Transforming Management Reporting with Intelligent Process Automation (IPA): Enhancing Business Analytics, Forecasting, and Decision-Making in Organizations

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Abstract

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This research-focused thesis investigates the integration and impact of Intelligent Process Automation (IPA) technologies on managerial accounting reporting within organizations. It explores on how advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML), and robotics redefine the processes of managerial reporting, thereby enhancing the quality of data and supporting decision-making. Conducted within the Bachelor of Business Administration program at Haaga-Helia University of Applied Sciences, this study aims to provide a comprehensive understanding of the dynamic capabilities of IPA.

The theoretical foundation of this thesis is built on two main pillars: the conceptual and practical applications of managerial accounting, and the transformative influence of IPA technologies on these processes. It includes an overview of the evolution of managerial accounting in the context of technological advancements, focusing on the increasing importance of data analytics and decision support in managerial roles.

Employing a qualitative approach, the study utilizes case studies to draw insights from real-world applications of IPA in three different organizations. This method was chosen for its effectiveness in capturing the nuanced impacts of technology on managerial accounting practices. Data were collected through semi-structured interviews with management personnel who oversee and interact with IPA systems in their reporting processes.

The findings reveal that IPA technologies significantly enhance the efficiency and accuracy of management reporting systems. Organizations implementing these technologies benefit from faster processing times and more reliable data outputs, which in turn facilitate more informed strategic decision-making. The study also highlights the challenges and managerial implications associated with transitioning to automated systems. The thesis concludes that IPA represents an effective advancement in managerial reporting, with profound implications for business operations. It offers strategic insights for organizations contemplating the adoption of these technologies, suggesting a need for thoughtful integration and adaptation strategies. This research contributes to academic discussions on digital transformation in accounting and provides practical guidelines for organizations aiming to leverage technology for enhanced decision-making efficiency.

Key words
Managerial accounting, Management reporting, Intelligent Process Automation (IPA), Decision-making, Business analytics, Forecasting

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1 Introduction

This research-focused bachelor's thesis for the Degree Programme in Business Management at Haaga-Helia University of Applied Sciences, is exploring how recent technological advancements, notably Artificial Intelligence (AI), Machine Learning (ML), and robotics, which are part of Intelligent Process Automation (IPA), are transforming management reporting within businesses. These technologies, critical components of the broader digital transformation, are fundamentally affecting how companies conduct their management reporting activities. By leveraging IPA technologies, businesses can achieve more efficient, accurate, and insightful management reporting, thus enhancing overall business operations. This transformation facilitates better business analytics and forecasting by providing real-time analytics and comprehensive data insights leading to improved decision-making within the companies, which is essential for maintaining a competitive edge in the market. As noted in a Forbes article, management reporting, when powered by such technologies, offers comprehensive insights into a business's performance, aiding in the formulation of effective business strategies and operational improvements (King 2023).

The advent of digital technologies has compelled management accountants to transition from traditional record-keeping to more strategic roles, focusing on business analysis, decision support, and future-oriented forecasting. Deloitte's (2018) insights highlight that the future of business reporting is leaning towards intelligence, interactivity, and real-time analytics, drastically altering the company's functions' landscape, through digital transformation. According to Mihir A. Desai (2023) in the Harvard Business Review's article, the rapid integration of new technologies, exemplified by the transformative impact of Artificial Intelligence (AI) on financial operations, underscores the critical role these advancements play in reshaping industry dynamics, fostering both disruption and innovation. Additionally, a McKinsey & Company's research by Panikkar, Xiao, Sahu, and Sood (2022) reveals that automation using various digital technologies significantly enhances business efficiency and satisfaction, with successful companies making substantial technological changes and prioritizing employee training to fully leverage these tools.

Considering these perspectives, it is compelling to observe the broad impact of digital technologies (with focus on IPA technologies) on management reporting and its integration into daily business operations, signalling a profound evolution in how companies leverage information for increasing efficiency and strategic advantage.

1.1 Benefits

1.1.1 For the reader

The results of this research provide valuable case studies and data-based insights on transformation of management reporting, its importance, and the application of new technologies. This can help other companies in strategizing technology implementation, also provide academic researchers with real-life examples of the impact of new technologies and enrich the knowledge base for professionals interested in technological innovations in management reporting.

1.1.2 For the participating companies

These companies will directly benefit from a thorough examination of their management reporting processes. They will gain insights into potential areas for improvement, identify how IPA, or overall new technologies can be better integrated into their operations, and understand the impact of these technologies on their overall business performance. This reflective analysis will help them streamline operations, improve business analytics and forecasting, and enhance decision-making.

1.1.3 For myself (the researcher)

Conducting this study will allow me to deepen my expertise in overall business operations, by going through management reporting, which is connected to day-to-day operations management and process improvement of the companies and seeing the technological advancements that are shaping its future. It will also facilitate professional growth by establishing connections with business leaders and companies' experts, thereby expanding my network within the current business industry.

1.2 Sustainability aspect

Reviewing the sustainability aspect in this thesis is crucial due to the increasing emphasis on sustainable business practices and regulatory requirements, particularly in Europe. The Corporate Sustainability Reporting Directive (CSRD) mandates that companies disclose comprehensive sustainability information, adhering to the European Sustainability Reporting Standards (ESRS). This directive aims to enhance transparency and ensure that investors and stakeholders have access to relevant sustainability information, fostering more sustainable business practices. Sustainability in business encompasses Environmental, Social, and Governance (ESG) criteria, which are crucial for ensuring long-term viability and responsible resource management. ESG criteria evaluate a company's performance in environmental direction, social responsibility, and corporate governance, collectively influencing its sustainability and societal impact. (KPMG International 2024.)

If reviewing the outcomes of this research (chapters 5 and 6 with subchapters), from the perspective of the three case companies that were interviewed (defined in chapter 4.1.3), we can see the significant benefits of Intelligent Process Automation (IPA) technologies from the sustainable perspective. The integration of IPA technologies significantly enhances sustainability by optimizing resource use and improving efficiency. Automating data collection and analysis reduces operational costs and streamlines processes, leading to better decision-making capabilities. For instance, Company A's AI-based price forecasting model allows for quick, precise market data analysis, improving pricing accuracy and reducing losses (chapter 5.1.5). Company B benefits from automated demand forecasting and inventory management, minimizing food wastage and enhancing profitability (chapter 5.2.5). Company C's AI-driven stock management system dynamically adjusts inventory levels based on real-time sales, ensuring cost-effective purchasing and improved profitability (chapter 5.3.5). The automation of these processes not only frees up employees' time for more strategic tasks but also aligns with ESG principles by supporting environmental sustainability through reduced waste, economic sustainability through enhanced efficiency, and social sustainability through improved working conditions. This comprehensive approach underscores how Intelligent Process Automation (IPA) in management reporting can drive sustainable business practices by effectively addressing key ESG criteria.

1.3 Research question

This thesis aims to understand and analyse how new technologies - Intelligent Process Automation (IPA), particularly through Artificial Intelligence (AI), Machine Learning (ML), and robotics, transforms management reporting processes to enhance business operations, focusing on especially data analytics and forecasting, leading to improved decision-making in companies. The outcomes of this research provide a comprehensive understanding of how IPA can be leveraged to streamline reporting processes, improve decision-making, and facilitate a more agile and responsive business environment.

The international aspect of this thesis is fulfilled by examining how these technological trends are being adopted across different companies globally (see table 3, with characteristics of interviewed companies) and from three different industry perspectives, demonstrating the universal relevance and application of these technological advancements in management reporting.

Research question (RQ): How do Intelligent Process Automation (IPA) technologies transform management reporting, and what are their implications for enhancing business operations?

In order to answer the research question in a more detailed way, a comprehensive set of investigative questions (IQ) were structured as follows:

IQ 1: How do Artificial Intelligence (AI), Machine Learning (ML), and robotics, as components of Intelligent Process Automation (IPA), transform management reporting processes?

IQ 2: What benefits and challenges in business operations can be attributed to the integration of these technologies in management reporting?

IQ 3: How do these technological advancements influence decision-making in companies through improved business analytics and forecasting?

Table 1. Overlay matrix

Investigative question	Theoretical Framework (chapters)	Methods	Data analysis/Results (chapters
IQ 1. How do Artificial Intelligence (AI), Machine Learning (ML), and robotics, as components of Intelligent Process Automation (IPA), transform management reporting processes?	2.1, 2.2, 2.2.1, 3.1, 3.2	Qualitative interviews with business management personnel (see chapter 4 with subchapters)	6.2.2
IQ 2. What benefits and challenges in business operations can be attributed to the integration of these technologies in management reporting?	3, 3.1, 3.2	Qualitative interviews with business management personnel (see chapter 4 with subchapters)	6.2.3
IQ 3. How do these technological advancements influence decision-making in companies through improved business analytics and forecasting?	2.4, 2.4.1	Qualitative interviews with business management personnel (see chapter 4 with subchapters)	6.2.4

1.4 Delimitation/demarcation of this research

This thesis is demarcated to concentrate solely on managerial accounting's part, which is management reporting and the role of Intelligent Process Automation (IPA) technologies. This research is exploring how IPA technologies, such as Artificial Intelligence (AI), Machine Learning (ML), and robotics, are revolutionizing managerial reporting. This narrowed focus is chosen to explore the profound impact of these only specific technologies on companies' decision-making processes, offering insights into their implementation, benefits and the down sides.

By concentrating exclusively on managerial reporting within managerial accounting, this study excludes broader financial accounting aspects, such as external reporting and compliance, as well as other operational accounting tasks. Managerial accounting encompasses a wide range of functions, including cost analysis, budgeting, and performance evaluation (Atrill & McLaney 2018, 26-27). However, this research focuses on the aspects of reporting specifically focuses on the business analytics and forecasting, highlighting how these elements enhance decision-making in companies. This targeted research aims to reveal how advanced IPA can transform the reporting processes that are critical for effective business analytics and strategic decision-making.

1.5 Key concepts

Intelligent Process Automation (IPA) is a strategic technological advancement that integrates Robotic Process Automation (RPA) with Artificial Intelligence (AI) and Machine Learning (ML) to enhance business process automation. This combination allows for automating complex tasks that require judgment and decision-making, extending beyond the capabilities of RPA's rule-based tasks. IPA aims to improve efficiency and facilitate digital transformation within industries, as demonstrated in a manufacturing industry case where it significantly optimized processes and reduced waste. (Lievano-Martínez, Fernández-Ledesma, Burgos, Branch-Bedoya & Jimenez-Builes 2022, 3-4.)

Managerial accounting is distinct from financial accounting as it primarily serves the internal management of an organization rather than external stakeholders. While financial accounting prepares financial statements for external use, managerial accounting provides tailored information to help internal managers run the company efficiently. It supports planning, directing, and controlling, with a continuous focus on decision-making and evaluating alternatives. (Braun & Tietz 2015, 20.)

Management reporting focuses on internal analysis for strategic decision-making and operational improvements, covering aspects like cash flow and profitability, by translating data in reports that are providing insightful information which help CEOs optimize business strategies and performance. (King 2023.)

