UNIVERSITY OF TURKU

ABSTRACT

Abstract

This thesis examines the crucial issue of AI governance in companies and addresses the lack of clear governance frameworks that facilitate adopting and maximizing AI benefits.

Through a qualitative approach involving ten participants from the Bosch environment (Belgium, Netherlands, Germany, and Portugal), this study investigates the implementation of AI-driven tools and proposes insights for effective governance.

Companies should prioritize implementing Intelligent Process Automation by leveraging precise analyses and establishing clear internal guidelines. Moreover, creating dedicated teams, such as a data team, can significantly contribute to automating processes across different departments.

This research is built upon existing literature and knowledge in the field while providing unique insights by incorporating an internal perspective within Bosch. In practice, the recommendations from this study can be applied by creating specific teams within the company and emphasizing comprehensive documentation of AI processes and guidelines.

Further research could explore developing tailored approaches to suit specific company requirements. It is essential to acknowledge that a limitation of this study is the perpetual evolution of IPA.

Keywords | IPA governance, AI, automation processes, qualitative research, Gioia, Bosch

AI GOVERNANCE: THE IPA CASE

A Bosch Home Comfort case study

Master's Thesis
in Information System Science

Author:
Guillaume Manoukian

Supervisor(s):
Prof. Hannu Salmela

Company Supervisors:
Luisa Cuomo
Leandra Kohler

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LIST OF ABBREVIATIONS

AI: ....Artificial Intelligence

ANN: ....Artificial Neural Network

API: .... Application Programming Interface

BPA: ....Business Process Automation

BPM: ....Business Process Management

DSRPAI: ....Dartmouth Summer Research Project on Artificial Intelligence

EDI: .... Electronic Data Interchange

ERP: ....Enterprise Resource Planning

HC: ....Home Comfort

HTML:	Hypertext Markup Language
IIOT:	Industrial Internet of Things
IOT:	Internet of Things
IPA:	Intelligent Process Automation
ML:	Machine Learning
MRP:	Materials Resources Planning
PMIS:	Project Management Information System
RFID:	Radio Frequency Identification
RPA:	Robotic Process Automation
UI:	User Interface

1   INTRODUCTION

This chapter delves into the current state of Artificial Intelligence and shed light on the driving forces behind this thesis. The research motivations stem from Bosch Home Comfort's desire to incorporate increased automation processes and artificial intelligence into their business operations, also called Intelligent process automation. And an overview of the company's background. Furthermore, the conclusion of this chapter will present the research questions and outline the structure.

1.1   Background

AI (Artificial Intelligence) may be seen as a new phenomenon, but it has been going on for years; indeed, according to (Kaplan, 2019; Gartner, 2021), AI dates to the 1950s. However, only in the 1990s did AI play a significant role in business operations. This was primarily due to the emergence of neural networks and machine learning algorithms, which enabled computers to learn from data and make predictions without being explicitly programmed (Russell & Norvig, 2010).

In recent years, the rapid advancement of AI has brought forth significant transformations in society and businesses alike, such as self-driving cars to virtual assistants; its potential to reshape industries and drive unparalleled economic growth is undeniable (Russell & Norvig, 2016). As AI becomes increasingly prevalent, the need for proper AI governance has become crucial for companies. Effective AI governance encompasses successfully implementing AI-driven tools and their ongoing maintenance and management throughout their lifecycle.

1.1.1   Problem Statement

In the modern era of connectivity, interdependence, and globalizing, AI governance has become a critical component of business strategy, providing companies with a competitive advantage. It enables organizations to leverage AI-driven tools and automated processes to save costs and time, optimize resource allocation, and enhance operational efficiency. However, implementing AI in companies presents various challenges, including needing *"mindset adaptation and comprehensive employee training"* (Interview data manager Bosch Belgium, 2023). This thesis addresses the pressing issue of a clear Intelligent Process Automation governance framework for companies, which hampers the adoption and realization of the full benefits of AI in companies. As AI systems become

more sophisticated and wider, the need for frameworks to guide their deployment becomes increasingly urgent (Floridi et al., 2018).

As Intelligent process automation (IPA) is a rapidly evolving field that combines robotic process automation (RPA) with artificial intelligence (AI) and machine learning (ML) technologies to automate complex business processes, the need to clear governance is required.

Specifically, as a case study, the focus will be investigating IPA governance within Bosch, a multinational corporation. By examining the implementation of AI-driven tools and processes within Bosch, this research seeks to identify governance insights for companies grappling with AI adoption.

Given the incomplete guidance offered by the existing literature, this challenge presents an exciting opportunity for a thorough investigation.

1.1.2 Company Introduction

The researcher is currently conducting this study during their master's degree internship at Bosch Home Comfort Belgium, as the company agreed to be an essential part of this thesis. Bosch HC is seen in the Bosch environment as the *"Start-up"* division; according to my mentor and manager of the data team, Home Comfort can be seen as a blank page where risks can be taken, and disruption of processes can happen.

On the contrary, the automotive division of Bosch is seen as the most rigid division of the multinationals, as its German way of doing business and thinking is predominant. This way of thinking can be seen by its strict and rigorous work. This is absent in HC as the company tends to be younger, with younger teams, more autonomy from significant decisions, and a will to live with innovations.

Therefore, in Belgium/Netherlands, as it is the same entity, creating a data team that takes all automation processes, implementing artificial intelligence-driven tools, and information technology projects is unique in the Bosch environment. The etool manager of the company, who is part of a team, says, *"The data team is so unique in Bosch that the very top of the Home comfort division is analyzing every change in performance to see if they can fire some people to decrease the budget."* Nevertheless, tremendous implementations were done thanks to this team, such as EDI, bots, SAP customization…
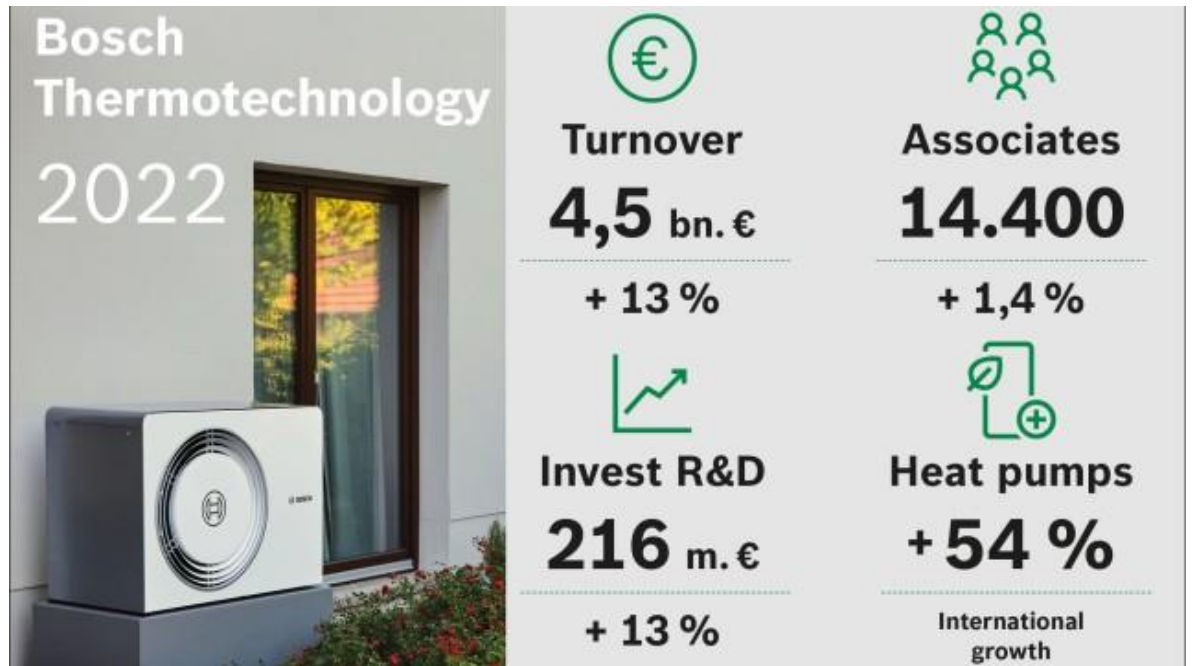
Figure 1: Data from Bosch Thermotechnology worldwide in 2022

As shown by this figure from Bosch Thermotechnology Worldwide, the level of investment in R&D is increasing from 2021 to 2022 by 13% to reach 216 million euros. Of course, these numbers are not tremendously high, but it is essential to remember that this subdivision is considered a "start-up" of Bosch worldwide.

1.2 Research Motivation and Relevance

The following relevance and research motivation analysis will help to understand the aim of the research and its contribution.

The AI market worldwide is estimated to grow up to 21 billion US dollars in market value by 2030 (NMSC), while it was valued at 4,4 in 2021. Artificial intelligence is growing fast, and the more it grows, the faster it will. Artificial intelligence-driven tools are responsible for tremendous changes in an organization, from their capacity to get rid of repetitive tasks to real-time help during a phone call from a client.
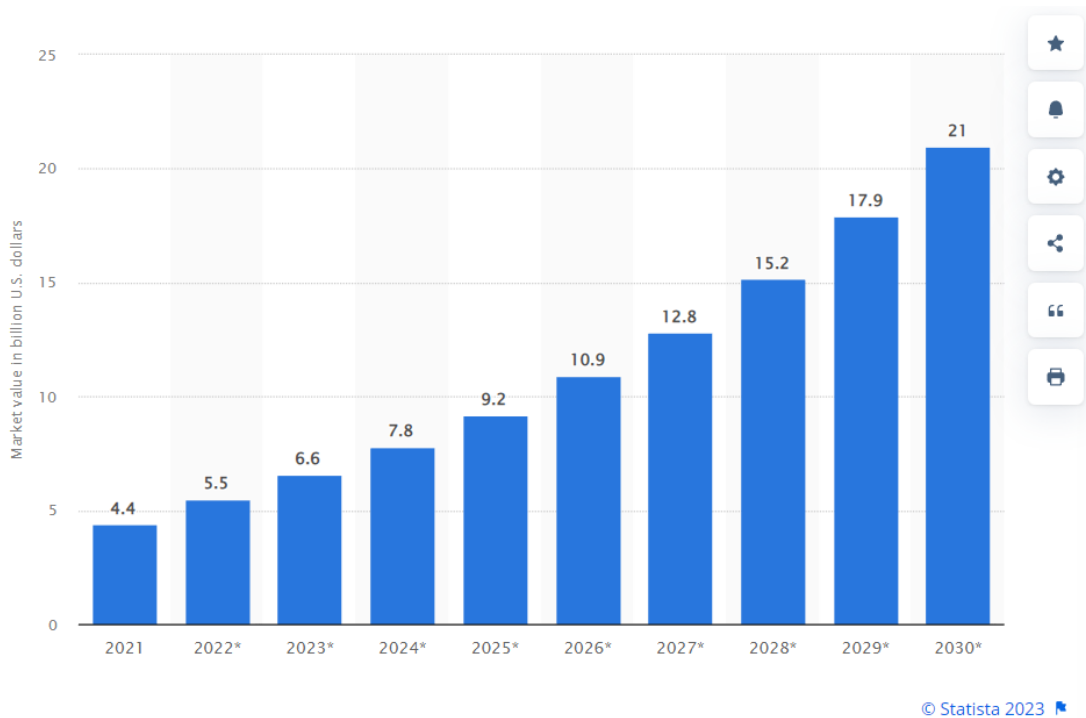
Figure 2: Market value of AI worldwide in USD

This figure clearly shows this exponential aspect of AI, as its market value is also exponential. It shows the expected market value increase from 2021 from 4,4 to 2030 21 billion USD, an increase of more than sixty billion worldwide. Therefore, gaining knowledge and answering a need for companies is valuable, especially for companies that want to implement new automation processes.

Additionally, the investment in AI is following the same trend as the market value.

Figure 3: Annual global corporate investment in AI in USD

This figure shows the annual corporate investment in AI from 2013 to 2021, from almost zero to more than 160 billion USD. NetBase Quid showed this tremendous increase in investment via their AI index report in 2022.

Furthermore, according to a report by Gartner (2019), IPA is the next big thing in the automation industry, with a predicted market growth of 55% between 2019 and 2022.

As Bosch is investing increasingly in AI and automation, and during the internship, many automation processes came to the desk; it was logical to start working on this. As said, it is the present and the future of business and society; instead of being afraid of it, there is a need to embrace it to understand it.

Therefore, this research contributes to AI governance, especially IPA governance by offering a fresh perspective derived from an internal examination of a company. The research methodology employed for this study adopts a qualitative approach, utilizing interviews with ten employees and colleagues from the Bosch environment across Germany, Belgium, and the Netherlands.

As multinationals like Bosch transcend geographical boundaries, they must grapple with the diverse legal and cultural landscapes of the countries in which they operate. Harmonizing AI governance across borders requires collaboration and coordination among governments, industry leaders, and international organizations (Boddington, 2017). Hence the will to interview people from different countries. These interviews provide valuable first-hand insights into the experiences and perspectives of individuals involved in AI implementation within Bosch.

Through interviews with a diverse range of employees, including managers, programmers, and project leaders within the Bosch environment, and an internal analysis, this study provides practical insights into the imp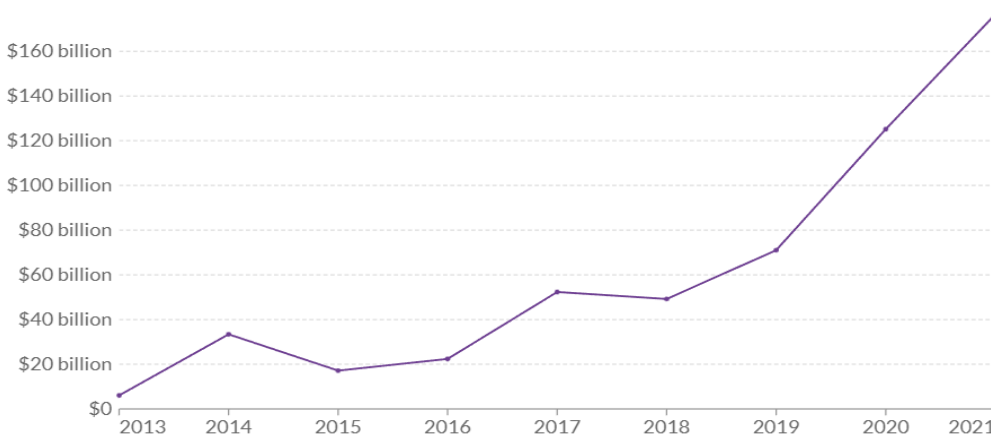lementation and governance of AI. By shifting the focus from theoretical aspects to the practical realities within a company, this research aims to pave the way for future studies and guide companies in their quest for effective AI governance.

1.3   Research Question

This thesis will answer the following research question:

"How can a company effectively govern Intelligent Process Automation?" This question lies at the core of understanding the governance of AI. This study will delve into the challenges associated with AI implementation, shedding light on the potential barriers and obstacles that companies can face.

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Understanding these challenges is crucial for developing comprehensive and practical solutions that enable companies to successfully navigate the complexities of AI governance. By identifying and examining these challenges, this research aims to contribute to a deeper understanding of the practical realities and considerations involved in integrating AI technologies into business processes. The challenges faced by multinational corporations in governing AI are multifaceted, encompassing legal, ethical, and societal dimensions. Ensuring fairness, equity, and unbiased decision-making in AI algorithms, guarding against data privacy breaches, and managing the potential displacement of human workers are just a few of the pressing concerns that demand comprehensive governance strategies (Jobin et al., 2019).

Therefore, they seek to identify a suitable strategy and provide insights to enhance adaptability and governance for companies grappling with AI adoption. It will be constructed around three sources of data: **(1)** a literature review and **(2)** ten user interviews with employees from the Bosch environment, **(3)** an internal analysis of Bosch processes.

1.4 Structure of the Research

Following this introduction, the paper will be structured with first a comprehensive literature review, encompassing the history of AI, a focus on business processes (BPA, RPA, IPA), and an examination of AI governance, without forgetting the case of customer creation bot in SAP in the Netherlands for Bosch Home Comfort. Subsequently, the research methodology is presented, detailing the Semi-structured user interviews approach taken for data collection and its analysis. The findings from the research and the internal analysis are then discussed, followed by an analysis and interpretation of the results within the context of AI governance. Finally, the last chapter will conclude this research.

1.5 Transparency

Furthermore, in the context of this paper's exploration of artificial intelligence, it is crucial to emphasize transparency regarding the utilization of publicly accessible AI technologies. With that in mind, it is essential to acknowledge that the assistance of an AI provider has aided in this paper's composition. Specifically, Grammarly played a role in enhancing the overall clarity and grammar, and vocabulary accuracy of the content. In addition, an AI website called audiotranscript.eu helped me with the transcript of the interviews.

2 LITERATURE REVIEW

This chapter analyzes and synthesizes various studies, and articles, to comprehensively understand the research problem.

This chapter then provides state-of-the-art Artificial intelligence and business processes like Business Process Automation, Robotic Process Automation, and Intelligent Process Automation. The definition and context are presented. This chapter will finally introduce different notions of governance from ethical to corporate points of view.

Therefore, existing literature will be studied to grasp the full knowledge and notions of AI governance and all linked subjects.

2.1 History of AI and ERP

Artificial Intelligence (AI) and Enterprise Resource Planning (ERP) intersection is a relatively new study area. Still, it has already shown tremendous promise in transforming how businesses operate. AI-powered ERP systems can improve efficiency, reduce costs, and enable more strategic decision-making by automating routine tasks, predicting outcomes, and providing insights into key performance indicators.

The history of AI and ERP can be traced back to their respective origins. ERP systems have been used since the 1960s, whereas AI dates to the 1950s (Kaplan, 2019; Gartner, 2021). However, only in the 1990s did AI play a significant role in business operations. This was due to the emergence of neural networks and machine learning, which enabled computers to learn from data.

Today, AI and ERP are increasingly used to achieve various benefits, including improved decision-making, predictive analytics, and process automation (Gartner, 2021). For instance, AI-powered analytics can provide real-time insights into supply chain operations.

The combination of AI and ERP systems has the potential to revolutionize the way businesses operate, providing real-time insights and automated decision-making capabilities that were previously impossible. For example, an AI-powered ERP system can analyze vast amounts of data to identify trends, predict outcomes, and make recommendations for improving operational efficiency and customer satisfaction. It can also automate routine tasks such as data entry and inventory management, freeing employees to focus on higher-value activities.

This chapter will explore the history of AI and ERP systems and how these two fields have converged. The key figures and their contributions, the significant milestones and setbacks, and the societal implications of this convergence will be examined. Also, provide real-world examples of how AI-powered ERP systems are already transforming manufacturing, healthcare, and finance businesses.

2.1.1 History of AI

Artificial Intelligence (AI) is a transformative technology that has revolutionized the way people live, work, and interact with each other. From intelligent personal assistants and autonomous vehicles to medical diagnosis and drug discovery, AI has the potential to solve some of the world's most complex problems and improve the quality of life in countless ways. However, the history of AI is long and complex. The roots of AI can be traced back to the early days of computer science when people like Alan Turing and John McCarthy began to explore the possibility of creating machines that could *"think"* and *"learn"* like humans (Russell & Norvig, 2010).

Firstly, the roots of artificial intelligence may also be found in philosophy or literature (Russell & Norvig, 2010). Early advancements in engineering, electronics, and many other fields have inspired AI. This field of AI has rapidly evolved over the past few decades (Kurzweil, 2005), not only for companies but also for society with the new OpenAI websites and tools such as ChatGPT or Dall-E, revolutionizing how society interact in their daily life with technology and changing the landscape of various industries. AI refers to creating intelligent machines that can perform tasks that typically require human intelligence (Nilsson, 1998), such as visual perception, speech recognition, decision-making, and language translation. Nevertheless, AI is way more than that; it touches all parts of society and can be implemented in all industries as it is possible to learn and adapt is tremendous (West, 2018).

As stated, Philosophy, Cinema, and Art, in general, have always seen AI broadly as the future of humanity, and this aspect has always captured the public's imagination. Since the 19th century, people have always fantasized about artificial intelligence robots; can think of Descartes's *"mechanical man"* or Jules Verne's fantastic travels, or even 20th century movies: *2001 A Space Odyssey* by Kubrick, *Blade Runner* by Ridley Scott, or even, *Star Wars* can be seen as a future of what society was seen at the time (Harvard Business Review, 2019). Talking about the last century, a big turn was made, from an imaginary point of view to a more demonstrative one, thanks to the rise of modern

computers after World War II like IBM (Gardner, 2021). One specific milestone was reached with the defeat of Gary Kasparov in 1997 by a program called Deep Blue (Burrell, 2016).

Figure 4: (Picture 1) Kasparov against Deep Blue in 1997

Speaking of turning point, *Mind* from Alan Turning (The Bombe) explains the historical imitation game and crystallizes concepts concerning the feasibility of programming an electrical machine to act intelligently.

Along with Turning, Isaac Asimov is considered one of AI's precursors. However, for literature, this time, with its story in Runaround back in the 1940s, depicts *"three laws of robotics"* stated as such: *"A robot may not injure a human being or, through inaction, allow a human being to come to harm. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. A robot must protect its existence as long as such protection does not conflict with the First or Second Law."* (Runround 1942). These laws made the upcoming literature and movies how society views robots. In *"The Feeling Economy: Managing in the Next Generation of AI"* by Huang, Rust, and Maksimovic, these authors demonstrate a fascinating aspect that AI systems will replace cognitive jobs in a way similar to how mechanical duties have been replaced by machines and robots, leaving human workers more and more involved in emotional tasks in the future.

The main turning point for artificial intelligence development at Harvard University was undoubtedly the *"logic theorist"* program presented at DSRPAI (Dartmouth Summer Research Project on Artificial Intelligence) in 1956. After this conference was held by McCarthy, success and setbacks were seen in this field.

