examines business-to-business (B2B) sales, both in a general context and specifically within the industrial manufacturing sector. This section aims to highlight the shift from product-centric to service-centric business models in industrial manufacturing, emphasising the integration of services with products to meet evolving customer needs.

## 2.1 Industrial services and solutions

A service business is characterized by its focus on offering services, either independently or in conjunction with products, to meet customer needs and preferences (Meierhofer et al., 2023). The concept of servitization, particularly relevant in this context, refers to the transformation of a product-centric business into one that strategically integrates services. This integration ranges from adding basic services to products to developing comprehensive solutions encompassing both products and services. (Annarelli et al., 2016) Industrial service businesses encompass a wide array of services and solutions that enhance the performance and efficiency of industrial processes and equipment, emphasizing not just the delivery of physical products but also the provision of value-added services. These services can include maintenance, repair, optimization, and even complete management of industrial systems. (Friedli et al., 2021)

The development of service business in the industrial manufacturing sector represents a paradigm shift from a product-centric to a service-centric approach. Historically, many manufacturing companies have had a strong focus primarily on tangible products, with services considered as supplementary offerings such as spare parts and repairs. (Friedli et al., 2021) However, over time services emerged as a key competitive differentiator and a significant contributor to revenue and profitability that safeguards companies from declining margins and the risk of product commoditization (Fischer et al., 2012). Industrial manufacturer that have put emphasis on the development of service businesses and adopt

strategies that focus more on services tend to see an increase in the level and growth of their revenue streams (Eggert et al, 2014).

Simultaneously the growing emphasis on sustainability is evident also in the industrial manufacturing domain. Companies are handling increasing regulatory pressures and market, and investor demands to develop their business operations to embrace more sustainable practices and offerings to be more eco-friendly and less polluting. The trend is clearly visible for service business offerings that are increasingly focusing on enabling customers to make eco-friendly decisions regarding equipment use and operational strategies. (Myerholtz et al., 2020) The increased focus on service delivery rather than product sales, companies can reduce resource consumption and waste production, contributing to a more circular economy. This shift can also increase the use of renewable energy and improve energy efficiency, further enhancing environmental sustainability (Meierhofer et al., 2023).

The servitization trend is visible in the industrial manufacturing sector as industrial manufacturers are now integrating services into their core business strategy and offering comprehensive solutions that meet customer needs more holistically and directly impact their customers' bottom lines (Friedli et al., 2021). This involves e.g., integrating into customers' operations or processes to optimize performance and reduce downtime (Myerholtz et al., 2020). The development of service business models and strategies within industrial manufacturing companies has been characterized by a gradual increase in the value and customization of services offered. Companies have moved from offering ad-hoc service support in cases of product failure or regular maintenance services to providing comprehensive service contracts and eventually performance-based service models. The focus is now on enhancing perceived customer value and optimizing and tailored customer support that meets specific customer needs. (Friedli et al., 2021)

The rapid adoption of digital technology has been a critical factor for service business development among companies in the industrial manufacturing sector. Digitalization and connectivity enable enhanced monitoring and control of industrial products, empowers technical customer service, and fosters the development of new business models like performance-based contracting. (Dayan and Ndubisi, 2020) Widespread assets connectivity has accelerated the transition towards smart services, changing the process landscape of manufacturing companies. Processes have become more customer-centric and agile,

allowing for the development of service offerings that cater to specific customer needs and experiences. (Friedli et al., 2021)

## 2.2 Business-to-Business sales (B2B)

Business-to-Business (B2B) sales is a broad and complex domain and can be understood through various perspective. However, at its core B2B sales involves transactions where one business sells products or services to another business. This contrasts with Business-to-Consumer (B2C) sales, where the focus is on selling directly to individual consumers. B2B transactions can range from a manufacturer selling to a retailer, to a service provider offering specialized solutions to another company. The B2B sales process and transactions are generally characterized by their complexity, involving longer sales cycles, higher order values, and a greater emphasis on personalized customer service (Buchenau, 2023).

The nature of B2B sales therefore demands a more strategic and long-term approach, focusing on building relationships and understanding the specific needs, challenges of business and operations of the customers. Selling in the B2B context implies direct interactions between businesses, where sales forces engage with other companies, often requiring tailored solutions, negotiation, and a consultative approach. (Hinson et al., 2019) In B2B sales, the salespersons are often positioned as advisors, aiming to solve specific business problems for the customer or trying to advocate how they can help the customer achieve their business goals (Buchenau, 2023). Such an approach relates to the concept of value-based selling that is crucial in the B2B context. The value which the salesperson is selling extends beyond the functionality of a product or service and highlights the outcome that can be achieved with the product or service. (Andersson et al., 2018)

## 2.3 Sales of industrial services and solutions

Sales in the industrial manufacturing sector can be considered solely a B2B sales transaction that takes place between businesses, but it is distinctly different than the sales of tangible products such as industrial machinery. The extension into service business domain is a comprehensive transformation for many industrial manufacturers that influences business logic, product offerings, customer and supplier relationships, organizational structures,

management, and organizational capabilities. Therefore, it also requires a significant shift in sales processes, practices, sales incentives, management practices and even building up new sales organizations engaged specifically in service sales. (Kohtamäki et al., 2018) Such changes to the industrial manufacturers are often challenging in many respects but also from the fact that industrial manufacturers are not necessarily used to selling services beyond the basics such as spare parts and maintenance. In sales, the challenges often come from the lacking ability to demonstrate and communicate the value of the service to the customers business, which in turn leads to difficulty to create demand for the service and get it sold. Similarly, on the customer side there can be a lack of knowledge of the services that the supplier is selling, which can be a result of misalignment between the suppliers and the customers perception of the actual needs to be fulfilled or the measurement of value. (Friedli et al., 2021)

Product-oriented sales has traditionally been functionality-centric where the focus is on demonstrating the value of functionality in a product. Furthermore, the process of selling and buying of industrial products that are capital goods is characterized by an emphasis on short-term transactional efficiency prioritization over long-term lifecycle value. Customers are defining purchasing criteria that seek to optimize price or capital expenditure over value-in-use or operational expenditure. This is achieved by aiming for a strong negotiation position where the solution is disintegrating into smaller elements for easy comparison, which prioritizes short-term value capture over long-term value creation. (Kohtamäki et al., 2018)

In industrial services the value lies in the outcome of the service to the buyer of the service, which inherently transfers the focus away from short-term transactional efficiency to long-term lifecycle value. These differences in both value capture and value creation are listed in the table 2 adapted based on Töytäri (2018). (Töytäri, 2018). Industrial services offered by machinery manufacturers are frequently a combination of an underlying product i.e., a piece of industrial machinery and industrial service that directly relate to its function. Selling of such services must be done with a strong focus on demonstrating the value for the customer. Annarelli et al. state that a key aspect of selling industrial services is the engagement into long term value co-creation with customers, which requires a deep understanding of customer needs, understanding their processes and overall business (Annarelli et al., 2019). Such an approach requires industrial manufacturers to incorporate services into their strategy

so that it complements their core product offerings, builds on existing product value, and prioritizes the overall value delivered to the customer over the entire lifespan of the services or solutions (Kohtamäki et al., 2018). The service offering of an industrial manufacturer can differentiate the complete offering from mere product-based offerings, complicating direct price comparisons for customers and fostering loyalty (Fischer et al., 2012). Successfully doing so leverages the intangibility and flexibility of services to provide a competitive edge by making the complete offering difficult to imitate and weakening customer bargaining power (Annarelli et al., 2019).

Table 2 Key differences between value capture and value creation-focused strategies (adapted based on Töytäri, 2018)

| **Key Dimensions** | **Product Logic** | **Solution/Service Logic** |
|---|---|---|
| Exchange Focus | Transaction | Relationship |
| Optimization Focus | Exchange value (e.g. capex) | Use value (e.g. capex and opex) |
| Exchange Scope | Product | Solution / Product and Service |
| Temporal Focus | Short-term | Long-term |
| Relationship Logic | Independence for value capturing power | Partnership for joint value creation |
| Initiator | Buyer | Seller |
| Market Phase | Commoditized | Innovation |
| Solution Vision | Buyer's | Jointly created |
| Value Sharing Reference | Supplier cost | Customer value |

Service sales require a consultative and proactive selling approach, with customer needs and value for the customer at the centre. This approach relies on deep customer understanding and strong customer relationships, enabling service sales teams to articulate service benefits clearly and identify unique selling points that best position the company against competitors (Friedli et al., 2021) A crucial element in this process is understanding customer diversity and anticipating their behaviour. This understanding enables companies to match changing needs and preferences with adaptable and flexible services. Such customization often requires a close relationship with customers, where the sales team continuously learns from the customer and builds for long term success. Different customers can have varying

requirements, ranging from complete “do-it-for-me” services to more collaborative approaches of “do-it-with-me” or preferring to retain most tasks within their own operations. (West et al., 2022)

With the servitization of the industrial manufacturing sector visible through increased services-based business and innovation enabled by digitalization, the changes to sales are fundamental. The shift from product-oriented to service-oriented sales in the industrial manufacturing sector involves a comprehensive understanding of customer needs, a consultative selling approach and the ability to create value through solution that focus on the longer-term outcomes bottom line benefits for the customers business. This shift requires significant changes in sales strategies and practices, focusing on long-term customer relationships and value creation.

# 3 AI and GAI: Industry Applications, Challenges, and Pathways to Success

The third part focuses on reviewing relevant literature and other relevant sources to construct an understanding of AI and GAI in a general context. Furthermore, the sections examine AI and GAI with reference to the industrial manufacturing industry and B2B sales. Lastly, this section seeks to analyse the identified challenges related to AI and GAI with respect to the thesis context and defines the critical capabilities that according to the literature are needed to utilize GAI effectively.

## 3.1 Artificial Intelligence (AI)

Artificial Intelligence (AI) is a multi-layered field that encompasses the science and engineering of creating intelligent machines, especially intelligent computer programs. These computer programs are primarily concerned with replicating and automating intelligent behaviour that is naturally present among humans and animals. (Chowdhary, 2020) According to McCharty (2007) in the context of AI, intelligence is the computational part of the ability to achieve goals, a characteristic observed in humans and in many animals. In a more practical terms, this is the combination of capabilities such as perceiving, analysing, and then reacting to different situations (McCharty, 2007). In the core, AI consists of data structures, knowledge representation techniques, algorithms for applying knowledge, and programming techniques for implementation (Chowdhary, 2020). This makes it possible to develop computer programs that can process large amounts of data, recognize patterns, and make decisions based on these patterns, often surpassing human performance in terms of speed and cost-efficiency (Kreutzer and Sirrenberg, 2020).

McCharty (2007) argues that despite the rapid advancements in computer technology, with machines becoming increasingly fast and possessing vast memory, AI's abilities are still confined to the intellectual mechanisms that we currently understand and can program into them (McCharty, 2007). The current development phase of AI is termed 'weak AI', characterized by its application in narrow categories. However, the concept of 'strong AI' or Artificial General Intelligence (AGI), where machines capabilities to ‘think’ rival human

intelligence, is still a distant goal according to most. (Taulli, 2019) Most recent studies have been now suggesting that in the foreseeable future, it may be possible to build machines with intelligence comparable to that of humans. This aspiration extends to the potential development of AGI or even 'artificial consciousness' a concept that raises several philosophical questions, such as whether machines can truly think like humans or if consciousness is exclusive to biological entities. (Chowdhary, 2020)

Whether or not it is possible to ever achieve artificial consciousness, the progress of AI has been remarkable during the last decades and the speed of development is increasing constantly. AI is already today applied in vast number of ways in many different industries and more broadly in the society. Rapid AI development has led to practical applications that seamlessly integrate into everyday life, often without explicit recognition as AI technologies. Examples include digital personal assistants, translation aids, facial recognition systems, and autonomous driving, all of which demonstrate AI's growing impact and presence in various aspects of modern life. (Kreutzer and Sirrenberg, 2020) The application of AI can likely be categorized in various ways but in general it is possible to classify it into (1) cognitive and human-like AI that focuses on replicating human cognitive abilities in machines, encompassing areas like neural networks, natural language processing, speech processing, and machine vision. It aims to enable machines to interpret, interact, and respond in a human-like manner. (2) logical and decision-making AI that is centred around logical reasoning, decision-making, machine learning (ML), and decision tree learning to solve complex problems and make informed decisions. (3) computational intelligence AI approaches that mimic natural evolutionary processes and manage imprecise information, including evolutionary computation and fuzzy systems, to optimize solutions and handle uncertainty. (4) theoretical and foundational AI that focuses on the fundamental and theoretical aspects of AI, drawing insights from brain models and evolutionary biology to build a solid foundation for advanced AI development. (Chowdhary, 2020)

It is evident that the ultimate ambition of AI is not just to mimic human intelligence but to develop computer programs that can solve problems and achieve goals in the real world as effectively as humans (McCharty, 2007). As AI continues to evolve, it remains a dynamic and evolving field, with the potential to revolutionize how we interact with technology and understand intelligence itself. Already now, the application of the above-mentioned types of

AI are crucial for maintaining competitiveness in many industries, including healthcare, manufacturing, and consumer products. (Chowdhary, 2020)

## 3.2 Generative Artificial Intelligence (GAI)

The introduction of generative artificial intelligence (GAI) represents a considerable development in AI technology, characterized by its ability to generate novel content and ideas. The content ranges to various types such as text, images, and audio. GAI has gained immense popularity and can generate outputs that closely mimic human creativity and ingenuity. The history of GAI can be traced back to early AI models like Hidden Markov Models (HMMs) and Gaussian Mixture Models (GMMs) in the 1950s, primarily used for generating sequential data such as speech. The rapid development of DL has significantly enhanced the performance of generative models, particularly in the field of natural language processing (NLP) (Cao et al., 2023)

The core of popular GAI models is based on foundation models (FNs), that are extensive artificial neural networks (ANN) (Dasgupta et al., 2023). FNs are a type of DL mechanism that utilize deep neural networks (DNN), which are a more complex than ANNs and structured in layers of interconnected “neurons” capable of learning from vast amounts of data (LeCun et al., 2015). These networks mimic the human brain’s structure and function, enabling machines to recognize patterns, make decisions, and predict outcomes with remarkable accuracy (Gal and Ghahramani, 2016). With the introduction of FNs there has been a significant shift by training on large datasets of unstructured, unlabelled data, enabling them to perform a wide range of tasks directly or be fine-tuned for specific applications (Dasgupta et al., 2023). Such GAI applications have capabilities that earlier AI did not and in contrast focused on specific problem-solving and lack the creative and generative capabilities of GAI (Kar et al., 2023)

GAI models that have gained rapid popularity are built using Large Language Models (LLMs) which are a class of FNs capable of processing massive amounts of unstructured text and producing human-like responses, have significantly improved user interactions and broadened their applicability in various industries. The transformer architecture, introduced in 2018, has revolutionized the field of NLP and is the backbone of most modern LLMs. It employs attention mechanisms that allow the focus on information considered relevant to

enhance language processing, and forms FNs such as Bidirectional Encoder Representations from Transformers (BERT) and Generative Pre-trained Transformer (GPT). BERT can consider the context of a word both left and right of it, which contrasts it with a unidirectional model and enables it to understand better the word through its context. While GPT is trained on a very large data sets and utilize multi-layer decoder transformers, optimizing specific likelihood functions for advanced training techniques. This enables it to generate text in a superior way. Examples of LLMs include OpenAI's GPT-4 that powers ChatGPT and Google's LaMDA that powers Google Bard respectively. LLMs learn the relationships between words or portions of words, known as tokens. This learning process enables LLMs to generate natural-language text, performing tasks such as summarization or knowledge extraction. (Dasgupta et al., 2023)