1.6 Thesis structure

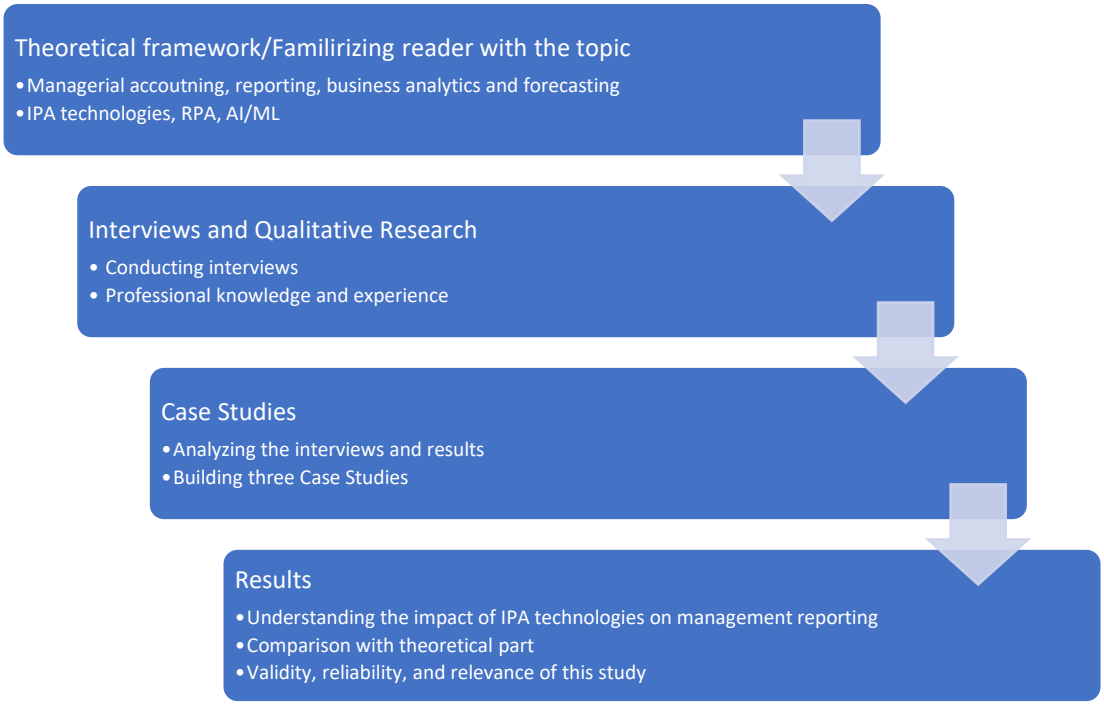

Figure 1. Research's framework

In crafting the research framework, concepts, processes, and components to address the specific needs of this research, were selected carefully. Figure 1 serves as a visual representation of this tailored framework, providing an overview of the key elements essential to this research, which focuses on leveraging Intelligent Process Automation solutions for enhanced management reporting, especially through business analytics and forecasting, leading to decision-making within companies. The structure starts with the theory part, which familiarizes reader with the topic (chapters 2 and 3). It then moves on to qualitative research, which includes choosing case companies and conducting interviews (chapter 4). This leads to translating and analysing the data in case studies (chapter 5). Finally, it presents the results and outcomes of the research, where the findings are compared with the theoretical framework, and the research question and investigative questions are answered (chapter 6).

It is also important to mention that Artificial Intelligence was used in this work. Artificial intelligence was sometimes employed to check the grammatical structure of sentences and identify spelling errors to best help the reader understand the research topic. Two types of applications were used: the Grammarly service and Rephrase by QuillBot. I used them to analyse words and sentences that I was unsure about. I copied the word or sentence and pasted it into these applications. The applications provided me with suggestions, which I then analysed to decide whether there was a spelling error and whether to use the corrected sentence. This means it was not a direct copying of

the text but rather highlighting possible grammatical errors, some of which I chose not to correct as I thought it was unnecessary.

Artificial Intelligence was also used for translating interview transcriptions. As mentioned in chapter 4.1.3, the companies chosen for the interviews were from different countries, and the participants spoke different languages. This helped me, the author of this study, to best transcribe and analyse the interviews, in order to structure properly the case studies (see chapter 5). The ChatGTP 4.0 with generative AI application was used for this, which is more effective at translating while understanding the meaning and structure of paragraphs. The ChatGTP 4.0 was tasked with simply translating the text without altering it, to preserve the essence of the interview topic. The translation was then reviewed by me and compared with the original transcription.

2 Understanding Management Reporting, Business Analytics, Forecasting, and Decision Making

In this chapter, the theoretical foundations of the study are examined to provide the necessary knowledge for understanding the key concepts and methodologies. The theoretical part of the research plays an important role, as it helps to establish the fundamental principles upon which all subsequent work is based. This enables to more deeply understand and analyse the research question and investigative questions, that define the topic of this research and help us to have a better understanding due to their close connection.

Figure 2. Theoretical framework/concept of this research

The second part in this research, as shown in figure 1, is the theoretical section where the author introduces the reader to the basic concepts of managerial accounting, management reporting, business analytics and forecasting, leading all to decision-making (chapter 2). Then it covers the Intelligent Process Automation (IPA) that is examined and is one of the main aspects of this research (chapter 3). Figure 2 visually describes the theoretical concept of this research, as described previously, starting from managerial accounting leading to the decision making, enhanced/supported by IPA. This theoretical part of the research is based on academic sources, which provide extensive theoretical explanations of the aspects used in this study. However, in

some cases, due to the lack of information—since the analysis of IPA technologies and their impact on management reporting is relatively new, as discussed in chapter 3, and not very common—there was a limited number of academic sources available. Therefore, in some chapters, non-academic sources based on the professional experience of individuals working in or related to this field, were used, as these sources still provide high-quality and valuable insights (see, in chapter 2.3.2 by Jedox (s.a.), chapter 3 by Gardner (2023), chapter 3.1 by UI Path (s.a.), chapter 3 and subchapters by various McKinsey & Company's researches).

2.1 Managerial accounting

First, it is to gain the theoretical understanding of the fundamental part of this thesis and the research question, which starts with the managerial accounting. As outlined by Braun and Tietz (2015, 21), managerial accounting is primarily focused on providing essential information to internal managers to facilitate effective decision-making and strategic planning. According to the American Accounting Association (s.a, in Bhattacharyya 2010, chapter 1), management accounting utilizes a blend of historical and projected economic data. This complements the second author, that using of this past and economic data are critical for crafting strategies that support informed decision-making and effective planning within organizations. Miller-Nobles and Mattison (2022, 20) agree with previous authors, that managerial accounting is providing information for internal decision makers, but also specify that managerial accounting involves a detailed analysis of not only financial, but also non-financial data. According to the Atrill and McLaney (2018, 27), a lot of businesses has highlighted that in order to make business more customer satisfied, the success cannot be measured in purely financial terms, which is making management accountant to use the non-financial measures, for example, such as quality-, product improving-, and delivery type of reports.

According to Braun and Tietz (2015, 21), managerial accounting can be divided in several areas: planning, directing and controlling, each contributing uniquely to the management's ability to fulfil organisational success as shown in figure 3.

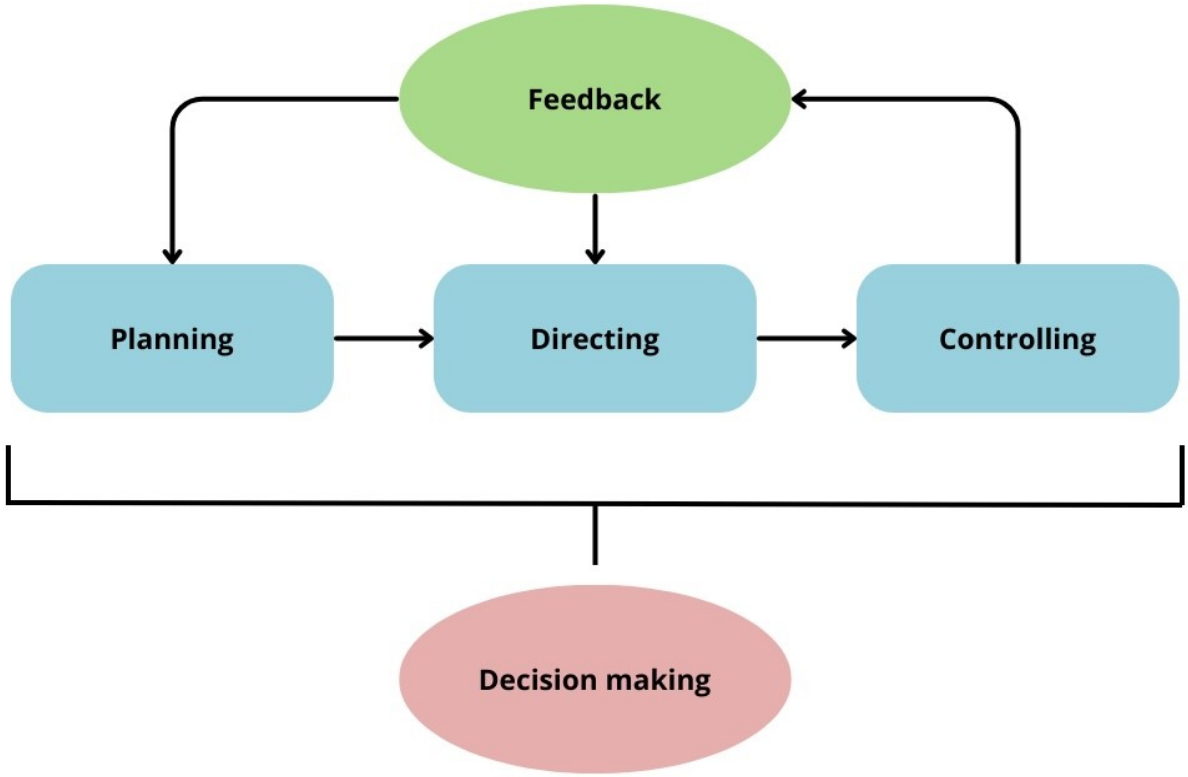

Figure 3. The three primary responsibilities of managers (Braun & Tietz 2015, 21)

Planning: Managerial accounting aids in the planning process by providing forecasts and budgets that guide organizational strategy and decision-making, which involves detailed projections of revenues and expenses, helping managers formulate actionable plans that align with the organization's long-term objectives (Braun & Tietz 2015, 22). Managerial accounting gives managers essential information that helps them prepare for upcoming challenges and opportunities. This means that managerial accounting is not just about keeping track of what is happening now, but also about predicting what might happen next and planning accordingly. (Horngren, Datar & Rajan 2015, 26-27.)

Directing: In the directing function, managerial accounting serves as a tool for implementing day-to-day operational decisions. It provides managers with the information necessary to direct resources effectively, ensuring that operations align with strategic plans and are carried out efficiently. (Braun & Tietz 2015, 22.)

Controlling: The controlling aspect of managerial accounting involves monitoring and evaluating the performance of organizational strategies and operations. Through variance analysis, performance metrics, and other control mechanisms, managerial accounting ensures that the

organization adheres to its plans and addresses any discrepancies or deviations in a timely manner. (Braun & Tietz 2015, 22.)

2.1.1 Comparative analysis of managerial and financial accounting

To enhance the reader's understanding of the research question addressed in this thesis, it is important to clarify the difference between managerial and financial accounting. These two types of accounting, often misunderstood as very similar, actually play different roles within a business and company context. Understanding these differences is essential for comprehending the broader implications of this research findings.

Managerial accounting is designed for an internal audience, providing data to support operational and strategic decision-making at various management levels. It aids in planning and efficient resource allocation, helping determine the cost-effectiveness of new product lines and optimizing budget allocations. In contrast, financial accounting targets external stakeholders—such as investors, regulators, and financial institutions—offering a historical perspective on the company's financial health through standardized reports that adhere to GAAP, allowing for reliable comparisons across different periods and companies. While financial accounting provides a broad view of the organization’s financial activities over specific periods, managerial accounting is more immediate and granular, focusing on real-time or future segments of the business. This facilitates responsive and agile management practices, supporting day-to-day operations and strategic initiatives. (Bentley University 2021.)

However, it should also be noted that these two types of accounting do not oppose each other, rather, financial accounting is dependent on management accounting. Financial accounting provides foundational historical data critical for management accounting, which in turn, analyses and interprets this data to assist in managerial planning, controlling, and decision-making processes. The necessary relationship between these two types of accounting, highlights that management accounting not only relies on but also adheres to the principles and practices of financial accounting, underscoring a significant dependency on financial accounting for operational success. (Bhattacharyya 2010, chapter 1.)