ARTIFICIAL INTELLIGENCE TIMELINE
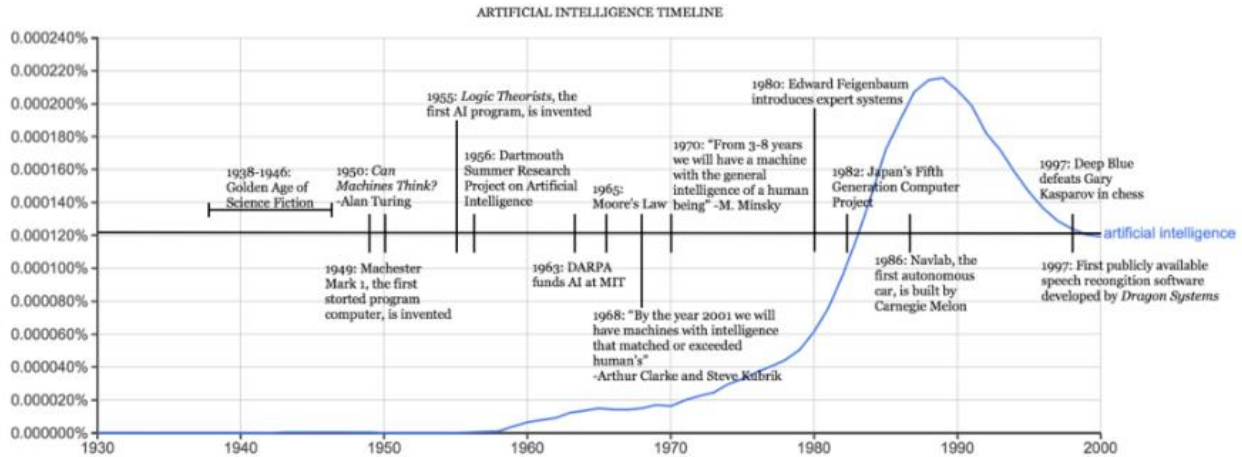
Figure 5: The Artificial Intelligence timeline

This figure shows the timeline of AI; it points out different eras of development, with a slow beginning with the golden age of science fiction literature and Alan Turing, until Dartmouth's summer research project on AI in 1956. From then, development, use, and interest grew, with more funding in 1963 from MIT, followed by Moore's law on the double of transistors in an integrated circuit. To hit its climax following the first autonomous car. From this figure, AI is a very new process in history. Nevertheless, as said, its roots date back in time, and its future is bright.

Due to the development of Big Data and advancements in computing power, it is a topic of discussion in both the corporate world and the public today. In *"Artificial Intelligence in Human Resources Management: Challenges and a Path Forward,"* Tambe, Cappelli, and Yakubovich, suggest when AI or humans should assume leadership and discuss how staff members could respond to various tactics. Advanced generative AI websites and tools are increasingly common and used by individuals.

Artificial Intelligence (AI) 's history is a fascinating journey spanning hundreds of years (McCorduck, 2004). It is a story of human ingenuity, innovation, creativity, the limitations of technology, and the complexities of human cognition. From the earliest myths of automata and golems such as the golem of Prague, through the philosophical debates about the nature of intelligence and the possibilities of automation, to the modern-day breakthroughs in machine learning and neural networks, the history of AI is filled with ups and downs, breakthroughs and setbacks, and a constant quest for greater understanding and progress (Russell & Norvig, 2010; Kelleher & Tierney, 2018).

One of the key takeaways from the history of AI is that progress in this field has been driven by a combination of theoretical insights, technological advancements, and

practical applications (Russell & Norvig, 2010). In the early days, AI was primarily a philosophical and theoretical pursuit, with researchers debating the nature of intelligence and the possibility of creating intelligent machines. Only with the advent of digital computers in the mid-20th century did AI research focus on developing practical applications, such as natural language processing and game-playing algorithms (Nilsson, 2010).

Over the years, AI has gone through several ups and downs, with periods of intense excitement and optimism followed by disillusionment and skepticism. In the 1950s and 1960s, researchers believed that machines would soon be able to do everything humans could, from playing chess to understanding natural language (Nilsson, 2010). However, by the 1970s and 1980s, progress in AI had stalled, and many experts began to doubt whether machines would ever be able to match human intelligence truly (Lighthill, 1973); these periods are called AI winter when funding for AI research dried up due to unrealistic expectations and disappointing results.
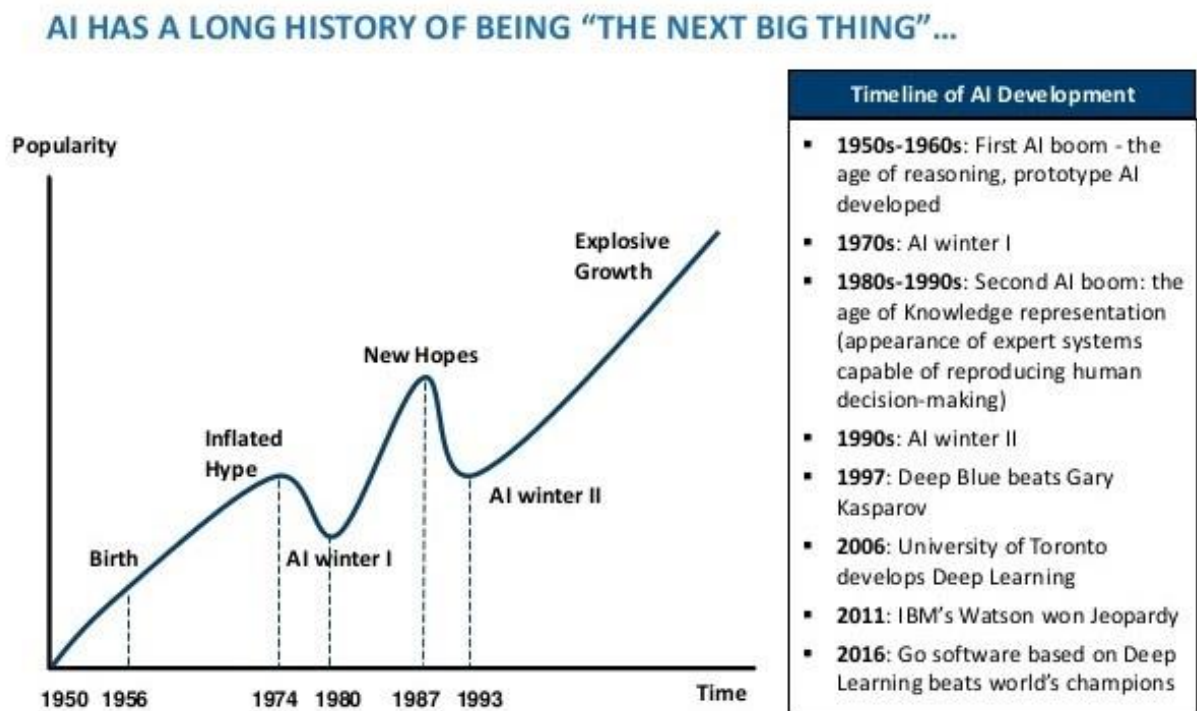
Figure 6: Timeline of AI development

This figure points out the timeline of AI development from 1956 to its actual birth, all the way to now. It shows different ups during the hype, hope, and explosive growth and downs, especially during the AI winters of 1980 and 1993.

Indeed, after experiencing a golden age for more than two decades (1953-1973), marked by significant discoveries. Optimism was in order, and funding was high. The first shudder occurred in 1966, with a study showing the inability of automatic translators

to transcribe Russian into English. A few budget cuts will follow this announcement. It led to the 1974 to 1980's great winter of AI. It is caused by adverse reports, especially that of the mathematician Lighthill. They highlight the need for concrete advances in AI (especially in robotics and language processing) and express doubts about discoveries shortly. As a result, the British government cut most of its research funding in this field. The return to strong interest in AI occurred in the 1980s, with Japanese and American projects leading to notable advances. The second winter of AI took place at the end of the 1980s (1987-1993). It again marked a halt in funding. Consumers moved away from AI (Lisp Machines) computers to newer and cheaper hardware without AI. With the emergence of deep learning enabled by the increase in computational capacities, notably via GPU processors, the 2000s are synonymous with a renewed interest in AI, which has remained strong since.

Today, AI is again experiencing rapid growth and innovation, with image and speech recognition breakthroughs in fraud detection and cybersecurity (Jordan & Mitchell, 2015). At the same time, concerns about the impact of AI on employment, privacy, and ethics have also become more prominent, highlighting the need for responsible and thoughtful development of AI technologies. Elon Musk and his pairs are asking for the reduction of ChatGPT's power. However, Goldman Sachs' insight on AI and its possible three hundred million jobs degraded or lost.

In conclusion, the history of AI is a rich and complex tapestry that reflects the aspirations, limitations, and potential of human ingenuity. Remembering past lessons and approaching the future with excitement and caution is essential. By doing so, society can ensure that the history of AI is one of progress, innovation, and a positive impact on humanity.

2.1.2   History of ERP

The history of Enterprise Resource Planning (ERP) is a story of technological evolution, organizational innovation, and business transformation. The history of ERP can be traced back to the 1960s when businesses first began to develop software to manage their manufacturing and inventory processes (Soltani, 2007) (Sumner, 2005). However, it was only in the 1990s that ERP systems became widely popular. Companies like SAP, Oracle, and PeopleSoft introduced integrated solutions that could handle multiple business functions and automate critical processes (Mabert et al., 2003). Over the years, ERP systems have played a crucial role in helping businesses streamline operations, improve decision-

making, and enhance customer satisfaction. They are complex software solutions that integrate various business functions and processes into a comprehensive platform, including finance, human resources, supply chain, customer relationship management, and more (Al-Mashari & Zairi, 2000). They have enabled organizations to gain a more comprehensive view of their operations, from finance and supply chain management to human resources and customer relationship management.

In this chapter, the history of ERP will be tackled. Examine the key milestones, technological advances, and business drivers that have shaped the evolution of ERP systems over the years. The evolution of ERP systems has been driven by a combination of technological advances and changing business needs. As businesses have become more complex and global, the need for integrated, real-time information and processes has become increasingly critical. ERP systems have responded to this need by incorporating various new technologies, from cloud computing and mobile devices to machine learning and artificial intelligence.

According to Davenport (1998), the origins of ERP can be traced back to reorder point (ROP) and materials requirement planning (MRP I and II) systems of the 1960s and 1970s (Adhikari & Ghosh, 2007). MRP systems were used to manage production schedules and inventory levels, but they were limited in scope and did not integrate with other business functions (Scheer & Habermann, 2000). In the 1980s, software vendors developed integrated systems to manage multiple business functions, such as accounting, inventory, and production. These early systems needed to be more functional, often expensive, and challenging to implement. Nevertheless, since the 1990s, ERP has become an essential tool for businesses of all sizes and industries. In addition, the Gartner Group defined Enterprise resource planning (ERP) at the beginning of 1990 (Wylie, 1990). According to a report by Gartner (2020), the global ERP market is expected to reach $41.7 billion by 2024. ERP systems have evolved to include cloud-based solutions, which offer greater flexibility and scalability, as well as advanced analytics and artificial intelligence capabilities.

In today's world, interconnection is everywhere between ERP and CRM developed under extended ERP or ERP II in the early 2000s. However, today, with all these new technologies available, not only talking about complex AI or machine learning but only talking about cloud or 5G, which are pretty standard now for everyone, ERP systems have continued to evolve over the past few decades, with advancements in technology, such as cloud computing, mobile devices, and artificial intelligence, providing new opportunities

for businesses to leverage their ERP systems (Botta-Genoulaz et al., 2005). They help to introduce cloud-based ERP (Hernes et al., 2020).

One of the earliest cloud-based ERP systems was NetSuite, founded in 1998 and offering a cloud-based business software suite. NetSuite was one of the first ERP systems to move to the cloud, and it paved the way for other cloud-based ERP vendors such as SAP, Oracle, and Microsoft (Berson, 2020). In addition, with the increased need for remote access to enterprise data with the growing trend of remote work, businesses require ERP systems that can be accessed from anywhere with an internet connection. Cloud-based ERP systems allow for this accessibility, which has become crucial in today's business landscape (Bala et al., 2019).

Nevertheless, more technologies and connectivity between systems and companies (Wang & Gao, 2020) increase its price and complexity, making it unaffordable for the SME industry (Cailean & Sharifi, 2014). The primary objective of ERP systems operating in the cloud is to optimize the utilization of existing resources, integrate them to achieve increased productivity, and enable the processing of large volumes of data within minimal time and cost (Jadeja & Modi, 2012). The switch to cloud ERP has been made thanks to tremendous spending for ERP cloud, with an increase of 15%-25% in 2016-2017 (Demi & Haddara, 2018).
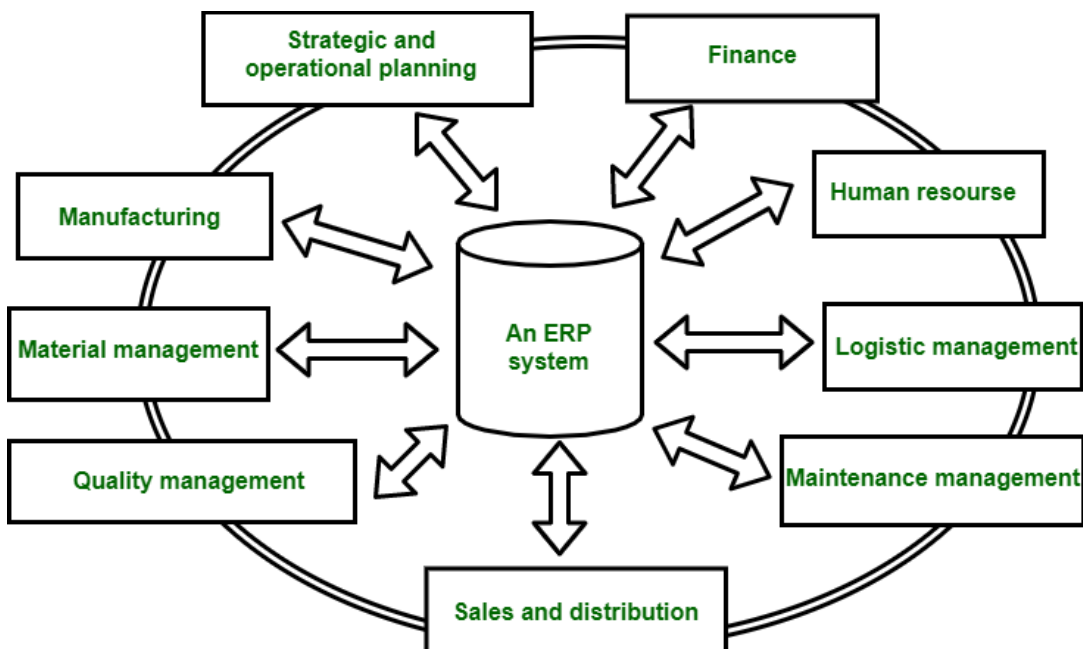

Figure 7: The ERP system process

All departments, from finance, to human resources, to quality management.

In conclusion, the history of ERP systems has seen tremendous growth and transformation over the years. From its inception as a materials requirement planning (MRP)

system in the 1960s to its current state as an integrated enterprise-wide system, ERP has played a pivotal role in helping organizations manage their resources more efficiently and effectively (Sumner, 2005). Integrating innovative technologies like AI, IoT, and cloud computing has increased their capabilities and expanded their potential applications (Al-Mashari & Zairi, 2000; Law & Ngai, 2007; Ma et al., 2016). In addition, adopting ERP systems has become increasingly prevalent, and studies have shown that factors such as firm size, industry type, and technological infrastructure affect ERP adoption rates (Yuan et al., 2018; Nah & Delgado, 2006).

However, despite the numerous benefits of ERP systems, their implementation takes time and effort. Studies have shown that factors such as resistance to change, lack of user involvement, and inadequate training and support can negatively impact the success of ERP implementation projects (Aladwani, 2001; Markus & Tanis, 2000). Therefore, it is crucial for organizations to carefully plan and manage their ERP implementation projects to mitigate these challenges and maximize the potential benefits of ERP systems. Nevertheless, the future of ERP systems appears promising as organizations continue to explore methods to simplify their operations and improve their competitiveness in the global market considering the emergence of cloud computing and Industry 4.0.

2.2   Business Processes

Business processes are the foundation of any organization and managing them efficiently is crucial for success. Over the years, businesses have tried to improve their processes through various means, such as automation and management. Automation involves using technology to perform tasks once done manually, while management focuses on optimizing and monitoring processes to achieve the desired outcomes. The combination of both has resulted in a significant shift in how businesses operate.

The importance of business process automation and management cannot be overstated. It has become critical in gaining a competitive edge and increasing efficiency in today's fast-paced business environment. With technological advancements, businesses can automate more and more of their processes, reducing errors and increasing productivity. Additionally, effective process management allows for better control and visibility into operations, enabling organizations to make data-driven decisions and improve overall performance.

This chapter will explore the history and evolution of business process automation and management and the different approaches and technologies used to achieve them.

Examining case studies and literature reviews to gain insight into the benefits and challenges of implementing these strategies and discuss best practices for successful implementation. By the end of this chapter, readers will better understand the role of automation and management in modern business processes and the potential impact on organizational success.

2.2.1 Business Process Automation

Business Process Automation (BPA) is a concept that has been extensively studied and researched in recent years. According to Hsieh, Lu, and Tzeng (2019), BPA is using technology to automate repetitive, manual tasks and processes, allowing organizations to streamline operations and focus on higher-level tasks. BPA has emerged as a game-changer in today's fast-paced business environment, where time is a critical resource (Vorakulpipat & Hengjakul, 2020). It has revolutionized how organizations conduct their daily operations, providing various benefits, including increased productivity, reduced errors, enhanced customer service, and cost savings (Sáenz & Álvarez, 2019). BPA is not a new concept; it has been around for several decades, but recent technological advancements have made it more accessible and affordable for organizations of all sizes (Hsieh et al., 2019).

Despite the numerous benefits of BPA, it also poses some challenges. According to Sáenz and Álvarez (2019), organizations must consider factors such as the cost of implementation, the impact on employees, and potential security risks. Additionally, some businesses may face resistance to change, as employees may fear losing their jobs or have concerns about the reliability of technology.

In their study, Vorakulpipat and Hengjakul (2020) examined the impact of BPA on organizational performance and found that it positively affected productivity, efficiency, and customer satisfaction. They also highlighted the importance of BPA in improving data quality and reducing errors in business processes. In another study, Hsieh, Lu, and Tzeng (2019) analyzed the different types of BPA tools and technologies available and evaluated their effectiveness in improving business operations. They concluded that BPA could significantly enhance organizational performance by automating routine tasks, reducing manual errors, and improving process efficiency. In a study on the impact of BPA on employee engagement, Sáenz and Álvarez (2019) found that BPA can have both positive and negative effects on employee engagement. While BPA can improve job satisfaction and reduce workload, it can also lead to job insecurity and reduced job autonomy.
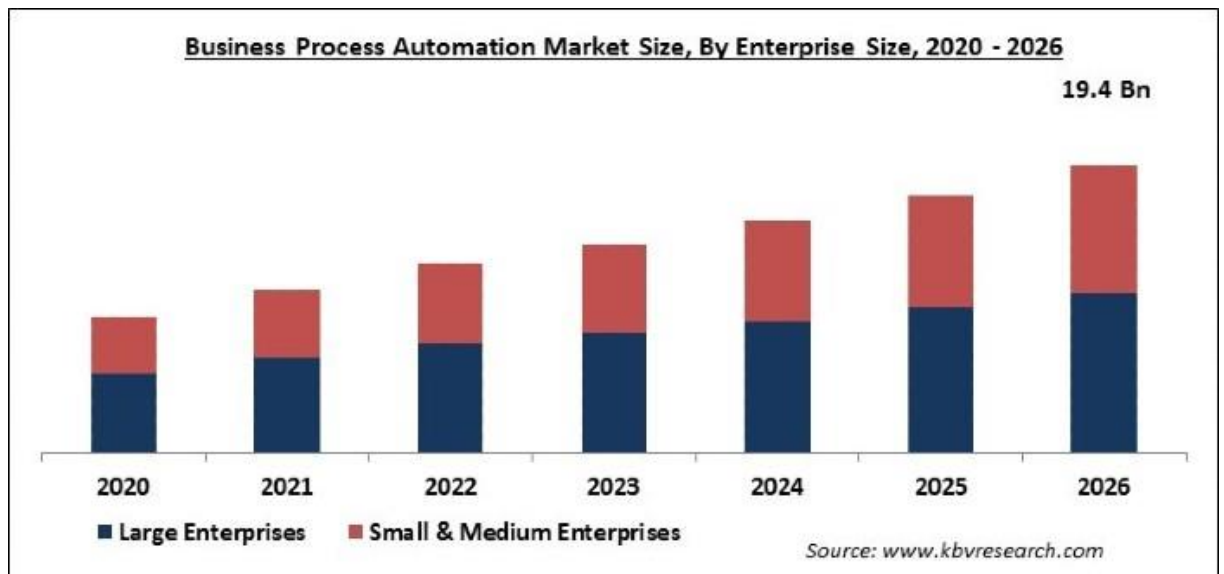
Figure 8: Market size for BPA by enterprise size (SME & Large)

In this figure, the level of market size per enterprise (large or SME) for BPA is shown. There is a constant growth of both SMEs and large organizations. Furthermore, SMEs will almost reach the level for large organizations by 2026 with 19,4 billion USD. From this, the expectations show that companies will continue investing massively in BPA as it is the first step for authentic and powerful automation. That may lead to robust AI-driven tools.

BPA and business process management (BPM) as it is a required field for all companies if they want to compete on all levels. In order to accomplish organizational objectives, BPM entails the analysis, design, implementation, monitoring, and optimization of business processes. Through the identification of problem areas, the elimination of waste, and the reduction of bottlenecks, BPM seeks to enhance business processes. Roles, responsibilities, and workflows must also be defined as part of BPM to guarantee that business operations are carried out correctly and efficiently.

A strong BPM is needed to achieve better process management; the level of spending in the BPM industry is expected to reach $16 billion by 2023. Studies have shown a link between BPM and BPA. According to a survey by Mims and Piccoli (2018), BPM and BPA are complementary approaches to improving organizational performance. The study found that organizations combining BPM and BPA achieve more remarkable process improvement and efficiency than those focusing solely on BPM or BPA. Furthermore, Ravichandran and Rai (2019) found that successfully implementing BPA requires a strong

BPM foundation. The study found that organizations with a well-defined BPM strategy and process architecture were more successful in implementing BPA than those without.