The recent rapid increase in GAI is heavily connected to the popularity of transformer architecture-based solutions but there are other important technologies that enable GAI models such as Variational Autoencoders (VAE) and Generative Adversarial Networks (GAN) that are also very prominent in the field of GAI. VAEs are essentially autoencoders that are trained to encode a latent representation of the input which, when decoded, reconstructs the input. They ensure that the latent vectors are drawn from a Gaussian distribution, making them most widely used for image generation, among other types of data like music, text, and voice. (Kingma and Welling, 2019) Unlike VAEs which optimize a likelihood function, GANs are likelihood-free models that consist of two neural networks, namely the generator and the discriminator, competing against each other. The discriminator tries to distinguish between real and generated data, while the generator aims to create data that is indistinguishable from real data, leading to the generation of realistic images, texts, or any form of data (Goodfellow et al., 2014)

Table 3 GAI technologies and models.

| Model | Description | Known use cases |
|---|---|---|
| **Hidden Markov Models (HMMs) and Gaussian Mixture Models (GMMs)** | Early AI models from the 1950s used for generating sequential data such as speech. | Sequential data generation |
| **Foundation Models (FNs)** | Extensive artificial neural networks (ANN) that utilize DL mechanisms and are trained on large datasets to perform a wide range of tasks. | Pattern recognition, decision making, outcome prediction |
| **Large Language Models (LLMs)** | A class of foundation models capable of processing massive amounts of unstructured text and producing human-like responses. | User interactions, industry applications, text summarization, knowledge extraction |
| **Transformer Architecture** | Introduced in 2018, utilizes attention mechanisms to enhance language processing and is the backbone of modern LLMs like BERT and GPT. | Language processing, context understanding |
| **Bidirectional Encoder Representations from Transformers (BERT)** | Considers the context of a word in both directions, enabling better understanding of the word through its context. | Contextual word understanding |
| **Generative Pre-trained Transformer (GPT)** | Trained on large datasets using multi-layer decoder transformers for generating text. | Text generation, advanced training techniques |
| **Variational Autoencoders (VAE)** | Autoencoders trained to encode a latent representation of the input and ensure latent vectors are drawn from a Gaussian distribution. | Image generation, music, text, voice generation |
| **Generative Adversarial Networks (GAN)** | Comprise two neural networks, a generator, and a discriminator, competing against each other to create realistic data. | Realistic image, text, or data generation |

The future of GAI seems promising with potential for further innovation and application across various industries and the potential is immense, however there are also challenges that have been raised related to GAI models. There is already widespread concern about the factuality and reliability of generated content. Ethical concerns related to GAI generated content, particularly in natural language processing and computer vision, can inadvertently perpetuate societal biases if the training data are biased. This can lead to discriminatory actions if the model is allowed to make decisions based on this. Also, the risk that GAI models are used to spread misinformation is considerable. A common example of this is generation of deepfakes or manipulated media, potentially spreading false information, or causing harm. It is also still quite common for GAI applications to make errors, which

inherently slows the deployment into high-stakes fields like healthcare, finance, autonomous vehicles, and science. These fields are characterized by requirement for high accuracy, reliability, transparency, and low fault tolerance. There are also technological concerns related to GAI such as the increasing complexity of models like GPT-3 and BERT, that pose challenges in practical deployment due to their size, speed, resource consumption, training time, and scalability. Efficient deployment of these models requires a balance between the model's size and resource consumption versus training efficiency (Cao et al., 2023)

## 3.3 Industrial applications of AI and GAI and their impacts

The growth of AI adoption in numerous business domains is illustrated by the surge in enterprise applications, as illustrated in Figure 2 adapted from Kreutzer and Sirrenberg (2020). The forecasted turnover with enterprise applications in the field of AI worldwide from 2016 to 2025 highlights a robust, upward curve in financial commitment to AI technologies in general. (Kreutzer and Sirrenberg, 2020) As outlined by Chan et al. (2022), the significant financial inflow is revealing of AI's expanding utility and incorporation across diverse sectors, from optimization of manufacturing operations to predictive maintenance and quality control as well as enhanced customer service and sales automation. This growth assumes that AI-powered technologies can drive efficiencies, innovate product and service offerings, and revolutionize traditional industrial practices. This is reflected in a cross-industry consensus on the strategic value of AI investment for competitive advantage and operational excellence. As industries continue to recognize and harness the transformative potential of AI, this trend is projected to accelerate, reshaping the landscape of many industries globally on a profound manner. (Chan et al., 2022)

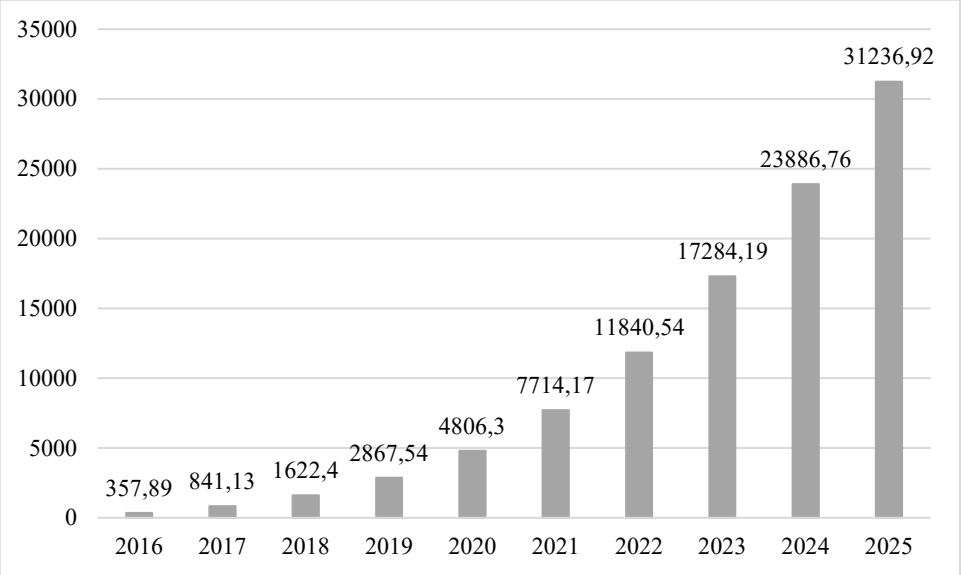



Figure 2 Forecast of turnover with enterprise applications in the field of Artificial Intelligence - worldwide from 2016 to 2025 (in US-$ million) (Kreutzer and Sirrenberg, 2020)

In the industrial manufacturing sector, the last decade has marked a significant increase in the application of AI. This transition is part of Industry 4.0 that is characterized by the integration of advanced digital technologies such as the Internet of Things (IoT), AI, BDA, and cloud computing into manufacturing and industrial practices. Technological advancement has demonstrated profound impacts on efficiency, productivity, and innovation throughout many manufacturing sectors. Especially the integration of AI with the IoT has led to the creation of intelligent and even self-optimizing factory operations. These factories leverage AI-driven analytics for predictive maintenance, quality control, and supply chain optimization with an aim to significantly reduce downtimes and enhance production efficiency. (Chan at al., 2022)

AI-driven operations not only boost productivity but also extend the lifespan of machinery, contributing to sustainable industrial manufacturing practices. AI applications have already been instrumental in enhancing workforce engagement by automating monotonous tasks. This allows operatives to focus on more strategic and creative aspects of manufacturing, thus adding value to their roles and improving job satisfaction. (World Economic Forum, 2022) In the industrial maintenance sector this is known as smart maintenance, where AI-powered services use data generated by connected industrial assets to schedule timely interventions, and thereby prevent costly downtimes. This extends the lifespan of machinery and ensures uninterrupted production flows and machinery usage. Industries are also witnessing the rise

of AI-powered robots and digital assistants that take over routine or hazardous tasks, improving operational safety and efficiency. (Kreutzer and Sirrenberg, 2020)

GAI's potential to further revolutionize industrial manufacturing is underscored by Boston Consulting Groups recent study stating that GAI-based applications could elevate shop-floor productivity by over 20%. This boost is attributed to GAI's ability to integrate into various types of industrial operations. (Küpper et al., 2023) GAI-based solutions can assist in automating and enhancing continuous operations, maintenance, defect detection, and inspection. It can help plant floor personnel, field technicians and other operatives to swiftly identify machines operating outside their preferred boundaries, thus enabling real-time adjustments to prevent downtime or quality issues. (Stackpole, 2023)

The generative capability of GAI has a significant role in future workforce engagement as it could provide employees with question-and-answer platforms or detailed work instructions for specific maintenance incidents, including visualizations and information on required spare parts (Stackpole, 2023). Operatives could utilize step-by-step instructions which they can query by asking questions in natural language revolutionizing the way operative personnel perform their duties. This could transform workers' experience-based intuition and know-how into data-driven, validated recommendations, which especially for inexperienced technicians would be a game-changer to increase manufacturing efficiency. (Küpper et al., 2023)

The impact of GAI in industrial manufacturing spans from increasing shop floor productivity and efficiency to revolutionizing maintenance and inspection processes. The integration of GAI in industrial manufacturing is not just about technological advancement but also about empowering the workforce with more efficient and intelligent tools, ultimately leading to a more agile, sustainable, and productive manufacturing sector.

## 3.4 Sales applications of AI and GAI and their impacts

AI has been transforming sales operations for the past decade in various forms through technologies such as ML, DL and BDA. This change is shaping sales strategies and customer relationships in many industries and companies are feeling the urge to adopt and incorporate AI technologies into sales to stay competitive in the evolving market landscapes. (Chan,

Hogaboam and Cao, 2022) This eagerness to adopt AI is consistent with the expectation that the implementation of AI technologies will increase market share, generate higher volume of sales, and overall improve both financial and non-financial performance. This includes retaining existing clients and attracting new ones, as well as increasing levels of customer satisfaction. (Baabdullah et al., 2021)

McKinsey Global Institute stated in their industry research from 2018 that marketing and sales are seen as the functions where AI is estimated to have the highest value potential. Back then customer service management, individualized offerings, and more effective customer acquisition and lead generation were seen as the most important business challenges that AI will likely impact. (Chui, M. et al., 2018) In a more recent industry report McKinsey & Company highlights that businesses that have implemented AI technologies in sales report significant improved efficiency, increased sales, and heightened customer satisfaction. Many executives also emphasize the increased capability to adapt to market changes and understanding customer needs more deeply. (Deveau et al., 2023)

AI is having a significant impact on multiple sales activities that are either boosted, transformed, or automated by AI-powered technologies. AI enables sales and marketing professionals to predict and understand customer behaviours and preferences more accurately through BDA and ML. These technologies outperform in handling messy, noisy, and complicated customer and sales data, thereby enhancing the decision-making processes in sales strategies and customer engagement. (Syam and Sharma, 2018) Improved lead identification enabled by predicative analytics is noted to significantly improve B2B marketing accuracy through evaluating prospective customers more efficiently (Vlačić et al., 2021). AI enables more personalized customer interactions via chatbots and virtual assistants that are powered by capabilities like text mining, speech recognition and in more broader sense NLP (Huang and Rust, 2021).

Throughout all major industries the consensus is that AI will significantly transform B2B sales. This is enabled through both increased quality and quantity in both the repetitive and more complex sales and marketing activities. AI will improve the accuracy, speed, and quality of the administrative sales activities, which in turn allows sales personnel to focus on the more complex and value-adding tasks. Syam and Sharma (2018) argue that while the greatest impact of AI for sales has been on making the routine, standard, and repeatable

activities more efficient, the future will see AI technologies acting as active decision facilitators (Syam and Sharma, 2018).

The rapid advancement of GAI during the last years brings the next level of AI-powered capabilities for B2B sales and marketing. Regardless of the significant advances that GAI brings to the field of AI, the application areas within sales remain quite similar. McKinsey & Company highlight in their recent industry report from 2023 that the advanced generative capabilities of GAI will further enhance sales activities that were already AI-infused. Figure 3 below highlights high impact activities such as real time lead identification and classification, A/B testing and Search Engine Optimization (SEO), and predictive data analytics allowing advanced optimization of marketing strategies and targeting of unique segments that may have been overlooked in existing data ensure maximized return on investment (ROI) for market and sales efforts. Simultaneously, customer can expect a hyper-tailored and personalized customer experience at scale that was not possible before. (Deveau et al., 2023)

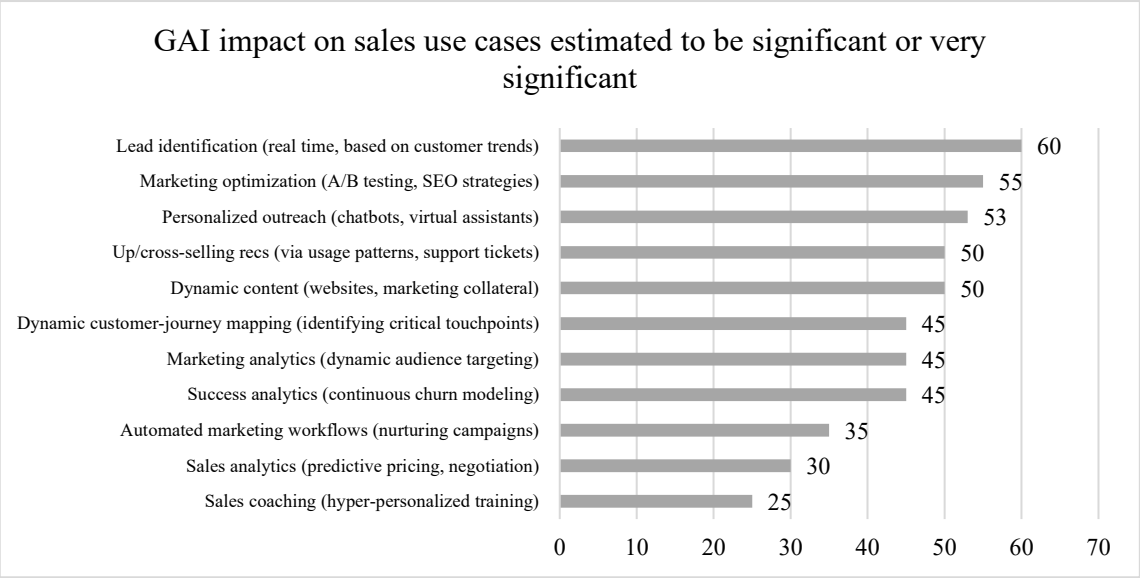



Figure 3 B2B Estimated GAI impact on marketing and sales use cases. (adopted based on Deveau et al., 2023)

Despite the significant benefits of both AI in general and more specifically GAI, the adoption of such advanced technologies in B2B sales and marketing is for many companies still in its

infancy due a lack of understanding of the technologies or organizational readiness. Moradi and Dass (2022) argue that the acceptance and wider utilization of AI technology primarily depends on the degree to which companies are knowledgeable about AI and the advantages of such new technology (Moradi and Dass, 2022). Furthermore, McKinsey & Company states in its 2023 report that in order to leverage the value of GAI sustainably at scale, organizations must deploy a clear AI strategy that must embraces a culture of openness to change and willingness to experiment with GAI, understand the risks associated with GAI especially in terms of data privacy, cyber security, and brand reputation as well as raise the level general awareness and knowledge of GAI within the organization. (Deveau et al., 2023)

## 3.5 Challenges in AI and GAI implementation

The transformative potential of AI and GAI is undeniable across various industries. However, full-scale deployment has encountered a variety of challenges. In the industrial manufacturing sector, there is a high level of awareness of the business value of AI potential among industry players, with 70% understanding its benefits and 59% having an AI strategy but less than 10% have reached targeted financial gains. (World Economic Forum, 2022) This discrepancy highlights the challenges in translating strategic AI initiatives that most companies have into tangible outcomes. In a very recent study by World Economic Forum and McKinsey & Company from 2023, a similar message is visible in Figure 4, with 89% of companies aiming to incorporate AI into their operations, 68% have started the implementation but still only 16% have realized AI-related targets. The studies are from sequential years so in that sense the growth of AI is significant but the growth of the realization of the value potential is not as steep. (Basso et al., 2023) With the additional complexity that GAI brings to the landscape due to its advanced capabilities there is a demand for even more sophisticated technological foundations to be in place as well as the robust strategic insight about AI capabilities at the highest management level (Küpper et al., 2023).