2.2 Management reporting

This thesis preliminarily consists of management accounting and reporting as its research question explores the process of managerial reports. In order for reader to gain a deeper understanding of exactly how this research analyses this issue, it is critical to first understand the nature of the management report and its components. This chapter is building on that foundation of managerial accounting explored in chapters 2.1 and 2.1.1 by reviewing the reporting aspect.

Management reporting, unlike financial reporting, focuses on internal business analysis to guide strategic decision-making and operational improvements. While financial reports are primarily for external compliance, management reports focus on various business aspects like cash flow, profitability by department, and customer value, aiding CEOs in enhancing business strategies and operations. These internal reports are essential for identifying performance trends and making data-driven decisions to optimize company performance and growth. (King 2023.)

Company management frequently finds itself in a situation where it must make decisions in the face of uncertainty without having access to timely and appropriate information if there is no effective management reporting procedure in place. Following the best worldwide practices, modern organisations work to tailor the information-provision process to best meet the demands of management at a given moment. The first step in the methodical process of management reporting is the documentation of specific occurrences, each of which serves as a source of data. Examples of such events include a customer entering a business, an employee arriving at work, or a customer service call. Each of these occurrences produces data that can be utilised for reporting and analysis. For later use, this data—which includes details about the kind, timing, location, and aftermath of events—is gathered and organised. The goal of management reporting is to collect, organise, and present this information to the appropriate person at the appropriate time in a way that makes it most helpful for management decision-making. (Axson 2010, 141.) The impact of management reporting on decision-making is discussed in more detail in the chapter 2.5.1.

Management reporting uses a broad range of information across three dimensions: operational/financial, internal/external, and leading/lagging. Operational data tracks internal activities, including productivity and resource use, while financial data translates these into outcomes, as for example, revenue and profit. Internal information covers internal operations, whereas external information deals with outside entities such as customers and competitors, and factors like regulation. Leading information predicts future trends, and lagging information reflects past results. (Axson 2010, 149.) This view aligns with the one reviewed above in chapter 2.1, where it was also stated by Miller-Nobles and Mattison (2022, 20), that both financial and non-financial information are used in reporting, which assures management of the reliability of the types of information used in managerial accounting and reporting.

2.2.1 Management reporting’s process/steps

This research extensively explores how new technologies can improve management reporting. To fully appreciate the potential enhancements, it is essential to gain the understanding of the processes involved. This chapter covers the core elements of the management reporting process, including an outline of each step.

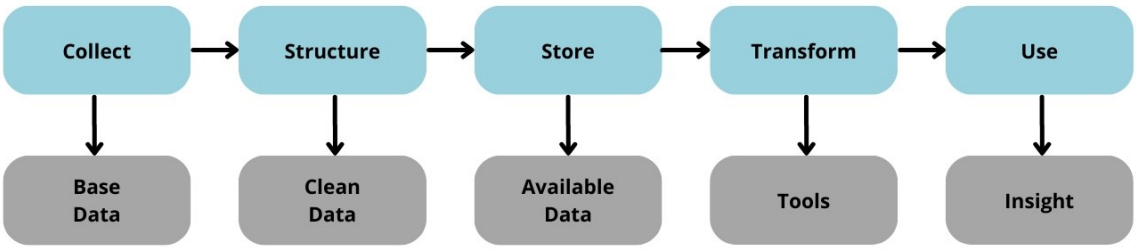

Figure 4. Five key steps in converting data into valuable management information (Axson 2010, 142)

As shown in figure 4, management reporting involves five major steps, according to Axson (2010,141-142). This author skilfully explains the foundational aspects of management reporting in a straightforward, comprehensible, and detailed manner. Written in 2010, this academic source explores into basic themes and theories of managerial reporting, providing an essential resource for understanding the core elements involved in the transformation of data into valuable managerial information. This research leverages the author's insights to explore enhancements in fundamental managerial accounting practices, making it particularly relevant for studies aimed at improving basic accounting processes. The management reporting process begins with data collection, which involves gathering data from a variety of sources such as systems handling transactions including sales, order processing, inventory management, production, distribution, finance, human resources, and customer service, as well as externally from supplier and customer systems, marketplaces, and third-party information sources, providing a comprehensive base for informed decision-making. Following data collection, the next step involves organizing the data into logical groups such as by customer, product, geography, department, or time period, and performing validation checks to ensure the integrity, accuracy, and consistency of the data, a step crucial for the reliability of reporting outcomes. Data must then be stored in a manner that supports easy access for various reporting needs, such as in a general ledger or a data warehouse, to enhance the efficiency of the reporting process by ensuring data are readily available for further processing and analysis. The transformation step then converts this raw data into meaningful information through sorting, selecting, and executing calculations or manipulations, creating reports that may be delivered in traditional paper form or through modern means such as online access, email, web-based platforms, and wireless delivery to devices like smartphones, also including tools that facilitate

effective use of the information, such as drill-down capabilities, spreadsheet modelling, and other analytical tools. The final and most critical step, data utilization, ensures that appropriate distribution and access methods are in place so that authorized users can retrieve and use the data, and it guarantees that each user has the necessary tools, skills, and training to effectively utilize the information, essential for translating data-driven insights into actionable decisions. (Axson 2010,141-142.)

2.3 Business analytics and forecasting

Business analytics and forecasting are integral components of this research, as discussed in chapter 1.4, particularly reviewing them in the context of Intelligent Process Automation (IPA) in the case studies. This section of research explores the main aspects of business analytics and forecasting, in order to be able to review in the outcome of this research, how integration of IPA, including Artificial Intelligence (AI), Machine Learning (ML), and robotics enhances business analytics and forecasting processes, and see how in turn they influence management reporting and strategic decision-making in business operations.

2.3.1 The role of business analytics in management reporting

Business analytics is characterised as a complete strategy that goes beyond simple data analysis. While traditional analytics involves data-driven processes for generating insights, such as customer segmentation or performance summaries, business analytics focuses on leveraging these insights to drive strategic changes within the organization. It is about transforming insights into actionable strategies that create real value, distinguishing itself by pushing organizations to adapt and innovate based on data-driven evidence. This transformational approach highlights the importance of not just understanding data but also effectively implementing it to guide decision-making and foster organizational growth. (Liebowitz 2013, chapter 1.)

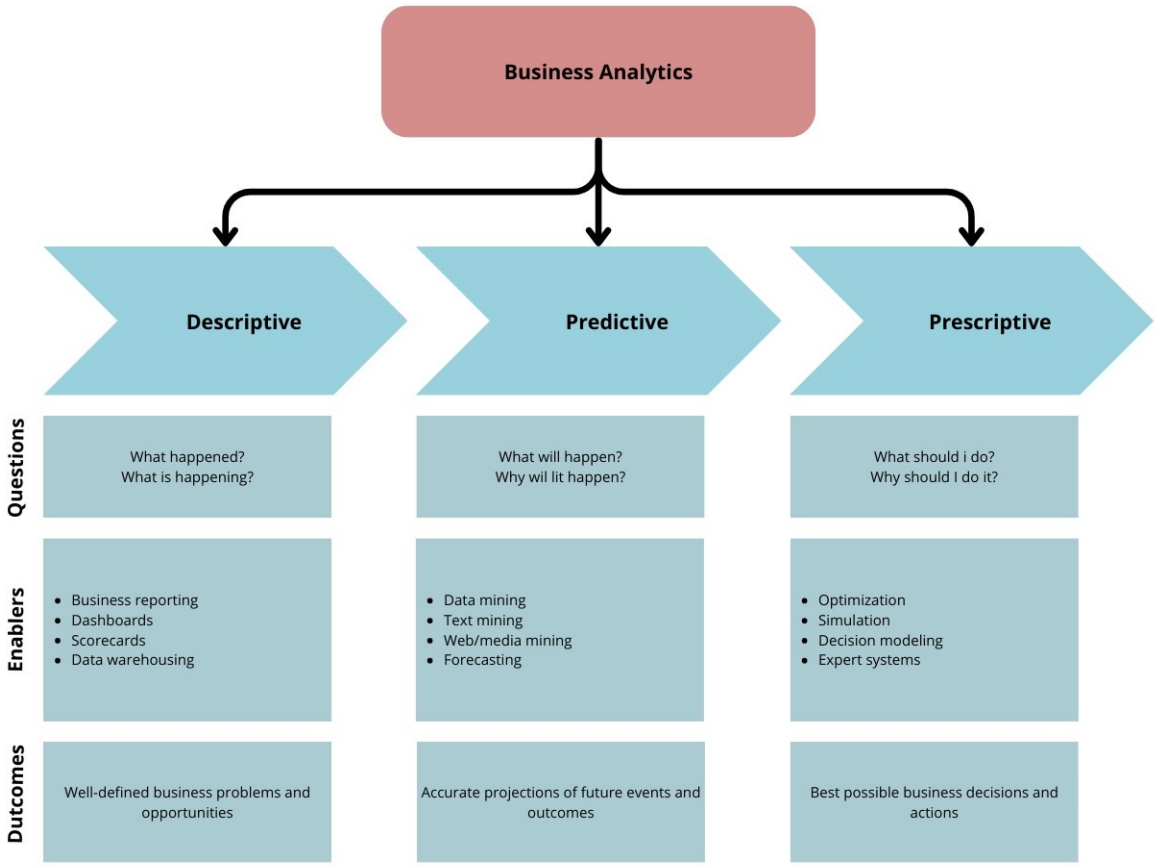

Figure 5. Three categories of analytics (Sharda, Delen & Turban 2018, 49)

In the realm of business analytics, three interconnected levels—descriptive, predictive, and prescriptive analytics—form a comprehensive framework for decision-making, as shown in figure 5. Descriptive analytics consolidates historical data to inform businesses of past and current trends, primarily through reports and dashboards. Predictive analytics builds on this by employing statistical models to forecast future events, providing insights into potential future forecasting. Finally, prescriptive analytics combines results from descriptive and predictive analytics to identify strategic actions that improve corporate outcomes. This approach not only assists organisations in understanding and predicting business trends, but also advises on the most effective tactics for dealing with them. (Sharda, Delen & Turban 2018, 49-53.)

The connection between management reporting and business analytics is well illustrated in chapter 2.3 by King (2023), where management reporting is described as focusing on internal business analysis that aids in making decisions and enhancing operational activities. This process involves collecting data and transforming it through various analytical procedures into useful and actionable insights, as also described in chapter 2.2.1 in figure 4, which figure 5 supplements by showing actually what kind of analytics is made after the insight has been created, which in order brings us to

the visualisation aspect in this context of analytics and decision-making based on that. The importance of visualization in business analytics is highlighted by Sharda, Delen and Turban (2018, 67) as “Because visualization is the primary way thus far for exploring analytics in industry, this sector has witnessed the most growth.” The data is brought in the report by the visualization, and the type of it that a company chooses depends on its specific needs, including the urgency and types of decisions that need to be made. There are several different types of data visualizations available: Dashboards, which are dynamic tools designed to display key metrics and update frequently, often in real-time, are tailored to show metrics and goals that are directly tied to strategic objectives and used widely across organizational levels for continuous monitoring and management of business processes. Reports provide static, historical information about specific items or metrics, such as revenue, offering in-depth analysis intended to support specific management decisions and are typically updated less frequently due to their detailed nature. Scorecards offer a comprehensive view of a business, tracking a variety of indicators linked to strategic objectives. They are designed to monitor progress toward these goals and identify areas needing attention, and importantly they are updated regularly and often used by executives to oversee various aspects of business performance. (Liebowitz 2013, chapter 3.)

2.3.2 Forecasting

In this chapter, the forecasting is reviewed, from the perspective what it is, and how it is related to business analytics and management reporting. As already mentioned in chapter 2.4, this study also considers management reporting under the influence of Intelligent Process Automation (IPA), focusing specifically on business analytics and forecasting.