Talking about BPM means also thinking of Project management, as it can benefit from them; according to Bakens (2010), *"Project management is not easy regarding the complexity, uncertainties and a large number of activities involved, even in a single project environment."* by applying their techniques to project management processes. Numerous studies have highlighted the link between BPM, BPA, and project management; as stated by Yasin et al. (2021), the significance of BPM and automation technologies has grown considerably in today's rapidly evolving business landscape.

Organizations that adopt these technologies can obtain a competitive edge in their respective markets. For instance, a study by Shenhar et al. (2018) found that process management is a critical success factor for project management, as it enables the effective management of project-related processes. Another study by Saaty and Vargas (2017) found that integrating BPM and project management can help to improve project outcomes by providing a structured approach to project planning, execution, and monitoring. Indeed, big corporations utilize PMIS (Project Management Information System) to simplify the process of making effective decisions and managing information efficiently (Radovic-Markovic & Vucekovic, 2015).

Overall, insights into the potential of BPA and BPM and their implications for organizations have been presented. Adopting these technologies is essential for organizations seeking to remain competitive in today's rapidly changing business environment. As such, organizations must carefully evaluate their business processes and identify opportunities for automation and optimization to achieve their strategic objectives.

2.2.2 Robotic Process Automation

Robotic process automation (RPA) technology has its roots in Business Process Automation (BPA) and has evolved over the years to become more advanced and sophisticated; the focus has shifted towards automating more complex tasks using software robots that can perform a range of functions, from data entry to decision making (Schatsky et al., 2016). Indeed, Jovanović, Durić, and Šibalija (2018) defined RPA the following way *"refers to technologies that use the user interface to conduct activities in the same manner that humans do."*

Robotic Process Automation (RPA) is a rapidly evolving technology that has garnered significant attention in recent years. According to a report by Grand View Research

(2021), the global RPA market size was valued at USD 1.89 billion in 2020; Forrester Research expects the RPA market to reach \$2.9 billion by 2021 (Lesjak, 2018), almost +1 billion in only a year, and is expected to grow at a compound annual growth rate (CAGR) of 33.6% from 2021 to 2028. RPA has the potential to revolutionize business processes by automating routine, mundane, and repetitive tasks that humans typically perform. This technology can significantly reduce human errors, enhance process efficiency, and enable organizations to achieve greater productivity.

The use of RPA has been increasing across a range of industries, including healthcare, manufacturing, and finance. In the finance industry, RPA has been used for automating repetitive tasks such as data entry, account reconciliation, and report generation (Wickramasinghe et al., 2019). RPA has been applied in healthcare to automate patient registration, appointment scheduling, and insurance claims processing (Oliveira et al., 2020). Similarly, RPA has been used in manufacturing to automate supply chain processes such as inventory management and order tracking (Wong et al., 2021).

RPA is a new and developing technology in business process automation. The main objective of RPA is to enable swift and easy automation by implementing a user interface automation layer instead of engaging deeply with the application code, database, or system that supports those applications. There are three approaches made by Gao J et al (2019) and Han X et al, (2020).

-The first approach involves teaching RPAs to automate tasks through observation or demonstration. RPAs may directly observe human actions or analyze the software's behavior logs. -The second strategy consists in acquiring skills through natural language textual instructions that outline the steps involved in the process. -The third strategy involves acquiring knowledge from a task defined by a surrounding environment with its reward mechanism or input/output examples. This approach, commonly known as RPA 2.0, aims to remove the need for human-dependent training. RPA can work alongside humans, and its integration with existing systems is easy, making it a popular choice for organizations (Yoo et al., 2019).

Indeed, for Ribeiro et al. (2021), RPA is *"the automation of services tasks that reproduce the work that humans do"* it highlights that RPA is not created to replace people but to help them in daily, repetitive, and annoying tasks, such as taking orders from customers, instead of putting orders from emails to a production system, employees can work on more critical tasks and broaden their knowledge and horizons. As said in the introduction, the RPA tools demand is through the roof since 2016, and some research where these

tools are used for automating digital forensics (Asquith et al.; G., 2019), auditing (Moffitt et al.; M. A., 2018) and industry (Madakam et al., D. K. 2019). As well as the use of IoT to increase data collection, such as intelligent devices to improve RPA learning. This connected work between employees and *"robots"* allows a 30% to 50% decrease in operational costs, especially in transactional activities (Williams et al.; I., 2017).

Manual, expensive, error-prone process	Automated through RPA in 2 weeks
Tens of thousands of life insurance policies in **suspense** that need to be remediated	Robots developed on an RPA platform within **two weeks** by a Digital McKinsey team
Regulatory pressure on the client from multiple state regulators to bring policies out of suspense before the deadline	Suspense-remediation activity **automated** & executed by robots. Number of robots highly scalable (no additional training time/robot). Policy-conversion time for each policy reduced by 50%
30+ individuals working on remediation on a daily basis; five to seven minutes of manual effort required to bring each policy out of suspense	Skilled **resources freed** up to work on higher-value activities. Human errors mostly eliminated
3-4 weeks of training to bring a new individual onboard and make them productive	80% reduction in **process cost**. Tremendous improvement in **process quality, logging, and auditability**

Figure 9: The help of Robotic process automation in the company

As McKinsey shows, the productivity gain from RPA alone is significant. It points out the rapidity and the cost and time-saving aspect of RPA for a company, including an 80% reduction in process cost as week as more skilled workers with a higher value for the company that can work on more exciting tasks.

In conclusion, robotic process automation (RPA) has emerged as a powerful tool for automating repetitive and time-consuming tasks in various industries. The use of RPA is expected to proliferate in the coming years due to its ability to improve operational efficiency, reduce costs, and increase accuracy. As organizations continue to embrace digital transformation, the demand for RPA will likely increase, and RPA systems will become more advanced and sophisticated. RPA is still a relatively new technology, with many opportunities for further research and development. Systems can automate increasingly complex tasks and processes as they become more intelligent and capable. Researchers are exploring new approaches to RPA, such as machine learning and cognitive automation, which will enable RPA systems to learn from experience and make decisions based on data.

The potential benefits of RPA are more comprehensive than large enterprises. Small and medium-sized businesses can also benefit from RPA by automating manual tasks and streamlining operations. RPA is a flexible and scalable technology that can be customized to meet the specific needs of each organization. Overall, the future of RPA looks bright, and it will continue to transform how organizations operate. As Gagne et al. (2019) point out, *"RPA technology is rapidly evolving, and its full potential is yet to be realized."* As technology advances and becomes more sophisticated, it has the potential to revolutionize the way businesses operate and compete in the global marketplace.

2.2.3 Intelligent Process Automation

"The convergence of AI, automation and customer data has now seen the emergence of a new class of tools, known as intelligent process automation (IPA)" Tuttle (2019). Intelligent process automation (IPA) is a rapidly evolving field that combines robotic process automation (RPA) with artificial intelligence (AI) and machine learning (ML) technologies to automate complex business processes (Tuttle, 2019). IPA enables organizations to streamline operations, reduce costs, and improve productivity by automating routine tasks and decision-making processes that would otherwise require human intervention.

The report also highlights the benefits of IPA, such as increased operational efficiency, improved accuracy and quality, and enhanced customer experience. IPA can also help organizations stay competitive in today's fast-paced business environment by enabling them to quickly adapt to changing market conditions and customer needs (Fingar, 2020). IPA combines five core technologies RPA, Machine Learning, cognitive agents, natural language generation, and innovative workflow; these technologies help to create intelligent tools that can perform complex tasks such as natural language processing, image recognition, and predictive analytics. These bots can also learn from their experiences and make decisions based on real-time data, enabling them to continuously improve their performance over time (HBR, 2021). Overall, IPA represents a significant opportunity for organizations to automate their business processes and gain a competitive advantage.

AAAI (Association for the Advancement of Artificial Intelligence), the virtual AI conference, hosted the first workshop on IPA in 2020. Even though it is such a new domain, that information is not available, nevertheless it can become the future of society as it might become important in the coming years. IPA reaches for more complex automation thanks to AI. Contrary to RPA, its goal is to minimize human-dependent training while automating complex decision-making tasks.

McKinsey reports show that automating 50-70% of tasks has resulted in 20-35% yearly savings and decreased straight-through processing time by 50-60%. Consulting firms have the same results experts such as Accenture (2017) and Forrester (2018); their reports show that IPA can automate up to 70% of business processes, leading to cost efficiencies of 20-35% and a reduction in process time of up to 60%. IPA's return on investment (ROI) is also in triple digits, making it a desirable investment for businesses seeking to improve their bottom line. Intelligent process automation (IPA) is a rapidly growing field that has the potential to transform the way businesses operate. As discussed in this chapter, IPA combines the power of artificial intelligence and machine learning with robotic process automation (RPA) to automate complex business processes, resulting in significant cost savings, improved efficiency, and enhanced customer experiences.

Several tools exist to help the rapid growth of IPA, such as Kofax, Automation Anywhere, or UiPath. The tools offered by Kofax and Automation Anywhere integrate various RPA processes with connections to ERP systems, particularly SAP ERP. These proprietary tools typically incorporate algorithms that align with the goals of AI, this encompasses the identification, enhancement, categorization, and retrieval of knowledge from both RPA documents and processes. By leveraging a blend of user interface (UI) interactions and Application Programming Interface (API) connections, one can effectively manage mainframes, client servers, and Hypertext Markup Language (HTML) code. This enables the execution of verifications on structured data (Miers et al., 2019).

Despite its many benefits, the adoption of IPA is still in its early stages, and with any new technology, there are challenges associated with implementing IPA. The lack of skilled personnel, integration issues with legacy systems, and concerns around data privacy and security are some challenges that organizations may face (Bloomberg Tax & Accounting, 2019). However, with the increasing availability of AI and RPA technologies and the growing need for businesses to remain competitive in an ever-changing marketplace, the demand for IPA solutions will continue to proliferate. In conclusion, IPA is a powerful technology that can revolutionize business operations, leading to significant cost savings, increased efficiency, and enhanced customer experiences. As more and more businesses recognize the benefits of IPA and as it continues to evolve and mature, further advancements in this field can be expected, with even more sophisticated automation capabilities and improved efficiency (Adhikari & Pal, 2020; Gartner, 2019).
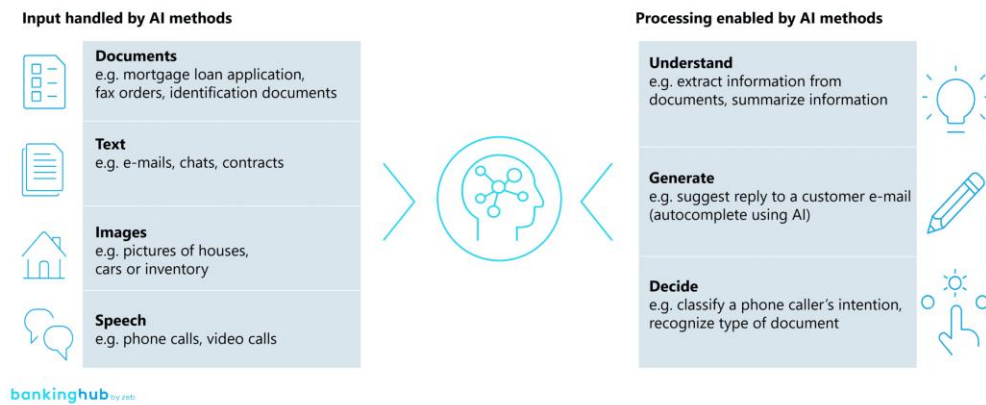
Figure 10: Internal process of Intelligent process automation

As IPA is the *"merge"* between AI and RPA, this figure shows how IPA works with the input dealt with by AI methods such as documents or images. On the other hand, the intelligent process of understanding, generating, and deciding.

In conclusion, business processes are critical to the success of any organization, and automation and management play a vital role in improving their efficiency and effectiveness. Therefore, organizations must invest in the automation and management of their business processes to improve performance and stay ahead in today's dynamic business environment. However, it is essential to note that implementing automation and management strategies requires careful planning and execution to avoid potential challenges and pitfalls. Organizations must ensure that the processes they automate are well-defined and standardized to achieve maximum efficiency. Moreover, they must ensure that their management strategies align with their business objectives and provide continuous monitoring and improvement.

2.3 AI Governance

AI has emerged as a transformative force across various domains, from healthcare and finance to transportation and entertainment (Mittelstadt et al., 2016). As AI continues to permeate society, examining and understanding the governance frameworks that guide its development, deployment, and impact has become increasingly vital. The governance of AI encompasses a complex web of policies, regulations, ethical principles, and societal considerations that aim to ensure the responsible and beneficial use of this powerful technology (Jobin et al., 2019).

Effective governance is crucial to address algorithmic bias, data privacy, accountability, transparency, and the potential socioeconomic implications of AI adoption

(Buchanan et al., 2018). By establishing comprehensive frameworks, institutions and policymakers can mitigate risks, foster trust, and harness the potential of AI for the betterment of humanity. The literature on the governance of AI offers a rich tapestry of insights, theories, and empirical studies that shed light on the multifaceted dimensions of this intricate field. This chapter is a comprehensive exploration and synthesis of the existing scholarship, aiming to provide a comprehensive understanding of AI governance approaches and challenges.

This review will analyze and integrate critical themes and perspectives within AI governance by drawing on various academic sources, research articles, policy documents, and industry reports. By examining theoretical frameworks and practical implementations, this chapter seeks to identify best practices and gaps in the governance landscape, ultimately contributing to the ongoing discourse surrounding AI's responsible and effective governance. This chapter delves into the multifaceted dimensions of AI governance, examining the ethical, legal, social, and technical considerations associated with the responsible use of AI. The rapid advancement of AI has raised several ethical concerns, such as biases in algorithms, privacy breaches, and the potential for AI to perpetuate discrimination or harm (Bostrom & Yudkowsky, 2014). AI governance aims to address these concerns by establishing guidelines for transparency, accountability, fairness, and explainability in AI systems (Schermer, 2011). It encompasses principles and frameworks for ethical decision-making, risk assessment, and regulatory compliance to ensure that AI technologies are developed and used to align with societal values and respect individual rights (Floridi et al., 2018).

Moreover, the legal landscape surrounding AI is complex and ever evolving. Intellectual property, data protection, liability, and privacy laws are just a few of the legal aspects that must be considered in the governance of AI (Calo, 2017). The societal impact of AI must be noticed. AI can disrupt labor markets, reshape industries, and influence social dynamics (Brynjolfsson & McAfee, 2014). AI governance aims to mitigate the negative consequences of AI deployment and ensure its benefits are distributed equitably. This chapter explores the social implications of AI and discusses strategies for promoting inclusivity, diversity, and fairness in the development and deployment of AI systems (Jobin et al., 2019). Lastly, the technical aspects of AI governance encompass considerations such as algorithmic transparency, interpretability, and bias detection (Wachter et al., 2017). This chapter delves into the technical challenges of governing AI systems,

examining approaches and methodologies for auditing and monitoring AI algorithms to ensure compliance with ethical and legal standards.

2.3.1 Ethical Governance

Governance of AI is a topic that emerged a few years ago with the boom of artificial intelligence in companies and society. Nevertheless, through the years, there was a significant change in governing. For several authors, research and theory went from an all-ethical point of view to a *"rush for pure governance."*

Corinne Cath and Lipton & Steinhardt point out three essential points in AI governance:

2.3.1.1 Ethical Concerns

This addresses the primary ethical concerns brought forth by AI, encompassing topics like fairness, transparency, and privacy. It also explores how to tackle situations where AI deployment can result in widespread discrimination. Furthermore, it examines the allocation of services and goods, highlighting the utilization of AI by industry, government, and companies. Lastly, it delves into the ethical considerations surrounding economic displacement caused by automation driven by AI, particularly addressing the responsible approach toward the loss of jobs.

2.3.1.2 Explainability and Interpretability

They are potential means to enhance algorithmic fairness, transparency, and accountability. In Europe, there is an ongoing debate surrounding the *"right to explanation"* concept for algorithmic decisions. Nevertheless, on the website of the European Commission, it is possible to see that the fifty-two members of the Commission on the implementation of a European AI strategy are made for more than half from the industry, and only four from civil society, which is the most affected by these changes. This right would empower individuals to request an explanation when an algorithm makes decisions that impact them, such as denying a loan application. However, the assurance of this right is still being determined. Additionally, there is a need to determine what constitutes an *"ideal algorithmic explanation"* and how these explanations can be effectively integrated into AI systems.

2.3.1.3 Ethical Auditing

In the case of intricate and opaque algorithmic systems, accountability mechanisms cannot solely depend on interpretability. Instead, proposed solutions advocate for auditing mechanisms that assess the inputs and outputs of algorithms to identify bias and potential harm without necessarily delving into the system's inner workings. In addition, Brynjolfsson & McAfee (2017) show that machine learning methodologies frequently generate social biases that stem from programming decisions and the training data employed. These biases can pertain to factors like individuals' gender and ethnic background, influencing their access to equal opportunities. Given the complexity of these systems, it becomes exceedingly challenging to identify such biases and formulate practical *"debiasing"* algorithms. Furthermore, Cadwallar & Graham-Harrison (2018) and Muller (2016) tackle another kind of challenge linked to the use of AI itself about algorithmic technologies have been leveraged to undermine democratic processes and exert control, potentially leading to societies characterized by extensive surveillance and pervasive scoring systems that impact every facet of people's lives.

Hence, Koniakou (2021), Floridi (2018), Miller (2020), and Mass (2019) all agree on the radical change that happened, the significance of human rights in the context of AI ethics and AI governance. It emphasizes that AI systems and algorithms have raised concerns about their impact on human rights encompassing various fundamental principles, including but not limited to privacy, data protection, and non-discrimination. Human rights are frequently mentioned within the realm of ethical principles and guidelines, which have been formulated by national and intergovernmental organizations, research groups, and private entities working on AI. However, the text acknowledges that including human rights in these guidelines is often superficial, needing comprehensive lists of rights, redress mechanisms, or external monitoring.

Some researchers and human rights advocates argue for basing AI governance on human rights in its place of ethics. They believe that human rights provide a more robust and comprehensive framework for analyzing the impact of AI on individuals' rights and determining accountability. The international human rights law system offers specific obligations, guidance, and mechanisms for addressing violations, making it more straightforward and enforceable than ethical guidelines. It also has moral legitimacy and an established institutional framework for monitoring compliance.

Then, by tackling the early responses to concerns about the adverse impacts of AI and algorithms. Various ethical codes, guidelines, and declarations have been developed. For Koniakou, this proliferation of ethical principles has been driven by the need to make AI more *"ethical"* and mitigate its harmful effects. All concur that governments, inter-governmental organizations, private actors, companies, and research entities have all contributed to developing ethical norms for AI. Floridi even adds that, at a regional level, the EU, the UN, and the OECD's expert groups have been formed to generate guidelines concerning the ethical utilization of AI.

Ethical codes and guidelines have played a valuable role in informing and shaping the responsible development of technologies. They raise awareness, promote ethical education, and provide criteria to censure unethical behavior. However, ethical norms are not legally binding, and their normative power depends on the consequences and deterrent mechanisms attached to them. There needs to be more conceptual clarity and concrete direction in many ethical codes, which hampers their practical impact. The vagueness of principles and the cultural differences in interpreting them undermine their effectiveness and universality. Ethical codes focus on specific issues and often overlook broader societal impacts. Private actors and prominent technology companies may use ethical principles to establish the ethical AI narrative according to their own perspective and advocate for their specific interpretation of *"ethical and responsible AI."* The proclamatory nature of these commitments and the lack of meaningful mechanisms for enforcement limit the normative effect of ethics.

2.3.2 "Pure" Governance

In recent years, the increasing importance of AI governance has led scholars and policy-makers to shift their focus from soft-law instruments and ethical codes to hard-law solutions and binding obligations. Various public and private stakeholders compete to develop AI governance models that mitigate risks and enhance trust. However, there needs to be more consensus on regulating AI, and existing proposals often need to be more cohesive and focused on specific applications or legal domains. The challenges of governing AI include the need for more conceptual clarity and consensus on the definition of AI, the opacity and unpredictability of algorithms, and the need to engage diverse stakeholders and establish appropriate governance models. Balancing the power and authority of private entities with public interests is also a challenge. Creating effective AI governance requires addressing these challenges, balancing protecting society, and enabling

technological advancement. Nevertheless, two aspects of AI Governance must be considered: public and private.

2.3.2.1   Public Governance

Indeed, for Christian Djeffal, Markus B. Siewert & Stefan Wurster (2022), the state is the actor; governments can adopt either a proactive approach involving decisive state intervention, or a more passive stance (weak state intervention), allowing private actors and markets to govern AI with minimal interference. It allows governments to have the choice to focus on regulating the potential risks associated with AI technologies through an enclosure-and-control approach or prioritize the deployment of AI, viewing their role as primarily promoting its development through a simulation approach.

Table 3. Expected policy instrument mix of the four state types.

Dimensions	Entrepreneurial state	Market-oriented state	Regulatory state	Self-regulation-promoting state
Authority				
Direct regulations	neutral	low	high	low
Governmental strategies	high	neutral	neutral	low
Finance				
Public investments	high	low	neutral	low
Financial incentives	neutral	high	neutral	neutral
Organization				
Institutions	neutral	neutral	high	low
Networks	high	neutral	low	high
Information				
Data & Monitoring	neutral	neutral	high	neutral
Certificates & Labels	neutral	high	neutral	high
Outreach & Literacy	high	neutral	neutral	neutral

Notes: 'High' indicates that we expect a high number of policy instruments to be generic for the respective state concept; 'low' indicates that we expect a low number of policy instruments to be generic for the respective state concept; 'neutral' means that we do not have clear theoretical assumptions, i.e., it can be both high or low numbers of policy instruments.