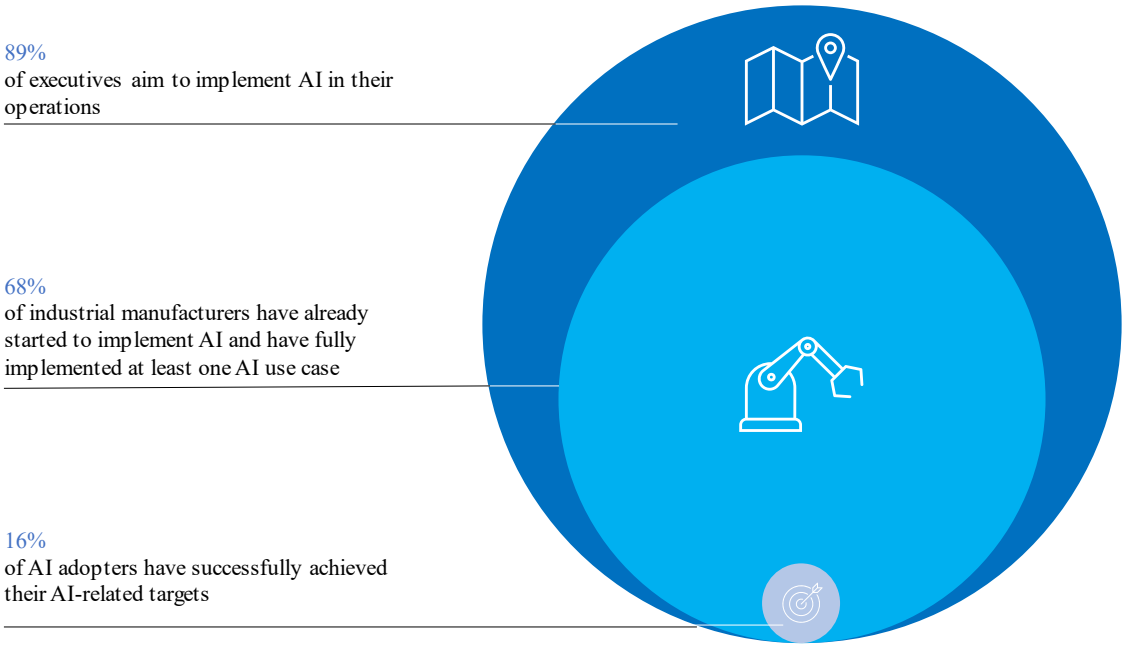



Figure 4 World Economic Forum and Boston Consulting Group Global Survey on AI in Industrial Operations (adopted based on Basso et al., 2023)

With the adoption of any novel technology, the primary business challenges often lie in the alignment of the new technological capabilities with the actual business needs. While some companies in the industrial manufacturing sector have made great progress through a well-articulated and clear AI strategy focusing on building the organizational and technological capabilities, many still struggle to derive value from their AI investments. The struggle often relates to integrate AI into the core business operations due to a lack of a cohesive vision or strategy on how to use these new capabilities, which can result in underutilized benefits regardless of the effort. (Basso et al., 2023) This situation is further amplified among traditional heavy machinery manufacturing sector where the adoption rate of data-intensive technologies brought with the digitalization megatrend has been generally slow. One of the main factors behind the slow adoption rate are the industry-specific data challenges resulting from legacy systems and complex data structures. (Stackpole, 2023)

The organizational and technological readiness for AI is another factor challenging industrial manufacturers on the road towards successful AI implementation. AI technologies can be enablers for many kinds of use cases and hence the introduction of AI capabilities into an organization requires the establishment of clear governance structures, roles and processes

that support AI initiatives. (Stackpole, 2023) Effective AI implementation relies heavily on high-quality data, robust technological infrastructure, including high computational power, effective networking, and stringent cybersecurity measures (Küpper et al., 2023). Organisations often struggle with collecting, cleaning, and structuring data in a way that makes it usable for AI applications. Additionally, data governance that ensures data privacy, cyber security, and compliance with regulations is a complex task that requires dedicated resources and expertise. (Moradi and Dass, 2022) Companies in the manufacturing industry often find such activities challenging due to lacking data management skills and a lagging technological base with a heavy legacy systems infrastructure causing issues (Basso et al., 2023).

With GAI, the competence requirements are further raised by the need to have knowledge about GAI model development. In addition, the processes related to GAI system oversight must be clearly defined due to the concerns of potential GAI output biases and privacy and intellectual property issues. (Basso et al., 2023) These are essential topics to address as the role of GAI systems is to complement human skills rather than direct replacement. Therefore, a culture of continuous learning and adaptability to new ways of working is critical. (Paschen et al., 2019) Such restructuring can be challenging, especially in the industrial manufacturing sector where many organizations are still unaccustomed to such rapid technological change (Basso et al., 2023).

Thirdly, AI and GAI initiatives are always a topic of changing the existing in potential disruptive ways. Hence investment into technologies that will alter ways of working through changes to business processes, operative and staff roles, various IT systems and even the underlying business logic is a tremendous cultural topic requiring strong change management. The contemporary discussion around AI deals with the employees fear of job obsolescence due to unforeseen and rapid changes to the status quo. Effective change management strategies are challenging but essential to address any concerns within the organization stemming from AI or GAI initiatives. (Paschen et al., 2019) AI and GAI applications must be seen as a complement to human skills rather than a replacement. Nevertheless, it is likely that the wider application of AI technologies will have an impact on the existing workforce in at least two ways. Firstly, organizations lack the necessary skills among their existing workforce to effectively utilize, develop, deploy, and maintain AI technologies that presents a skill gap that will require the hiring new talent with the necessary

skills. Secondly, it is widely accepted that certain roles will become obsolete with wider application of AI, which presents the need for significant investment in training, retraining and upskilling programs within many organizations. (Basso et al., 2023)

## 3.6 Key resources in building capabilities for successful GAI implementation

The implementation of GAI is a complex endeavour that requires companies to have the needed readiness within many different areas. The academic and grey literature studied for this thesis suggests that the successful implementation of AI and GAI applications in the industrial manufacturing sector and within B2B sales requires a broad range of tangible, intangible and human resources. It requires companies to foster a culture that considers AI technologies in strategic decision making and willingness to learn and adapt quickly when new insights are uncovered through the first real implementation of GAI technology in practice. It must be noted that academic literature on GAI implementation is still quite scarce because it is a new and constantly evolving field of AI technology. The available literature on GAI does not explicitly define what are the capabilities needed for the successful implementation of GAI. However, there are many sources that discuss what capabilities are needed to successfully implement AI and some suggestions on how to proceed with the use of GAI in general.

The literature highlights various resources as critical for the successful utilization of GAI, but the basis on the path to success is to understand the overall capabilities of GAI and how it can be utilized for the business in question. This understanding stems from the capability to build a link between the technical and managerial aspects of the technology, which is often grounded in a robust set of skills in ML, DL, data science and software development which are crucial for understanding and developing the algorithms that make up GAI technologies and for managing the complexities involved in their implementation. (Cao et al., 2023) The technical skillset must then be reinforced with effective strategic insight and understanding of where and how to integrate GAI solutions into the broader business processes and objectives (Kar et al., 2023).

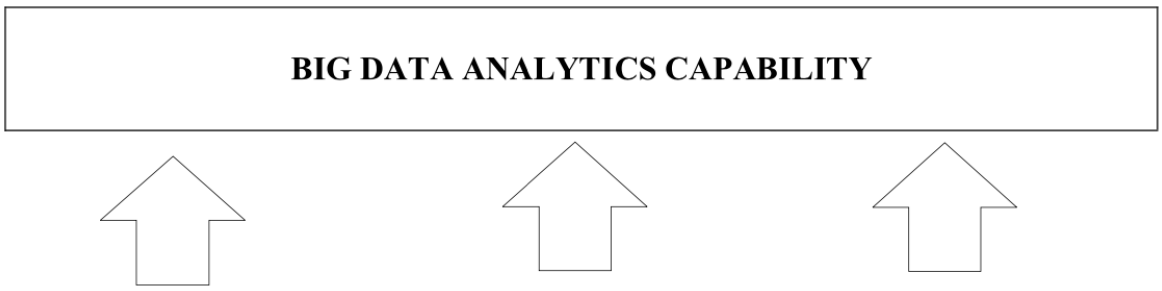
Furthermore, an extremely crucial asset for GAI is data. As GAI systems, like any other AI-powered solutions, are heavily reliant on having access to vast, diverse, and high-quality datasets that allow GAI models to be trained effectively for a certain purpose (Kar et al., 2023). Another crucial asset is the computational power and infrastructure that is needed to run the extremely complex and vast algorithms that power constantly advancing GAI technologies. For example, the evolution from GPT-2 to GPT-3, saw an increase in parameter size from 1.5 billion to 175 billion. This demonstrates the need for extensive computational resources with an ever-increasing speed to develop more sophisticated and capable GAI models. (Cao et al., 2023)

Moreover, the cultural shift within organizations and potential competence development need will be significant. Companies will need to promote and build a culture that fosters innovation, adaptability, and a willingness to experiment and continuously learn from GAI. (Kar et al., 2023) GAI is expected to have a significant impact on white-collar knowledge workers and operatives, reshaping their roles and redefining the standard skill set required. Therefore, organizations must invest in capability and upskilling programs that level educational disadvantages and underline the importance of an inclusive and innovative organizational culture. (Küpper et al., 2023) There will be a growing need for individuals to move from content creation to evaluation and editing due to the capabilities of GAI. This will require more skills in critical thinking together with analytical, and evaluative skills. These skills empower individuals to assess the value and impact of AI-generated content and to refine it according to specific needs and audiences. (Kanbach et al., 2023) While in more operative roles, there will be a significant need to upskill workers as GAI applications will become integrated into standard working procedures (Basso et al., 2023).

As GAI applications take on a role beyond that of a simple tool to more of an assistant handling task independently, ethical, and regulatory considerations in the development and application of GAI become a growing factor that companies need to tackle (Cao et al., 2023). Companies must have roles and responsibilities in place to ensure the proper regulation and control of GAI. In practical terms, there is a need for human oversight of AI-powered processes to perform quality checks and control mechanisms especially in high-stakes applications where the need for accuracy, reliability and transparency is high. (Chui et al., 2023) Finally, the financial investments needed for GAI development and application are substantial due complexity and resource-intensity of the projects that are multi-layered and

cross functional covering many layers and part of organizations. Implementation of GAI often includes initiatives related to data management, technological investments, computational infrastructure, and human capital development. (Kar et al., 2023)

While there are several distinguishable resources needed to GAI capability within an organization, no model for this has yet been proposed in the scholarly articles or other sources reviewed for this thesis. Therefore, it is required leverage a model that can be generalized to suit this purpose as it is arguably close enough. Gupta and George (2016) propose a model for identifying what companies need to create BDA capability and identify distinct resources such as data, technology, managerial and technical skills, and data-driven culture. (Gupta and George, 2016) The model visualized in Figure 5. categorizes the resources as tangible, human, and intangible. One of the key ideas is that BDA capability is a combination of unique resources that are tangible, human, and intangible in nature. This emphasizes that BDA, which from a technical standpoint is a combination of data, information systems and analytics tools, BDA capability is also combination of various resources.




| TANGIBLE | HUMAN | INTANGIBLE |
|---|---|---|
| • Data (internal, external, merging of internal and external)<br>• Technology (Hadoop, NoSQL)<br>• Basic Resources (time, investment) | • Managerial Skills (analytics acumen)<br>• Technical Skills (education and trainings pertaining to big data-specific skills) | • Data-driven Culture (decisions based on data rather than on intuitions)<br>• Intensity of Organizational Learning (ability to explore, store, share, and apply knowledge) |

Figure 5 Classification of Big Data Resources (Gupta and George, 2016)

Their study of BDA capability is grounded on the resource-based theory (RBT) that is one of the most prominent theories to describe, explain and predict organizational relationships. Gupta and George use a definition of a resource originally put forth by Amit and Schoemaker (1993), which defines a resource as something that is owned and controlled by a company. They further define a capability as a special type of resource that enables companies to aggregate other resources and deploy these as combinations to meet a set goal. (Amit and Schoemaker, 1993) According to RBT, a company is a collection of tangible and intangible resources, which when used effectively and efficiently are the source of competitive advantage. Tangible resources are the types of resources that can be sold and bought from the market, human resources consist of the experience of companies' employees and their knowledge, business acumen, leadership skills and relationships with others. (Gupta and George, 2016)

The model proposed by Gupta and George is not directly applicable to the identification of what is needed to build GAI capabilities within a company, but the model's core idea can be used as a basis to build such a model. Firstly, this is justified because similarly to BDA capability, GAI requires companies to have a multitude of different types of resources and the understanding of how to combine these resources into capabilities. Secondly, the BDA model was proposed at an early stage when academic literature of BDA was at a similar stage as that of GAI is today. Hence, the model itself is quite broad and as stated by Gupta and George, in the context of BDA, the model is adaptable and will evolve due to the rapid advancement speed within the field of BDA. (Gupta and George, 2016)

# 4 Case studies from the industrial machinery manufacturing industry

The following section of the thesis looks at three different case studies conducted to understand how GAI can be used in the industrial machinery manufacturing industry, with a particular focus on the sale of industrial services. These case studies are crucial in shedding light on how GAI is perceived in different sectors within the industry and particularly within B2B sales. Each of the three companies, anonymised for confidentiality reasons and referred to as Company A, Company B and Company C, operates in a unique sector manufacturing machinery that ranges from smaller consumer used equipment to large scale and very complex production machinery. The companies do not compete as they each serve different industries. Each of the three companies is listed on the stock exchange and their net sales in 2022 are substantial, ranging from approximately EUR 5,100 million to EUR 11,000 million. All companies operate globally and derive a significant part of their revenues from their service business. (Company A, 2022 & Company B, 2022 & Company C, 2022)

## 4.1 Description of the case companies

Company A is a global leader in the vertical transportation industry. The company offers various types of transport and access solutions, as well as maintenance and modernisation services. Company A is dedicated to improving urban mobility and moves over 1 billion people every day. With a global customer base and operations in over 60 countries, Company A has a significant global presence. The company maintains an extensive network of over 1.5 million pieces of equipment. Strategically, Company A is committed to sustainability and recognises that its success comes from enabling sustainable solutions for its customers. Its strategic focus includes supporting sustainable cities and strengthening its position in the Chinese market. Company A's business model focuses on sustainable customer success, emphasising inputs such as leadership, collaboration, a robust supply chain and innovation. The key growth drivers for Company A are urbanisation, demographic change and the less volatile maintenance and modernisation market. The company's strategic anchors revolve

around customer centricity, digital transformation, sustainability, and a strong brand identity. (Company A, 2022)