Forecasting is the process of predicting future events based on examining data collected at regular intervals in the past. This involves analysing time series data—information recorded over time—to identify patterns that can help anticipate what might happen next. This method is commonly used in fields like finance and weather forecasting to make informed predictions. (Marr 2016, chapter 5.)

In today's dynamic business environment, organizations rely not only on traditional predictions but also on advanced predictive forecasting. Predictive forecasting is an advanced method within business analytics that extends beyond traditional forecasting by integrating various data sources, including real-time data, through Artificial Intelligence (AI) and Machine Learning (ML). Unlike traditional forecasting, which primarily uses historical data to predict trends, predictive forecasting employs diverse and dynamic data to uncover complex patterns and causal relationships, enhancing forecast accuracy and comprehensiveness. This approach enables organizations to make more informed decisions, effectively manage risks, and optimise operations by anticipating future changes and trends. (Jedox s.a.)

As AI systems learn from ongoing data, they continually improve in predictive accuracy, which in turn supports more effective and informed business decisions. This ongoing learning process underscores the value of AI-driven predictive forecasting in maintaining a competitive edge in fast-changing market conditions. (Jedox s.a.)

Artificial Intelligence (AI) and Machine Learning (ML) are both part of Intelligent Process Automation (IPA), and both are reviewed in more detail in the chapter 3 and its subchapters.

2.4 Decision-making

As it was already mentioned in the previous chapters of reviewing what are theoretical aspects of managerial accounting, there can be seen the sight of decision-making, which is playing crucial part in managerial accounting process, as shown in figure 3. To enhance our understanding of managerial accounting's role in decision-making, which connected to the investigative questions of this research, it is crucial to gain understanding of its theoretical and behavioural aspects in companies.

Decision making within companies or organizations, involve the management's process of selecting the optimal course of action from a set of available alternatives. This critical function is integral to business planning and control, supports the success of these initiatives. Effective decision making involves a comprehensive evaluation of both quantitative and qualitative data to confirm the most favourable option that aligns with the company's strategic goals. The decisions made are oriented on future and have significant implications on costs and various other business factors, by that influencing the organization's overall performance and direction. (Bhattacharyya 2010, chapter 11.)

Understanding decision-making requires an understanding of its structured process. This step-by-step approach helps ensure that decisions are made after a comprehensive evaluation of all relevant factors. Here’s an overview of the steps involved, as described by Bhattacharyya (2010, chapter 11):

1. Problem Definition: Clearly defining the problem at hand.
2. Identification of Alternatives: Listing all possible alternatives.
3. Evaluation of Quantitative Factors: Analysing relevant costs and revenues associated with each alternative.
4. Evaluation of Qualitative Factors: Considering non-cost factors that might affect the decision.
5. Selection: Choosing the best alternative based on the evaluation.

6. Performance Evaluation and Feedback: Assessing the outcome of the decision and using this information for future improvements.

Decision-making in management can broadly be categorized into two types: tactical and strategic. Tactical decision-making focuses on immediate or short-term goals, such as taking a special order at a lower price to increase this year's profits. Even though these decisions are quick, they should still fit into the company's larger, long-term plans. Strategic decisions are about setting up long-term advantages that keep the company competitive. Both types of decisions should work together, with tactical decisions supporting the broader, strategic goals of the business. (Hansen & Mowen 2006, 516.)

2.4.1 Decision-making with the help of management reporting

According to Axson (2010, 145): ”Effective management reporting is about delivering the right information to the right people at the right time.” Same author also describes that “The inability to access basic management information easily and quickly severely handicaps an organization's decision-making ability” (2010, 145). These statements highlight how important it is for managers to receive accurate and timely information through reports to make good decisions. Furthermore, if it is hard to get this essential information quickly, it can really hinder how well an organization can make decisions. It should be noted right away, as Axson also mentions (2010, 145), that in order for an organization to effectively make decisions based on information, it must clearly understand exactly what information it needs. Meaning, that the requirements for information are determined by the needs of its recipients.

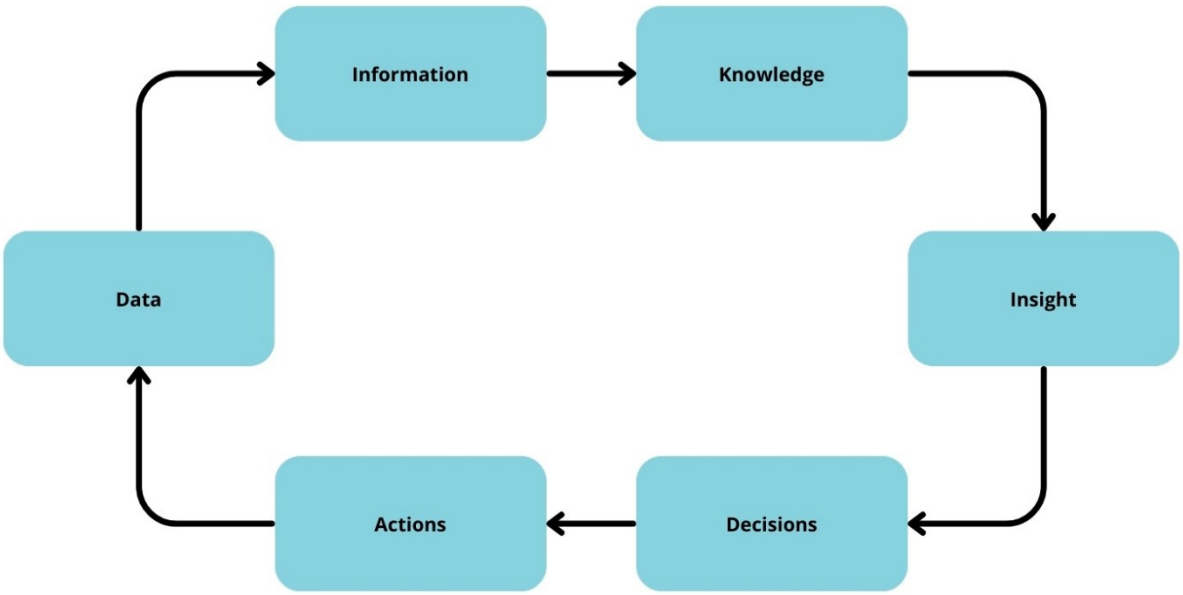

Figure 6. Converting data into decisions (Axson 2010, 157)

Understanding how data brings benefits is a crucial element in the process of implementing best practices. As shown in the figure 6, data goes through several processes before it can be utilised effectively. For example, it can start with a comprehensive dataset containing all orders for the month, which includes thousands of transactions. Simply studying these transactions does not bring real value to the company. However, composing this data to reveal sales volumes and customer for each product can identify key trends. The real value of data emerges when generated reports offer metrics with insights, enabling to validate and analyse the data for making decisions which are followed by actions. (Axson 2010, 156-157.) This process supports also other statement by the Axson (2010, 166), which asserts: "Translating data into decisions is the ultimate goal of an effective reporting process."

Managerial accounting plays a crucial role in enhancing decision-making by providing relevant, accurate, and timely information that supports decision-making. The effective design of management accounting systems is fundamental to overcoming barriers in decision-making, which often stem from information overload or a lack of relevant data. Refining these systems can significantly streamline decision processes, making them more efficient and effective. (Ojra, Opute & Alsolmi 2021, 2-17.)

In the book "Organisational Behaviour" by K. Aswathappa (2009), it is highlighted how management accounting significantly contributes to decision-making. The text illustrates that even in discussions centred around psychological behaviours within organizations, financial tools like the

balance sheet format can be pivotal. This structured approach to listing pros and cons aids in clarifying decision-making processes by organizing information effectively. (Aswathappa 2009, 50.) In the work environment and in general in life, we always face risks when making decisions. According to White (2023, 4), if we can sharpen our decision-making process by understanding common mistakes and learning to identify biases, we can come up with more nuanced strategic decisions. This particular point of view is consistent with the concepts of the Aswathappa (2009, 50). The clear chain can be seen between these concepts of different authors which are connected to each other and provides views of the effectiveness of management accounting if you understand where the risk is located. We have to make a decision, there are risks involved, and we have data. Management reporting allows us to present the data in a clear and effective way so that we can see the risks and take steps to mitigate them. As Bhattacharyya (2010, chapter 1) described, management accounting plays a crucial role as “decision-making support system” to the management.

3 Intelligent Process Automation (IPA)

The primary goal of this chapter is to develop a comprehensive understanding of Intelligent Process Automation (IPA), a second key concept throughout this research, from the initial research question to the final conclusions. IPA is integral to this study as it represents a significant advancement in how modern businesses controlling their processes and enhance decision-making capabilities. By exploring IPA's role and impact, this chapter aims to illustrate its crucial role in advancing managerial accounting and reporting practices.

Intelligent Process Automation (IPA) combines robotic automation with machine learning to enhance business operations and efficiency. IPA automates repetitive tasks and uses advanced technologies to improve processes. It includes Robotic Process Automation (RPA) for handling data-related tasks, smart workflows that coordinate tasks between machines and humans, Machine Learning (ML) for analysing patterns, Natural Language Generation (NLG) for creating reports from data, and cognitive agents that can perform tasks. These technologies help businesses improve their efficiency and customer service. (Berruti, Nixon, Taglioni & Whiteman 2017.) However, because these technologies are not standardised, IPA can be costly and challenging to set up. It can also have technical issues interacting with other systems and creating data silos. (Gardner 2023.)

Intelligent Process Automation (IPA) has originally developed from Robotic Process Automation (RPA) by incorporating advanced digitization technologies. Initially, RPA was used to automate simple tasks that worked with structured data like numbers and tables. Over time, technologies such as Optical Character Recognition (OCR) and Natural Language Processing (NLP) were added, allowing it to handle unstructured data like texts and emails. This evolution introduced Artificial Intelligence (AI) technologies to RPA, transforming it into IPA by giving software robots cognitive abilities to perform complex analyses and copy human decision-making processes. As a result, IPA has expanded the types of tasks that can be automated, improving the efficiency and quality of processes and reducing the need for human overload in routine operations. (Langmann & Turi 2022, 81-82.) This shift by adding AI not only streamlines business functions but also enhances the overall operational efficiency. Additionally, other key differences and advances in IPA are illustrated in table 2 of the referenced academic material.

Table 2. The differences between RPA and IPA, based on Hermann, Stoi and Wolf analysis (2018, 29 in Langmann & Turi 2023, 82)

Categories	**Rule-based automation**	**Intelligent automation**
Degree of standardization	High	Low

Data sources	Structured	Unstructured
Decision basis	Rule-based	Experience-based
Exceptions	Only a few possible, mostly requiring user intervention; number remains constant	Any number possible that trigger machine learning; number thereby decreasing
Human interaction	None or only extremely limited	Interactive social system

Langmann and Turi (2023, 82), also referring to another McKinsey & Company research made in 2018, which also states that IPA expands the range of applications for process automation, where, the number of processes that can be automated. Reduced execution time and higher process quality are additional benefits of IPA.

3.1 Explaining main Intelligent Process Automation (IPA) technologies

In this chapter, the main technologies within Intelligent Process Automation (IPA) are reviewed, examining their essential components and roles in enhancing business operations. This analysis aims to provide a thorough understanding of how these technologies automate and optimize processes, highlighting their significant contributions to improving efficiency.

Robotic Process Automation (RPA) stands as an important technology revolutionizing business processes, employing software robots to replicate human interactions with digital systems and software. These robots excel in tasks such as comprehending on-screen content, executing keystrokes accurately, navigating systems, extracting data, and swiftly performing predefined actions, all without fatigue or errors. Through RPA implementation, workflows are streamlined, leading to enhanced profitability, flexibility, and responsiveness within organizations. Moreover, RPA fosters employee satisfaction and engagement by alleviating them from ineffective tasks, thereby boosting overall productivity. (UI Path s.a.)