Table 1: Government policy instrument mix for AI

This table shows the expected policy mix for four types of states, entrepreneurial, market-oriented, regulatory, and self-regulation-promoting. Indeed, in the public sector, the need to be more careful regarding AI implementation is understandable. Nevertheless, there are high disparities between countries regarding private investments, as seen in the following figure. These disparities can come from cultural or political differences between these four types of states.

Ojo et al. (2019) highlight several benefits and challenges and Ben Rjab & Mellouli (2018) focus on several benefits of public governance. Firstly, for Ojo and the authors,

efficiency and performance benefits in government operations pertain to enhancing e-government services and systems. For instance, efficiency can be improved by automating processes and tasks and simplifying procedures through utilizing Machine Learning. Incorporating AI in government operations also presents opportunities for resource-constrained organizations to alleviate themselves from mundane and repetitive tasks. In addition, for Ben Rjab and Mellouli, risk identification and monitoring involve leveraging AI to enhance the effectiveness of risk identification. For example, governments can utilize AI to augment the monitoring of urban areas, improve fraud detection and law enforcement capabilities, and gain deeper insights into complex and urgent issues, thereby enhancing the overall intelligence of cities.

Furthermore, it can lead to economic benefits, like making e-government services or systems more economical, notably by reducing costs through workforce substitution, and additionally, the possibility to enhance industrial automation where robots perform complex tasks. All authors agree on the fact that the utilization of AI in government offers significant benefits in the realm of decision-making. Machine Learning can assist government decision-makers, leading to improved and more precise decision-making processes. By incorporating AI in government operations, decision-makers can identify potential areas for action more effectively. AI is anticipated to alleviate administrative burdens and implementing Big Data Algorithmic Systems can facilitate automatic decision-making within public institutions.

Secondly, Alexopoulos et al. (2019), Ojo et al. (2019), and Wirtz, in different papers in 2019, carefully describe the different challenges. First, the data challenges category encompasses data availability and acquisition, data integration, data quality, and the absence of structure and homogeneity. Poor data quality and ambiguous correlations between data and algorithms can result in biased or skewed outcomes of AI algorithms. Additionally, the challenges associated with using AI in government can be attributed to skill-related factors, including employees' insufficient knowledge of AI and machine learning and a need for more in-house AI talent. The need for more experts and gaps in education for acquiring highly technical skills are also noteworthy.

The demand for specialists and experts with relevant skills surpasses the current supply, highlighting the need to address these skill gaps. Then, the previous authors, joined by several others such as Toll, show that ethical and legitimacy challenges encompass various issues such as moral dilemmas, unethical data practices, AI discrimination, and improper utilization of shared data, particularly in the healthcare domain. Privacy

concerns, security risks, trust issues, and unfairness in the provision of public services are also significant themes within this category. Many of these ethical challenges arise from the potential elimination of the human element in critical decision-making processes. Moreover, regarding political, legal, and policy challenges, the deployment of AI can erode the core principles of due process, equal protection, and transparency. The opaque nature of AI systems, often characterized by unintelligible black-box processes, can create uncertainty regarding responsibility, accountability, and control over decisions made through AI.

Talking about legal, it is possible to add the technical opportunities and, therefore, challenges of AI. Indeed, Vaele argues that the principles of European data protection offer strong foundations. However, it is essential to note that the regulations, such as the General Data Protection Regulation, must fully address the numerous socio-technical challenges posed by machine learning and algorithmic systems. These challenges require a more comprehensive approach that goes beyond the evolving definitions and concerns covered by existing regulations. In this context, the role of technical standards becomes crucial in ensuring ethical and agile governance of robotics and AI systems.

In addition, Harambam and Lipton & Steinhardt discussed in a recent article concerning trends in machine learning scholarship cautioned against falling into the trap of technical solutionism and misusing concepts such as *"fairness"* and *"discrimination"*. They argued that using these complex social concepts in the context of *"simple statistics"* can be perilous, as it confuses researchers and misinforms policy-makers about the challenges of incorporating ethical considerations into machine learning. Furthermore, they emphasized that technology, including AI, is never an unstoppable or uncontrollable force of nature but rather a product of human creation and direction.

Nemitz, a significant author on this topic, focuses on the concentration of power among a select few corporations in the AI field as a topic of concern. The author emphasizes the need for a comprehensive examination of the interplay between new technologies like AI and fundamental aspects such as "*human rights, democracy, and the rule of law*". They argue that understanding the current reality of technology and business models is essential, including the accumulation of technological, economic, and political influence in the hands of a small group referred to as the *"frightful five"* These corporations play a central role in developing and integrating AI into commercially viable services.

Additionally, the author advocates for cultivating a new culture surrounding technology and business development grounded in principles of the rule of law, human rights,

and democracy. They emphasize the significance of pragmatism and the exploration of novel approaches to accountability and liability through legal experimentation. Furthermore, the author delves into considering machine learning models as personal data within the framework of European data protection law. They argue that empowering users with local personalization tools could rebalance power dynamics compared to large firms that accumulate personal data. The author contends that establishing robust ethical principles is merely the initial phase and asserts the necessity for further measures to ensure implementation and accountability. They argue that the accurate measurement of effective governance of AI systems arises when practical challenges are encountered, akin to when the rubber hits the road or, more accurately, when the robot comes into play.

Even if the governmental aspect is essential as it provides structural, legal, ethical, and economic guidelines and rules for society and public and private companies, these exciting elements can be applied to the organizational level. Tackling AI governance for businesses now. Johannes Schneider et al. (2022) define AI governance for businesses as a comprehensive structure of regulations, methodologies, and protocols aimed at guaranteeing that an organization's AI technology aligns with and propels its strategies and objectives.
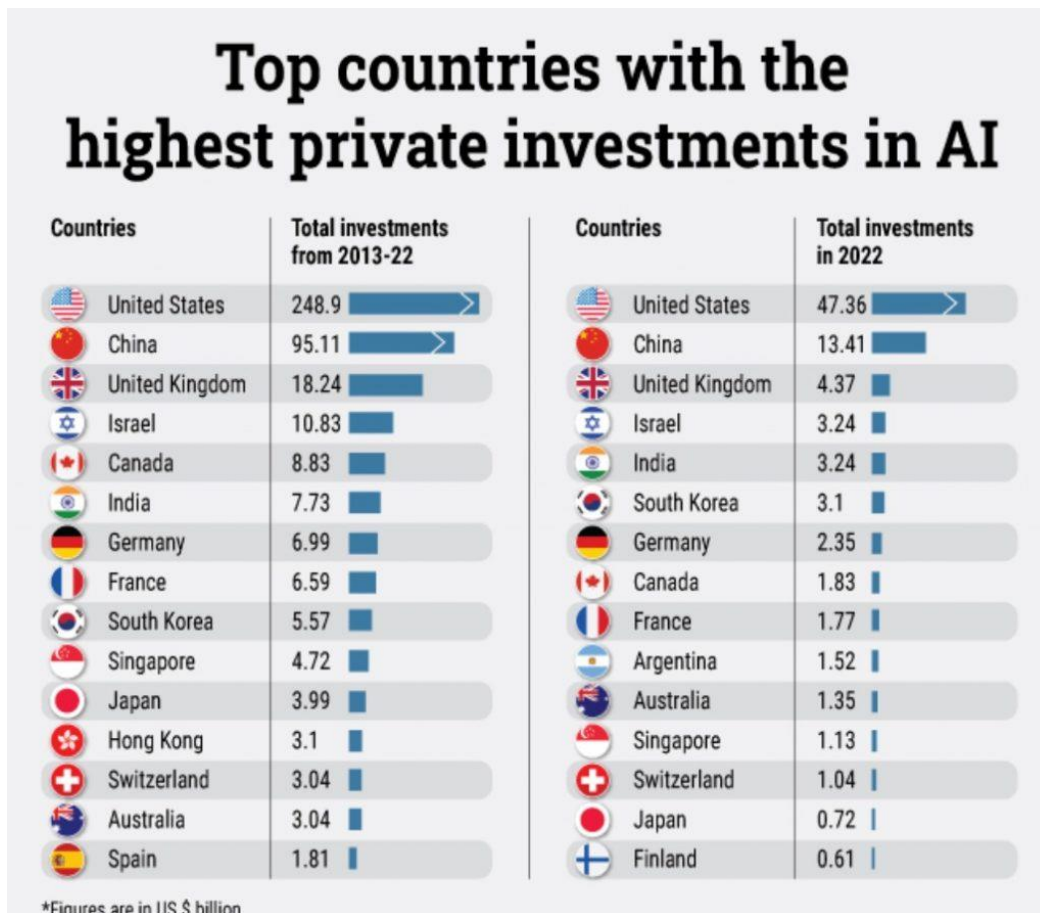
Figure 11: Top countries with the highest private investment in AI

This figure echoes the last one after understanding the different state regulations for authority, finance, organization, and information. The top countries for private investment in AI are known in advance, with the USA and China leading technological innovation again, followed by the UK, Israel, an essential actor in the innovative sector, and India. All of this is linked to the following figure.

Where New AI Research Comes From

How many papers are published in each country annually?

Global output of AI scientific papers
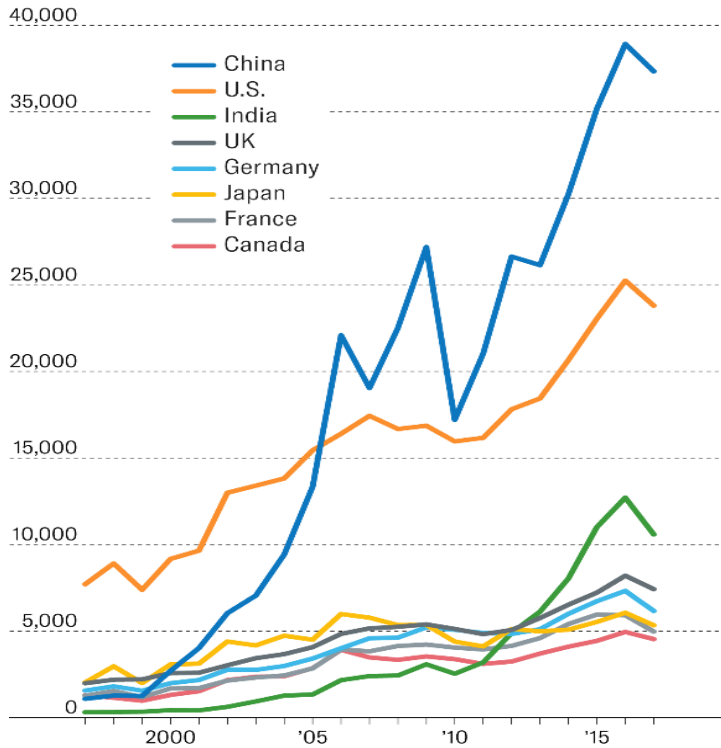
Figure 12: Top countries with the highest number of research published.

Indeed, AI research is published by different countries, and there is a trend with the number of publications and the level of investment; China, the US, India, UK are leading in Research and Investment. While Germany, Japan, France, and Canada follow closely for both. Israel is the prominent actor missing from the research.

The authors also add six components of AI governance: *"fostering collaboration across functions, structuring and formalizing AI management through a framework, focusing on AI as a strategic asset, defining how and who makes decisions, developing supporting policy, standards, and procedures, and monitoring"*. Which will be seen in the next part.

Exploring AI governance reveals a rapidly evolving landscape demanding the utmost attention and vigilance. The need for robust governance frameworks becomes increasingly apparent as AI permeates various sectors and transforms societies. The researchers have uncovered the multifaceted dimensions of AI governance, ranging from structural

and procedural mechanisms to relational and ethical considerations. AI governance is a critical compass, guiding organizations and policy-makers in navigating the complex terrain of responsible AI development and deployment. It encompasses a spectrum of challenges, from ensuring fairness, transparency, and accountability to addressing legal and regulatory requirements.

While understanding of AI governance continues to evolve, one thing remains clear: It is not a standalone endeavor but a dynamic process that necessitates ongoing adaptation and refinement. As new technological advancements emerge, AI governance must adapt and evolve in parallel, striking a delicate balance between innovation and ethical considerations.

2.4   IPA Framework Governance

For Vatche Isahagian, et al. (2020), Intelligent Process Automation encompasses the fusion of artificial intelligence technologies, including machine learning and natural language processing, with the conventional capabilities of process automation.

The field of IPA governance is currently lagging and in order to achieve success, it is imperative to fulfill the predetermined goals. A notable contribution by Johannes Schneider et al. (2022) sheds light on the three fundamental components that form the framework of Governance mechanisms: structural mechanisms, procedural mechanisms, and relational mechanisms, as visually represented in the following figure. This comprehensive framework highlights the interconnectedness of these mechanisms, emphasizing their collective significance in establishing effective and efficient governance structures within the IPA realm. Schneider's research serves as a valuable resource for governance mechanisms and their role in shaping the future of IPA governance.
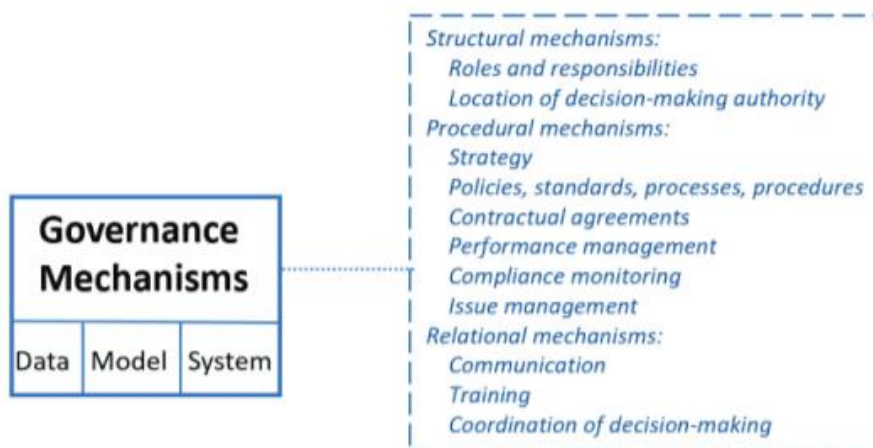
Figure 13: Structural, procedural, and relational mechanisms of governance

This figure summarizes the governance mechanisms with structural, procedural, and relational mechanisms.

These components collectively serve as crucial building blocks in establishing a practical framework for governance. By delineating these mechanisms, the author provides a comprehensive understanding of the multifaceted nature of governance and emphasizes the importance of each facet in ensuring its successful implementation. These mechanisms form an intricate tapestry that guides and shapes governance practices, facilitating sound decision-making, accountability, and transparency.

-First, regarding the governance mechanisms, businesses have access to a range of mechanisms for governing IPA, which involves formal structures that connect various functions like business, IT, data, model, ML, and system management. These mechanisms also encompass established processes and procedures for decision-making, monitoring, and practices that encourage active participation and collaboration among stakeholders. Drawing inspiration from the literature on IT governance, companies adopt a framework that includes structural, procedural, and relational governance mechanisms.

Digging into the different parts of the governance mechanism. First, structural mechanisms are said to establish reporting structures, governance bodies, and accountability frameworks within an organization. They encompass defining roles and responsibilities, as well as allocating decision-making authority. While there is a wealth of literature on data governance, the available literature on IPA governance could be more extensive. In a specific context, the authors briefly examined the roles and responsibilities of a Chief Data Officer (CDO) and Chief Information Officer (CIO).

Furthermore, there has been a proposal to introduce a centralized hub that would consolidate various responsibilities, including talent recruitment, performance management, and the establishment of AI standards, processes, and policies. During the adoption phase, the recommendation of setting up a center of excellence has also been put forward. Furthermore, developing AI systems necessitates a multi-disciplinary approach. Consequently, establishing an interdisciplinary AI governance council, as suggested in the context of AI in healthcare, addressing the complex interplay among model outputs, training data, and regulatory and business requirements may prove essential. Within this process, executive sponsors play a pivotal role. The extent of control and decision-making power exercised by the executive sponsor in determining the performance objectives could differ based on the level of AI implementation within the organization. For instance, it has been

recommended that, particularly during the initial phases of implementation, allocating a specialized AI budget without rigid performance requirements could expedite the process of adoption. As for more specific roles concerning model aspects, further investigation is still required.

-Secondly, Procedural governance mechanisms are designed to ensure the proper and efficient functioning of AI systems and ML models. They also focus on ensuring the security and compliance of these systems per legal and internal company requirements and policies related to explainability, fairness, accountability, security, and safety.

These mechanisms encompass various aspects of data, model, and system management. Specifically, they include (1) developing a strategic approach; (2) formulating policies; (3) establishing standards; (4) implementing processes and procedures; (5) setting up contractual agreements; (6) measuring performance; (7) monitoring compliance; and (8) managing issues. These elements collectively address the traits and targets associated with data, model, and system governance, individually and holistically.

By digging into these elements, exciting explanations for AI governance are found, especially about the:

(1) strategy as a guiding framework for actions aligned with strategic business objectives. It emphasizes two key aspects: on the one hand, antecedents. This comprises workflows driven by data, which cover the entire data value chain and ensure data quality. Additionally, it considers managerial willingness and organizational factors, including the AI strategy. On the other hand, consequences of AI in strategic management. This focuses on the impact of AI on both individual and organizational levels. Examples include exploring human-AI collaboration and the integration of AI in business models. Overall, the strategy provides direction by considering these aspects and their implications for effective strategic management in AI.

(2) AI policies serve as overarching guidelines and rules for organizations. These policies convey essential objectives, establish accountability, define roles, and outline responsibilities related to AI implementation. When formulating AI policies at the organizational level, one valuable source to draw from is best practices in the field.

(3) Standards play a crucial role in ensuring consistency and the organization aims to implement standardization across its systems by ensuring the normalization of data representations, machine learning models, and the architecture of AI systems, along with their respective processes. These standards should facilitate interoperability both within

the organization and across different organizations. Additionally, they should ensure that the AI systems and their components fit their intended purposes.

(4) Processes and procedures are standardized, documented, and repeatable.

(5) Contracts also significantly mitigate liability risks by explicitly defining the operational boundaries of AI systems.

(6) Measuring performance will help to understand where the organization is lagging or where it is going smoothly.

(7) Compliance monitoring is responsible for monitoring and guaranteeing compliance with regulatory requirements, organizational policies, standards, procedures, and contractual agreements, including the General Data Protection Regulation (GDPR).

-Finally, Relational governance mechanisms foster effective collaboration and coordination among stakeholders involved in AI governance. These mechanisms consist of three essential components:

(1) Communication: It involves establishing clear communication channels between different stakeholders. Effective communication ensures that relevant information, updates, and insights are shared promptly and accurately. Transparent and open communication promotes a shared understanding of goals, challenges, and progress in AI governance.

(2) Training: Offering training programs and resources is crucial for enhancing the knowledge and skills of stakeholders involved in AI governance. Training initiatives can cover various aspects, such as legal requirements, ethical considerations, technical understanding, and best practices. Organizations can ensure a common understanding of AI governance principles and foster informed decision-making by equipping stakeholders with the necessary expertise.

(3) Coordination of Decision-Making: Relational governance mechanisms also focus on coordinating decision-making. This entails establishing structured frameworks and processes that facilitate collaborative decision-making among stakeholders. By involving relevant parties, ensuring diverse perspectives, and fostering consensus-building, effective coordination of decision-making supports the alignment of AI governance with organizational objectives and stakeholder interests.

Overall, relational governance mechanisms play a vital role in promoting collaboration, knowledge-sharing, and coordinated decision-making among stakeholders, thereby contributing to the successful implementation of AI governance practices.

Secondly, the need to address ethical questions must be filled. To do so, the govern-ance framework needs to answer the following principles found in the next figure.
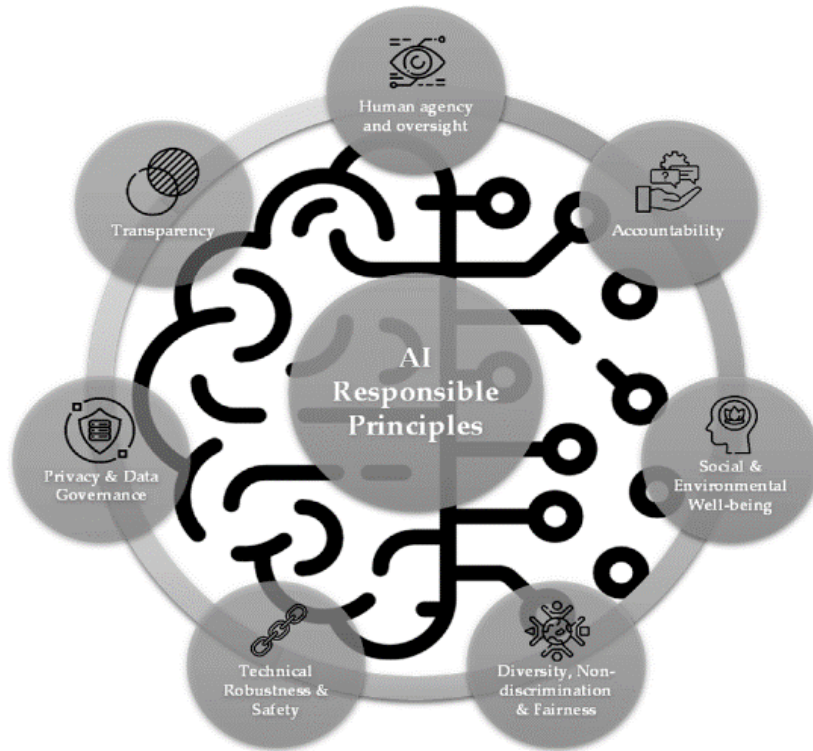
Figure 14: The principal principles of a responsible AI

This figure shows the responsible principles of AI. It points out several ethical principles, transparency, privacy & data governance, diversity, non-discrimination & fairness, and social & environmental well-being.

To answer these principles, governance must ensure that these goals are met. In order to adequately respond to these principles, governance must assume the responsibility of ensuring the achievement of these goals through the meticulous implementation of well-crafted guidelines, carefully formulated rules, and meticulously designed internal meth-ods. By embracing these crucial elements, governance can effectively navigate the com-plexities of decision-making, foster transparency, and accountability, and steer towards the realization of the intended objectives. Through the use of clear guidelines, governance can provide a roadmap for ethical conduct and best practices, offering a framework that enables consistent and principled decision-making.