Company B is a company specialising in technologies and services for the resource-based industries. It has three primary segments, which are services, automation, and process technologies. The Services segment focuses on improving process performance and reliability throughout the lifecycle of customers' operations. Automation provides key technologies and services for material flow control and automation solutions for plant operations. Process Technologies, which consists of several business areas, provides equipment and technology solutions for resource conversion and production industries. Geographically, Company B has a global presence and operates in four market areas: Europe, the Middle East and Africa, North America, South America, China, and the Asia-Pacific region. Company B's net sales in 2022 are well distributed across the regions, with the EMEA region being the largest contributor. Company B's strategic focus emphasises customer excellence, technology leadership and continuous improvement. Company B aligns its operations with the global megatrends of resource efficiency, clean energy, and urbanisation that it identifies as key to its industry. Company B positions itself as a leader in sustainable innovation and environmental responsibility. (Company B, 2022)

Company C, a prominent global player offering technology and services to the on the energy and marine sectors, of which the marine segment is the focus of this study. Their strategy focuses on being a leader of decarbonisation in the marine sector through diverse offering. The marine business is structured into two main divisions the first division concentrates on delivering decarbonization and optimization technologies, including digital tools for enhanced operational efficiency in the marine industry. The second division specializes in efficient solutions throughout the gas value chain and in exhaust management systems. Globally, Company C has a substantial presence, with Europe being its largest market followed by Asia, the Americas, and other regions. The company's approach emphasizes customer-centric solutions, technological leadership, and a drive towards a sustainable future, as evidenced by its strategic focus on transforming and performing in the realms of decarbonization, business growth, and excellence in execution. (Company C, 2022)

Although all the companies operate in different industries and are not competitors, there are similarities in the key trends affecting their business. In particular, sustainability, digitalisation and customer centricity are prominent themes for all three. These themes are

visible in the companies' strategies, which include similar actions and development paths in response to these trends. (Company A, 2022 & Company B, 2022 & Company C, 2022) All the companies highlight sustainability as a fundamental aspect in their operating environment and fully integrate it in their strategy and operations. All companies are committed to decarbonisation and have set emission reduction targets that are closely aligned with the UN's Science Based Targets Initiative (SBTi). In practice, the companies are committed to reducing CO2 emissions from their operations in line with the SBTi. All the companies are among the first in their respective industries to take such action, demonstrating a strong commitment to sustainability leadership. The companies also highlight the efficient use of energy and resources throughout their value chains, such as the increasing use of alternative and recycled materials in production. Circularity is also a trend that all three companies are targeting as a key action now and in the future. (Company A, 2022 & Company B, 2022 & Company C, 2022)

Secondly, all three companies emphasise is digitalisation. The extensive use of digital technologies in both internal and external aspects is clear. The companies embrace digitalisation in their own operations, effectively using data to optimise and develop their operations throughout their respective supply chains. Digitalisation is also an integral part of each company's product and service offering to their customers, as all three companies mention data-infused connected services and solutions as a growing business for them in various forms. (Company A, 2022 & Company B, 2022 & Company C, 2022) Company A emphasises that digitalisation enables them to offer new intelligent solutions that are both sustainable and provide added value to their customers. (Company A, 2022) Company B emphasises the development of new digital channels and services that enhance the customer experience throughout the customer journey. (Company B, 2022) Company C focuses on digitalisation as a driver of innovation, enabling it to develop products and services that support its customers in the decarbonisation transition. (Company C, 2022)

Thirdly, customer centricity is a key theme for all three companies. Company A focuses on embedding sustainability in its pursuit of customer centricity. They emphasise that their success must come through the sustainable success of their customers, to whom they provide solutions and services, all built on a sustainability foundation. It also highlights development initiatives such as renewing its sales and marketing practices and empowering its people to consider customers and sustainability in all aspects. (Company A, 2022) Company B

emphasises its focus on customer excellence in providing customer-driven solutions and the best delivery of these solutions and services to customers. It strives to ensure that all its customers have a positive experience from the first point of contact and actively develops its sales practices to this end. It aims to develop all its products and services in close collaboration with its customers, enabling them to reduce investment costs, improve operational performance and drive decarbonisation. (Company B, 2022) Company C emphasises its customer focus by incorporating all customer feedback and close analysis of customer satisfaction surveys into the continuous development of these products and services and innovation. It values and strives for long-term trust by meeting customers' needs and ensuring that there is a continuous feedback loop between it and its customers to ensure that the operation and performance of its customers' assets and the service it provides meet all set standards and requirements. (Company C, 2022)

## 4.2 Industrial services and solutions in the case companies

The range of services offered by these companies is extensive and closely linked to their product businesses. According to their 2022 annual reports, revenues from service activities ranged from 32% to 51% of their net sales, highlighting the critical role of service activities in their overall business models. (Company A, 2022 & Company B, 2022 & Company C, 2022) All companies also highlight that they see growth and profitability trends specifically in their service businesses. This is well aligned with the academic literature reviewed, which underscores the servitization transition that has been taking place in the industrial manufacturing industry.

The companies' service operations cover a wide range, from single transaction spare parts sales, through various levels of maintenance services, to fully outsourced maintenance operations. This shows that the case companies have arguably made the transition from traditional product sales to more service-centric business models, where perceived value added to the end customer is a critical success factor. The more comprehensive service offerings offered by the companies are tailored to the customer's needs and use business models that are performance-based, outcome-based or cost-based. (Company A, 2022 & Company B, 2022 & Company C, 2022) This highlights an increasing focus on performance

and outcome-based results, which is consistent with the literature's perspective on demonstrating the value of services to customers and engaging in long-term value creation.

The service business models of these companies reflect a strategic alignment with the academic literature on selling industrial services and solutions. Their practices embody a shift to a service-oriented sales approach that focuses on long-term customer relationships, value co-creation, and the use of digitalisation to enhance service offerings. This alignment not only validates the companies' strategic direction, but also illustrates the practical application of academic insights in the industrial manufacturing sector.

## 4.3 Interviews in the case companies

The interviews with all three companies were organised between November 2023 and February 2024. The interviews took place either in person or virtually. In total eight individuals were interviewed. This means that 2-3 individuals were interviewed per company and a majority of the interviews were conducted as a single person interview. All of the interviewees work in the service business units of the respective companies. They are either in senior management positions such as vice president or director or then in senior manager roles focusing on product management. The interviews were conducted as discussions on a pre-defined list of topics related to companies' service business in general and the research topic in focus. An overview of the interview questions was shared to all interviewees prior to the interviews, and all were given an opportunity to suggest additional or alternative topics to be added to the interview scope.

## 4.4 Results of the interviews - Company A

Company A's approach to GAI and its potential applications in its business is currently cautious but exploratory. While there is a general awareness of the capabilities of GAI due to the remarkable speed with which the technology has spread. Company A has started to use Microsoft's Bing Chat internally to enable its employees to explore and learn about the capabilities of GAI. Although the tool is not trained with the company's own data, this is still a significant step forward in the relatively short time since GAI technology has been introduced to the masses. However, the initial explorations have not yet been translated into

concrete use cases for Company A's business and the discussion around the use of the technology has remained at an abstract level. Company A notes that there is still a lot of uncertainty around the tangible applications of GAI, as well as the investment requirements and expected payback of GAI. Therefore, it seems that Company A is observing and waiting to see what concrete results of GAI application there will be in terms of concrete use cases relevant to its business, but at the same time enabling its employees to learn to use the technology in a more general setting as a tool to support current office work tasks and processes. At present, Company A's service business management is not actively prioritising GAI at the top of its agenda, but there is undoubtedly the capacity to do so if required.

In the broader area of AI use, Company A has already integrated AI technologies into its service operations. This includes offering 24/7 predictive maintenance services, leveraging the growing number of connected devices in its installed base. These services analyse data to identify patterns in the data that indicate potential equipment problems, which Company A's service operations then respond to before a problem occurs. In addition, AI technologies are gradually being introduced into Company A's customer service operations through machine learning-based chatbots. These chatbots are designed to provide customer service agents with automated responses to common queries, thereby reducing problem resolution time.

On the sales side of the service business, AI is used in tools that support account management by analysing potential financial risks and opportunities. This analysis helps in contract negotiations and in tailoring offers. However, adoption of such tools is not widespread, mainly due to problems with the output, which sales managers sometimes find illogical or counterintuitive. According to Company A, such scepticism is a common challenge in the adoption of advanced solutions, as the effectiveness of these tools is often undermined if end users do not fully understand the basis of the analysis or the guidance provided by the tool.

When it comes to the specific area of GAI, Company A recognises its potential value in service business development roadmaps but has yet to identify concrete use cases. There is an urgent need to better understand the value proposition. Identifying where the greatest potential lies in the overall sales process is critical to developing tools that are likely to be successful. In terms of implementation, any potential tool must immediately demonstrate

concrete benefits, as challenges often arise from unclear benefits or complex ROI realisation. GAI solutions should be intuitive and easy to use to minimise the need to address skills gaps and change management.

The benefits of GAI for service business sales, as envisioned by Company A, are versatile. They include sales support through virtual assistants that can reduce time spent on background work and improve preparation for customer meetings. GAI can enable personalisation of offers through tailored solutions based on customer data insights, and make customer interactions smoother, for example with more accurate pricing and more tailored offers. It can also support sales negotiations with risk ranking analysis and historical data, manage large data sets to identify subtle trends for informed sales actions, and indirectly enable more customer-centric sales by reducing administrative work. This in turn allows sales managers to focus more on relationship management. In essence, GAI is seen as increasing engagement and efficiency, leading to increased sales effectiveness, reduced administration, improved customer negotiation and proposal optimisation.

In discussing the potential challenges of implementing GAI solutions for service sales, Company A highlights the limited understanding of advanced AI technologies such as GAI among the service sales force. This highlights the need for tools that are intuitive and do not require extensive training. The sales force needs to understand the logic behind these tools from the outset, as GAI solutions are likely to change their established practices. This highlights the need for change management and selective implementation in sales roles and profiles. It is necessary to select the right type of person with the right type of skills to champion the use of GAI to ensure good momentum for implementation within the sales force. Data quality and availability is also an important issue raised by Company A from a technology perspective. Often, B2B sales data is not stored or structured in an optimal way to be used for analytical purposes, let alone to train an LLM model, so there is likely to be a significant amount of preparatory work on the technology infrastructure before a GAI model can be built. Cybersecurity issues, as well as concerns about the accuracy and trustworthiness of these tools and their rapid pace of development, also represent a significant uncertainty factor that needs to be addressed when considering the application of GAI.

To effectively build GAI capabilities, Company A believes in the critical role of change management, identifying the right people to drive adoption and demonstrating the true value of GAI tools. Full support from senior management is an essential foundation, as is in-house

expertise in AI and GAI. Starting with a very well-defined, small-scale pilot use case with clear expectations and goals is the path to success. This will enable them, as well as any company, to understand the difference between hype and real benefits, and to validate what is needed to implement GAI at scale, both from a management and technical perspective. Company A also emphasised the importance of a culture that fosters a willingness to experiment with new and novel technologies such as GAI to find the best possible ways to use them as part of their business operations.

## 4.5 Results of the interviews - Company B

The rapid rise in popularity of GAI applications such as OpenAI's ChatGPT has been noticed within Company B's services business. There has been a lot of informal discussion about GAI applications, their capabilities, and the potential impact of such applications in the future. To date, the actual use of GAI applications has been limited to testing by individuals on their own account, but it is noted that this is quite widespread. This is due to the enormous 'hype' that has surrounded GAI technologies since the end of 2022. Interviewees mentioned that they have discussed the potential use of GAI applications in their work and more broadly as part of Company B's service business, and there is a consensus about the potential of GAI as a technology, but they have remained at a relatively abstract level in terms of mapping out practical use cases. However, this is about to change as they have appointed an internal coordinator for advanced AI and GAI initiatives who will lead an exploratory study to identify potential use cases.

In terms of the current use of AI technology within Company B's service business, both internal and external uses were highlighted. Company B's provides a wide range of remote services to its customers, ranging from predictive maintenance of equipment to performance and reliability analysis and production optimisation. All these services are somewhat AI-enabled, using machine learning and advanced data analysis algorithms to assist human experts in their work. In addition, the service business is using AI technology to analyse customer satisfaction data. This has laid the groundwork for further use of advanced technologies such as AI, and increased the general understanding of how data analytics can be used to support sales by extracting valuable information from the data collected. Company B has not yet implemented any GAI-based applications in sales, but there are plans

to develop an enhanced version of the customer satisfaction analysis tool based on GAI technology in the medium term, which will be one of the first GAI use cases to be used in sales in Company B's service business.

While the practical use of GAI is still on the drawing board for Company B, it is a topic that resonates with both experts and executives. It is notable that Company B has a lot of intangible groundwork in the form of experience from previous implementations of data analytics solutions and predictive analytics. This demonstrates a broad understanding of what is required of an organisation to implement new technologies and capitalise on their value. Company B emphasises that the road to success with GAI will not be without challenges and the most important cornerstone that an organisation must get right is change management. This requires identifying and empowering early adopters who can champion such new tools. This is crucial because their support comes from recognising the tangible benefits of GAI in their day-to-day work. To win over these ambassadors for GAI technology, selecting initial use cases that deliver obvious value is paramount. These initial use cases need to be well-defined, small-scale internal proofs of concept to build confidence and ensure rapid development and implementation. This will ensure momentum and engage the early adopter and drive real demand within the organisation. Company B notes that there is variability in the use of technology among its sales force, often due to their individual competencies and perceived value of these advanced tools, which range from extensive to basic. Therefore, ease of adoption of potential GAI applications and fostering a culture that is open to innovation and experimentation is critical. According to Company B, this needs to be reinforced because the technological advances in the GAI field are so rapid, combined with the fact that the basic mechanisms of how GAI models work are still unknown to the majority. As a result, there is still a significant amount of mistrust and open questions about the trustworthiness of GAI applications.

Company B envisions the use of GAI within its service business to reveal a range of potential improvements, particularly in the use of CRM data for insightful analysis. GAI could revolutionise account management by providing a comprehensive view of customer interactions, performance metrics and feedback, thereby optimising sales strategies and customer engagement. The automation of administrative tasks and proposal generation through GAI solutions could significantly increase sales efficiency, allowing sales managers to focus on nurturing customer relationships and acting as trusted advisors. This strategic

shift towards proactive selling, supported by timely and relevant offers, promises not only to expand the customer base, but also to enrich the quality of existing customer relationships, thereby catalysing business growth and customer satisfaction.

## 4.6 Results of the interviews - Company C

Company C's approach to GAI seems enthusiastic and there seems to be a notion of taking the lead in the area of GAI in their industry compared to the other companies. Company C emphasises that they want to be a leader in the use of such new and novel technology, and there is also a push from the top management to drive initiatives related to better use of data and advanced technologies such as AI and GAI. Therefore, it seems that Company C has the willingness to be a first mover in its respective industry. In terms of current practical use of GAI, Company C is still at a high-level planning stage and no practical use of GAI for its service business has yet emerged. At a corporate level, they have implemented an internal OpenAI's GPT that runs in a secure internal environment that allows all employees to experiment with GAI and learn the basics of the technology.

In terms of the current use of AI in Company C's service business, AI technologies are being used to analyse sensor data collected from connected assets to predict maintenance cycles and needs. Similarly, AI is used to ensure field service availability through intelligent resource allocation. The AI model predicts when equipment needs maintenance or repair based on performance data, thereby optimising which field service technician with the appropriate skills should be dispatched to the job. AI is also used to monitor customer purchasing behaviour on the e-commerce platform, enhancing the recommendation engine to suggest additional products to customers based on their choices. Building these capabilities is seen as a success, and the company considers its internal IT organisation to be strong, with significant AI expertise. However, it recognises the need for continuous learning, as there have been challenges with previous digitisation and data projects. The lessons learned from these experiences have led to the integration of technology expertise into the core business.