Artificial Intelligence (AI) is defined as a machine's ability to perform cognitive functions usually associated with human brains, such as learning, reasoning, and problem-solving. AI applications, such as voice assistants and customer service chatbots, are becoming increasingly integral in business, enhancing efficiency and profitability. The effectiveness of AI lies not just in the technology itself but in how businesses deploy these tools to optimise human work and build trust with stakeholders. (McKinsey & Company 2024.)

Machine Learning (ML), a branch of AI, involves algorithms capable of learning from a variety of data inputs, such as historical or synthesized data, without direct programming. These algorithms are skilled in identifying patterns and can evolve over time to enhance their precision and ability to make decisions. Machine learning, including its subset deep learning, plays a crucial role in predictive analysis and automating complex tasks. (McKinsey & Company 2024.)

As mentioned in chapter 3. by Langmann and Turi, (2022, 81-82) Optical Character Recognition (OCR) technology and Natural Language Processing (NLP) are new additions in IPA, which makes it smarter and more effective than RPA. OCR facilitates the conversion of text and numbers from scanned images and documents into digital format, enabling automation of tasks such as invoice processing. It extracts relevant content, whether typed, handwritten, or printed, making it readable and usable by software systems. OCR is easily integrated into Robotic Process Automation (RPA) solutions, further streamlining automation processes. The second technology which makes IPA more efficient is Natural Language Processing (NLP), which involves the analysis and understanding of human language through algorithms, enabling tasks such as categorizing content, recognizing topics, and converting speech into text. (Langmann & Turi 2023, 84-89.)

3.2 Intelligent Process Automation (IPA) used in management reporting

The purpose of this chapter is to examine how Intelligent Process Automation (IPA) assists in the management reporting process, including its compilation and analysis, among other aspects. It is also worth mentioning that this chapter discusses Robotic Process Automation (RPA), which is part of IPA meaning that it is not separate technology, as has been noted by various authors in the previous chapter 3 and 3.1.

The management reporting process is a central element in the management accounting system. In a typical reporting process, data is collected and prepared, followed by report production and verification. After these steps, the accountant begins to analyse, comment and discuss the report. Significant portion of the process, approximately 70%, is dedicated to collecting, preparing, reporting, and verifying the reliability of data. This emphasizes the intensive effort required in the initial stages of data management to ensure accuracy and utility in subsequent analyses. These tasks often do not add value and take up time from management accountants that could be used to perform more meaningful activities, such as conducting additional analysis, commenting, or deriving key metrics. However, it is precisely these actions that can significantly improve the quality of reporting and create added value. (Langmann & Turi 2023, 121.)

These technologies are particularly effective at creating quantitative reports. They automate the process by logging into source systems, running queries, and transferring data into central files

such as Excel. Robots also perform checks, for example by reconciling data between different systems. This technology allows reports to be regularly updated and automatically distributed to target user groups via email. (Langmann & Turi 2023, 121-122.) We can observe how effective this characteristic of these technologies is, where reports can be updated regularly. As mentioned by Axson (2010, 161), the real-time flow of information provides numerous advantages to a company. Additionally, the author pointed out that companies investing in these management information systems back in 2010 were dominating the market due to the superior flexibility in decision-making that these systems offer. The effectiveness of using Intelligent Process Automation (IPA) in reporting can be seen, especially when reports need to be generated multiple times across different product groups or teams. Although changes to reports are often minimal, such as changing parameters for different products, automation can significantly reduce workload and improve productivity, especially during critical periods such as month-end close.

According also to the McKinsey & Company's research by Berruti, Nixon, Taglioni, and Whiteman (2017), where can be seen the advantage of use IPA is that "One large financial institution used an RPA transformation at scale to automate 60 to 70 percent of tasks in record-to-report processes and create annual run-rate efficiencies of 30 percent or more. Using the same methodology, another institution achieved an 80 percent reduction in processing costs in excess queue procedures." Truly high efficiency can be seen in the use of these technologies, considering what 30% means for a large financial institution—it effectively improves resources.

4 Research Methods

In this chapter, the methodological approach adopted for the implementation of this research is examined. Particular attention is given to describing the data collection procedures, research instruments, and analysis methods that ensure the reliability and validity of the results obtained. This section helps reader understand how the data were gathered, upon which conclusions are drawn, and how these conclusions can be interpreted and applied within the context of the research topic.

This research is aimed at determining how Intelligent Process Automation (IPA) affects management reporting. **The main** research question is: How do Intelligent Process Automation (IPA) technologies transform management reporting, and what are their implications for enhancing business operations?

The topic of IPA and management reporting is very broad because there are many different business directions, which in turn leads to a wide variety of business operations.
To comprehensively address and deepen understanding of the research question, investigative research questions were also formulated:

IQ 1: How do Artificial Intelligence (AI), Machine Learning (ML), and robotics, as components of Intelligent Process Automation (IPA), transform management reporting processes?

IQ 2: What benefits and challenges in business operations can be attributed to the integration of these technologies in management reporting?

IQ 3: How do these technological advancements influence decision-making in companies through improved business analytics and forecasting?

4.1.1 Research design

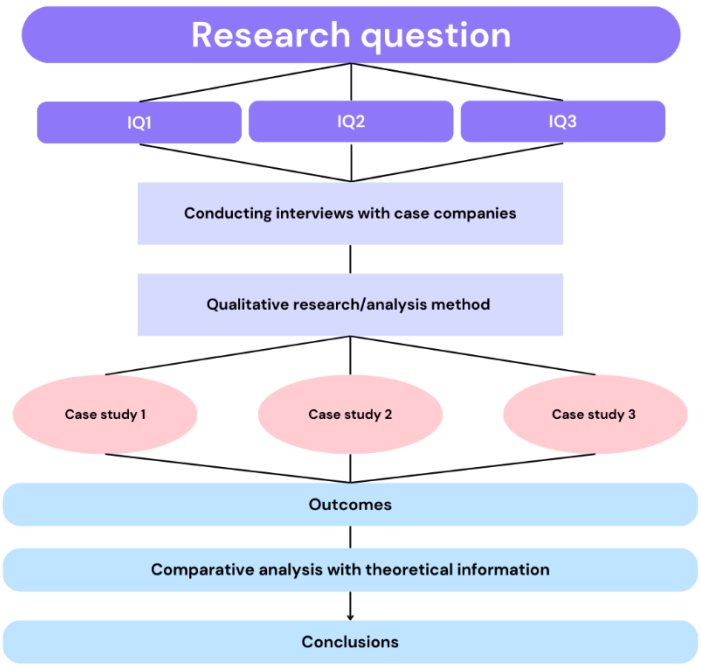

Figure 7. Research design

The figure 7 provides a detailed illustration of the research design plan. Initially, the main research question and investigative questions were formulated, which laid the foundation for the entire study. Thorough consideration of these questions in this chapter is crucial, as all subsequent stages of the research design are based on them. The next step involved conducting interviews with three companies that are already utilising these new IPA technologies in managerial reporting, which allowed for the collection of a solid base of qualitative data. The reason why the research interviewed companies already using these IPA technologies is that the research aims to understand how these specific technologies enhance managerial reporting. Therefore, using companies that already employ this technology was a necessary key in attempting to answer the research question. The results of these interviews were analysed using a qualitative method, which in turn provided the opportunity to format each interview as a separate case study, to best answer the research question.

In the following chapters, the justified reasons with the support of academic materials for each method used, are considered, as mentioned above, specifically why this research method is most suitable for this study.

4.1.2 Qualitative method

In this research, the choice to employ qualitative research methods was intentional, reflecting the complexities of investigating how Intelligent Process Automation (IPA) technologies affect managerial reporting, particularly in the realms of data analytics and forecasting, which are critical to decision-making processes. As noted by Hammarberg, Kirkman, and de Lacey (2016, 498-499), qualitative research methods are particularly well-suited for uncovering the nuanced experiences, meanings, and perspectives of participants, which are often challenging to analyse within quantitative frameworks. Such an approach has advantages in the context of this topic, as it allows for a deeper exploration of the interaction between IPA technologies and managerial reporting, including their impact on data analytics and decision-making. As asserted by Lincoln (2021, 3), qualitative research aims to uncover a diverse array of expressed perspectives, encompassing viewpoints that reflect the majority of participants involved in the study. As also confirmed by Saunders, Lewis, and Thornhill (2016, 168), the adoption of qualitative methods in this research facilitates an in-depth exploration of the meanings participants attach to their experiences and the dynamics of their relationships. This approach, through diverse data collection and analytical techniques, is instrumental in building a robust conceptual framework and enriching the theoretical landscape of the research.

For a comprehensive coverage of this research's topic and to reveal the essence of the research question, qualitative methods are also preferred rather than quantitative, as they provide a more detailed description and explanation, most suitable for the specific situation. In other words, we have a specific topic, and we need to research on how it creates specific situation, and we need experience on that, and exactly the qualitative research is interested in variation and concrete experience. (Lincoln 2021, 3-4.)

4.1.3 Data collecting

All data in this research was collected through interviews of three companies, from individuals who are directly involved with managerial reporting. The choice of conducting exactly three interviews is justified because these interviews were analysed and presented in three case studies. This means that this research is not designed to present a multitude of identical interviews. Instead, it involves three interviews that provides extensive information. Based on this information, three comprehensive and distinct case studies have been developed, to better understand the research and respond to its questions. As noted by Saunders, Lewis, and Thornhill (2016, 168), in qualitative method: "Data collection is non-standardized so that questions and procedures may alter and emerge during a research process that is both naturalistic and interactive."

The preparation for the interview was diligent and included an analysis of theoretical foundations from the chapters 2 and 3 and their subchapters, which significantly improved the approach to conducting the conversation, in order to draw full case-studies.

The importance of thorough preparation and a conscious approach to interviewing cannot be overstated. Experienced interviewers develop key ideas and hypotheses about the subject of the study and the interviewee's attitude towards it, forming the foundation for a successful interview. The research retains an exploratory nature but is based on a strong deductive foundation. The effectiveness of the interview largely depends on the interviewer's ability to identify the core problems revealed during the conversation and to quickly formulate questions that help delve deeper into these issues or ascertain which approaches have already been tried. (Widner 2022, 121-122.) Building on this approach, questions for the interview were developed (see appendix 1), to which responses were obtained from the interviewee. Additionally, by studying the theories outlined in the chapters 2 and 3 and their subchapters, further problems and new aspects of the conversation were identified, allowing the interview to be supplemented with information that provided a more comprehensive understanding of the study. This meant that the questions prepared for the interview were supplemented with writer’s own observations. For instance, when the company responded to questions touching on new topics, this made writer to ask additional questions, allowing for more in-depth information to structure case studies.

The data is analysed and presented in a case studies format. The case study approach is particularly suitable for our investigation into the impact of Intelligent Process Automation (IPA) technologies on managerial reporting, as it allows for a deep and extensive understanding of complex issues within their real-life context.

The case study approach is particularly effective for analysing with explanatory questions such as "how," "what," and "why," enabling a deeper understanding of the processes of implementation and the reception of these technologies. It also identifies gaps in implementation and explains the choice of deployment strategies, which contributes to the development and refinement of theoretical approaches. (Crowe et al. 2011, 4.) This characteristic of case-studies fits well with the current research, which aims to discover how and in what ways IPA technologies affect managerial reporting, leading to decision-making.

In terms of analysing the data collected from interviews for the case studies, a clear distinction was made based on the main aspects as outlined in chapter 4.1.4, to best understand and analyse the information. As Rowley (2002, 24) points out, data analysis should be based on studying qualifications and tabulating evidence, as this approach effectively validates the initial positioning of the research, because analysing evidence in case studies is a challenging task.