Simultaneously, the establishment of robust rules creates a solid foundation for com-pliance and governance, ensuring that actions are conducted within the boundaries of le-gality, fairness, and integrity.

The development of rigorous internal methods, such as performance monitoring, risk assessment, and feedback mechanisms, allows governance to maintain a proactive approach in assessing progress, identifying areas for improvement, and adapting strategies accordingly. By synergistically harnessing the power of guidelines, rules, and internal methods, governance can forge a path toward sustainable success while upholding the values of transparency, accountability, and responsible decision-making.

Structural mechanisms
- Roles and Responsibilities
- Location of decision-making authority

Procedural mechanisms
- Strategy
- Policies, standards

AI Responsible principles
- Human agency and oversight
- Accountability
- Social & environmental wellbeing
- Diversity & fairness
- Technical robustness & safety
- Privacy & data
- Transparency

- Contractual agreements
- Performance management
- Compliance monitoring
- Issue management

Relational mechanisms
- Communication
- Training
- Coordination

Figure 15: Governance mechanisms and AI responsible principles, merged.

This illustration emphasizes the importance of considering both ethical considerations and "pure governance" as a unified framework.

To effectively govern IPA (Intelligent Process Automation), it is crucial for the organization to recognize the interconnectedness and interdependence of these aspects.

In conclusion, this literature review explored the intersection of the history of AI, business processes, and AI/IPA governance. The analysis of various scholarly sources revealed the significant role that business processes play in successfully implementing and managing AI technologies within organizations. Effective governance of AI systems is crucial to ensure ethical and responsible use, and to address potential risks and challenges. This review underscores the importance of aligning business processes with AI governance principles to drive sustainable innovation and competitive advantage in the rapidly evolving digital landscape.

3 RESEARCH METHODOLOGY

3.1 The Method

This thesis aims to provide guidelines and insights to companies that wish to implement AI-driven tools in their business while overcoming challenges arising from their governance.

3.1.1 The Problem

This method is made in different parts; there is a will to improve the situation, here is the governance of IPA by organizations; indeed, by focusing on ethical aspects, researchers, regulators, and organizations have forgotten to focus on how companies should implement and govern AI in their processes. The focus has changed since AI has become more important in society and companies. All the open AI can be applied daily to a company, enabling companies to automate routine tasks, enhance decision-making processes, and gain a competitive edge in the market (Li et al., 2021, p. 1). However, the lack of in-depth analysis, guidelines, and research from within a company, creates a gap in the literature and a knowledge gap for the companies themselves. Therefore, the governance of AI-driven tools should be improved, and the problem in this situation is the lack of IPA governance.

3.1.2 The Solution

For the first time, the building of insights and, the second, guidelines for companies to follow or at least to acknowledge is a way to answer this problem. First, by understanding what is at stake here, going meticulously through prior literature, and defining which keywords and data sources, several keywords came to mind by going deeper into the research question and previous courses. After searching for them, others were added. After dividing them into two separate sets, AI-oriented keywords: "IPA," "RPA," "AI," "Bot," "IT," "BPA," "Industry 4.0", "machine learning," "deep learning," "natural language processing," "computer vision," "adaptive algorithms," "machine intelligence," "challenges of AI," "integrate AI," "big data," "influence of AI." Secondly, Organizational elements: "Business value," "organizational challenges," "governance," "competitive advantage," "BPM," "data-driven decisions," and "customer value."

Due to the wideness of these words and the exponential aspect of this technology. Papers from at least 2015 were looked upon, even though some elements may come from older papers; in addition, if a paper was focusing only on technical aspects or, on the contrary, only on organizational aspects, it was not selected for the analysis. Fifty academic and research papers were gathered thanks to Google Scholar, Web of Knowledge, and the Association of Information Systems library. Out of these fifty papers, fifteen were used for the literature review. They were divided into several subtopics with the history of artificial intelligence, its origins to understand where it comes from, how this element has and will change society, and how enterprise resource planning systems have shaped companies as society knows them. In addition, essential notions were reviewed, such as BPM, BPA, RPA, or the newest IPA. After talking about those notions, IPA frameworks were studied.

3.1.3   The Requirements

To have clear and precise insight, it is necessary to understand the processes of AI and other essential subjects linked with automation. This is necessary to have an optimal and complete outcome for a subject.

3.1.4   The Outcome

All of this is made to improve the governance of IPA in companies, from its adoption to its maintenance, by going through its design and implementation. Indeed, organizations always try to improve their business processes and values. This can be done by reducing cost and time and reallocating resources to more valuable tasks. The goal is for the company to have a comparative and competitive advantage while offering better customer service to the clients. Throughout history, businesses have tried to follow their instincts; now, with the endorsement of big data and AI, decisions do not depend purely on people anymore but on data and robots. Therefore, this paper aims to help companies continuously improve their business thanks to adopting AI-driven tools.

3.2   Semi-Structured Interviews

3.2.1   Data Collection

Interviews are conducted with employees from Bosch environments specialized in AI and Automation. The objective was to learn from the interviewed people their feelings and

their knowledge of AI governance; it was to understand the challenges, the benefits, and the rules they had to follow during the analysis, design, implementation, and maintenance. The semi-structured interview made the most sense for this topic, as it is a broad subject. It allows the interviewer and the interviewee to reach levels of precision and knowledge that cannot be reached with structured or unstructured interviews. Indeed, the former kind of interview enables them to focus and gain insights while letting freedom in order to convey their personal experiences and provide motivation in their responses, individuals are encouraged to share their insights using their own unique language and perspectives. Additionally, semi-structured allows an essential aspect of interviews that other methods cannot offer: the freedom to improvise while asking questions based on the answers. Nevertheless, the main drawback is the necessity to know the topic during the interviews very well to answer or ask new questions.

The sampling was made rapidly as the data team and project manager were always in contact with programmers, team, and tools managers; finding relevant people to ask questions was straightforward. As this paper focuses on Bosch, the sampling strategy was conducted within the Bosch environment. Therefore, a list of people that should be contacted thanks to their position or knowledge was made; this list went up to twenty-five names, going from CFO to interns. Nevertheless, after reassessment, a list of eleven people was made after carefully explaining the purpose of the upcoming interview, its anonymity, and asking about availability for the said interview. A date was chosen, and a meeting was scheduled. The variety of profiles allows this paper to fully grasp the differences in point of view and the complementary knowledge between positions and people.

As said, the first stage of the whole process was to contact the individual by email, explaining the situation, the motivation behind this research, and what it will mean for them in the company to be part of this, as they are the ones dealing with automation. Once positive feedback was given, the future interviewee was asked to be interviewed on a specific date.

Unfortunately, one person that was part of the list was not able to schedule an interview at such short notice. Therefore, a list of ten people has remained. The chosen interviewees did not receive the questions beforehand to avoid biased answers. Additionally, all the interviewees self-evaluated their proficiency in various areas, including Automation, IT management, Etools, Bot creation, process automation, and Programming. They rated themselves as good to very good in these fields.

As each interviewee has a different position and compatible knowledge. It is essential to precise the following information:

For anonymity purposes, interviewed people's names will not be stated, only their position and years of seniority. Four members of the Data team based in Belgium have been interviewed, the IT project manager with two years of seniority, the Data Team manager with seven years of seniority, a bot programmer with four years of seniority, and the Etools manager with seven years of seniority, this team is considered to be relatively young with experienced people but with a fresh mindset, it allows to fully grasp the potential of AI-driven tools, the governance, and challenges. From The Netherlands, the Automation manager with forty years of seniority, an Etools programmer with ten years of seniority, and the programmer manager with ten years of seniority. An IT process manager from Portugal with three years of seniority. Finally, the EDI implementation manager from Germany with twelve years of seniority and the chief programmer for Bots with a five-year background.

After this description of the job title and their year in the company, it is necessary to understand their position and how their interviews were helpful for this research.

First, starting with the data team in Belgium.

The IT project manager establishes objectives and executes projects and strategies, specializing in IT, data, and technologies. He possesses a comprehensive understanding of business and IT domains. This position encompasses involvement in various IT or Business projects and possesses a broad perspective on managing IT's projects.

The data team manager's role is to oversee and guide a team of data professionals in their efforts to collect, analyze, and interpret data to drive business insights and strategic decision-making. They are responsible for setting goals, allocating resources, and ensuring the team has the tools and skills to effectively manage data projects and deliver impactful results to the organization. This position is essential to fully grasp the process behind the implementation, the choices, and the budget because it is not only about managing the people but also about managing and improving the business processes by automating them.

The bot programmer's role is designing, developing, and maintaining automated software bots to perform specific tasks or simulate human-like interactions. Bot programmers leverage programming languages and frameworks to create intelligent bots that can automate repetitive tasks, provide customer support, or assist in data retrieval and analysis. They collaborate with cross-functional teams to understand requirements, implement bot

functionalities, and continuously improve performance and user experience. It is tremendously important to understand these processes to understand AI-driven tools. Additionally, understanding the process behind the bot is understanding the process of all automated processes in a way.

The Etools manager's role is to oversee and manage the implementation and maintenance of various electronic tools and software solutions within an organization. They are responsible for identifying and evaluating suitable etools to support business processes, managing vendor relationships, and ensuring the effective utilization of these tools by end-users. Additionally, etools managers may provide training and support and drive continuous improvement and optimization of etools functionality. This position offers knowledge on continuous maintenance, support, and training for people; even though it is not AI related, it is still internet related and innovative, which can be applied to AI teaching and support.

In the Netherlands, with people in the company for longer.

The automation manager's role is to lead and oversee the implementation of automation initiatives within an organization. They are responsible for designing and developing automated solutions and managing the automation roadmap. Automation managers collaborate with cross-functional teams to understand business processes, optimize workflows, and streamline operations using robotic process automation (RPA) and other technologies. They also monitor automated processes' performance, identify improvement areas, and drive continuous innovation in automation practices. This position is one of the most important for a suitable automation process.

The etools programmer's role is very similar to the bot programmer, but it affects the etools. He is in close contact with the etools manager as they decide together the future steps of the platforms. As the bot programmer, it is crucial to understand the processes and have insight into this aspect of the work, especially since automation happens in the etools portals.

The role of a programmer manager involves overseeing and managing a team of programmers or software developers within an organization. They are responsible for setting project goals, allocating resources, and ensuring timely and successful completion of programming projects. Programmer managers also collaborate with stakeholders to understand requirements, provide technical guidance, and ensure that best coding practices and standards are followed. They may also mentor and coach team members, facilitate knowledge sharing, and drive continuous improvement in programming methodologies

and processes. This position is vital for a company that wishes to implement more automated processes, AI, and bots. In some ways, he is the bridge between management and pure programming. Therefore, gaining insight from him is essential to grasp the potential fully.

From Portugal.

The role of an IT process manager is to establish and maintain efficient and effective IT processes within an organization. They are responsible for defining and documenting IT processes, ensuring compliance with industry standards and regulations, and identifying areas for process improvement. IT process managers work closely with cross-functional teams to analyze and optimize IT workflows, streamline operations, and enhance overall IT service delivery. Therefore, it is similar to the project manager. Hence, the same purpose in interviewing him.

Finally, from Germany.

The role of an EDI (Electronic Data Interchange) implementation manager is to oversee the successful implementation and integration of EDI systems and processes within an organization. They coordinate with stakeholders, such as trading partners and IT teams, to analyze requirements, design EDI solutions, and ensure seamless data exchange. EDI implementation managers also manage project timelines, monitor system performance, and troubleshoot any issues that may arise during the implementation process. This position was more to see the managing side of an old process that has evolved through the years, to understand how it has managed that, and how it is possible to extract and implement it in AI.

The role of a chief programmer for bot is a mix of programmer manager and a bot programmer, as they supervise, manage, but also design and develop automated processes.

Job title	Unit in Bosch	Relevant experience	Length of the interview
IT project manager	Data team, Belgium	Implementing IPA Solutions, Integrating IPA with Existing Systems (SAP), Change and stakeholder Management, Risk Management and Compliance	One hour
Data team manager	Data team, Belgium	AI Strategy and Roadmap Development, Data Governance and Ethics, Collaborating with IT	One hour

		and Business Teams, Performance Monitoring and Optimization	
Bot programmer	Development, Belgium	Intelligent Automation Integration, Bot Testing and Optimization, Continuous Improvement and Monitoring	One hour and fifteen minutes
Etools manager	Data team, Belgium	AI Solution Evaluation and Selection, User Experience Optimization, Data Security and Privacy, Continuous Improvement, and Innovation	Forty-five minutes
Automation manager	Development, Netherlands	Automation Strategy and Roadmap Development, Intelligent Automation Tool Evaluation and Selection, Governance and Compliance, Continuous Learning, and Innovation	One hour and fifteen minutes
Etools programmer	Development, Netherlands	AI Integration into Etools, Robotic Process Automation, Testing and Quality Assurance, Collaboration, and Integration with AI Teams	Fifty minutes
Programmer manager	Development, Netherlands	AI Strategy and Roadmap Development, AI Technology Evaluation and Selection, Ethical and Responsible AI Practices	One hour
IT process manager	Service and process, Portugal	Process Automation Strategy, Intelligent Process Identification, Compliance and Governance, AI for IT Service Management	One hour
EDI implementation manager	Service and process, Germany	Intelligent Error Handling, Performance Monitoring and Optimization, Compliance and Security	Fifty minutes
Chief programmer for bot	Development, Germany	IPA Development, Ethical Considerations, Innovation and Research	Fifty-five minutes

Table 2: Interviewee's job linked to the relevant experience.

The structure of the interviews was made thanks to the literature review done before; indeed, as said earlier, in this kind of topic, the need to understand and know the whys and wherefores. It also helped during the construction of the question. The literature targeted various domains: AI, ERP, Business, robotic and intelligent process automation, and pure AI governance. The semi-structured interviews are helpful for this research because they allow the interviewee to speak freely about their knowledge, what he has encountered during his work, and the evolution of the processes and governance.

By dividing the interview into distinct parts, it is easier to understand. Three different ones with the introduction, the work experience, and the governance.

The first objective is to empower the informant to share meaningful information. In case of confusion, digressions, or the need for clarifications, examples are given, and informants are actively encouraged to provide a personal experience. The emphasis is on allowing informants to express their thoughts and perspectives freely.

The second one allowed informant the flexibility to share their advice, encompassing topics ranging from governance to unexpected activities or domains that may not be related to the subject matter. The aim was to encourage informants to provide insights from various perspectives and explore unconventional areas of expertise.

The last one focused on advice, experience, and knowledge regarding governance related directly to AI governance.

Finally, each interview lasted one hour for a total of ten interviews. To enable the interviewer to concentrate on follow-up questions, the interviews were audio-recorded instead of immediately transcribing the answers. The participants willingly agreed to the data collection and terms, expressing their consent.

3.2.2   Data Analysis

After gathering the data, a systematic analysis was imperative to obtain a trustworthy outcome. Therefore, the Gioia method was followed (Corley & Gioia, 2011, Gioia, Corley & Hamilton, 2013; Gioia, 2021); open coding, axial coding, and selecting coding are the primary processes of the method. Indeed, The Gioia method follows a systematic process involving several stages. First, the researcher familiarizes themselves with the data by reading the text to gain a comprehensive understanding. Then, they start coding the data by assigning labels or codes to text segments representing key ideas, concepts, or themes. The codes are derived directly from the data, ensuring a grounded approach.

Once the coding is complete, the researcher organizes the codes into broader categories or themes based on their similarities or relationships. This process involves grouping related codes and identifying overarching patterns within the data. The researcher may refine or modify the categories iteratively as they analyze more data and gain a deeper understanding. By following this systematic process of initial, axial, and selective coding, the researcher ensures a rigorous analysis that captures the richness and complexity of the interview data, facilitating a comprehensive exploration of the research objectives and generating valuable insights.

The final stage of the Gioia method involves interpreting and analyzing the categorized data. Researchers critically examine the themes, explore connections between categories, and generate insights or conclusions based on observed patterns. The goal is to extract meaningful and rich information from the data, providing a basis for understanding the phenomenon under study.

The analysis will progress from the micro to the macro level to provide a comprehensive explanation. This involves thoroughly examining specific elements, such as relevant quotes and illustrative examples derived from the axial coding stage. A deeper and more nuanced understanding of the interviewees' ideas and perspectives can be achieved by closely associating these elements with the subthemes identified. This process helps establish connections and relationships between the micro-level data and the emerging subthemes, contributing to a broader comprehension of the interview data. Ultimately, the analysis culminates in identifying main themes through selective coding. These central themes represent the higher-level conceptual categories that encompass and unify the subthemes and related elements.

Overall, the Gioia method offers a structured and rigorous approach to qualitative analysis, helping researchers uncover patterns, themes, and insights from textual data sources. It allows for systematically exploring the data and facilitates the generation of new knowledge or theories in a research study.

3.3   Research Quality

The quality of the work depends on the quality of the research, hence, on the interviews. The trustworthiness of qualitative research is commonly assessed using four criteria: credibility, dependability, confirmability, and transferability. These criteria serve as widely accepted measures to evaluate the reliability and validity of qualitative research studies (Korstjens & Moser, 2017; Steinke, 2004).

-Credibility: refers to the accuracy of research findings, particularly regarding the faithful representation of participants' original perspectives (Korstjens & Moser, 2017). In this thesis, credibility was reinforced through multiple data sources. The literature was complemented by insights gathered from ten user interviews, enhancing the overall credibility of the research.

-Transferability: refers to the degree to which research findings can be applied to different situations or participants (Korstjens & Moser, 2017). In this thesis, transferability holds significance as the aim is to provide insights that any company can utilize. To

enhance transferability, the interviewees were selected from various divisions within Bosch.

    -Dependability: refers to the consistency of findings across different timeframes and conditions (Korstjens & Moser, 2017). In order to bolster the reliability of the thesis, comprehensive elucidations were furnished concerning the gathered data, encompassing intricate information about the sampling procedure, protocol, and interview framework. Moreover, a meticulous explication of the data analysis methodology was presented, thereby augmenting the overall trustworthiness of the research.

    -Confirmability: refers to the degree to which other researchers can validate the findings of a thesis. A confirmable study derives its results from the data rather than relying solely on the researcher's interpretations (Korstjens & Moser, 2017). To facilitate validation by other researchers, the insights presented in this research have undergone validation by multiple professionals from Bosch, enhancing the confirmability of the study.

4   RESULTS

In this chapter, the Gioia method, a valuable analytical framework, will be introduced and employed to analyze the interviews comprehensively. Utilizing the Gioia method allows for a thorough examination of the original research objective: *"How can a company effectively govern Intelligent Process Automation?"* This method not only facilitates a detailed exploration of the research aim but also enables the investigation of additional pertinent questions, including the encountered challenges and the benefits and risks associated with implementing AI-driven tools. These additional inquiries played a crucial role in structuring the interviews and deepening the understanding of the adoption and governance of AI in the business context.

The decision to employ the Gioia method for analyzing the qualitative data was deliberate and well-suited to the nature of the research, which involved conducting ten semi-structured interviews. Grounded in the principles of grounded theory, the Gioia method was the most appropriate choice, providing an intriguing and systematic approach to analyzing the gathered data. Its application promises to yield valuable insights and contribute to a comprehensive understanding of the governance of IPA.

4.1   The Analysis

During the analysis of the interviews, intriguing similarities emerged, even though the interviewees were engaged in varied roles within the Bosch environment. While their specific activities differed, there was a notable common ground regarding their proximity to IT in general and automation processes. This encompassed a broad spectrum ranging from utilizing bots and pure AI to employing automation tools like Automation Anywhere or focusing on e-commerce tools. This diverse range of experiences and knowledge empowered the interviewees to provide insightful and well-defined answers. Consequently, the open coding analysis revealed numerous interconnections in each interview. These links highlighted the underlying threads that tied together the experiences and perspectives shared by the interviewees.

4.1.1 Adoption of AI

4.1.1.1 The use of AI for the company

-Undoubtedly, despite differing perspectives on the ultimate impact of such changes, all interviewees acknowledged the fundamental purpose of AI: to replace repetitive and redundant tasks that were bogging down the company's workflow. Their insights reflected a consensus that AI is highly beneficial for automating tasks characterized by repetition and redundancy. Statements such as *"I think it is constructive for very repetitive tasks," "tasks that are redundant can be automized," and "It is also perfect for any kind of repetitive tasks that have to be done very regularly"* underscored this shared viewpoint.

This alignment between AI, bots, and automation processes and streamlining repetitive tasks is logical and intuitive. As the bot programmer explained, *"A bot learns nothing. It is just a repetition of commands you give it."* Programmers further emphasized that the development of such programs could leverage artificial intelligence, *"You can use an artificial intelligence, a chatbot kind of thing, to make a bot."* This revelation adds an intriguing dimension, demonstrating that AI is not merely an application applied to specific tasks but can also contribute to the process of other projects.

-Furthermore, confident individuals, particularly managers, and project managers, perceive AI as a valuable tool for resource reallocation within the company. This reallocation extends beyond cost considerations; as one manager noted, *"The cost aspect can be reallocated to other departments."* It also encompasses the redistribution of human capital. With AI shouldering repetitive tasks, employees now have more available time. This newfound time enables them to take on new tasks and responsibilities, as expressed by interviewees: *"Now employees have more time"* and *"You can also give them more new tasks.".* The ability to reallocate human capital to previously neglected areas is viewed as a significant advantage. It allows employees to tackle new tasks previously deemed too demanding, *"reallocated to new tasks that before they were maybe too busy to deal with."* This reallocation of resources is seen as directing human potential toward more worthwhile and impactful endeavors within the company, *"reallocation of resources to more valuable tasks."* Notably, this perspective is not limited to managers alone; employees also appreciate the ability to diversify their daily job functions and embrace new challenges. The shared sentiment among managers and employees highlights the transformative power of AI in optimizing resource allocation and fostering a dynamic work environment.