When discussing the potential of GAI, Company C states that they believe GAI will have a significant impact on the efficiency of sales processes and allowing sales professional to focus more on actual selling and less administrative work in the near future. Although practical applications are still being explored as GAI is a relatively new technology for most companies, regardless of industry, there is a need to act quickly as the pace of development of GAI is also fast. In terms of potential use cases for GAI in the context of services sales, Company C highlights the fact that sales processes currently involve gathering vast amounts of product information scattered across numerous systems, which is very time consuming. Company C envisions, that GAI could help by transforming and leveraging all the as-maintained data, service field service reports and technical maintenance manuals into sales-supporting insights that would help sales identify where the greatest value lies for the customer at any given time, what the customer's readiness to buy is considering the current situation and focus efforts on what is most beneficial to sell. This would save significant time, allowing salespeople to focus more on value-adding activities such as managing customer relationships. Similarly, GAI could enable quick understanding of lengthy technical documents, making field service more effective as well as utilize data to significantly expedite spare part and machine configuration identification process. In terms of customer self-service, particularly in e-commerce, GAI could enable customers to easily locate their data as a value-added service. A GAI-based information retrieval service could empower customers, especially those interacting through the online store, to help themselves more effectively. In a broader sense, Company C also highlighted the potential for more customer centric product development. If all the insight gained from operating the machinery and how the customer is perceiving the value of the machines could be effectively analysed and channelled with GAI to the research and development organization, this could significantly improve the time-to-market lead times and overall customer satisfaction.

The potential of GAI is clearly something that Company C has thought about in relation to its service business, and this is also evident when discussing the challenges of GAI. Confidence in the data is a fundamental requirement, as is the quality of the underlying data. Without it, GAI's power and accuracy most likely won't reach the level required. To build this requires that both the technology capabilities, such as IT and technology infrastructure, data management, and system integrations are in place and that the right governance models are in place. The organisation must have the expertise to really understand how GAI models work to build trust and understand where the use of such technology is best suited. In

addition, the use of GAI requires a mindset shift from the traditional approach of human salespeople doing and checking everything themselves to trusting "the machine" to do things for them. This trust can only be developed by demonstrating the real-world value of GAI, so starting with well-defined, sufficiently small pilot use cases is very important. Company A also recognises that there is currently a skills gap within its sales force when it comes to advanced technologies such as GAI. The lack of data literacy and analytical skills is a challenge as well as the change that GAI will bring to sales roles. With GAI, the role of the salesperson will shift from quoting and data collection to a more consultative selling approach. This approach emphasises understanding the broader business context for the customer, where value is created for the customer, and identifying what customers really need and want.

When discussing the critical capabilities that the company needs, Company C highlights that implementing GAI in the sales of services requires a significant operational change, requiring a change in mindset and extensive training in new sales methods and tools. This can be challenging as salespeople are often resistant to digital tools that incorporate data into the sales process, partly due to past experiences with data quality issues and failed digital initiatives. Therefore, perhaps the most critical factor in building GAI-based tools and business capabilities is a well-thought-out change management plan that puts people at the centre. Without a solid change management plan, the organisation recognises that it is unlikely to succeed in effectively integrating GAI. Another critical factor is top management support for understanding GAI, both from a technology perspective, but more importantly, from a strategic perspective. It is also very important that a culture of experimentation and risk-taking is encouraged in the right way, as a traditional cautious and detailed planning approach may not be appropriate when working with GAI, especially for those seeking to be industry leaders in this area. From a more practical capability point of view, ensuring high quality data availability for GAI applications, having sufficient technical know-how and business technology acumen, and understanding the customer's point of view towards GAI are the key capabilities according to Company C.

The value of GAI to Company C's service business seems clear and they are likely to look at the technology soon. When asked to highlight the potential business benefits of GAI as a technology to support service business sales, Company C emphasised improving the speed, quality, and accuracy of service, ultimately delivering more value to customers. Company

C's customers are increasingly looking for predictability in their interactions and, with the right type of application, GAI could enable Company C to deliver this to its customers. There is potential to build a competitive advantage with GAI.

## 4.7 Summary of case studies

The perception and approach to GAI varies slightly between the case companies interviewed, but overall, all the case companies recognise the potential of the technology for their business and service business in particular. All companies are actively discussing the potential of GAI for their respective businesses, although the discussion has so far remained at an abstract level and the work to identify tangible use cases and take concrete steps towards this is still in the drawing board. Company B mentioned the appointment of an internal coordinator to focus on the application of GAI, and the others noted that in general there are probably already small-scale plans or pilots underway in companies A and C, even if they don't exist specifically in their service business now. All companies clearly stated that GAI is part of their service business development roadmaps and that there is a willingness to take steps forward.

As noted in the literature review, GAI is the latest in a long line of developments in the field of AI, so understanding the companies' attitudes to AI in general was also a focus of the interviews. All companies have implemented solutions that use AI technologies in their service business. More specifically, the current deployments are aimed at predictive maintenance, customer service improvement, customer satisfaction analysis, service performance analysis, field service resource allocation and e-commerce optimisation. The fact that all companies are using advanced AI technologies as part of their service business provides a strong foundation for the potential use of GAI.

The potential of GAI in service business sales is recognised across the companies, with the aim of revolutionising sales support, customer data analysis and sales strategies through data-driven insights and automation. The effective use of GAI could increase sales efficiency, customer retention and competitive advantage by personalising customer interactions and optimising sales processes. All the companies noted that the deployment of such advanced data-centric solutions hasn't always been successful, and some have even failed in some of their attempts to build new business use cases based on data and advanced

technologies. The realisation of these envisaged benefits is therefore not without its challenges, and in particular data quality management, cyber security and the development of the necessary skills and change management strategies, senior management support and a culture of innovation and experimentation are cited as critical capabilities that organisations need to have in place. Identifying clear pilot use cases and addressing skills gaps are also critical to effectively integrating GAI into business operations.

# 5 Discussion

This chapter summarizes the key findings of the literary sources that were reviewed to gain an understanding of the service business sales in the industrial manufacturing sector, AI and GAI in more detail, and the application of such technologies in relevant industries and business functions. Secondly, a proposal of a modified GAI capability model aimed at identifying the critical resources necessary for building GAI capability within an organization is presented. This model is adapted from the BDA capability model presented by Gupta and George (2016), reflecting the unique requirements and nuances of GAI presented in section 3.4. The validity of this adapted model is examined through insights gained from interviews conducted with case companies, providing empirical evidence to support its relevance and applicability. Following this examination, the section delves into the challenges associated with GAI implementation and the potential benefits of the technology for industrial service business as identified in the literature. It then compares these findings with the perspectives of the case companies, providing a comprehensive view of the practical implications of GAI implementation and how these findings confirm or differ from the established academic discourse.

## 5.1 Key findings for the literature

The industrial machinery manufacturing sector is increasingly shifting from a purely product-centric to a more service-centric approach. This trend known as servitization highlights the increased focus on value-added services ranging from basic maintenance and repair services to comprehensive performance-based solutions. Industrial companies are developing their service business to differentiate, increasing revenue, and responding to declining margins and product commoditization risks. The adoption of digital technology has been crucial enabler for this shift towards smart services and new customer-centric business models that cater to tailored customer needs and experiences, marking a significant change in the industrial manufacturing landscape. Sales of industrial services in the industrial machinery manufacturing sector is B2B sales characterized by complexity, longer sales cycles, and customer value, which comprises more elements than product sales. This requires

a consultative selling approach where salespersons act as advisors, focusing on value-based selling and solving specific business problems for the customer. Deep understanding of customer business, customer needs, strong relationships, and the ability to articulate the long-term value of services over short-term transactional efficiency in crucial.

AI technologies have evolved significantly during the last decade and are today extensively present in various industries to enhance efficiency, productivity, product, and service innovation, and revolutionizing traditional practices and processes. AI can be broadly defined as intelligent computer programs that replicates and automates intelligent behaviour with applications ranging today from chatbots to autonomous driving. In the industrial manufacturing sector, the utilization of AI can be seen as a part of Industry 4.0, characterized by integrating advanced digital technologies like IoT, AI, BDA, and cloud computing into industrial manufacturing. AI-driven operations enhance productivity, extend machinery lifespan, and improve workforce engagement by automating monotonous tasks, allowing workers to focus on more value adding aspects of their role or change the role altogether. In B2B sales AI is improving efficiency and customer satisfaction through lead identification, predictive analytics that enables more personalized customer interactions.

GAI represents a significant advancement in the AI field capable of creating novel content like text and images based on enormous data sets used to train GAI models. GAI is expected to significantly boost productivity and its generative capability could transform roles and responsibilities within both the operative and white-collar workforce significantly. In the industrial manufacturing sector, GAI applications could revolutionize maintenance and inspection processes, empowering the workforce with more efficient tools, and leading to a more agile, sustainable, and productive manufacturing sector. In B2B sales, a recent McKinsey & Company study indicates that marketing and sales are the functions where GAI potentially has the highest value potential. Utilization of GAI will enable AI enhanced decision making in sales strategies and a hyper-tailored customer experience.

Regardless of the significant potential benefits of AI technologies, and GAI in particular, many companies are still in the early stages of adopting AI due to a lack of understanding or organizational readiness. Among industrial manufacturing companies there is still a significant gap between understanding AI's benefits and achieving financial gains from its implementation. While many companies have AI strategies, only a small percentage have realized their AI-related targets. Organizational and technological readiness is crucial,

requiring clear governance, high-quality data, robust technology infrastructure, and stringent cybersecurity. Additionally, GAI applications will raise competence requirements as well as addressing challenges related to ensuring factual reliability, ethical concerns of GAI model biases, risks of misinformation and practical deployment issues due to complexity and resource consumption. Despite the challenges, it is very likely that AI technologies like GAI will to some extent revolutionize in some form the status quo for the current workforce on all levels. Hence, the further incorporation of AI and GAI will necessitate strong change management practices to address the cultural shifts and workforce concerns, including skill gaps and potential obsolescence of certain roles that will require significant investment into hiring new talent and training and upskilling the current workforce within organizations.

## 5.2 Proposal for a new GAI capability model

The GAI capability model visualised in Figure 5 is a modification of the BDA capability model proposed by Gupta and George (2016). It follows a similar construct where the resources identified as critical to building GAI capability are several different types of resources. As in the model originally presented by Gupta and George, the resources used in the GAI capability model are categorised as tangible resources, human resources, and intangible resources.

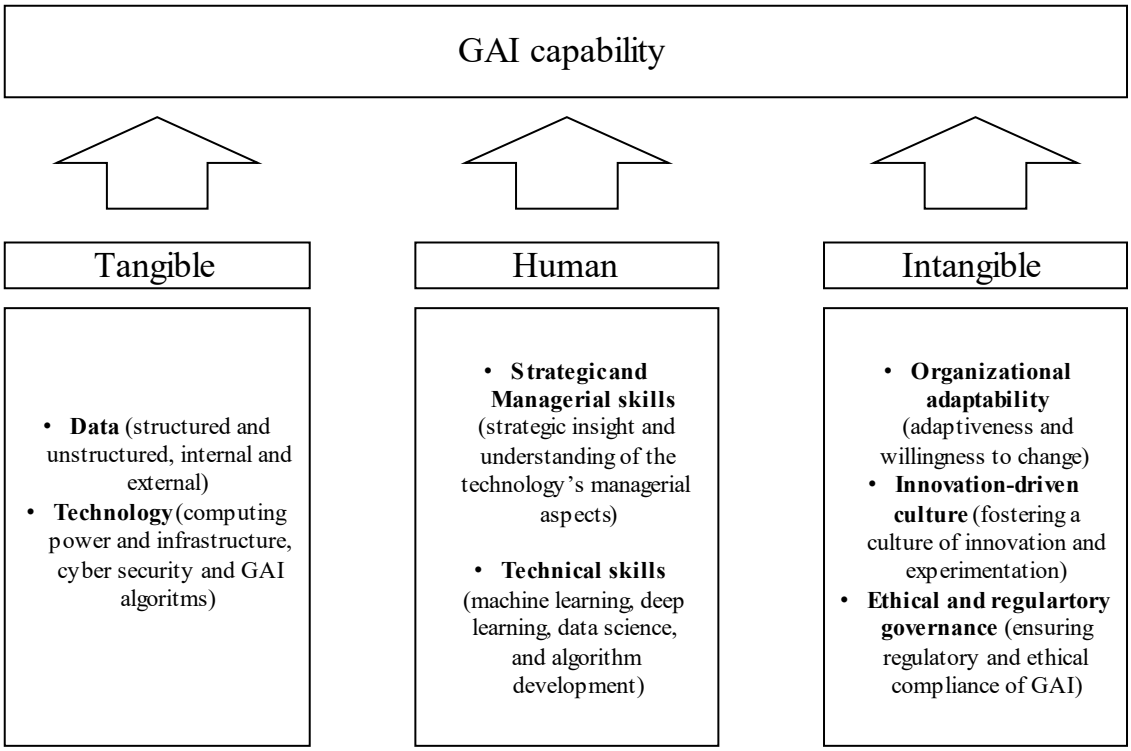



Figure 6 GAI capability model (modified from Gupta and George, 2016)

Based on the literature reviewed, data and technology have been identified as the critical tangible resources needed to build GAI capability. Vast amounts of both structured and unstructured data, which can be either internal data from within the organisation or any type of external data, are the primary learning and training resource for a GAI model. The quality of this data is critical as the GAI models will recognise patterns and trends within this data, allowing for potential biases in the content it generates. So, both volume and quality are important. Another key resource is the technology, both software and hardware, required to build solutions that use GAI. This refers to the computing infrastructure, such as end-user solutions, servers, and storage systems, which can be either physical or cloud-based services. The cybersecurity infrastructure put in place to protect the system on which the GAI systems run is equally important, as the data handled is often of a sensitive nature. In addition, there are the actual DL algorithms that make up the generative capabilities, such as the LLMs.

The human resources identified from the literature reviewed highlight two distinct sets of skills that the company should have or acquire. These are strategic and managerial skills and technical skills. The strategic and managerial skills range from strategic decision-making skills related to the use of GAI and its implications as a technology within the industry, to more managerial skills such as the business acumen to understand how GAI can be used to develop the business operations in question to gain benefits such as efficiency and productivity. The technical skills refer to the competencies in ML and DL, as well as data science and algorithm development, which are critical to build with the necessary depth and breadth to ensure a robust understanding of how the GAI tools work in practice. Such skills can either be built within an in-house organisation or acquired through partners, depending on the application area of the GAI-powered applications.

Intangible resources refer to the building blocks needed to create the overall readiness to apply GAI within an organisation. These include organisational adaptability, which is the ability and willingness to make changes to current ways of working and the willingness to learn continuously. An innovation-driven culture is the notion that innovation is crucial to foster development and experimentation on a large scale is seen as a practice that everyone in the organisation should embrace, regardless of their role. Ethical and regulatory governance refers to the more novel need to build control and review mechanisms around the actions that GAI-powered applications perform or the content they create. As the trend moves towards GAI-powered applications performing tasks autonomously or with little human oversight, it becomes necessary to ensure that the output remains valid in accordance with ethical, regulatory, and legal standards.

The proposed GAI capability model does not dictate the importance of any of the identified resources or whether all the identified resources are necessary to build GAI capability. The model argues that the identified resources are among the critical resources that, according to the literature reviewed, make up GAI capability within an organisation that seeks to use GAI in its business operations. These resources are also not explicitly applicable only to cases of GAI application in industrial manufacturing or B2B sales, but it should be noted that the sources reviewed are primarily concerned with this context. It can therefore be assumed that the applicability of the GAI capability model is stronger in these areas.