When selecting companies for interviews and subsequent case study development, the criteria were focused on how IPA technologies impact management reporting, rather than whether the companies were merely using these technologies, which explains that the primary criteria for selecting companies were their existing use of these technologies. The second criteria were that the chosen companies should have been using these technologies for a few years, meaning they would have experience with them. This experience is crucial for the study to understand precisely how IPA technologies influence management reporting, including decision-making, business analytics, and forecasting. Selecting the appropriate companies to target for this research was achieved through leveraging the writer's network, including friends and professional contacts, which as a result provided three companies: two large-sized and one small-sized (as shown in table 3). Even if it was just from the network and friends, it still gave an informative and "real" sample for analysis. All the recipients were invited to the interviews through various channels, including emails, phone calls, and face-to-face conversations. However, the invitations themselves are not included in this thesis to avoid the risk of exposing company names or sensitive information. Since maintaining data confidentiality and not disclosing company and personal names were among the primary conditions for their participation in this study.

Selecting three companies instead of fewer or more can be explained by the statement from Stephen (2017), which can be adapted to almost any situation: "Think of the old adage: 'one’s an incident, two’s a coincidence, and three’s a pattern.'" In my opinion, this fits well with the reason for choosing three companies. Choosing only one company might not seem like a thorough research, as I would not have the opportunity to compare any claims with other practical examples. Choosing two companies is better but still not as definitive, as we could only compare two companies, providing examples but not as conclusive for truly understanding the impact of IPA transformation on managerial reporting. However, by choosing three, we have a much more comprehensive study. Each case study is deeply researched and provides a lot of information, allowing for comparative analysis and comparison with theory. By choosing three instead of four, it allows for a clearer focus on answering the research question and its investigative questions. Having more cases could confuse the reader, and the study would lack a clear understanding of the specific real-world examples of transformation, as well as the pros and cons.

As previously mentioned, three companies were used for the case studies, with interviews conducted with each. Table 3 displays the key information about the companies, the individuals interviewed, and the specific methods used for conducting the interviews. During each interview, as mentioned, both pre-prepared questions and additional questions created by the interviewer were used for a more extensive analysis of the interviews. Each interview was recorded and saved in agreement with the companies and individuals interviewed. Following this, I, the writer of this

research, analysed the transcriptions and video recordings of the interviews (the details of analyses of data are described in the upcoming chapter 4.1.4.). Video recordings and transcriptions are not provided in the research document, as confidentiality was a key condition set by all of the companies involved in this study, as mentioned earlier.

Table 3. Interviewed companies and methods

Interview Company	Company's business industry	Person Interviewed	Interviewed method
Company A	Large sized forest industry company specializing in manufacturing and international sales of forest products. Operates in Finland and in many other international markets	Business Intelligence Manager	Microsoft Teams Video Conference
Company B	Large sized logistics provider for food items operating across Europe and Eurasia.	CEO	Zoom Video Conference
Company C	Small sized sustainable clothing retailer company, operating in the North America.	CEO	Zoom Video Conference

It should also be noted again that all data used in this research is presented anonymously to prevent the disclosure of any company sensitive information and secrets. Furthermore, what could be utilised from the information provided by the companies was clarified multiple times, ensuring that the agreed-upon terms during the interviews were strictly adhered to. The data is presented in the format of "Company A, Company B, Company C" to maintain confidentiality in accordance with restrictions outlined previously, as can be seen in table 3. However, each case study has

comprehensively detailed the field of business or industry along with the explanation of the primary processes of each company.

4.1.4 Data analysis

In the previous chapter, it was reviewed how data was collected. This chapter is exploring how the data was analysed. As described in chapter 4.1.3, all data is presented in the case studies.

The analysis of data began by viewing the interview recordings and reading their transcriptions. As mentioned in the chapter 4.1.3 by Rowley (2002, 24), analysing data in case studies can be quite challenging and having in tabulating evidence will help. Building on that, in order to ensure all case studies were consistently structured for effectiveness in responding to the research questions, and indeed the effectiveness of Intelligent Process Automation (IPA) technology on managerial reporting and its subsequent impact on analytics, forecasting, and operational processes of the company, while reviewing the video recordings and reading the transcriptions, the data was analysed and structured in a format established by me, the writer, which best helps to answer the research question and investigative questions. Specific defined structures helped to efficiently analyse them and highlight the main aspects of the functioning of these IPA technologies in companies when building managerial reporting and its impact on the operational structure of companies.

Structure was defined as:

1. Technology Name
2. Type of work
3. Decision Making
4. Challenges
5. Benefits
6. Overall outcome

In the Figure 8, a visualized data analysis process was constructed.

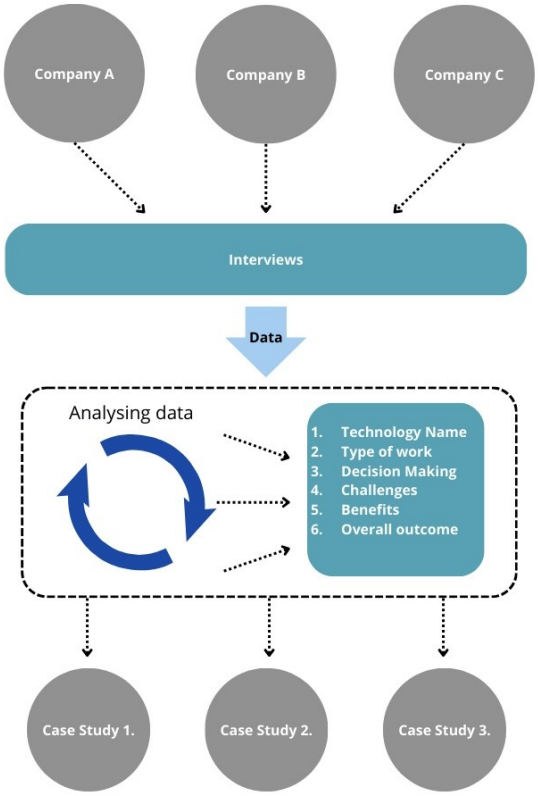

Figure 8. Process of data analysis

This analysis can be considered effective because each interview was about two hours long, and a large amount of information was provided. By reviewing chapter 5, we can see a deep analysis of each case study, providing the most important information as well as the pros and cons of the topic and the study. Because of the structuring, it was possible to summarize the information, identify important with relevant points, and summarize some less important facts into separate parts that completed the relevant ones. In the end, this analysis proved its effectiveness because as can be seen in chapter 5, it has comprehensive case studies with main aspects' information.

It is also worth mentioning that in case studies #1 and #3, me, the author of this research, have outlined models of IPA technologies in managerial reporting in figures (figure 9 and figure 10). The reason why these models were constructed and shown only in case studies #1 and #3 is that their operation is more simplified, unlike case study #2, where the company uses a complex layout that includes many different aspects of IPA technologies operation. However, it should be mentioned that case study #2 is not inferior in quality to the others because there, the entire work was comprehensively presented and revealed in text. The complexity here is considered in the context of drawing a figure with a layout, rather than in the analysis and presentation of this case.

5 Case Studies

In this chapter, the case studies that were collected from interviews are explored, analysed and structured according to the framework defined in chapter 4 and its subchapters. These case studies provide practical insights into the implementation and impact of Intelligent Process Automation (IPA) technologies in three different organizations. By examining these real-world examples, it aim to understand the transformative effects of IPA on management reporting. Each case study is presented in a structured format, offering detailed analysis and contextual relevance to the theoretical concepts discussed earlier in this research (chapters 2 and 3).

5.1 Case Study #1

The exploration of Intelligent Process Automation (IPA) technologies within Company A, a company specialising in the forest industry, underscores a transformative journey towards digitalization, more efficient processes and enchased decision making. This company, through implementation of advanced technologies, has revolutionized its traditional operational and decision-making processes. By integrating Artificial Intelligence (AI) for predictive analytics, Company A has not only enhanced its management reporting capabilities but also ensured a powerful response mechanism to market dynamics, critical for maintaining a competitive edge.

5.1.1 Technology Name: AI-based Forest Products Price Forecasting Model

At the core of Company A's technological advancement is the Artificial Intelligence (AI) based forest products price forecasting model. This technology employs AI algorithms to analyse large datasets, making predictions about future product prices with increased accuracy. Company A has been using this technology already for a few years.

5.1.2 Type of work

At Company A, the AI-based model is tailored to conduct predictive analytics on forest products prices, which is crucial due to the industry's vulnerability to frequent market fluctuations. The model utilises advanced machine learning algorithms to process a vast array of data, including historical price data, production volumes, market demand indicators, and macroeconomic factors like GDP growth rates and currency exchange rates. Through meticulous analysis of these data patterns and trends, the AI system is adept at forecasting future price movements with a high degree of accuracy. This predictive capability is integral to strategic planning and operational efficiency across the company, from production to sales.

The insights generated by the AI model are effectively visualized in management reports through their own software (name was not revealed by the company). These reports offer a clear and actionable view of future market conditions, presenting current suggested prices per product alongside forecasted prices. This tool supports the company's various departments, particularly the sales department, by providing management report that suggest pricing strategies which lead to more precise decision-making. As a result, there is a reduction in financial losses, which is crucial since production and sales are core operations of the company. Additionally, this same AI technology facilitates proactive adjustments to production schedules, inventory management, and marketing strategies, allowing the company to anticipate and adapt to market developments efficiently.

Before adopting the AI-based forecasting model, Company A relied heavily on manual processes where sellers made pricing decisions based on their intuition and limited historical data. This approach lacked precision, resulting in suboptimal pricing strategies that did not fully account for market characteristics.

In Company A, one of the major aspects of the work of this AI technology is the data, meaning that data plays a significant role in the analysis itself and the outcome. Therefore, this chapter is examining more closely the use of data and its principle.

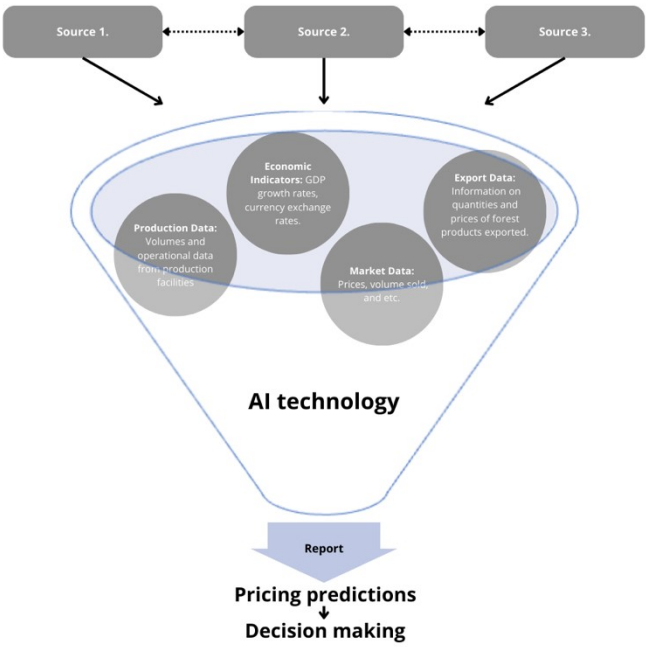

Figure 9. Type of work and data utilization in Company A’s Intelligent Process Automation (IPA) technologies usage

As can be seen in figure 9, the model integrates various forms of time-series data essential for accurate predictions:

- Export Data: Information on the volumes and prices of forest products exported to different countries.
- Production Data: Details on the amount of forest products produced in various facilities across different regions.
- Economic Indicators: This includes data on GDP growth rates, currency exchange rates, and other macroeconomic factors that influence market prices.
- Inventory Levels: Current stock levels across different warehouses, which impact decisions on production and sales.