Throughout the interviews, the interviewees provided valuable insights and focused on specific elements related to using AI-driven tools. One prominent aspect discussed was the impact of AI on repetitive tasks. Several interviewees emphasized how AI and automation effectively replace mundane and repetitive tasks, freeing up valuable time and energy for employees to engage in more meaningful and intellectually stimulating work. This recognition of the time-saving nature of AI-driven tools highlights their potential to enhance organizational productivity and efficiency. Automating repetitive tasks frees employees from mundane responsibilities, enabling them to dedicate their time and skills to more valuable and intellectually challenging endeavors.

4.1.1.2 Benefits of IPA

-As mentioned earlier, the primary benefit highlighted by the interviewees regarding AI-driven tools and automation is quite evident. The project manager pointed out that the *"benefits obviously of any kind of automation are that it can reduce any kind of manual labor."* This reduction in manual labor significantly impacts both time and cost. Another interviewee noted, *"I would say it is time-saving for sure because you have time to do just basically other things to create, to have other time to help on other projects to support.".* The benefits extend further, as an automation leader explained, *"Benefits rise from AI. I know that it can be cost-saving and can be time-saving; you can increase productivity, therefore."* These statements from the interviewees highlight the tangible advantages of implementing AI-driven tools and automation. The reduction in manual labor not only saves time but also leads to cost savings.

-As employees can shift their focus towards other tasks, managers recognize an additional benefit: the ability to enhance the customer experience. With the reduced time needed to perform repetitive tasks, employees can now dedicate more time to attending to customers' needs. One manager emphasized this point, stating that employees can now increase the *"customer experience because, in this case, you do not only have less time needed to place an order, but you also have the time now to take care of the people of the customers that need something on the phone.".* By having the freedom to prioritize customer interactions and provide personalized assistance, employees can significantly improve the overall customer experience. Managers recognize that enhancing customer-centric activities significantly benefits AI and automation.

-Thanks to the increase in available time and the shift in daily tasks, employees can experience the expansion of their knowledge and an improvement in job satisfaction. The

process manager noted, *"It can make jobs more interesting because people do not have to do tasks that are mostly a bit boring; it increases job satisfaction."* Both managers and employees agree that this transition brings significant benefits, allowing individuals to learn and explore new topics. According to their feedback, *"It is absolutely beneficial because people can learn and have time to learn something else and have time to explore new topics. Furthermore, because of it, you can also give them more new tasks they can develop on, which is really nice because otherwise, you would have, let us say, an apparent status quo."* A concrete example within the company illustrates this positive impact. One colleague, who previously had limited knowledge and skills, was allowed to grow through AI and automation. As explained, *"He was a person that did only know how to place an order in SAP. His knowledge is now broader because he said, 'Okay, now you will implement, and you will become the project leader of EDI.' So he needed to learn a new digital solution."* The ability to widen knowledge, increase job satisfaction, and foster personal growth are clear outcomes of integrating AI and automation in the workplace. These insights shared by managers and employees highlight the transformative effects of these technological advancements on professional development and the dynamic nature of work.

-Finally, in this specific axial coding focused on the different benefits highlighted by employees, one crucial factor that directly impacts the work itself is the reduction of errors. AI and automation are crucial in minimizing human errors, particularly non-manual mistakes that can occur when people are only partially concentrated. As one manager stated, *"It reduces often mistakes, especially non-manual mistakes, people who are not concentrated."* The significance of error reduction becomes even more apparent when considering the risks and costs associated with human errors. He highlighted the importance of finding alternatives to human mistakes, stating, *"It was too risky for human errors, and it was not worth the money and the cost that we were paying those employees."* Another interviewee emphasized the need for automation to reduce the risk of errors, saying, *"Automation can help reduce error; human mistakes are common, and as it is common, the need to find something that can replace that mistake with something good is high; therefore, automation processes help to reduce this risk."*. Organizations can significantly minimize errors by implementing AI and automation, improving efficiency and higher-quality outputs. The reduction of errors not only enhances the overall effectiveness of operations but also mitigates risks and associated costs.

The interviews shed light on the diverse range of benefits AI brings to companies. Several vital advantages emerged, including time and cost savings, improved knowledge, enhanced customer satisfaction, and error reduction. This enables employees to focus on higher-value activities, ultimately increasing productivity and output. Through AI-driven tools, employees can access advanced analytics and data-driven insights, enabling them to make more informed decisions. This acquisition of knowledge and expertise enhances their capabilities and enables them to contribute more effectively to organizational goals. Leveraging AI-driven tools and automation processes allows companies to deliver improved, personalized customer experiences. Organizations can enhance customer satisfaction and loyalty by reducing response times and streamlining service delivery. Implementing AI-driven tools and automation processes minimizes potential mistakes, ensuring greater precision and reliability in operations.

4.1.1.3   Risks of IPA

-Even if ethical questions have been extensively addressed in previous years, the focus has shifted toward the governance of AI. While ethical issues are still on the minds of some individuals, the emphasis has now expanded to include data governance and safety considerations. One employee from Germany raised concerns about the ethical risks for customers, particularly regarding how data is treated and transferred within and between companies. They emphasized the increasing importance of data protection and compliance, citing the significance of regulations like GDPR: *"One risk that I suddenly have in mind now will be the ethical risk for the customer can be because of how data is treated, how it is handed over in the company or between companies. Also, if there are transfers, this can be tricky and needs to be checked more and more as it is more important today with also the GDPR."* Data safety and ethical considerations also extend to the perspective of process managers. They stress the need to obtain customer consent and ensure proper data handling: *"You need to get the customer's approval that he wants access to an application. You cannot just steal the customer's data and put it there. So, all these ethical things you need to take care of."*

-Furthermore, the ethical dimensions of AI implementation in companies go beyond data safety. Some managers and programmers express concerns about the potential risks of using AI as a substitute for human workers. They emphasize the importance of maintaining a human presence in customer interactions: *"In the customer journey, you have to be sure that you still have this human presence in the touchpoints."*. A manager closely

linked to the CEO highlights the potential risk of prioritizing productivity and monetary gains over the human aspect, emphasizing the need for humans and AI to work together: *"If you are too into productivity gains or money, then you forget about the human side of it, and that is the risk. If there is no human, then there is no intelligence; there is no company. You cannot use your artificial intelligence and your automation processes to replace people; you need to make them work together."*

-As a consequence of laying off human capital, there is a noticeable increase in dependency on AI, automation processes, and bots. While these technologies offer significant benefits, they also introduce new dependencies and risks. As one interviewee pointed out, relying solely on AI or bots can lead to a different type of dependence: *"Not just a programmer or, for example, a bot that understands how it is functioning, but that it is because then you are again dependent on a person, the programmer, or on AI itself.".* This observation highlights the potential pitfalls of shifting reliance from human employees to technology. Another colleague from Belgium who is etool manager shared a similar sentiment, expressing concerns about the risks associated with excessive dependence on fixed processes like bots or AI: *"You become too dependent on the process; you cannot take that as a risk because even fixed processes like bots or AI, which fluctuate more, can break.".* This quote emphasizes the recognition that AI and automation, while powerful tools, are not infallible or invulnerable to failures or disruptions.

During the interviews, significant attention was drawn to the potential risks associated with AI, particularly in ethics, data security, human substitution, and dependency on AI and automation. Ethical concerns emerged as a focal point, with interviewees expressing apprehension regarding the treatment and handling of data. The ethical risk of customer data and its transfer between companies was emphasized, especially in data protection regulations such as GDPR. Ethical considerations extend beyond data security. Interviewees raised concerns about the potential risks associated with the misuse or overreliance on AI technologies. This recognition of the critical role that human interaction plays in certain aspects of business highlights the need to strike a balance between automation and maintaining a human-centered approach.

Furthermore, the interviews highlighted the risks associated with dependency on AI and automation. While these technologies offer numerous benefits, it is essential to recognize that they are not omnipotent or omniscient. Over reliance on them can introduce vulnerabilities and potential disruptions.

4.1.1.4   Implementation of IPA

-One crucial aspect project managers, managers, and programmers emphasized during the interviews is the importance of conducting a comprehensive analysis when implementing AI and automation. Interviewees unanimously agree that thoroughly analyzing the environment and relevant factors is essential for successful implementation. A project manager highlighted the significance of conducting meticulous analysis, particularly for significant initiatives, stating, *"When it is about the big topics, I think then it makes sense to have really first a good analysis of what you are doing.".* This underscores the need to evaluate the requirements and challenges associated with AI implementation to ensure its effectiveness and alignment with organizational goals. An illustrative example the data team manager provided further illustrates the significance of conducting an analysis.

The manager shared an experience with a chatbot project focused on after-sales support. It became apparent that a more comprehensive analysis should have been performed before implementation. The manager explained, *"We had a chatbot project for after-sales, and there we realized we should have done a better analysis. Because it was quite a big project, and the AI could not identify all the special words in heating... The complexity was too high; it had a hard time understanding the accents in the country, Flemish and Walloon."* This example highlights the importance of understanding the nuances and specific requirements of the environment in which AI will be deployed, as overlooking such factors can lead to suboptimal results. The need for thorough analysis is reiterated by interviewees, emphasizing the need to evaluate various aspects such as the environment, cost, and time saved through AI implementation. A participant says there is a *"Need to do the analysis of the environment, of the cost, of the time saved by the implementation of an AI before everything.".* The value of conducting a comprehensive assessment is ensuring that AI's benefits and potential drawbacks are well understood before implementation.

-Linked to the importance of analysis, it is crucial for managers and CEOs to have a deep understanding of the organization's needs and capabilities, particularly during the implementation of AI. It is not enough for company leaders to be driven solely by the eagerness to adopt AI technologies. Instead, they should consider whether AI implementation aligns with the organization's objectives and whether the company possesses the necessary skills and resources to support it effectively. Automation manager emphasized the need to understand the people and their skills within the organization, stating, *"You*

have to understand the people; you have to understand their skills. Is it going to be mean-ingful, or are you going to implement it because it is the fashion, you know? So, therefore, I would say that is a risk.". This highlights the importance of evaluating the organization's internal capabilities and ensuring that AI adoption is driven by genuine value and align-ment with strategic goals rather than purely motivated by trends or external pressures.

Awareness of the organization's needs and capabilities is crucial at all levels, from employees to managers and top-level executives. As one interviewee explained, *"A com-pany should be very aware of what it needs, of what they are capable of doing, especially at the employee level, at the manager level, at the CEO, CFO, CIO.".* The significance of a holistic understanding of the organization's capacities and expertise enables informed decision-making regarding AI implementation. Moreover, there are inherent risks asso-ciated with AI adoption, and organizations must be mindful of these risks and the impact of change. Implementing AI solely by considering the organization's specific needs can be beneficial. As one programmer cautioned, *"But there are risks, of course, a lot. You need to be aware of the change, you need to be aware of your needs. You do not need to do it because you want to do it.".* It highlights the importance of a strategic and deliberate approach to AI implementation, where decisions are driven by a deep understanding of the organization's requirements and the potential benefits and challenges associated with AI adoption. In addition to internal considerations, understanding the customers' needs is crucial. Organizations can gain insights into customer requirements and ensure that AI implementation aligns with those needs. This external perspective should be considered when evaluating the suitability of AI technologies. As one interviewee pointed out, *"You have to know more about the needs, for example, of the customer.".*

The analysis of the environment was considered a crucial step in the implementation process. Interviewees stressed that before adopting AI, organizations should conduct a comprehensive assessment of their operational landscape. This includes examining exist-ing processes, systems, and data infrastructure. By conducting a detailed analysis, organ-izations can identify areas where AI can bring the most value and understand how it aligns with their business context. Understanding the organization's needs and capacity was also highlighted as a vital aspect of successful AI implementation. This involves not only con-sidering the technical capabilities but also the skills and expertise of the workforce. Inter-viewees emphasized the importance of comprehending the human element and ensuring employees possess the necessary skills to work alongside AI technologies. It is significant

to align AI implementation with the organization's capabilities and ensure it is purposeful and well-suited to the workforce.

Furthermore, the interviewees emphasized that the implementation process should be driven by the organization's specific needs rather than being motivated solely by the desire to adopt AI. It was emphasized that organizations should clearly understand their objectives and evaluate how AI can contribute to achieving them. Interviewees cautioned against implementing IPA merely to follow trends, emphasizing the need for a meaningful alignment between AI adoption and the organization's goals.

Through selective coding, a comprehensive understanding of the interviews has been achieved. The data has been analyzed, and critical quotes have been extracted to form the first big picture, which can be categorized into four main themes: the use of AI, its benefits, its risks, and the implementation process. This selective coding can be labeled as the *"Adoption of IPA."*

The first theme, the use of AI, explores how interviewees perceive and utilize AI in their respective companies. It delves into the practical applications of AI and how it is beneficial in solving specific business challenges. By analyzing the interviews, insights have been gained into how AI is being leveraged by professionals working with it.

Moving on to the benefits and risks, the second theme highlights the advantages and disadvantages of implementing AI within an organization. Interviewees highlighted AI's positive outcomes and improvements, such as time and cost savings, increased knowledge, better customer satisfaction, and error reduction. Simultaneously, AI's risks and ethical considerations, including data security and the potential for human substitution, are also addressed. This theme provides valuable insights into the multifaceted nature of AI's impact on businesses.

The fourth theme centers around the implementation of AI. It underscores the significance of this phase, particularly for managers and CXOs. Interviewees emphasized the importance of conducting thorough analyses of the external environment and internal organizational needs and capabilities. This comprehensive understanding ensures a successful implementation and alignment of AI initiatives with the organization's goals.

In conclusion, the selective coding process has allowed for a systematic categorization of the interviews, resulting in a comprehensive understanding of the adoption of AI. This analysis provides valuable insights into the use of AI, its benefits and risks, and the significance of a well-planned implementation process... A holistic view of the adoption

of AI has been achieved by categorizing the interviews into these distinct themes. The themes explore facets of AI implementation, ranging from its practical use to the benefits, risks, and criticality of a well-informed implementation process. Organizations can make informed decisions about adopting and integrating AI into their operations, considering these dimensions.
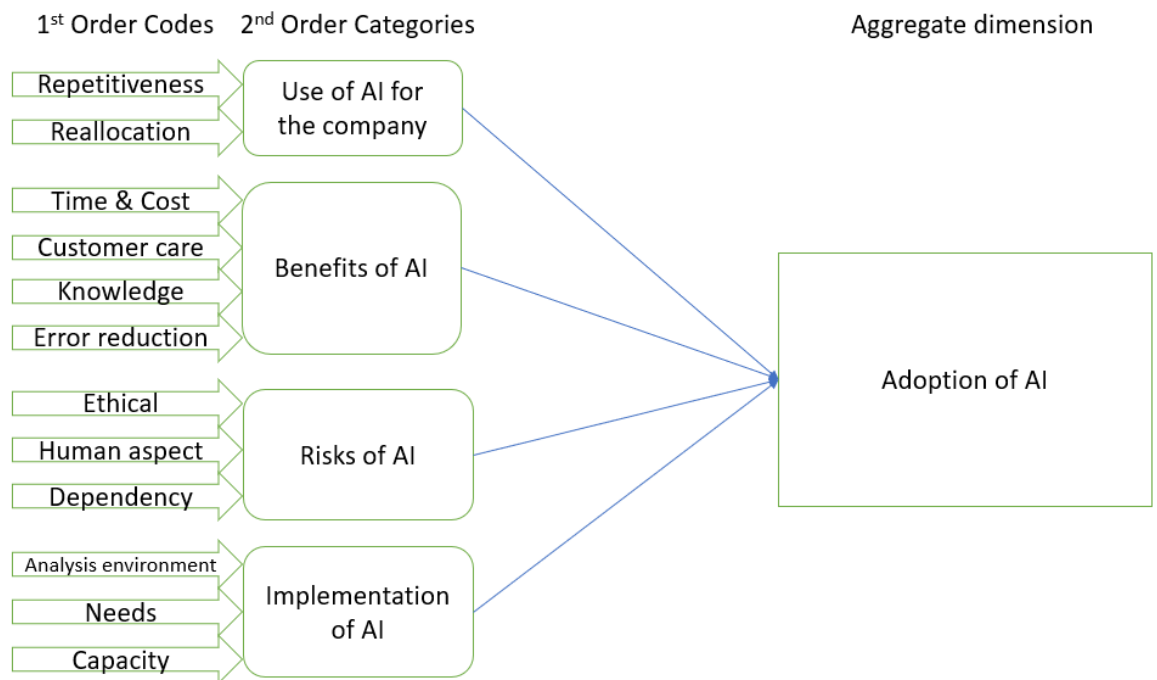
Figure 16: Data Structure for Adoption of IPA

4.1.2   Governance of IPA

4.1.2.1   Communication

-When faced with change, individuals often experience fear and apprehension, driven by concerns about job security, financial stability, and personal well-being. Recognizing this, project managers, process managers, and the data team manager emphasize the critical importance of effective internal communication. As managers expressed, *"Internal-external communication needs to be fulfilled with precise elements to make everybody understand what is at stake and what is going on because people must understand the changes correctly."* Managers stress the need for efficient communication that fosters understanding among CXOs, stakeholders, and employees whose roles may be affected by the changes.

The aim is to alleviate fears and ensure that individuals perceive the change as a support mechanism rather than a threat. As one project manager emphasized, *"Communication within the company is critical and maybe the most important aspect because you need to make people aware that they are not going to be replaced; they are going to be helped, and that people will agree on the change. Otherwise, you cannot do anything if people disagree".* Effective communication not only addresses individual concerns but also helps align stakeholders' perspectives and gain their support. Open and transparent communication channels allow for constructive dialogue and a shared understanding of the change process. Another interviewee remarked, *"If you can communicate correctly with your managers and stakeholders, then you can implement whatever you want as long as it is not detrimental to the company's bottom line."* By providing clear and precise information, organizations can help individuals understand the purpose and impact of the changes, fostering acceptance and support.

-While embarking on projects involving new automation processes, effective communication with programmers is essential, extending beyond internal team members and managers. The interviews reveal a consensus among certain interviewees, particularly project and process managers and programming managers, regarding the importance of engaging the right designers and maintaining clear communication channels. Bot manager said, *"The right designer to design the AI can be from within the environment, within the organization, or from other countries like India, Poland, Hungary, or South America. Implementing it correctly and communicating effectively with them is crucial".* Communication challenges in AI implementation and maintenance were also highlighted. As one programmer pointed out, *"I would say, in general, communication is still difficult. Maintenance is my main problem because I am more used to working with that".* Maintenance, alongside design, emerges as a crucial pillar of successful implementation.

Clear and precise communication becomes paramount in the design phase, ensuring that programmers fully know the desired outcomes and requirements. One manager stressed, *"The design part requires pickiness in articulating what you want and need. It would be best to establish excellent communication with programmers, making them aware of your expectations. Once you achieve that, you can attain the desired outcomes without any process-related issues".* These insights highlight the significance of effective communication within teams and management and with external programmers involved in designing and maintaining automation processes. Engaging the right designers and establishing open lines of communication enable organizations to convey their needs and

expectations accurately, maximize the chances of successful implementation and mini-mize process-related challenges.

The interviews emphasized the importance of effective communication, which emerged as a recurring theme throughout the discussions. The need for robust internal communication between managers and employees affected by the changes was high-lighted, as it fosters understanding and alignment. Managers acknowledged that efficient communication is vital to alleviate fears of job loss and enable employees to embrace the changes as supportive rather than threatening. In addition to internal communication, the interviews emphasized the significance of clear and continuous external communication with programmers involved in designing and maintaining AI systems. Collaboration with programmers requires effective communication channels to overcome challenges associated with design intricacies and ongoing maintenance, as one interviewee remarked.

The recognition of communication as a critical factor underscores its role in navi-gating the complexities of AI implementation. A holistic approach to communication, encompassing internal communication to address employee concerns and external com-munication with programmers for seamless collaboration, is vital to successful outcomes. By fostering clear and open lines of communication, organizations can promote under-standing, collaboration, and effective problem-solving, thus paving the way for successful AI integration and minimizing challenges associated with design and maintenance.

4.1.2.2 Internal management

-Bosch had some problems in the past with the documentation of their processes, as men-tioned by one interviewee: *"We were lacking behind."* However, the significance of doc-umentation in understanding processes must be considered. A programmer bot requires a clear overview and understanding of the processes, as highlighted by another interviewee: *"There needs to be a clear overview of the processes, a clear understanding, clear knowledge for clear teamwork."* Managers also emphasize the importance of documenta-tion. According to one manager, it is crucial to *"document really well what happens."* This sentiment is echoed by another manager who emphasizes the need for *"better docu-mentation [and] better understanding of the company and the other processes from other departments."* This underscores the importance of comprehensive documentation to un-derstand the organization and its interdepartmental processes better. The harmony of pro-cesses is essential to facilitate the governance of AI and automation. According to one

process manager, the focus is on *"documenting all the processes of the company, of all the sales organization of Bosch Thermotechnology to try to get harmonized processes."* Internal documentation and understanding between employees and departments are critical, as stated by another interviewee: *"You cannot, for instance, implement automation or AI process if you do not know how the other department works because everything is linked."* This highlights the need to document and harmonize each department's processes to ensure a cohesive, streamlined approach.

-Thanks to the insights from managers, project managers, and process managers, a clearer understanding of the management side and its importance in governing was gained. It is recognized that a well-defined strategy is crucial to ensure the correct procedures are followed from design to maintenance. As one manager emphasized, *"There needs to be a clear, organized strategy in the long term that will help employees from different departments to work together and understand what we are asked to do."* Furthermore, understanding the current situation and having a clear vision of the desired future state is essential for the team. Knowing where they come from and where they want to go, the team can align their efforts and work towards a common goal. The data team manager said, *"We did a lot of cleaning up the last two years and structuring and defragmenting. And what we have now is an apparent vision of where we want to go".* This demonstrates the importance of having a long-term perspective and a shared vision for the organization's direction and knowing that the focus may have been on short-term benefits and immediate business support in the past. However, there has been a shift towards a more balanced approach. As described by the project manager, *"It was very short-term, having an immediate benefit to the users and support the business. Whereas now, I think we have a midterm view. So, the team works partly on still serving the business but partly on where we want to be in 2-3 years".* This highlights the need to consider midterm and long-term objectives to drive sustainable growth and progress.