## 5.3 Validation of the GAI capability model

This section of the thesis seeks to validate the proposed GAI capability model by establishing the relevance and necessity of the proposed types of resources for building GAI capability within organisations. The aim is to analyse the content of interviews conducted with case companies and to establish a link between the types of resources recommended in the model and the findings from these interviews.

The analysis is organised to allow an in-depth discussion of each category of resource suggested by the model. This is achieved by relating each category to the relevant findings from the interviews. For example, if a case company highlighted the importance of a particular type of resource for successful GAI implementation, this feedback is specifically linked to that resource category within the analysis. In addition, the analysis will address any resources identified by the case companies that do not fit directly into the proposed model and present these findings towards the end of the analysis. This approach ensures a comprehensive review of the empirical data in relation to the theoretical framework proposed by the model.

In the final part of this chapter, the validity of the model is assessed through a Likert scale analysis of all the resources outlined in the model. This Likert scale assesses both the frequency and importance of mentions for each resource by the case companies, ranging from 'Not Mentioned', indicating the absence or perceived irrelevance of a resource, to 'Consistently Mentioned, Very High Importance', highlighting the critical role of a resource and the centrality of the GAI considered by the company. It is important to note that this validation process, as carried out by the author, is subjective and that a more thorough and objective validation of the model would require more extensive analysis.

The Likert scale used for this rating is defined as follows:

**1 (Not mentioned):** The resource is not mentioned, indicating that it is neither present in the company's operations nor considered important.

**2 (Mentioned, low importance):** The resource is mentioned but is considered to be of minimal importance, either mentioned in passing or as a low priority.

**3 (Mentioned, moderate importance):** The resource is clearly mentioned and is considered to be of moderate importance to the company's operations or strategic objectives.

**4 (Frequently mentioned, high importance):** The resource is frequently mentioned and is considered an important aspect by the company.

**5 (Consistently mentioned, very high importance):** The resource is mentioned consistently and strongly, underlining its critical importance to the company's success in GAI.

### 5.3.1 Tangible resources

The subsequent sections explore the tangible resource category proposed by the GAI capability model, which suggests data and technology as crucial resources and how these were mentioned and with what importance by the case companies. Data encompasses both unstructured and structured sources, whether internal or external to the company, while technology includes the software and hardware necessary to develop GAI-based solutions. This encompasses the computing infrastructure ranging from end-user solutions and servers to storage systems which may be either physical or cloud-based services.

In the context of building GAI capability, the critical role of data - its quality, availability, and the underlying management infrastructure - emerges as a resource that all case companies consider critical. The consensus underlines the fundamental requirement, clear

in the academic literature, that for GAI applications to achieve their full potential, the integrity and reliability of the underlying data is paramount.

Companies A and C specifically highlight the preparatory work required to ensure that data is not only accessible, but also optimised for analytical and GAI model training purposes. As an example, common to all case companies, the handling of B2B sales data illustrates a common hurdle where the optimal structuring of data for analytical purposes, particularly for training sophisticated LLMs, often falls short. This recognition signals a broader need for robust data management practices that can support the complex requirements of GAI technologies. In addition, concerns about cybersecurity and data trustworthiness, such as those expressed by Company A, underscore the delicate balance between using advanced GAI tools and maintaining data integrity and user trust. The sensitivity surrounding data security requires stringent safeguards, which are critical to the safe and effective deployment of GAI solutions.

Cybersecurity also emerges as an important issue, particularly highlighted by Company A. This focus on cybersecurity underlines the complex relationship between advanced GAI applications and the need for robust data protection measures, especially when dealing with sensitive and proprietary data. The emphasis on cybersecurity is not just a technical requirement, but a fundamental aspect of ensuring user confidence and maintaining the integrity of GAI-driven solutions. This concern points to the need for strong cybersecurity protocols and frameworks that are critical to protecting the data that powers GAI applications.

Discussions with the case companies also highlighted the need for a robust IT infrastructure capable of handling the complexities of GAI, with particular emphasis on the preparatory work required in terms of data management and system readiness to support GAI applications, particularly highlighted by Company A. Company C recognises the importance of a strong IT and technology infrastructure, data management, and system integrations, not only for operational support, but as a critical component in ensuring the successful deployment of GAI technologies. Company C also highlights the need for continuous learning to overcome data and IT infrastructure challenges experienced in previous digitisation and data projects. The collective insights from these companies illustrate a common recognition that a comprehensive IT infrastructure - including data storage and processing capabilities - is needed, but there has been very little detailed consideration of

what the IT resources should look like in practice, other than that the data needs to be stored and managed in a way that it can be used by GAI applications, and that the surrounding infrastructure needs to support this. This is understandable given that none of the interviewees directly represented the IT or technology functions of the case companies and therefore their expertise lies elsewhere.

In the proposed GAI capability model, resources associated with GAI algorithms were also identified as a critical resource. However, none of the companies specifically mentioned this. This is most likely since in-house or purpose-built GAI algorithms have not yet emerged in any of the companies. This casts doubt on their validity as a critical resource for building GAI capability. Potentially this is something that will become more important in the future as GAI applications become a standard technology in the industry.

### 5.3.2 Human resources

This section explores the category of human resources proposed by the GAI capability model, distinguishing two critical types of human resources that are essential for the effective use of GAI technologies. First, it emphasises strategic and managerial skills, encompassing the critical need for strategic insight and leadership in deploying GAI in a business context. This includes not only the ability to provide visionary leadership that aligns GAI initiatives with broader organisational goals, but also the practical management skills that are critical to overcoming the day-to-day challenges of integrating GAI into existing workflows. It also underlines the importance of a deep understanding of how GAI can be pragmatically applied within one's own organisation and the wider industry, highlighting the need for a nuanced understanding of GAI's potential to transform business operations and industry practices.

The paramount importance of strategic leadership and managerial capabilities in the complex journey to embedding GAI within corporate structures is vividly illustrated, with Companies A, B and C offering nuanced perspectives on this crucial aspect. Company A outlines the critical need for leadership support and robust change management strategies, emphasising that the successful adoption of GAI technologies is highly dependent on an organisation's ability to align these initiatives with overarching strategic business objectives, while preparing the workforce for the impending changes that the transition to AI-supported

processes will bring. Similarly, Company C emphasises the need for a strategic vision from top management that encompasses not only the technological dimensions of GAI but also its strategic implications for the business. This requires not only senior management buy-in to GAI projects, but also a concerted effort to embed GAI capabilities into selected processes, with a willingness to continually learn and adapt to make the most of the solutions.

Expanding on this theme, Company B articulates the importance of cultivating early adopters and internal champions who are tasked with leading the cultural and process changes essential to GAI integration. This is critical for change management as it ensures that the tangible benefits of the tools are demonstrated by the real end users behind the change. Recognising the potential barriers posed by skills gaps within the workforce, Company B advocates targeted upskilling and retraining programmes aimed at improving data literacy and analytical skills across teams to ensure that employees are equipped to effectively use the full range of GAI tools. Company C also highlights the challenges of integrating GAI into existing sales business processes, pointing to the need for operational readiness and a willingness to undertake significant training and development efforts. This includes preparing sales and customer service teams for the changes GAI will bring to their roles, with an emphasis on consultative selling and enhanced customer engagement strategies enabled by GAI insights.

The emphasis on technical skills also emerges clearly as a critical issue, highlighting the delicate balance between technological innovation and workforce skills. Company A highlights the need to equip employees with the skills to explore and use GAI technologies effectively and recognises the initial use of platforms such as Microsoft's Bing Chat as a step towards familiarising its workforce with GAI capabilities. Company C's approach to GAI and technical skills development is characterised by a proactive attitude towards leadership in new technologies, supported by a strong internal push for data literacy and technical acumen among its employees. The implementation of an internal OpenAI's GPT, in a secure environment for all employees to experiment with GAI, represents a comprehensive approach to skills development aimed at ensuring that the workforce is not only familiar with GAI technologies, but also able to use these tools to drive operational efficiency and innovation in the future. Similarly, Company B noted that there is a lot of grassroots use of commonly available GAI tools, which fits well with their idea of a bottom-up approach to skills acquisition and the identification of empowered GAI early adopters and champions

within the organisation. Both approaches further facilitate technology adoption and the building of basic GAI skills and understanding, which is a necessity when considering GAI potential and wider organisational goals.

In Companies A, B and C, there is a common recognition of the critical importance of technical skills and the need to bridge skills gaps and foster a culture of continuous learning and adaptability that is essential to navigate the complexities of GAI implementation. The collective insights from these companies highlight the intricate relationship between technological advancement and human capital development, underscoring the notion that the transformative potential of GAI is not only a function of the technology itself, but also of the organisation's ability to cultivate a workforce that is equipped, motivated, and prepared to harness these new capabilities.

While not explicitly detailed in the text, the notion is that technical acumen, particularly in AI, ML and DL, data analytics skills, and operational skills in using specific GAI tools and platforms are critical. However, this again highlights the fact that the interviewees did not come from an IT or technology background, so it's understandable that the technical skillset was not as clearly defined. However, there is a very clear understanding that both managerial and technical skills are required to build GAI capability.

### 5.3.3 Intangible resources

The following sections explore the third proposed resource category, identified as intangible resources that are critical to building GAI capabilities within organisations. First, organisational adaptability is highlighted, referring to the ability of an organisation to respond to change with agility and the inherent willingness to undergo such adaptations. This adaptability is a fundamental requirement for navigating the rapidly evolving GAI landscape. Secondly, the importance of fostering an innovation-driven culture is emphasised. This culture is characterised by an environment that not only supports but actively encourages new innovations, the continuous practice of innovation, and a willingness to take risks and engage in experimentation. Finally, ethical, and regulatory governance is identified as a critical intangible resource. It encompasses the organisation's ability to ensure that its use of GAI complies with all relevant regulations and ethical

standards, and to address the unique challenges posed by such a novel and impactful technology.

The importance of organisational adaptability and an innovation-driven culture seem quite inseparable topics based on the interviews. Both resources are present in the discussions and evident in the practices of all companies. Company A that illustrates a commitment to embedding sustainability and innovation at the core of its strategic focus is enabling its employees to familiarise with GAI through tools such as Microsoft's Bing Chat, reflecting a proactive stance towards building an adaptable and technologically literate workforce. Additionally, this is a practical step towards nurturing an environment where learning and experimentation with emerging technologies are valued. Company C's enthusiasm to be a leader in GAI adoption within its industry is exemplified by its internal GPT environment enabling all employees to experiment with and learn about GAI, thereby embedding. technological curiosity, openness to new ideas and fostering a culture of learning and adaptability. Such efforts by Company C underscore a strategic commitment to not only adopting advanced technologies but also to leading through innovation. Company B, on the other hand, actively engages in informal discussions and individual testing of GAI applications, reflecting a grassroots approach to fostering an innovative mindset among its workforces. The designation of an internal coordinator for GAI initiatives within Company B suggests a move towards formalizing this innovation and experimentation, aiming to systematically explore and identify potential GAI use cases.

These are all structured efforts that not only prepare the workforce for the practical applications of GAI, but also fosters a mindset of continuous learning and openness to technological evolution. A common thread running through all three companies is an emphasis on change management, training, and the cultivation of a culture that values innovation and experimentation, highlighting the recognition that organisational adaptability is a critical success factor in the effective integration of GAI technologies. This adaptability is not seen as a static attribute, but rather as a dynamic, ongoing process that involves the entire organisation, from the C-suite to the front line, demonstrating a comprehensive understanding that the transformative potential of GAI can only be realised within an organisational context that is flexible, forward-looking, and prepared to navigate the complexities of technological change.

The focus on ethical and regulatory governance or GAI's compliance with laws and regulations was not explicitly highlighted by the companies and is therefore the only resource proposed in the model that has not been validated to any degree. The focus of the interviews was, by default, more on the strategic, operational, and technical facets of GAI adoption, as mentioned in relation to organisational adaptability, innovation-driven culture and the importance of technical and managerial skills, and the paramount importance of data and technology. Undoubtedly, the issue of ethical and regulatory governance is very important for such global companies, and the fact that it was not discussed does not justify the argument that the companies interviewed wouldn't consider it as such. The reason for the lack of focus is most likely due to the novelty of the GAI technology and the fact that most companies, like those interviewed, are at the very beginning of their journey with GAI.

### 5.3.4 GAI capability model validity

Analysis of the data collected from the company interviews suggests that the proposed GAI capability model has a moderately good level of validity, but it is important to recognise that the wider applicability of the model beyond this particular research scope remains uncertain and requires more validation. This conclusion follows from the observation that most of the resources identified as critical to building GAI capability were ranked between highly and moderately important by all participating companies. It's worth noting, however, that resources related to ethical and regulatory governance were not explicitly mentioned in the interviews, an exception to the overall trend.

The assessment of resources was categorised into tangible, human and intangible resources, and the respective scores are shown in Figure 6. The tangible resource category received the highest score of 3,6, highlighting the criticality of data as a key resource that drives GAI solutions. The prominence of this category also underscores the importance of technology, such as IT systems infrastructure and integrations, which are critical to creating an environment that can effectively utilise vast amounts of data. Notably, data and technology received some of the highest individual resource type scores, 3,75 and 3,5 respectively, as shown in Figure 7. This reflects the perception of GAI primarily as a technological advance, with its broader organisational consideration perhaps still perceived as more abstract.

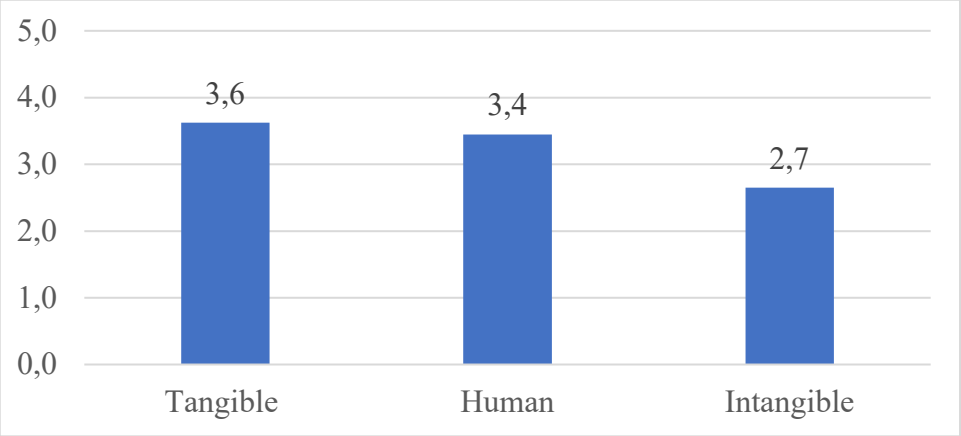



Figure 7 GAI capability model – resource category level scores

The human resources category was the second highest, with the resource type of strategic and managerial skills being the highest scoring individual resource type at 3,89. This indicates the paramount importance of strategic insight and foresight in exploiting GAI, as well as the ability to act on that insight. It highlights the need for top management and all higher levels of management to possess these skills to ensure a company's success in GAI. Managerial skills related to the applicability of GAI in day-to-day business operations were also seen as critical to the rapid identification of appropriate use cases. Technical skills, while important, were not ranked as highly with a score of 3,0. This lower ranking is attributed to the novelty of AI and GAI, where non-technical professionals may struggle to accurately identify the technical skills required. Nevertheless, the importance of having in-house AI and GAI skills to build strategic and robust capabilities was recognised, meaning that such resources cannot be fully outsourced.