In Company A, they use a wide variety of data sources, most of which are paid partners that provide reliable information that can be trusted, and their own company departments, for example such as inventory department, market analysis department. To make it convenient for the company to use this data for AI analysis, they also use a separate program. In this program data is assimilated through an automation, which automates data ingestion from diverse sources, ensuring that the latest information is always available for analysis. This seamless integration supports real-time data updates, enhancing the responsiveness of the predictive model.

5.1.3 Decision Making

The predictive model's outputs significantly enhance Company A's decision-making process. Sellers and managers receive management reports filled with predictive insights, which are crucial for making informed strategic decisions. For instance, if the model predicts a significant rise in prices, sellers might decide to hold inventory, anticipating higher future prices to maximize revenue potential. Alternatively, if a drop in prices is anticipated, they could increase marketing efforts or initiate promotions to quicken sales and mitigate losses from falling prices. This data-driven approach allows sellers to adapt their pricing, promotions, and inventory strategies effectively to align with predicted market trends. The use of this IPA technology empowers Company A's workforce, equipping them with the tools necessary to anticipate and react effectively to changes in the market.

5.1.4 Challenges

The transition to an AI-enhanced system was challenging. Initially, the company faced significant hurdles due to the unavailability of clean, integrated data suitable for AI analysis. Many data sources were incompatible with the new system, requiring extensive pre-processing to standardise and clean/transform the data. Furthermore, integrating the AI model with the existing IT-

infrastructure presented technical difficulties that demanded substantial time and expertise to overcome. During the early stages, the forecasting accuracy of the AI model was also questioned, as the system needed time to learn from diverse data inputs and improve its algorithms.

5.1.5 Benefits

Despite the initial difficulties, the implementation of the AI model has dramatically transformed the decision-making process in Company A. The AI system now provides highly accurate forecasts, allowing the company to adjust their pricing strategies proactively based on predictive insights. This accuracy has led to significantly better alignment of supply with market demands, optimizing profit margins and enhancing competitive advantage. The implementation is not just about time savings for the Company A, it is fundamentally about leveraging precision to drive profitability and decision-making. The improved forecasting accuracy has proven to be a crucial asset in navigating the tense market of forest products, ensuring that Company A can anticipate changes and adjust their strategies accordingly.

5.1.6 Outcome/ overall view

Overall, while the path to integration was fraught with challenges, the tangible improvements in forecasting accuracy and strategic outcomes have affirmed the value of the AI model, justifying the initial investment and effort involved in transforming Company A's approach to pricing forest products.

5.2 Case study #2

In this chapter the second case study is reviewed. In the food logistics sector, Company B has implemented AI-driven solutions to optimize their supply chain and management reporting, which leads to improved forecasting and decision making. Company B is particularly focusing on food distribution to numerous fast-food restaurants across Europe and Eurasia. This case study explores how the implementation of an AI-based ordering and forecasting tool has significantly improved their operational efficiencies and service offerings.

5.2.1 Technology Name: AI-based Demand Forecasting and Inventory Management Reporting System

Company B has implemented an Artificial Intelligence (AI) based reporting system designed to enhance predictive forecasting and inventory management across its extensive network of fast food restaurant clients. This tool employs advanced analytics to predict future sales and optimize

inventory levels at each restaurant. Company B has been using this technology already for four to five years.

5.2.2 Type of work

The primary functionality of the AI tool is associated with its ability to automatically order needed ingredients and accurately predict the demand for individual food items across various restaurants, creating reports for almost all Company B departments. The system begins with a comprehensive data collection phase, gathering historical sales data, event calendar information, and details about marketing campaigns. Historical sales data provide insights into past consumer behaviour, which helps identify patterns and trends in sales. The event calendar includes local and national events that could impact restaurant foot traffic, such as public holidays or sports events. Marketing data is also crucial, as promotions and discounts significantly influence food demand.

Using this collected data, the AI applies Machine Learning (ML) algorithms to analyse and forecast future needs. These predictions take into account seasonal variations, the impact of marketing strategies, and any anomalies caused by unexpected events. Based on these forecasts, the system generates and recommends optimal inventory levels for each item at each restaurant, aiming to minimize shortages and reduce wastage, and at the same time, it suggests ordering of needed items to logistics company itself, to have it in the warehouse ready for the restaurants. Additionally, this tool compares various restaurants by analysing those similar in size and location, by for example examination of their consumption of specific items over a certain period and identifies areas where management should focus to enhance performance. This analysis also contributes to better decision-making, as the tool itself suggests where improvements should be made.

The system is designed to be dynamic, allowing restaurant managers to input additional information, such as last-minute local events or unplanned promotional campaigns, which might affect food demand. This adaptability ensures that the forecasts remain relevant and accurate even when conditions change unexpectedly.

Moreover, the predictive forecasts generated by the AI tool are directly integrated into Company B's logistics operations. This integration aids in planning efficient delivery routes and schedules, ensuring that all restaurants receive the necessary supplies on time when they are needed, based on the AI sales forecasts. It is also worth noting that if Company B requires a more accurate forecast, investing additional funds becomes necessary as the AI tool must improve enhanced capabilities to meet this requirement.

Finally, a feedback loop enhances the system's accuracy. Real-time sales data and inventory levels are fed back into the AI model, allowing it to continually improve its forecasts. This ongoing

process of refinement ensures that the AI tool effectively adapts to new data and restaurant needs, creating increasingly precise reports.

Prior to the introduction of the AI tool, Company B relied on more traditional methods for forecasting and inventory management. Before the implementation of this AI tool, all the restaurants operated separately, each on its own. Currently, they are part of a chain connected with Company B by this AI tool. This process was largely manual, involving spreadsheets and basic software solutions that required significant human input, which lead to errors. Restaurant managers often made decisions based on intuition or incomplete data, leading to common issues such as overstocking or understocking, which resulted in higher operational costs and food wastage. The lack of precise, data-driven predictive forecasting made it difficult to align supply with fluctuating demands, particularly during unexpected events or promotional campaigns.

Management reporting is streamlined through AI software fully developed by co-partner IT-company of Company B. This software functions are visualizing complex datasets and forecast results effectively. This enables restaurant managers and company executives to make informed decisions quickly. The reports generated by this system provide daily, weekly, and item-specific forecasts, assisting in precise order placements and inventory adjustments while adhering to company policies regarding software confidentiality.

5.2.3 Decision making

The implementation of the AI tool has significantly enhanced decision-making processes in their company and for their clients too. With real-time access to accurate forecasts and detailed analytics, decision-makers can respond more rapidly to changing market conditions and customer preferences. The system's ability to analyse massive amounts of data and identify trends allows the company to optimize their operations proactively, rather than reactively adjusting to sales outcomes. This shift has led to more strategic inventory management, better financial planning, and improved operational efficiency across all restaurant locations.

5.2.4 Challenges

Implementing the AI-driven system at Company B involved several challenges. It was difficult to integrate the new AI software with the current systems. Careful planning was needed to guarantee compatibility and smooth data flow without interfering with regular business activities. Maintaining the accuracy and completeness of data was crucial, as the system’s effectiveness heavily depended on the quality of input it received. Considerable work was needed to ensure continuous data integrity and establish reliable data collection procedures. Another significant challenge was user adoption, particularly among staff accustomed to traditional methods. Comprehensive training

was essential to build the trust level in the AI's recommendations and to demonstrate the system's benefits.

Continuous technological improvements were required as the system grew to handle data from more restaurants, making it difficult to maintain processing speed and system stability. Additionally, a new challenge emerged as employees hired post-implementation became overly reliant on the AI system, lacking the skills to operate effectively without it, which could pose a risk to operational continuity under unforeseen circumstances, for example if potential failure/glitch appears in the system.

5.2.5 Benefits

The introduction of the AI tool has brought substantial benefits to Company B, transforming its operations and contributing significantly to its strategic goals. The advanced data processing capabilities of the tool have greatly enhanced forecasting accuracy, significantly reducing instances of overstocking and understocking, which in turn has led to significant reductions in food wastage and improvements in profitability. Better demand forecasts have streamlined inventory management across all restaurant locations, ensuring optimal stock levels without excess and reducing storage costs. The automation of data analysis and forecasting has freed up staff time, allowing them to concentrate more on other core business activities. This efficiency has extended to time management, as employees can now focus more on tasks that contribute to company growth and improvements. The AI tool has also fostered a more data-driven culture within Company B, enabling informed decision-making and forecasting through detailed insights and reporting. Importantly the AI tool paid off within three years of implementation and is now used daily by everyone within the organization, demonstrating its integral role in the company's operations and its substantial return on investment.

5.2.6 Outcome

After reviewing the case study #2, it can be understood that the implementation of the AI-driven analysing and forecasting tool at Company B has significantly transformed business operations, resulting in marked improvements in inventory accuracy, cost reduction, and overall operational efficiency. However, achieving these outcomes required substantial investments, technological adjustments, and building a high level of trust among employees to adopt and rely on the new system. Despite these challenges, the tool has proven its value by paying for itself within three years and is now an integral part of the daily operations across the company’s network. By enabling smarter, data-driven decisions, Company B has not only enhanced its competitive edge in the food logistics

industry but also positioned itself for sustainable growth and continued success in meeting the dynamic needs of its customers.

5.3 Case study #3

In this chapter the case Company C is a small-sized company based in North America, specialising in sustainable clothing sold exclusively online through various large and small retail platforms, is reviewed. The company sells clothing made from recycled materials, making it sustainable. The company has several suppliers from whom they order clothing, meaning the company itself does not manufacture, but only procures, stores, and sells. Managing such a multifaceted operation, especially with limited financial resources and a small workforce, demands efficient data handling and automation systems.

5.3.1 Technology Name: Integrated Analytics and Forecasting AI System with Robotic Assistance

Initially, Company C deployed a basic Robotic Process Automation (RPA) system due to financial constraints, which provided basic reports by extracting essential sales and performance data. As their financial situation improved and operational demands increased, they collaborated with a partner firm to develop a more enhanced Artificial Intelligence (AI) driven platform, transforming it into Intelligent Process Automation (IPA). This new system not only integrates sales and analytics more effectively but also uses advanced robots for more dynamic data gathering and interaction with AI for deeper analysis, which helps company also mainly with forecasting. Company C has been using these technologies already for three to four years.

5.3.2 Type of Work

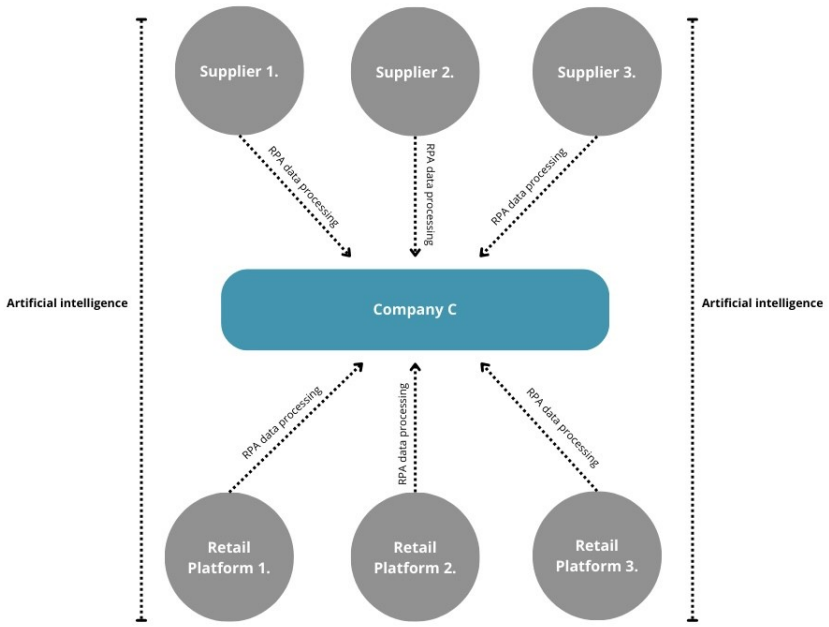

Figure 10. Type of work of Intelligent Process Automation (IPA) technologies in Company C

As figure 10 shows, that Company C employs advanced IPA technologies with AI system, enhanced with robotics, to streamline its e-commerce operations, selling sustainable clothing through various third-party retail platforms. The robots are tasked with collecting real-time data, including sales volumes, customer reviews, and pricing information, marketing trends, from these platforms. This data is crucial as it feeds into the AI system, which analyses it to discern sales patterns, customer preferences, and pricing impacts. This means the company has trained robots to extract necessary data from various sources, for example such as historical data (data from the past time), key transaction data about sales, also analysing websites of online resale platforms focusing on essential needed data, and gathering information about the delivery of purchased clothing, and historical data.