-To fully harness the potential of IPA within the company, implementing guidelines and rules is crucial, as managers and programmers highlight. One manager emphasizes the importance of having written guidelines or rules, stating, *"I would say guidelines or rules need to be written for the main part; you can also have unwritten rules, that is entirely fine, but you need to have something."* For another manager, implementing clear guidelines and processes is even more significant. They stress the need for clarity and agreement among employees, stating, *"Guidelines need to be implemented, can be from the analysis until the maintenance. You have to have clear guidelines and clear processes.*

You need something clear that people will agree upon, and that people will respect".
Additionally, they emphasize the importance of guidelines for analyzing the environment,
understanding the cost, and assessing the time saved by implementing AI. Expanding on
the idea of guidelines, one interviewee suggests the need to define a framework that es-
tablishes what is legal and what is not. They emphasize the importance of adapting and
evolving guidelines as new possibilities emerge, stating, *"We should define a framework
on what is legal and what is not. It is strict enough, but with the new possibilities, it should
be as strict as now. To define rules and governance for the new possibilities".* This high-
lights the need to continually update guidelines and rules to keep pace with the evolving
landscape of AI technology. Implementing guidelines and rules is crucial for leveraging
the benefits of IPA within the company. As AI technology continues to evolve, it is es-
sential for guidelines to adapt and evolve as well.

The internal managerial aspect is pivotal in successfully governing a company. Sev-
eral key factors contribute to this importance, including a focus on process documenta-
tion, a mid-to-long-term strategy, and establishing clear and evolving rules and guide-
lines.

Firstly, the documentation of processes and departments is crucial for facilitating ef-
fective communication, collaboration, and understanding within the organization. Man-
agers recognize the significance of clear process documentation. This emphasizes the
need for comprehensive and up-to-date documentation to ensure smooth workflow and
knowledge transfer between teams and departments.

Secondly, a clear mid-to-long-term strategy is essential to give the organization a
sense of direction and purpose. Managers emphasize the importance of a strategic vision
that guides decision-making and aligns employees toward common goals. This strategic
clarity enables the organization to make informed decisions regarding governing AI, en-
suring that efforts are directed toward long-term growth and success.

Lastly, establishing clear and evolving rules and guidelines is vital to provide a
framework for decision-making, governance, and ethical considerations. Managers rec-
ognize the need for guidelines that are adaptable to changing technological advancements.
These rules and guidelines ensure consistency and compliance within the organization
and allow for flexibility and adaptation to emerging challenges and opportunities.

In summary, the internal managerial aspect of AI and automation implementation is
paramount. Organizations can effectively navigate the complexities of AI by focusing on

the documentation of processes and departments, developing a clear strategic vision, and establishing evolving rules and guidelines. These measures contribute to enhanced communication, collaboration, and decision-making, enabling companies to leverage the benefits of AI and automation for long-term success.

Finally, through selective coding, the analysis reveals two distinct subthemes that contribute to the broader theme of governance of AI. These subthemes include internal and external communication and the internal managerial aspect. By identifying and categorizing these subthemes, the selective coding process helps provide a comprehensive understanding of the governance of AI within a company. This selective coding can be appropriately named "Governance of IPA."

During the interviews, it becomes evident that the governance of AI is a topic of great importance for the interviewees and the companies they represent. The governance discussion is divided into two key aspects: internal and external communication and internal managerial. The interviewees recognize the significance of effective communication and emphasize the need to address the right stakeholders. This includes clear and precise communication within the organization and effective communication with external stakeholders such as programmers and other relevant parties. The aim is to ensure everyone understands AI implementation's goals, challenges, and processes.

Furthermore, the internal managerial aspect is a critical component of AI governance. The decisions and actions taken by management play a significant role in shaping the governance framework. Managers must provide strategic direction, establish guidelines and rules, and oversee the implementation of AI technologies. By doing so, they create an environment that fosters responsible and effective AI governance.

A comprehensive understanding of the two subthemes emerges by categorizing the interview data under the selective coding of Governance of AI. This categorization enables a deeper exploration of the internal and external communication needs and the internal managerial decisions that contribute to effective AI governance. It allows for a more holistic view of the challenges and considerations surrounding the governance of AI within an organization.
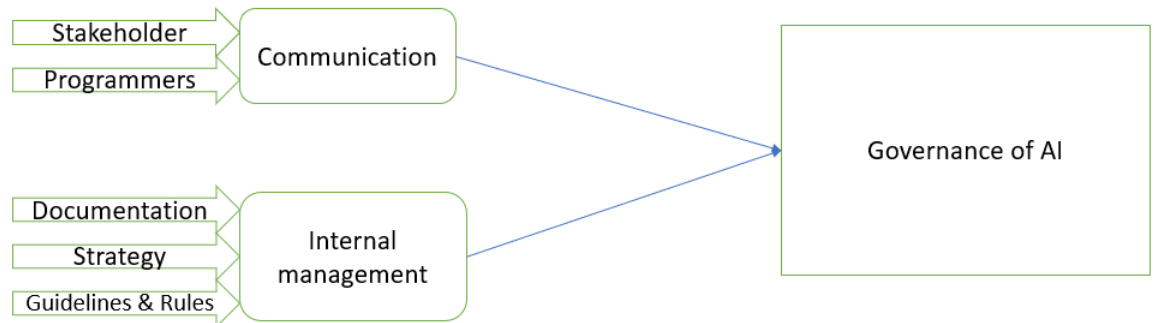
1st Order Codes   2nd Order Categories   Aggregate dimension

Figure 17: Data Structure for Governance of AI

4.2   Selective Coding

An open and axial coding approach was employed to organize and categorize the data by thoroughly analyzing the interviews. The axial coding process revealed several distinct subthemes, which include the use of AI for the company, the benefits, and risks associated with AI, the implementation process, communication strategies, and the internal managerial aspect. These subthemes represent crucial components in understanding the adoption and governance of IPA within organizations.

The first four subthemes, encompassing the use of AI, its benefits, risks, and the implementation process, collectively contribute to the overarching theme of "Adoption of AI." These subthemes shed light on how companies can effectively incorporate AI into their operations and leverage its potential to drive positive outcomes. They provide valuable insights into the practical aspects of adopting AI, including its applications, advantages, and potential challenges.

On the other hand, the remaining two subthemes, namely communication and the internal managerial aspect, form the key theme of "Governance of IPA." These subthemes delve into the importance of clear and effective communication, both internally and externally, throughout the AI implementation process. They also highlight the critical role of management in guiding and overseeing the governance of AI, emphasizing the need for strategic decision-making, guidelines, and rules.

Identifying these two main themes, the Adoption of AI, and the Governance of AI, through the axial coding process offers a comprehensive framework for understanding

the insights derived from the interviews. These themes encapsulate the core elements necessary for organizations to harness the full potential of AI while navigating the associated challenges. By focusing on these themes, companies can make informed decisions, implement appropriate strategies, and ensure responsible and effective adoption and governance of AI. Overall, the analysis of the interviews provides valuable knowledge and guidance on the practical steps and considerations involved in adopting AI within organizations, as well as establishing effective governance frameworks to maximize its benefits.

4.3 Bosch Thermotechnology

This case study aims to comprehensively analyze the challenges and solutions implemented for the use of AI-driven tools and, in the broader sense, Etools by Bosch Belgium, a subsidiary of the German multinational corporation Robert Bosch GmbH. Bosch Belgium Home Comfort operates in the highly competitive market of heaters, heat pumps, thermostats… Its operations and sales are spread across Belgium for installers, wholesalers, end consumers, architects, and schools.

Bosch Belgium has implemented various strategies and technologies to address these challenges, such as enterprise resource planning (ERP) systems with SAP, robotic process automation (RPA) with Automation Anywhere, or internal tools that allow employees and companies to save time and money. This case study aims to explore the effectiveness of these technologies by focusing on their impact on the business, implementation, and adoption.

Hence, the Etools that Bosch Belgium offers clients and the internal tools or processes that the employees use. In addition, creating a bot in the Netherlands that automatically creates customers in SAP will be looked upon.

4.3.1 Adoption of etools, automation, and AI

Adopting etools has allowed Bosch Belgium Thermotechnology to streamline its processes and improve collaboration across its various departments. The company has implemented various digital solutions to gather and analyze product and service data, including data analytics, cloud computing, and Internet of Things (IoT) technologies. This has enabled Bosch Belgium Thermotechnology to identify trends and insights that help the company to develop more efficient and effective solutions for its customers. The

governance of AI is also an area of increasing interest for Bosch Belgium. The company is exploring how AI can improve its products and services while ensuring the technology is used ethically and responsibly. This involves developing a clear framework for developing and deploying AI solutions, as well as identifying the potential risks and benefits of AI. Adopting etools and governance of AI are essential steps for Bosch Home's comfort as it continues to innovate and provide sustainable solutions for its customers. The company is committed to using technology to improve its products and services while ensuring that it operates responsibly and ethically. Through its adoption of etools and exploration of AI governance, Bosch Belgium Thermotechnology is well-positioned to continue leading the way in energy-efficient heating and hot water systems.

In Bosch Belgium Home Comfort, the researcher-led and co-leaded several internal IT projects, such as digital invoice automation in SAP, EDI implementation for some customers, BOT creation, automated exports from SAP to SQL to Excel… Moreover, it uses internally and externally a lot of different tools: etools or driven by AI. Some of them will be reviewed to see how a company such as Bosch has adopted AI comprehensively and etools in its business.

Externally different tools have been developed that are useful for the two brands, Bosch and Buderus: The eshop and the partner portal; those two websites allow customers to purchase directly online without the need to send emails or make orders via phone, and the orders arrive directly in SAP and can be processed without any delay. For ordering, the client needs an account with a Bosch ID; thanks to a bot, this account is created automatically on the shop, but also in SAP ERP, this bot helped reduce time and reallocate employees to more exciting tasks, same for EDI where all employees that used to put these orders in SAP are now managing the relationships with partners and are evolving to more exciting position, with new knowledge provided by best practices but also online classes within the company, such as SQL, Excel, Python… Another very used website developed for Belgium and Netherlands is the RMA for unused and warranties return, where clients put their articles. The issue comes from it, which is directly connected to the sales and logistics departments, where they can solve all their problems. A customer-oriented experience with time-saving, automated, and user-friendly tools.

Internally, the back-office side is used. In addition to SAP ERP, which is linked to all the tools, especially the eshop, for implementing the orders in SAP so that all departments have access, including sales, logistics, after-sales, and the data team, to where the

work is being done. The daily work is done on SAP to test the automation process to implement it in the customized ERP. Indeed, many contacts are made with numerous programmers in India to help implement new functionalities, particularly transactions that help reduce time execution and improve automation. For instance, a new digital automated invoicing method in SAP for the Netherlands has been done; this will reduce errors and increase time for other tasks. SAP CRM and Microsoft Lists are also used notably for process claims. Programmers and people responsible for automated tasks widely use Automation Anywhere linked with Excel and SQL. As of now, the researcher is co-leading another project that will help several co-workers in the automated download of Excel files coming from different databases and websites; these excel files will be processed in SQL and will get XML reports that the stakeholder will be able to upload in the Compano tool to increase data quantity and quality regarding articles and spare parts.

Thanks to these numerous internal and external tools, Bosch has strong knowledge of adopting different technologies, from websites, automated tools, bots, and programmed tools manufactured only for internal aspects, widely known as SAP and AI tools.

As Bosch is using and studying more and more the possibility of implementing chatbots and other AI tools in their daily tasks, for instance, once, an experiment is going on with the use of chatbots for providing sentences and assistance to employees that need to make and receive phone calls with clients; it will allow them to provide faster and more precise answers to specific demands, especially since Belgium is a multi-language speaking country with Dutch and French, but also, German and English. Talking about the chatbots, a presentation will be handed over to the whole data team about their usage and the possibility of applying them to the organization. The organization is increasingly aware of the possibility of using strong AI. Hence, guidelines have been implemented for Bosch worldwide for this tool.

Risks of ChatGPT*

There are multiple risks in using ChatGPT. Here are a few potential risks to consider:
1. Spreading fake news and disinformation, because ChatGPT can generate convincing and misleading text.
2. Bias and discrimination: If a language model is trained on discriminating and biased data, the model can reproduce this in its' generated text.
3. Privacy: Using ChatGPT demands the collection and saving of great amounts of personal data. This can be a danger to the privacy of its' users.
4. Abuse: ChatGPT can be abused for purposes like generating spam or phising emails. Or for manipulating conversations. Because of its familiarity and accessibility of ChatGPT there's a bigger risk on trustable fraud.

Using ChatGPT inside of Bosch

In Bosch ChatGPT can be used, but under certain conditions. These are:
1. No use of confidential or strictly confidential data. This includes know-how and intellectual property of Bosch. The bot trains itself by the information that is provided by other users, so in this way users outside Bosch could get access to our knowledge.
2. No use of personal data (avoiding violation of data protection laws such as the GDPR etc.).
3. Responses from ChatGPT should not be accepted unchecked due to their error susceptibility, but should be critically reviewed. Especially in case of further use of the responses, they should also be marked as coming from ChatGPT.
4. In the development environment, the person in charge for ITE Software in the division must also be included according to CD 07151 (IT in Engineering).
5. Take regard on copyright and open source licenses.

Recent developments of Bosch' policy about ChatGPT (and other AI chatbots) can be found here. More information about the use of ChatGPT in Bosch, you can find here.

Figure 18: Internal guidelines for the use of ChatGPT in Bosch

Several steps must be considered to implement new E and AI tools; as IT project coordinator and manager, several ideas have been developed with the manager. One can be ESKER EDI-email, which is used for smaller customers; it works as EDI. For instance, for this specific project, the leader had to:

(1) Assess the business problem: Identify the business problems and opportunities AI can address. It was essential to clearly define the problem and opportunity and set realistic goals for what the AI solution should achieve.

(2) Identify the data needed: Identify the data sources required to train the AI model. The quality and quantity of data are critical to the success of an AI solution. To do so, there is a need to check in SAP the different clients and their purchase rates in several transactions, have meetings with people processing the orders manually to understand the process, build process flows, and have meetings with some colleagues in the Netherlands.

(3) Build or buy an AI solution: Building a solution requires significant investment in AI talent, infrastructure, and technology. On the other hand, buying a solution can be quicker and more cost-effective but requires careful evaluation of vendors and their solutions. 12000 to 15000 euros for the implementation, then it is one€ per order, but the cost-benefice balance is much more enjoyable.

(4) Integrate the solution into business processes: Once the AI solution has been validated, integrate it into the existing business process. This significant point will be discussed in detail after this list.

(5) Monitor and maintain the solution: Monitor and maintain the AI solution to ensure it remains accurate and up to date.

As said, the fourth point needs to be more developed as it is significant for the company, the employees. Bosch has many different departments, automotive, heating, engineering, and tools… being flexible; the automotive industry is less flexible, with little room to implement new ideas, a very *"German"* way of strictly working. Whereas the heating department is considered the *"Start-up"* of Bosch, where you can try many things; for instance, the data team is the first and only team in the Bosch organization. With so many differences, the company's culture can be different. As of today, in the company, people are willing to change, add new technologies, more and more, more automation, and more tools. Nevertheless, communication is essential.

Some colleagues consider communication to be more important than the technical improvement coming from the implementation of new assets. Because people are looking for the outcome coming from the tool rather than for the technological improvements,

with lousy communication, people will think that they do their work the wrong way, that they are too lazy, and that they are going to be replaced; this happened to one mentor for a specific tool which in the end did not implement, due to a lousy communication to the stakeholder. There is a tremendous need to explain the outcome, what it means, what the change will be, and whether this new tool will replace people. Or will it provide them with support on specific tasks, thus allowing them to reallocate their time better? The teams have understood this distinction, as there is the will to implement new things to ease the workload. Therefore, communication became vital for us; process flow and PowerPoints during meetings, clear and precise internal communication, and best practices and training so that everybody understands perfectly what it is about.

In Bosch, adopting new AI-driven tools is studied and effective not only because it is a multinational with enough money to start projects but because these projects make sense in the business process, improve the user experience, and improve the allocation of resources. Bosch is not implementing AI and new tools because it is a new era. The implementation makes sense and is needed.

The company has recognized the importance of digital transformation in today's fast-paced business environment and has taken steps to integrate technology into its operations. Adopting etools has allowed Bosch to improve collaboration, leading to more efficient and effective customer solutions. Meanwhile, exploring AI governance demonstrates the company's commitment to using technology ethically and responsibly by developing a clear framework for developing and deploying AI solutions.

4.3.2   Bot Implementation in Bosch Netherlands

Organizations constantly seek innovative solutions to enhance operational efficiency and provide exceptional customer experiences. One area where technology has made significant advancements is in customer management systems and enterprise resource planning. CRM and ERP platforms have become crucial business tools to manage and nurture customer relationships. This chapter will delve into the project that the researcher co-leads on SAP, where the team embarked on creating an advanced bot that automates the customer creation process. Traditionally, this process involved manual data entry and repetitive tasks, which were time-consuming and prone to errors. By harnessing the power of SAP and leveraging intelligent automation technologies, it aimed to revolutionize how customer creation is handled within the organization. Automation has become a game-changer in various industries, and the project sought to capitalize on its potential within

customer management. By developing a sophisticated bot that integrates seamlessly with the SAP system.

This kind of project, related to automation and bot, is familiar in the Bosch world, as there is a will to improve time-saving methods; automation and AI are playing a dominant role. Furthermore, this project allows people to reallocate their time spent on different tasks, introduce new time-saving aspects, and, importantly, replace the four eyes principle existing at Bosch and the critical combination.

These two aspects are fundamental to us, and the bot allows the company to save time and money on each customer's creation. The four eyes principle is straightforward to understand as for each creation, including a financial aspect such as a change in IBAN, two people need to be affected, firstly the person changing it, secondly a manager to check if the IBAN is the one from the customer and not from the employee, with the bot 100% sure that the IBAN will always be the one from the company. The critical combination goes with the four eyes; an employee cannot have roles overlapping regarding security; in other words, an employee can create a customer with a new IBAN and place orders or credit notes. Otherwise, it would be easy to create a fake customer with the employee's IBAN and create a credit note to send money to himself. With the bot, again no more problems, and more people can access more rights.

The case study on Bosch, Belgium, provides valuable insights into how a large multinational company can successfully implement intelligent process automation to improve its operations and achieve significant cost savings. By adopting a comprehensive approach that involved identifying suitable processes, selecting appropriate tools, and engaging with stakeholders at all levels, Bosch achieved a high degree of automation throughout its processes. The company realized significant cost efficiencies and reduced process times while improving data accuracy and enhancing the employee experience.

5   DISCUSSION AND LIMITATIONS

5.1   Discussion

The governance methods of AI employed by Bosch Thermotechnology, the case company, align with the AI governance approaches discussed in the literature review, particularly concerning ethical considerations (Floridi, 2018; Miller, 2020) and overall governance frameworks (Schneider et al., 2022). Demonstrates that Bosch Thermotechnology's practices align with existing research and industry standards. Furthermore, the challenges encountered by the company mirror those identified by Alexopoulos et al. (2019) and Ojo et al. (2019), indicating the universality of these challenges across organizations.

However, it is crucial to recognize that the AI landscape is constantly evolving, and no fixed solution exists. This dynamic nature necessitates ongoing adaptation and innovation within the sector. From the analysis of the interviews and the internal process of Bosch, several key findings have emerged that contribute to addressing the initial research question of the paper. These findings shed light on various aspects of IPA governance within Bosch Thermotechnology and offer valuable insights for the company and the broader industry. They provide guidance frameworks and gate challenges, establish effective governance frameworks, and address ethical considerations. Additionally, these findings contribute to the existing knowledge base and can serve as a basis for future research and practical applications.

Overall, the analysis of the interviews and the internal analysis validate the alignment of Bosch Thermotechnology's practices with existing research and highlight the dynamic nature of the IPA domain. By considering the key findings from the analysis, organizations can enhance their understanding of the governance of IPA, making informed decisions to drive positive outcomes in this evolving field.

Bosch Thermotechnology is following IPA governance on the ethical and governance aspects of it, with specific internal guidelines about privacy, and security. Additionally, the main mechanisms such as communication and training, strategy, policies, or roles and responsibilities are also well tackled.

Nevertheless, Bosch's governance misses several important points to fully grasp the potential of IPA, there is a clear lack of contractual agreements in procedural mechanisms. Additionally, there is an absence of coordination from the relational mechanisms.

Nonetheless, Bosch governs in a specific way that is not described in the framework, the machine learning model governance, which can be part of the procedural mechanisms as it involves ensuring that models are developed, deployed, monitored, and updated in a responsible and compliant manner.
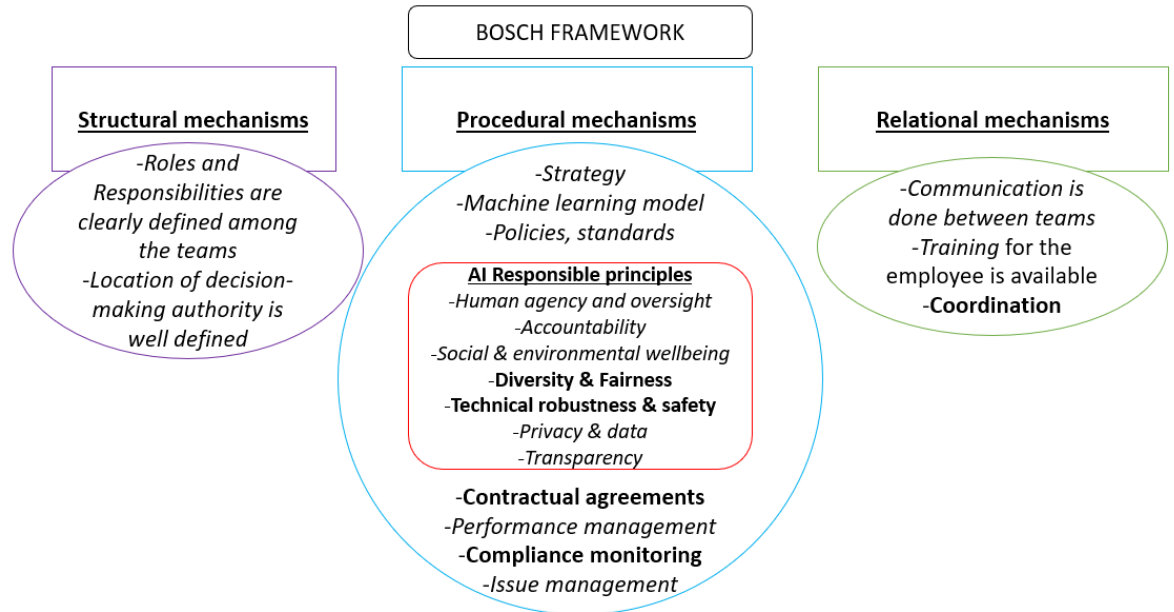

Figure 19: Bosch IPA governance framework

Companies, driven by the allure of new and trendy technologies, may overlook the importance of careful planning and evaluation. The rush to implement the latest methods without due diligence can lead to suboptimal outcomes and even detrimental effects on the organization. By emphasizing the importance of thoughtful consideration and avoiding the trap of unthinkingly following trends, companies can safeguard themselves from potential pitfalls and establish a more sustainable and prosperous approach to adopting new methods and technologies.