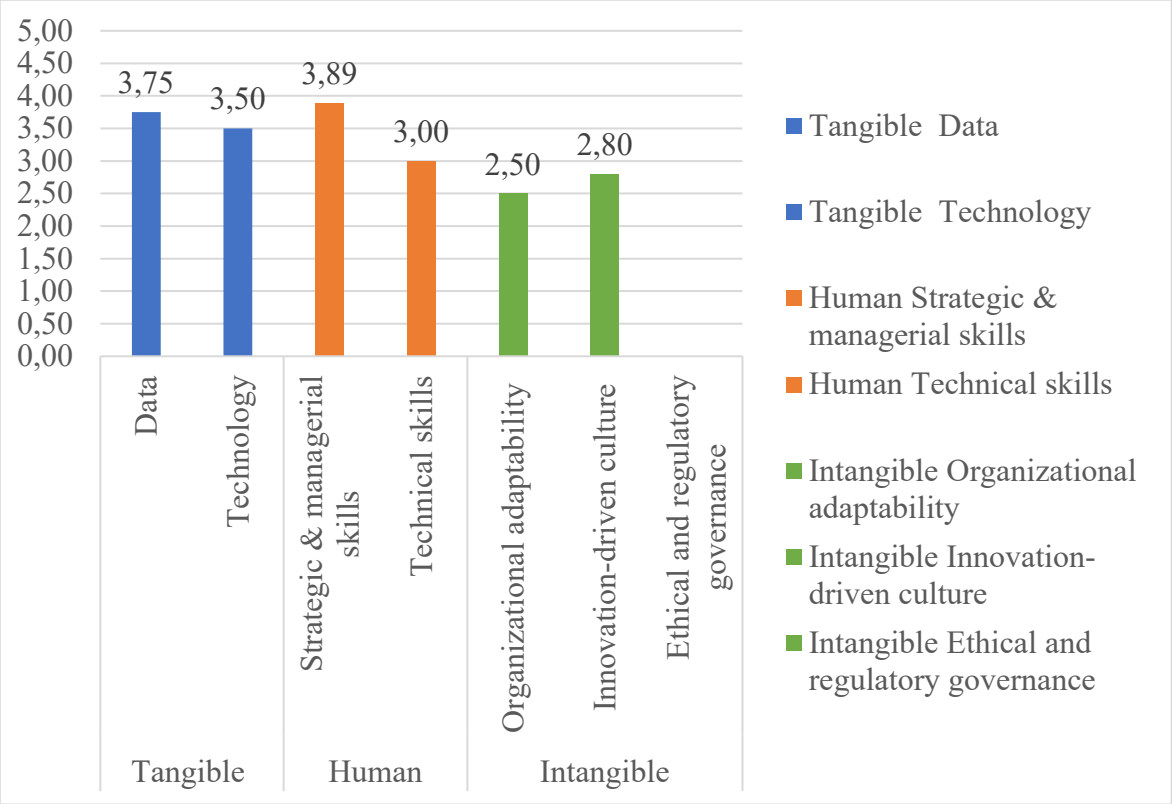



Figure 8 GAI capability model - resource type level scores

The category of intangible resources received the lowest score of 2,7 but was still considered moderately important by all companies. This score was primarily based on organisational adaptability and an innovation-driven culture, as ethical and regulatory governance was not directly addressed in the interviews. The relatively low score for this category suggests that the issues of organisational adaptability and culture are more abstract and deeply intertwined with the overall organisational values. The analysis suggests that more specific questions about organisational culture might have provided clearer insights. Given that all participating companies are recognised as strong innovators and performers in their industries, the actual importance of intangible resources may be understated in the results.

In conclusion, the GAI capability model shows a fairly good validity based on the analysis. However, it's important to recognise that the wider applicability of the model beyond industrial manufacturers and B2B sales remains uncertain and would benefit from further validation to confirm its effectiveness in other sectors.

## 5.4 Identified implementation challenges of GAI

Companies A, B and C identify a wide range of technical, strategic, and operational challenges as they move towards using GAI in their service businesses. One of the key issues is the perceived uncertainty around the tangible applications of GAI, combined with concerns about the investment required and the expected returns. This uncertainty is shared to some extent by all the companies interviewed, and is raised particularly by Company A. Even though all three companies recognise the potential of GAI and are in the process of exploring GAI, they have yet to identify concrete use cases. This gap between the potential benefits of GAI, which are recognised by all companies, and its practical implementation is further reinforced by a widespread concern about the results of GAI, which sometimes appear illogical or counterintuitive to end users, and this is a significant barrier to widespread adoption and confidence in these advanced technologies.

Another identified challenge is the potential skills gaps identified within the workforce, particularly in Company A's service sales force, pointing to the need to upskill and retrain employees, particularly in data literacy and AI in general, for the age of GAI. Both Companies A and C emphasise the critical need for high-quality, well-structured data to train GAI models, highlighting barriers related to data management, quality and availability issues that need to be overcome to use GAI effectively. In addition, concerns about cybersecurity and the trustworthiness of GAI tools are significant uncertainties that require rigorous attention to privacy. The complexity of integrating GAI into existing workflows is underscored by the need for comprehensive change management strategies and cultural shifts towards acceptance and trust of automated systems, a challenge that Company C specifically notes as requiring a change in mindset and extensive operational adjustments.

At the heart of successfully overcoming these challenges is the critical role of top management support and the cultivation of a culture that encourages experimentation and innovation, as highlighted by Companies A, B and C. This involves not only embracing new technologies, but also adapting to the rapid pace of development characteristic of the GAI field. Addressing the operational changes required for GAI integration, particularly in service sales, requires a concerted effort to overcome resistance to digital tools, often rooted in past experiences with data quality issues and failed digital initiatives. As these companies grapple with the task of translating GAI capabilities into tangible business success, the

journey underscores the multifaceted nature of preparing for and implementing GAI, from ensuring technical readiness and data integrity to fostering an organisational ethos that promotes adaptability and continuous learning.

## 5.5 Potential benefits of GAI and practical use cases in service business sales

This section presents the identified potential business benefits that the use of GAI in service business sales could lead to and summarises the potential practical use cases for GAI in industrial service business sales as envisaged by the case companies. The use cases are listed in Table 4. The interviewed companies share a strong consensus that despite the lack of concrete applications of GAI in their service business sales at present, and the many challenges and uncertainties surrounding GAI, it will have a significant impact. The potential benefits are similar to those already highlighted in sections 3.1. and 3.2. of the literature review from various academic and industry sources.

Table 4 Potential GAI use cases in service business identified by case companies

| Potential GAI use cases | Company A | Company B | Company C |
|---|---|---|---|
| **Personalization of Offers** | Utilize customer data to offer highly tailored solutions and services based individual customer preferences and requirements. | | Leverage operational (machinery sensor etc.) data and insights to offer highly tailored and timely solutions |
| **Customer Service Chatbots** | Use chatbots and virtual assistants that learn from customer communications | Not explicitly mentioned | Not explicitly mentioned |
| **Risk Management and Negotiation Support** | Enhance account risk ranking to help sales teams in making informed decisions, tailoring offers that account for potential risks identified | Not explicitly mentioned | Not explicitly mentioned |
| **Customer Self-Service in e-commerce** | Not explicitly mentioned | Not explicitly mentioned | GAI could enhance self-service capabilities of e-commerce platforms by learning from customer buying behaviour |
| **Support for Product Development** | Not explicitly mentioned | Not explicitly mentioned | Using GAI to analyse insights from machine operation and customer value perception can significantly enhance R&D, reducing time-to-market and boosting customer satisfaction. |
| **Predictive Maintenance Services** | Enhance predictive maintenance capabilities with GAI capabilities - Remote queries to machines in human language | Not explicitly mentioned | Enhance predictive maintenance by asking for ad hoc analysis of component wear and tear and suggested maintenance intervals + service packages |
| **Sales Process Optimization** | Use GAI for sales process optimization by reducing administrative work for sales team and enable a more customer-centric sales team. | | Leverage GAI to transform and expedite the identification process for spare parts and service needs and thereby significantly enhance tendering process for sales teams |
| **Enhanced Customer Satisfaction Analysis** | Not explicitly mentioned | Utilize GAI to improve the understanding of customer needs and feedback, thereby laying the groundwork for more effective sales strategies | Not explicitly mentioned |

In Companies A, B and C there is a strong belief that the introduction of GAI into their sales processes will improve sales process efficiency, customer loyalty and innovation. For Company A, GAI is emerging as a key tool for optimising sales processes, facilitating the

personalisation of offers through deep insights into customer data, and enabling a more customer-centric approach by reducing administrative tasks and allowing sales managers to focus on relationship management. This is complemented by the planned use of virtual assistants and sophisticated data analytics to streamline customer service and sales negotiations, underlining GAI's potential to significantly improve the quality of customer interactions and the effectiveness of sales strategies.

Similarly, Company B recognises the transformative power of GAI, particularly in improving customer satisfaction analysis as a basis for refining sales processes and customer engagement. Although specific GAI applications in sales are still being explored, the anticipated development of an enhanced customer satisfaction analysis tool in the near future highlights a strategic commitment to using GAI for operational improvement. Company C reinforces this narrative by targeting GAI applications around operational efficiency, specifically in the rapid identification of spare parts and equipment configurations. This focus aims not only to streamline service and maintenance tasks, but also to improve the customer service experience by ensuring faster, more accurate service solutions. Taken together, these insights from Companies A, B and C highlight the multiple business benefits of GAI, from operational efficiency and improved customer engagement to strategic sales and service capability enhancement, setting the stage for a new era of business innovation driven by artificial intelligence.

# 6 Conclusions

The premise of this thesis is based on the two major trends that have been evident in the industrial machinery sector, particularly over the past decade. First, industrial machinery manufacturers, which have traditionally relied on profits from the sale of new equipment, are facing increased competition, making product innovation alone insufficient to remain competitive. Second, the trend towards digitalisation has increasingly transformed equipment into 'smart' machines, capable of generating valuable data through connectivity and sensors. The combination of these two trends is catalysing a shift towards new service-oriented business models, which have emerged as a key competitive differentiator and a significant contributor to revenue and profitability, protecting companies from declining margins and the risk of product commoditisation.

Furthermore, the focus of this thesis is on the B2B sale of services in the industrial manufacturing sector, which is very different from product sales that are transactional, and feature based. Selling industrial services requires a long-term relationship approach that leverages deep knowledge and understanding of customers' operations and value drivers for success. However, while digitalisation enables the growth of the services business with new types of data-driven services, it also presents challenges in managing and integrating the large and diverse data assets generated, underlining the complexity of effectively using this data to drive sales.

Finally, the use of GAI has grown rapidly over the past year, underlined by its ability to generate content such as text or images using advanced DL models and neural networks. Consultancies such as McKinsey & Company predict that GAI will transform many business processes in the near future. Sales, marketing, and various customer interface functions are seen as key areas where GAI is expected to have the most profound impact, improving productivity, and adding value.

While B2B service selling and the use of AI technologies in the industrial manufacturing sector is not a new research topic, the specific impact, and organisational requirements of GAI on B2B service selling within the sector remain underexplored. This thesis has explored this notable research gap by first conducting a literature review, then an empirical analysis

of three global engineering companies, and finally discussing the required capabilities, challenges, and benefits of using GAI in industrial service sales.

## 6.1 Answering the research questions

This section provides comprehensive answers to the primary research question and the supporting questions outlined in this thesis. Beginning with the main research question, the discussion proceeds to address the supporting questions to explore the specific organizational capabilities required to deploy GAI, the potential challenges associated with deploying GAI, and finally the benefits that GAI offers in improving service business sales. Each question is addressed individually, ensuring a thorough exploration of the issues central to this research.

***How can GAI be used to support B2B sales of industrial services in the machinery manufacturing industry?***

GAI is an advanced AI technology that can generate new content from the vast amount of data used to train GAI algorithms. The technology most associated with GAI today is LLM-based solutions such as ChatGPT, which can generate text, audio, video, and program code. The content it generates is based on the patterns and structures it has identified in the training data. Based on the academic literature, expert reports and studies and case company interviews, GAI will revolutionize the B2B sale of industrial services in the engineering industry by significantly improving efficiency, personalization, and decision support. Through these lenses it's clear that GAI can serve as a central tool for streamlining sales operations and deepening customer engagement. For example, Company A's exploration of GAI for predictive maintenance and proposal automation illustrates how sales teams can shift their focus from administrative tasks to nurturing customer relationships and strategic selling, thereby improving efficiency and customer satisfaction. Company B's ambition to use GAI to analyze customer satisfaction data and optimize service offerings further highlights the potential of GAI to tailor sales strategies based on deep data-driven insights, making interactions with customers more relevant and impactful. Meanwhile, Company C's proactive approach to integrating GAI to improve field service operations and customer self-service platforms demonstrates GAI's versatility in improving service delivery and operational efficiency. These practical applications highlight GAI's capability to automate

routine tasks, generate personalized proposals based on customer data insights, and provide sales teams with powerful tools to make informed decisions, ultimately leading to a more dynamic, efficient, and customer-centric sales process in the machinery manufacturing industry.

*What are the key capabilities required from an organization to use GAI in service business B2B sales within the machinery manufacturing industry?*

Based on the academic sources and expert studies and reports, the key resources that an organization needs to possess are diverse, ranging from data and IT infrastructure to strategic insight and cultural attributes such as organizational adaptability and willingness to experiment. However, based on the research conducted as part of this thesis, it is suggested that the most important resources are strategic and managerial skills and data. These resources are the most critical that a company needs to build what is referred to in this thesis as GAI capability. GAI capability itself refers to a resource that is a combination of other resources that enables an organization to effectively use GAI as part of its business operations. This thesis proposes a GAI capability model, which is a modification of Gupta and George's (2015) BDA capability model. It is argued that the model is at least moderately valid and can therefore be used as a basis for determining whether an organization has the necessary resources to begin exploring the use of GAI.

*What are the main challenges for the utilization of GAI in service business B2B sales within the machinery manufacturing industry?*

The use of GAI in B2B sales of services in the machinery manufacturing industry faces several major challenges, as highlighted by academic sources and insights from company interviews. First, the adoption of GAI requires a high degree of organisational and technological readiness, which includes high quality data and an appropriate IT infrastructure. According to the case studies, these are often a challenge because data is scattered across different systems and is of inappropriate format or quality. There is also a need for a solid IT infrastructure and the technical skills to develop, manage and ethically deploy GAI solutions, of which the latter companies do not necessarily have at the moment, and which can be hard to come by in the current market. Another significant hurdle is the cultural and operational change required for sales teams to move from traditional methods to relying on GAI-driven processes. This includes overcoming resistance to change within

the sales force, bridging skills gaps such as increasing data literacy and general skills to adapt to technological change, and fostering a culture that embraces continuous learning and adaptability. In addition, ensuring data privacy, cybersecurity and addressing ethical considerations around the use of GAI remain critical concerns although not explicitly highlighted by the case companies. This is something quite new and novel for companies in the relatively traditional machinery manufacturing industry, where digitalisation itself has only really taken hold in the last decade. Finally, as companies navigate these challenges, it is paramount that a strategic investment in technology and people such as GAI is based on a clear strategic vision of how GAI can be integrated into sales processes. As GAI is such a new technology, this can be challenging due to all the unknown factors that still surround GAI. However, without it, it will be very difficult to realise the full potential of GAI to improve efficiency, personalisation, and strategic decision-making in B2B sales.

> *What are the potential benefits of using GAI in service business B2B sales within the machinery manufacturing industry?*

The use of GAI in B2B sales within the machinery industry offers a wide range of potential benefits, as highlighted by both academic sources and company interviews. GAI can transform sales efficiency by automating administrative tasks, allowing sales teams to focus on strategic selling and relationship building. It can improve the personalisation of sales strategies by analysing customer data, enabling sales professionals to tailor their offering more effectively to individual customer needs and preferences. In addition, GAI's predictive analytics capabilities can lead to more informed decision making, helping sales teams identify and prioritise opportunities with higher conversion potential. The technology also supports the development of innovative service offerings by providing insight into customer usage patterns and feedback, enabling a more customer-centric approach to product development and sales. Overall, the integration of GAI into B2B sales processes in the engineering industry promises to revolutionise the way companies engage with their customers, increasing sales efficiency and fostering a more adaptive and intelligent approach to sales and customer service.

## 6.2 Limitations

This study was conducted to assess the potential practical applications of GAI within the B2B sale of industrial services in the industrial manufacturing sector. While this work contributes to the understanding of the potential of GAI in B2B sales within the industrial manufacturing sector, it is important to acknowledge its limitations.

This research topic has not been extensively covered in the academic literature, which can be attributed to the relative newness of GAI as a subfield of artificial intelligence that has only recently gained prominence. Given the nascent nature of GAI and its application within the specified industry, this thesis has occasionally had to rely on non-peer-reviewed sources to establish a theoretical foundation, particularly in relation to the implementation of GAI in industrial manufacturing and B2B sales.

In order to gather empirical data on the potential use of GAI within the relevant context, interviews were conducted with three companies. These interactions were qualitative in nature, relying on semi-structured interviews to gain insights. However, relying on qualitative data through semi-structured interviews to understand the use of GAI has certain limitations. Firstly, all interviewees were service industry professionals rather than technical experts, which is notable given the technical complexity of GAI. This selection of participants may limit the depth of understanding of the technical nuances of GAI application. Secondly, although the companies interviewed are from a variety of manufacturing industries, they are all similar in that they are all large companies with significant resources and a global reach. These characteristics may limit the applicability of the study's findings to a wider range of manufacturers, particularly smaller and more local companies, as well as manufacturers that don't operate in the B2B space, which may not have the same capabilities as manufacturers.

Finally, the GAI capability model proposed in this thesis requires further validation. The validation process undertaken by the author was based on a Likert scale assessment of the model's validity, which is not sufficient for a thorough, comprehensive validation. A more robust study, involving a larger sample of companies and using some potential statistical methods to validate the findings, is required to increase the credibility and generalisability of the proposed GAI capability model.

## 6.3 Further research

This thesis represents a focused study in a narrowly defined area, specifically examining how GAI can support B2B sales of industrial services within the industrial manufacturing sector. Given the specificity of this scope, there is ample room for further research to expand on the findings and insights from this initial study.

An immediate avenue for further research stems from the limitations identified in the current literature review. The reliance on many non-peer-reviewed sources, while necessary due to the novelty of the topic and the scarcity of scholarly articles on GAI in this context, presents an opportunity for future studies to enhance academic rigour. A more thorough literature review using peer-reviewed sources could deepen the understanding of the role of GAI in B2B sales of industrial services, thereby strengthening the foundation on which this thesis is built.

Another promising direction for further research is to extend the empirical aspect of the study to include a wider range of manufacturers. By engaging with a more diverse and extensive sample of firms, future research could gather more data to support or refine the statements made in this thesis based on the literature reviewed. This expansion would provide a more comprehensive view of the applicability of GAI across the industrial manufacturing sector.

Furthermore, the GAI capability model proposed in this thesis, which is considered to be moderately valid based on the authors' assessment, requires further validation through an extended empirical study. Such a study would ideally include a significantly larger number of case companies and could also include a survey of relevant manufacturers to assess the validity of the model more rigorously. This approach would address one of the key limitations outlined above and contribute to a more robust and reliable framework for understanding the potential of GAI in the sector.

Finally, it is important to acknowledge that while this thesis contributes to filling a specific research gap in B2B sales in the industrial manufacturing sector, the findings of this study are not directly generalisable beyond its specific context. Therefore, a broader investigation of the impact of GAI on B2B sales across different industries represents a valuable research opportunity.

# 7 References

Amit Rand Schoemaker PJH (1993) Strategic assets and organizational rent. *Strategic Management Journal* 14(1): 33-46.

Andersson P, Axelsson B and Rosenqvist C, (2018) *Organizing Marketing and Sales: Mastering Contemporary B2B Challenges.* Bingley: Emerald Publishing Limited.

Annarelli A, Battistella C and Nonino F (2016) Product service system: A conceptual framework from a systematic review. *Journal of Cleaner Production* 139: 1011-1032.

Annarelli A, Battistella C and Nonino F, (2019) *The Road to Servitization how Product Service Systems can Disrupt Companies' Business Models.* Cham: Springer International Publishing.

Basso, M., Fendri, M., Seitz, K.-F., Triantafyllidis, K. & Küpper, D. (2023) *Harnessing the AI Revolution in Industrial Operations: A Guidebook.* World Economic Forum. Geneva, Switzerland: World Economic Forum.

Buchenau P (2023) *Strategic Sales Management: Insights and Guidance from Top Interim Managers.* Cham: Springer.

Cao Y, Li S, Liu Y, Yan Z, Dai Y, Yu P, et al., (2023) *A Comprehensive Survey of AI-Generated Content (AIGC): A History of Generative AI from GAN to ChatGPT.* arXiv.org. Ithaca: Cornell University Library, arXiv.org.

Chan L, Hogaboam L and Cao R, (2022) *Applied Artificial Intelligence in Business: Concepts and Cases.* Cham, Switzerland: Springer International Publishing.

Chowdhary KR (2020) *Fundamentals of Artificial Intelligence.* New Delhi: Springer India.

Chui, M., Manyika J, Miremadi M, Henke N, Chung R, Nel P et al., (2018) *Notes from the AI Frontier Insights from Hunders of use Cases.* Boston: McKinsey Global Institute.

Chui, M., Hazan E, Roberts R, Singla A, Smaje K, Sukharevsky A et al., (2023) *The Economic Potential of Generative AI the Next Productivity Frontier.* Boston: McKinsey & Company.

Company A. (2022). *Annual Report 2022*.

Company B. (2022). Annual Report 2022.

Company C. (2022). *Annual Report 2022*.

Dasgupta D, Venugopal D and Gupta KD, (2023) *A Review of Generative AI from Historical Perspectives.*

Dayan Mand Ndubisi NO (2020) B2B service innovation and global industrial service management. *Industrial Marketing Management* 89: 140-142.

Deveau, R. Griffin, S. J. Reis, S. (2023) *Growth, Marketing & Sales Practice AI-Powered Marketing and Sales Reach New Heights with Generative AI.* Boston: McKinsey & Company.

Fischer T, Gebauer H and Fleisch E, (2012) *Service Business Development: Strategies for Value Creation in Manufacturing Firms.* Cambridge: Cambridge University Press.

Friedli T, Osterrieder P and Classen M, (2021) *Managing Industrial Services: From Basics to the Emergence of Smart and Remote Services.* Cham, Switzerland: Springer.

Gal Yand Ghahramani Z (2016) Dropout as a Bayesian Approximation: Representing Model Uncertainty in Deep Learning. *arXiv.Org*.

Gerry D (2021) *Leveraging Big Data in A Sales Organization.* [Forbes]Retrieved [Nov 7, 2023] Available at: https://www.forbes.com/sites/forbesbusinessdevelopmentcouncil/2021/01/27/leveraging-big-data-in-a-sales-organization/?sh=369aab5a6cd3.

Goodfellow I, Jean Pouget-Abadie, Mirza M, Xu B, David Warde-Farley, Ozair S, Courville A and Bengio Y (2014) Generative adversarial networks. *Communications of the ACM* 63: 139-144.

Gupta Mand George JF (2016) Toward the development of a big data analytics capability. *Information & Management* 53(8): 1049-1064.

Hinson R (E, Adeola O and Amartey AFO, (2019) *Sales Management: A Primer for Frontier Markets.* Charlotte, North Carolina: Information Age Publishing, Inc.

Huang Mand Rust RT (2021) A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science* 49(1): 30-50.

Joshi, A., Kale, S., Chandel, S., & Pal, D., 2015. Likert Scale: Explored and Explained. *British Journal of Applied Science and Technology*, 7, pp. 396-403. https://doi.org/10.9734/BJAST/2015/14975.

Kanbach DK, Heiduk L, Blueher G, Schreiter M and Lahmann A (2023) The GenAI is out of the bottle: generative artificial intelligence from a business model innovation perspective. *Review of Managerial Science*.

Kar AK, Varsha PS and Rajan S (2023) Unravelling the Impact of Generative Artificial Intelligence (GAI) in Industrial Applications: A Review of Scientific and Grey Literature. *Global Journal of Flexible Systems Management* 24(4): 659-689.

Kingma DPand Welling M (2019) An Introduction to Variational Autoencoders. *arXiv.Org*.

Kohtamäki M, Baines T, Rabetino R and Bigdeli AZ, (2018) *Practices and Tools for Servitization Managing Service Transition.* Cham: Springer International Publishing.

Kreutzer RT and Sirrenberg M, (2020) *Understanding Artificial Intelligence Fundamentals, use Cases and Methods for a Corporate AI Journey.* Cham: Springer International Publishing.

Küpper, D., Kuhlmann K, Saunders M, Knapp J, Seitz K, Englberger J et al., (2023) *Generative AI's Role in the Factory of the Future.* Boston: Boston Consulting Group Boston.

Lapo, Mori, Richardson, Bryan, Saleh, Tamim, Sellschop Richard, Wells, Ian (2023) *Clearing Data-Quality Roadblocks: Unlocking AI in Manufacturing.* Boston: McKinsey & Company.

LeCun Y, Bengio Y and Hinton G (2015) Deep learning. *Nature (London)* 521(7553): 436-444.

McCharty, J. (2007) *What is Artificial Intelligence?* Stanford, CA: Stanford University.

Meierhofer Jü, West S and Buecheler T, (2023) *Smart Services Summit: Smart Services Creating Sustainability.* Cham: Springer.

Merriam SB and Tisdell EJ, (2015) *Qualitative Research: A Guide to Design and Implementation.* Newark: Wiley.

Moradi Mand Dass M (2022) Applications of artificial intelligence in B2B marketing: Challenges and future directions. *Industrial Marketing Management* 107: 300-314.

Myerholtz B, Rees S, Benaiges D and Lorenz M, (2020) *Industrial Machinery Faces a Decade of Disruption.* [BCG Insights]Available at: https://www.bcg.com/publications/2020/disruptions-faced-by-industrial-machinery-industry.

Myerholtz B, Rees S, Pieper C and Westerlund M, (2019) *Three Paths to Value Creation for Machinery Companies.* [BCG Insights]Available at: https://www.bcg.com/publications/2019/three-paths-value-creation-machinery-companies.

Ooi K, Tan GW, Al-Emran M, Al-Sharafi M, Capatina A, Chakraborty A, Dwivedi YK, Huang T, Kar AK, Lee V, et al. (2023) The Potential of Generative Artificial Intelligence Across Disciplines: Perspectives and Future Directions. *The Journal of Computer Information Systems*: 1-32.

Paschen J, Kietzmann J and Kietzmann TC (2019) Artificial intelligence (AI) and its implications for market knowledge in B2B marketing. *The Journal of Business & Industrial Marketing* 34(7): 1410-1419.

Stackpole, B. (2023) *For AI in Manufacturing, Start with Data.* Cambridge, MA: MIT Sloan.

Staebe M and Lustgarten T, (2022) *Thinking Outside the Machine Global Machinery & Equipment Report 2022.* [Bain Insights]Available at: https://www.bain.com/insights/topics/global-machinery-equipment-report/.

Syam Nand Sharma A (2018) Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice. *Industrial Marketing Management* 69: 135-146.

Taulli T (2019) *Artificial Intelligence Basics a Non-Technical Introduction.* Berkeley, CA: Apress.

Töytäri P, (2018), *Selling solutions by selling value in Practices and Tools for Servitization: Managing Service Transition* Springer: pp. 269-289. https://doi.org/10.1007/978-3-319-76517-4_15

Vlačić B, Corbo L, Costa e Silva S and Dabić M (2021) The evolving role of artificial intelligence in marketing: A review and research agenda. *Journal of Business Research* 128: 187-203.

West S, Gaiardelli P and Saccani N, (2022) *Modern Industrial Services: A Cookbook for Design, Delivery, and Management.* Cham: Springer Nature.

World Economic Forum (2022) *Unlocking Value from Artificial Intelligence in Manufacturing.* Geneva, Switzerland: World Economic Forum

APPENDIX 1. Interview questions

The following includes all the interview questions that were presented to the interviewees during the interviews. All questions were not explicitly raised as separate questions as the topic of some questions were covered as part of the discussion that was initiated related to another question. The questions were the authors own creation.

*Q1: Could you describe the core business areas, market position, and unique aspects of your company?*

*Q2: What variety of industrial services does your company offer, and how do they stand out in it's industry?*

*Q3: Who are your main customers, and what specific needs and challenges do they typically present?*

*Q4: In what ways does your company differentiate its services from competitors in the industry?*

*Q5: Could you describe your sales strategy and process for you service business?*

*Q6: What trends are you observing in your industry (service business), and how are they influencing your strategic decisions?*

*Q7: Could you describe your organizational structure, particularly focusing on service sales?*

*Q8: How would you describe your company's familiarity and understanding of AI and Generative AI technologies?*

*Q9: In what ways are you currently utilizing AI technologies in your business operations?*

*Q10: How does your company perceive the role and potential of GAI in the context of industrial services?*

*Q11: What experiences have you had with implementing or considering AI solutions in your sales processes?*

*Q12: What specific challenges have you encountered while implementing AI technologies in your business?*

*Q13: In what ways do you prepare and train your workforce for adopting AI and advanced technologies?*

*Q14: What role do you see for GAI in your product development or service innovation processes?*

*Q15: In what ways do you think GAI could enhance the effectiveness of your sales processes?*

*Q16: How might GAI enable more personalized and efficient service offerings to your clients?*

*Q17: In what ways could GAI improve how your company utilizes data in formulating sales strategies?*

*Q18: How could GAI enhance customer interactions and relationships in your view?*

*Q19: In what aspects do you see GAI reducing costs in your sales processes?*

*Q20: What skill gaps do you foresee in utilizing GAI for sales, and how might these be addressed?*

*Q21: What do you consider as the main barriers to adopting GAI in your sales operations?*

*Q22: What are your thoughts on how your customers might react to the introduction of GAI in your sales processes?*

*Q23: How do you think GAI can contribute to gaining a competitive edge in service sales?*

*Q24: What change management strategies do you think would be required for successful GAI integration?*

*Q25: What risk management strategies do you think would be necessary when adopting GAI in sales?*

*Q26: How do you perceive the current technological limitations of GAI affecting its application in your industry?*

*Q27: In what ways is your organization currently prepared or unprepared for adopting GAI technologies?*

*Q28: How do you think the market and your clients perceive the introduction of GAI in service sales?*

*Q29: What key capabilities do you believe are essential for successfully utilizing GAI in your sales operations?*

*Q30: How is your company planning or has built the necessary infrastructure to support GAI utilization?*

*Q31: What steps is your company taking to foster a culture that embraces technological advancements like GAI?*

*Q32: What major benefits do you envision GAI bringing to your service sales and client interactions?*

*Q33: In what ways could GAI enhance the customer experience in your service offerings?*

*Q34: How does GAI align with your strategies for becoming more customer-centric in sales?*

*Q35: How can GAI be a tool for competitive differentiation in your industry?*