-Key finding 1: *To ensure good procedural mechanisms, companies wishing to implement AI must clearly and precisely analyze the environments, needs, and the organization's capacity.*

This proximity between top management and IT teams allows them to achieve better automation and AI faster than competitors. IT teams that are finely attuned to the requirements of the business, fostering a high level of trust between the business and IT, can effectively leverage the federal model for application needs to harness potential synergies.

-Key finding 2: *To answer structural and procedural mechanisms, the CXOs, team managers, and project and process managers must gather at least once a year to write a clear roadmap and do follow-ups based on the company's strategy.*

Furthermore, effective communication and knowledge sharing across departments, including after-sales, sales, and logistics, are paramount. This is particularly crucial considering the frequent interactions between these departments, their collaborative handling of customer complaints, and their shared utilization of SAP.

-Key finding 3: *To fulfill relational mechanisms, stakeholders linked to AI and automation need to document the processes carefully, and the team managers need to be aware of similarities and differences between teams and departments.*

Nonetheless, it is important to remind that organizations and Bosch here need to focus on global governance for IPA which results in a global approach.

-Key finding 4: *The contractual agreements as well as compliance monitoring need to be carefully overseen by managers during all phases of the project. To do so coordination with developers needs to be made.*

IPA is a product of two phenomena that broaden its possibilities: the incorporation of artificial intelligence like computer vision and machine learning, and the integration of automation technologies such as RPA and workflow automation. When implementing governance, it is important to consider the nature of AI as a variable. The emergence of Intelligent Process Automation (IPA) is poised to revolutionize companies' utilization of AI. The governance surrounding IPA must be tailored by building upon the existing framework.

5.2 Limitations and Future Research

Perfection is an ideal that researchers would like to reach, but limitations are part of the work. Hence, they must be aware of these limitations and work around them. Indeed, throughout the study, limitations were identified.

-Exponential aspect of AI: AI is, in a sense, a new phenomenon; articles and research are made every day for all kinds of AI. To be up to date with the innovation, the researchers. Moreover, knowing the exact state-of-the-art is almost impossible. Therefore, this

study gives a picture of what is currently, at the time of writing, taken for granted and confirmed in the AI universe.

-Researcher's bias: Although efforts were made to minimize researcher bias, there is a possibility that participants' interviews could have been subjected to excessive interpretation. This could be attributed to the researcher's involvement in Bosch Thermotechnology's automation and IT project. To mitigate this limitation, the researcher took necessary precautions and explicitly communicated the potential conflict of interest to all interviewees. They emphasized the importance of participants sharing their experiences and behaviors without any interpretations being included in the final findings.

Hence, the limitations recognized present a window for further research endeavors. Firstly, forthcoming studies should employ insights within real-world business environments to evaluate their efficacy in facilitating organizational governance. Secondly, additional research should be undertaken to validate the knowledge acquired especially by linking empirical materials and IPA experts' knowledge. Lastly, future investigations on continuously administering AI-driven tools should integrate diverse data sources from various temporal and spatial contexts which will help the comparison between IPA and other AI governance.

6   CONCLUSION

The goal of this paper was to answer the following questions on the governance of AI in companies:

-RQ: *How can a company effectively govern Intelligent Process Automation?*

The significance of AI in shaping the future of society cannot be overstated. Recognizing this profound impact, it became evident that comprehending how to navigate its integration within a company effectively was an essential subject for study. While existing literature primarily focused on the theoretical aspects of IPA, it was the logical next step to delve into the practical, making this internship a catalyst that set the thesis apart.

The initial perception of IPA governance was limited, viewing it merely as a set of guidelines. However, engaging in discussions with employees actively involved in automation and immersed in the practical realities of the internship, soon realized the misconception of the thoughts. It emerged as a vital and indispensable element for companies, transcending mere guidelines and permeating every facet of their operations. The revelations during these conversations and experiences with automation within the internship shattered preconceived notions. It became abundantly clear that AI held a position of importance. The intricate relationship between IPA and effective governance demands careful attention and strategic foresight. This thesis offers to bridge theory and real-world application of intelligent governance by uncovering this vital perspective.

After capturing the internal perspectives of managers, developers, and project managers within the company, and by comparing them to prior knowledge in this field, it became evident that IPA governance is more complex than what managers and the organization can think. It is only a wish to think that everything can be overcome thanks to the key findings stated before. Practice is more complex; it is not just a few guidelines needed. It needs a full governance structure, from structural to relational mechanisms. Nevertheless, some mechanisms appear to be central to the Bosch organization and can be found in prior studies of researchers, such as procedural mechanisms with different policies and processes. And the relational mechanisms where communication and training are the main part of the Bosch framework.

This revelation is remarkable, considering the scarcity of prior literature that addresses this pressing issue. Existing research has focused on theoretical frameworks and guidelines, neglecting companies' essential insights and perspectives. However, the findings of this study stand as a testament to the necessity of delving beyond theoretical

constructs. A clearer understanding emerged by engaging with the internal stakeholders and exploring their first-hand experiences. The significance of strategy, roadmap, analysis, and understanding of the organization's capacity in AI governance was reaffirmed, aligning them with the prevailing theories in the field that focused on clear guidelines.

By giving advice to organizations for the rightful implementation of IPA governance, especially by building a complete framework merging ethical and pure governance aspects including AI principles and governance mechanisms, allowed this research to bridge the gap between theory and practice, unveiling the multifaceted dimensions of AI governance within companies. This research fills the gap of IPA governance for companies by providing more information on IPA governance goals and mechanisms. A more comprehensive picture has been painted by delving into the perspectives of those intimately involved in the process. It is a picture that demonstrates the challenges faced and the pathways to success, and the means to overcome those challenges. The insights gathered throughout this research offer a valuable roadmap for companies grappling with the complexities of IPA governance. By assimilating shared experiences and aligning them with established theories, organizations can navigate the landscape, embracing the ethical, legal, and technical guidelines indispensable in this transformative era. In summary, this research contributes to the existing body of knowledge by filling a crucial void and shedding light on the companies' perspectives. It affirms the need for comprehensive guidelines while offering actionable insights to pave the way for successful governance in the future.

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APPENDICES

Appendix 1. Research Data Management Plan

Research data

Research data refers to all the material with which the analysis and results of the research can be verified and reproduced. It may be, for example, various measurement results, data from surveys or interviews, recordings or videos, notes, software, source codes, biological samples, text samples, or collection data.

In the table below, list all the research data you use in your research. Note that the data may consist of several different types of data, so please remember to list all the different data types. List both digital and physical research data.

Research data type	Contains personal details/information*	I will gather/produce the data myself	Someone else has gathered/produced the data	Other notes
User interviews		X		
Validation interview		X		
Literature review			X	

* Personal details/information are all information based on which a person can be identified directly or indirectly, for example by connecting a specific piece of data to another, which makes identification possible. For more information about what data is considered personal go to the Office of the Finnish Data Protection Ombudsman's website

Processing personal data in research

If your data contains personal details/information, you are obliged to comply with the EU's General Data Protection Regulation (GDPR) and the Finnish Data Protection Act. For data that contains personal details, you must prepare a Data Protection Notice for your research participants and determine who is the controller for the research data.

I will prepare a Data Protection Notice** and give it to the research participants before collecting data ☐

The controller** for the personal details is the student themself ☐ the university ☐

My data does not contain any personal data ☒

** More information at the university's intranet page, Data Protection Guideline for Thesis Research

Permissions and rights related to the use of data

Find out what permissions and rights are involved in the use of the data. Consult your thesis supervisor, if necessary. Describe the use permissions and rights for each data type. You can add more data types to the list, if necessary.

Self-collected data

You may need separate permissions to use the data you collect or produce, both in research and in publishing the results. If you are archiving your data, remember to ask the research participants for the necessary permissions for archiving and further use of the data. Also, find out if the repository/archive you have selected requires written permissions from the participants.

Necessary permissions and how they are acquired:
-User Interview: Asked consent to interviewees to store audio recording of interview on researcher's personal laptop for 5 years (no personal information, anonymized), recording will be deleted after

Data collected by someone else

Do you have the necessary permissions to use the data in your research and to publish the results? Are there copyright or licensing issues involved in the use of the data? Note, for example, that you may need permission to use the images or graphs you have found in publications.

Rights and licenses related to the data:
Literature review: data collected through literature review is publicly available on google scholar and other web servers.

Storing the data during the research process

Where will you store your data during the research process?

In the university's network drive ☐

In the university-provided Seafile Cloud Service ☐

Other location, please specify: ☒ On the researcher's personal laptop, and a copy of it on the researcher's work laptop (that will be deleted before the end of the internship)

The university's data storage services will take care of data security and backup files automatically. If you choose to store your data somewhere other than in the services provided by the

university, please specify how you will ensure data security and file backups. Remember to make sure you know every time where you are saving the edited/modified data.

If you are using a smartphone to record anything, please check in advance where the audio or video will be saved. If you are using commercial cloud services (iCloud, Dropbox, Google Drive, etc.) and your data contains personal data, make sure the information you provide in the Data Protection Notice about data migration matches your device settings. The use of commercial cloud services means the data will be transferred to third countries outside the EU.

Documenting the data and metadata

How would you describe your research data so that even an outsider or a person unfamiliar with it will understand what the data is? How would you help yourself recall years later what your data consists of?

Data documentation

Can you describe what has happened to your research data during the research process? Data documentation is essential when you try to track any changes made to the data.

To document the data, I will use:

A field/research journal ☐

A separate document where I will record the main points of the data, such as changes made, phases of analysis, and significance of variables ☒

A readme file linked to the data that describes the main points of the data ☐

Other, please specify: ☐

Data arrangement and integrity

How will you keep your data in order and intact, as well as prevent any accidental changes to it?

I will keep the original data files separate from the data I am using in the research process, so that I can always revert back to the original, if need be. ☒

Version control: I will plan before starting the research how I will name the different data versions and I will adhere to the plan consistently. ☒

I recognise the life span of the data from the beginning of the research and am already prepared for situations, where the data can alter unnoticed, for example while recording, transcribing, downloading, or in data conversions from one file format to another, etc. ☒

Metadata

Metadata is a description of you research data. Based on metadata someone unfamiliar with your data will understand what it consists of. Metadata should include, among others, the file name, location, file size, and information about the producer of the data. Will you require metadata?

I will save my data into an archive or a repository that will take care of the metadata for me. ☐

I will have to create the metadata myself, because the archive/repository where I am uploading the data requires it. ☐

I will not store my data into a public archive/repository, and therefore I will not need to create any metadata. ☒

Data after completing the research

You are responsible for the data even after the research process has ended. Make sure you will handle the data according to the agreements you have made. The university recommends a general retention period of five (5) years, with an exception for medical research data, where the retention period is 15 years. Personal data can only be stored as long as it is necessary. If you have agreed to destroy the data after a set time period, you are responsible for destroying the data, even if you no longer are a student at the university. Likewise, when using the university's online storage services, destroying the data is your responsibility.

What happens to your research data, when the research is completed?

I will store all data for 05 years.

If you will store the data, please identify where: on the researcher's personal laptop and a copy of it on the researcher's external hard drive.

Appendix 2. Summary of the Interviews

Interview 1:

1) The person has been working for Bosch in IT services for a few years and has experience in the field.

2) The person has experience with artificial intelligence (AI) and bots, including leading a bot creation project. They mention the benefits of implementing AI chatbots in improving customer satisfaction and reallocating employees to new tasks.

3) A company should adopt AI-powered tools if they have the resources, budget, and skills necessary. However, careful analysis and study of the environment and impact on employees are important before implementation.

4) The main benefits of AI adoption in companies include better customer satisfaction, increased automation, and the ability to reallocate employees to more meaningful tasks. Risks include rushing implementation without proper analysis, lack of governance and guidelines, and not adapting to the changes AI brings.

5) To govern AI effectively and mitigate risks while maximizing benefits, a company should involve employees at all levels, have clear guidelines, rules, and a long-term strategy. The governance should consider technology, processes, projects, and mindset.

6) The person believes that the use of AI in companies is essential if there is capacity and need for it, including the use of chatbots in systems like SAP.

7) AI is considered important in society as well, with applications like Grammarly for school projects and automated cars like Tesla. While relevant, the approach to AI in society may differ from that in companies, requiring regulation and a focus on customer satisfaction.

8) AI can play a role in increasing interconnections between companies by facilitating data exchange and collaboration within and between industries. However, more research and information are needed to fully understand its potential impact.

Interview 2:

The person has been working for Bosch in an IT service for about 10 years. They have experience with AI and automation processes but not specifically with bots. A company should adopt AI-powered tools, but the implementation requires careful analysis, design, implementation, and maintenance. Change management and awareness of potential issues are crucial. The main benefits of AI adoption in companies include eliminating redundant tasks, time and cost savings, increased employee knowledge, and improved customer satisfaction. Risks involve the need for proper understanding of needs and environment. Governance is vital for AI adoption in a

company. Clear guidelines and processes should be established from analysis to maintenance. Communication and employee involvement are important for successful implementation. The person has a positive opinion on the use of AI in companies and believes there is a need for more implementation, both internally and externally. The person doesn't have a strong opinion on the use of AI in society but supports it as long as it respects security and provides benefits to users and society. AI can play a significant role in increasing interconnections between companies, leading to improved productivity and collaboration. Bots in SAP help solve critical combinations and other problems, such as implementing the four eyes principle for enhanced security.

Interview 3:

The person has been working for an IT service in Bosch for more than five years, but they are unsure of the exact duration. They have experience in automation processes but not specifically with AI or bots. They have knowledge about AI and its relation to their work. Companies should adopt AI-powered tools if they have the capacity to do so, but it should be done carefully and not solely for the sake of implementation. Risks associated with AI adoption include ethical concerns regarding customer data handling and transfer. Benefits include cost and time savings, as well as increased productivity. The person doesn't have a clear opinion on how AI should be governed to mitigate risks and maximize benefits. They mention the importance of analysis, guidelines, and documentation, especially in an organization like Bosch where departments are interconnected through SAP. The person doesn't have a strong opinion on the use of AI in companies but believes it can be a good thing if handled appropriately.

Interview 4:

The person has been working for Bosch in an IT service for around 12 years. They don't have expertise in AI or bots but have knowledge in automation and EDI. They are currently learning more about AI. Companies should adopt AI-powered tools if needed and if they have the capacity to adapt. Analysis of the current situation and employee availability and skills are important factors. Benefits of AI adoption include increased productivity, cost savings, time savings, and improved knowledge and understanding of the company. Risks involve the need for better documentation and communication internally and externally. Communication is crucial for governing AI in a company. Employees should understand that AI is meant to assist and not replace them. Effective communication allows for successful implementation. The person has a positive opinion on the use of bots and AI in SAP. They believe it leads to increased productivity and knowledge for employees. The person has mixed opinions on the use of AI in society. They acknowledge the

potential benefits but are concerned about privacy and security issues. They don't consider it a priority due to existing problems and threats.

Interview 5:

The person has been working for Bosch for a few years, mainly in IT services but also in other related areas such as automation, management, and marketing. They have some experience with AI and bots in their new job. They acknowledge that they are not experts but have knowledge and can answer questions based on their recent experience. Companies should adopt AI-powered tools when they understand the benefits and risks involved. The person believes that companies may have waited too long to implement such tools and emphasizes the importance of selecting the right tools that suit the company's needs. The main benefits of AI adoption in companies are increased productivity and potential cost savings. However, the person highlights the risk of neglecting the human aspect and stresses the need for teamwork between AI and human employees. To govern AI effectively, a company should have a clear understanding of the processes, promote internal communication, and foster a strategic long-term approach. Trust and precise communication are crucial for employees to understand the changes and work together. The person has a positive opinion on the use of AI and bots in companies. They believe it can lead to increased productivity and knowledge, as long as it respects the human aspect. They have a good opinion on the use of AI in society and emphasize the importance of embracing innovation and learning from it. They believe that as long as people understand and work with AI, it can bring progress and make individuals feel useful. AI can potentially play a major role in increasing interconnections between companies, similar to how EDI (Electronic Data Interchange) already facilitates interconnections. The person sees AI as an exponential technology that may become necessary for companies to gain a competitive advantage. Automation, including bots in SAP, helps solve critical combinations and reduces human error. They emphasize the importance of proper design and programming to avoid mistakes during the automation process.

Interview 6:

The interviewee talks about their role as a global process owner for order-to-cash processes and the implementation of a digital solution called S4 Anna. They discuss the shift towards automation and artificial intelligence in their organization to improve efficiency and reduce human errors in repetitive tasks. The goal is to free up employees' time for more productive and strategic tasks, such as providing better customer service. They mention the implementation of EDI (Electronic Data Interchange) for faster and more accurate order processing. The conversation also touches

on the benefits and risks of adopting AI-driven tools in companies, emphasizing the need to balance automation with human touchpoints and to consider privacy and ethical concerns. The speaker suggests that companies should assess the feasibility and potential benefits of AI adoption based on their business model. Finally, the speaker discusses the perception of AI in society, noting that attitudes toward automation vary across cultures and countries. They believe that while automation can bring efficiency gains, there should still be a limit to ensure that human creativity and critical thinking are not compromised.

Interview 7:

The interviewee works in the business intelligence department at Bosch, specifically in the data team, where they automate tools and business processes for the sales department. They mention that the data team is unique in the Bosch environment, but it can be challenging to know the specific automation needs of other departments without clear communication. They believe that having more team members with programming knowledge would facilitate the process.

The conversation also touches on the importance of clear documentation and awareness among team leaders regarding the use of AI and automation. The expert acknowledges the benefits of implementing AI, such as time savings and improved productivity, but expresses uncertainty about cost savings due to the expenses associated with programming and maintenance.

Regarding AI governance, the interviewee mentions the significance of guidelines and rules, particularly in relation to legal, ethical, and economic aspects. They suggest that as AI evolves and new possibilities arise, there should be a better framework to define what is legal and what is not. They also discuss the positive impact of AI tools, such as chatbots, in empowering individuals and society, but acknowledge the potential risks and "dark side" when used improperly. In terms of OpenAI's tools like ChatGPT, the interviewee appreciates the possibilities and productivity it offers. However, they express concerns about overreliance and misuse of such tools, highlighting the importance of learning the underlying concepts before relying solely on AI solutions. On the company level, they discuss the potential implementation of OpenAI's tools, such as using the API and paying for services. The interview touches on the challenges and benefits of AI adoption and emphasizes the need for clear communication, documentation, and ethical guidelines to maximize the benefits while mitigating risks.

Interview 8:

The interview discusses various aspects of business process management, project progress, data management, and the evolution of the company. The interviewee mentions that they have made progress in cleaning up and structuring data, creating clear vision and goals for the company. They also emphasize the importance of analyzing needs, conducting pilot projects, and balancing workload. About the adoption of AI and automation tools, they suggest doing a thorough analysis and starting with simpler use cases before moving to more complex ones. The conversation highlights the importance of analyzing both internal processes and customer needs. The interviewee mentions the benefits of automation, such as reducing manual labor, increasing job satisfaction, and reducing mistakes. However, they also mention the risks of depending on programming and the need for a different skill set. The conversation touches on the impact of automation on employees' ability to learn new tasks and broaden their knowledge. They acknowledges that AI implementation is inevitable and that regulations will likely be developed as it matures. They express the view that AI is currently in an early adopter and explorative phase. The conversation ends with a mention of ChatGPT use in society and companies.

Interview 9:

The conversation revolves around the topic of artificial intelligence (AI) and digitalization in the business world. The interviewee talk about its experience with AI and digitalization, mentioning bots, e-shops, machine learning, programming, and infrastructure. They share their experiences with bots and automated tasks in previous employment. They discuss the challenges of interdepartmental rivalry and the importance of adopting digitalization for cost reduction and error reduction. The interviewee believes that automation should be used to optimize tasks and provide employees with more time for higher-level activities. The potential benefits of AI include reducing errors and improving efficiency, while risks include overdependence on digital tools and potential cultural resistance to digitalization. They also discuss the interconnection between companies and the potential for AI to facilitate collaboration. They believe that while some jobs may be affected, new roles will also emerge. The conversation ends with a discussion about the potential impact of AI on job destruction, acknowledging the uncertainty but noting that new functions and opportunities will arise as well.

Interview 10:

The interviewee discusses their experience with personal computers and the development of technology in the field. They mention being a technical product manager for PCs and their interest in computer hardware. They also touch upon Moore's Law, which predicts the doubling of processor capacity every year. The conversation then shifts to the speaker's experience with bots and AI in their work. They mention using bot tools like Automation Anywhere 360 and their involvement in creating bots for downloading SAP data. The speaker discusses the advantages and challenges of implementing bots, such as automating repetitive tasks and resource allocation, but also the dependency on specific tools and potential issues with stability. They express the need for well-designed and structured tools and a holistic approach when considering bot implementation. Additionally, the speaker reflects on the need for central solutions within a large company like Bosch and the challenges of coordinating and implementing new tools across different countries.