The AI system is adept at using advanced predictive analytics to forecast future sales trends by integrating historical data with current market conditions. This predictive capability employing huge set of data analysis is crucial for Company C, enabling it to proactively manage inventory by anticipating demand for popular items. By accurately forecasting upcoming trends, the company can ensure that best-selling items are well-stocked, avoiding overstock situations that tie up capital and understock issues that lead to missed sales opportunities.

Additionally, the AI system optimizes Company C's marketing strategies and product placements across different platforms based on analysed trends, thereby maximizing revenue potential and reinforcing its market presence. This targeted approach helps to tailor promotions and inventory distribution to where they will perform best, enhancing overall sales performance.

Additionally, by figuring out the best times and quantities for reorders for every product, the AI streamlines inventory management and lowers the risks of stockouts and excess inventory. It automates the ordering process, maintaining a streamlined communication flow with suppliers to ensure that new stock is processed efficiently and ready for distribution as soon as it's needed.

Overall, the integration of AI and robotics in Company C’s operations not only enhances its capability to adapt quickly to changing consumer trends but also supports the company’s commitment to sustainability. This technological approach allows Company C to operate a dynamic and efficient e-commerce business, effectively balancing supply with demand, and enabling continuous growth in the competitive market of sustainable clothing.

5.3.3 Decision making

The implementation of the AI system at Company C has significantly transformed decision-making processes within the company. For instance, the AI’s analysis of sales trends across multiple platforms allows the company to make informed decisions about where to allocate inventory and which products to promote more heavily. This is particularly important during peak seasons and for trending items, ensuring that the company capitalizes on high demand periods. Additionally, by automating the analysis of supplier data and purchase costs, the AI enables Company C to make cost-effective purchasing decisions. This integration helps in negotiating better terms with suppliers, planning for future production needs, and managing cash flow more efficiently. For example, if the AI detects a consistent increase in demand for a particular style, Company C can decide to increase orders from suppliers proactively, avoiding potential stockouts that could lead to lost sales.

5.3.4 Challenges

The transition to an AI and robotics-driven system was not without challenges. Initially, due to financial constraints and a lack of clarity about which data were essential, the company could only afford basic functions of IPA technologies. This limitation restricted the depth of their data analysis and operational efficiency, as it was also a process for them to learn and determine what specific information was necessary for effective analysis and future actions. Integrating more advanced AI capabilities was a significant hurdle due to the limitations of their old systems, necessitating the development of a completely new software platform. Additionally, establishing digital connections with

some traditionally operating suppliers was challenging, requiring innovative solutions to bridge the technology gap.

5.3.5 Benefits

Despite the initial challenges, the benefits of this technological advancement have been significant. The AI and robotics system has enabled Company C to significantly enhance its analytical capabilities, providing a full spectrum analysis of purchases and sales. This system supports better forecasting for inventory purchasing and sales strategy, adjusting to market demands in real time. The automation of these processes has also freed up employee time, reducing the need for additional staffing and allowing the team to focus on expansion and other value-added activities. Overall, the integration of AI and robotics has positioned Company C for sustainable growth and improved competitiveness in the sustainable clothing market.

5.3.6 Outcome

The deployment of the AI and robotics system at Company C has effectively transformed the company's operational dynamics. This technology has enabled precise trend predictive forecasting and inventory management, allowing the company to adjust its stock levels dynamically to meet actual market demand. As a result, Company C has significantly reduced overstock and understock situations, enhancing its operational efficiency and profitability. The system’s comprehensive data analysis capabilities have also improved decision-making processes, enabling the company to optimize its sales strategies across multiple online platforms efficiently.

6 Conclusion

In this chapter, the outcomes of the case studies are summarized, examined, and evaluated, which aim to address the questions posed by this research. The analysis is exploring the findings to highlight how the integration of new technologies into business processes has met the initial objectives set out in the research. By reviewing the data gathered from case companies, this chapter is reviewing the tangible benefits and challenges encountered during the adoption of these technologies. The insights brought from these real-world company cases are crucial in understanding the broader implications for the field of managerial accounting and decision-making processes. Through a detailed discussion of the case studies, this conclusion provides a comprehensive overview of the research findings, confirming the significant impact of technological advancements on business efficiency and reporting accuracy.

6.1 SWOT Analysis

SWOT analysis was used as an outcome summarizing tool in this research to systematically evaluate how new technologies impact management reporting. This approach identifies strengths, weaknesses, opportunities, and threats, offering a comprehensive framework for understanding the effects of technological integration on organizational processes.

Strengths:

All companies had similar strengths:

- Efficiency and accuracy in reporting
- Increased decision-making support.
- Acceleration of company processes.
- Optimization of expenses and increased profitability (reduced time and employee costs, etc.).
- Enhanced reporting providing insights into real-time situation within the company.

Examples from Case Studies:

Case Study #1 (AI-based Forest Products Price Forecasting Model): This technology streamlined data analysis, allowing the company to process large datasets quickly and accurately. The AI model's ability to forecast prices with high precision significantly reduced decision-making times and improved the overall processes, which gave company more profit.

Case Study #2 (AI-based Demand Forecasting and Inventory Management Reporting System): Automated inventory adjustments and accurate demand forecasting minimized stockouts and overstock, leading to reduced operational costs and enhanced service levels across the supply chain.

Case Study #3 (Integrated Analytics and Forecasting AI System with Robotic Assistance): The combination of AI and robotics facilitated dynamic data collection and analysis, providing real-time insights into customer preferences and market trends, crucial for agile decision-making.

Weaknesses

All companies had similar weaknesses:

- High implementation costs.
- Complexity of working (e.g. due to mismatched data, potential technological glitches and failures).
- Adaptation (e.g. change of primary company processes, employee training).

Examples from Case Studies:

Case Study #1: The integration of AI technologies required substantial initial investment in both financial and human resources, including training and system customization, which posed a significant barrier to immediate returns.

Case Study #2: Challenges related to data integration with existing systems led to delays and additional costs, impacting the overall efficiency of the initial implementation phase. Also, a long process of building a trust level, among employees.

Case Study #3: The sophistication of the integrated AI and robotics system necessitated ongoing technical support and upgrades, adding to operational costs and complexity.

Opportunities

- Scalability and enhanced strategic capabilities.
- Building a chain/ecosystem through company processes and adding the client’s ones.
- Expansion to new customer segments.
- Adaptation to changing consumer trends.

Examples from Case Studies:

Case Study #1: With the AI model's capability to adapt to changing data inputs, the company has the opportunity to expand its market reach by applying the model to different product lines and geographic markets.

Case Study #2: The AI system's scalability allows for an expansion of services to new customer segments without a corresponding increase in complexity for management reporting.

Case Study #3: Advanced data analytics empower the company to explore new market opportunities by understanding emerging trends and consumer behaviours more effectively.

Threats

- Technological dependence
- Technology failure risks

Examples from Case Studies:

Case Study #1: An over-reliance on the AI forecasting model could result in risks, such as system breakdowns that drastically alter pricing and inventory management tactics. Even if the company chooses to operate manually, this might lead to lower productivity, higher time expenses, and less accuracy in projected prices, leading to less profit.

Case Study #2: Excessive reliance on AI for management reporting can result in employees becoming dependent on this technology. In the event of a failure, the company may struggle to operate as there might be no employees skilled in manual work.

Case Study #3: The possibility of technological failure and a lack of transparency in AI and robot processes raises ethical and operational concerns, potentially leading to company's processes disruptions and customer distrust.

6.1.1 Outcome and reflection with the theory

The SWOT analysis conducted in the previous chapter, reveals the dual nature of integrating Intelligent Process Automation (IPA) technologies into management reporting. These technologies, as discussed, serve not only to expedite managerial accounting processes but also to enhance the overall quality and responsiveness of management reporting. The capabilities of IPA to process and analyse vast amounts of data significantly faster than traditional methods allow businesses to a better analytics and forecasting which gives ability to react more efficiently to market changes, optimising both processes and profits.

Linking back to the theoretical discussions in chapters 2 and 3, we see a clear connection between the practical applications observed in the case studies and the theoretical benefits proposed by IPA. For instance, the roles of Artificial Intelligence (AI), Machine Learning (ML), and robotics in always learning through improving models, enhancing data accuracy discussed in chapter 3.1, providing more extensive supporting data visualised in the report, supporting and improving

decision-making are clearly demonstrated in case studies #1, #2, and #3. Each case illustrates how these technologies not only streamline data collection and analysis processes but also expand the capabilities of companies to manage complex information systems, ultimately leading to more informed and timely decision-making.

Chapter 2.2.1 explored the traditional management reporting process, starting with data collection and finishing with business analytics, that were described in chapter 2.3.1. The theoretical enhancement of these processes through IPA technologies has been empirically supported by the outcomes of the case studies in chapter 5, where companies leveraged AI and robotics to transform their management reporting, leading to improvements in speed and efficiency, as well as reducing operational costs. This also supports McKinsey & Company's research (Berruti, Nixon, Taglioni & Whiteman 2017) explained in chapter 3.2, which also indicates that many companies have been able to reduce expenses and increase profits, in other words, optimise their processes.

For instance, from all the case studies, it also can be seen that IPA technologies improve and accelerate management reporting. Even if they do not speed up the process in terms of time, they provide greater accuracy as demonstrated in all the case studies. Of course, companies can manage the management reporting process themselves manually, but as described in chapter 3.2 by Langmann and Turi (2023, 121), it is very time-consuming and slow. As we see in the SWOT analysis, new technologies not only improve and accelerate the processes of management reporting in Company A, B, and C, but also expand its boundaries and optimise other important operational processes.

However, its case studies also highlighted weaknesses, as high implementation costs and complexity, reflecting the need for careful integration strategies, a point that resonates with the critiques discussed in the chapter 3 by Gardner (2023) revealing exactly the same point of view that in the beginning IPA can be expensive and challenging to get start working.

The case studies across three different industries demonstrate how business analytics, integral to overall companies' operations, is significantly enhanced by Intelligent Process Automation (IPA) technologies. If viewing from the business analytics perspective, gained knowledge from theory part reviewed in the chapter 2.3.1, it can be seen that "three types of analytics" (Sharda, Delen & Turban 2018, 49) has been each leveraged by IPA technologies to connect and improve their analytical processes: descriptive analytics, which compiles historical data to analyse past trends, was exemplified by Company A's use to visualize sales data. Predictive analytics, as seen in Company C, utilizes historical data to forecast future inventory requirements. Prescriptive analytics, implemented by Company B, uses predictions to recommend precise actions, such as adjusting stock levels. This seamless integration of descriptive, predictive, and prescriptive analytics, all enhanced

by IPA, not only optimizes forecasting accuracy but also empowers smarter and more supportive decision-making. Also, after reviewing all the case studies it can be seen how companies by using IPA technologies and management reporting improved forecasting, especially focusing on predictive forecasting. Addressing back to the theory part explained in chapter 2.3.2, it supported by insights from Jedox (s.a.), which underscore the effectiveness of AI and ML in improving forecasting. These technologies continuously refine data analysis, enabling businesses to anticipate market shifts and strategize proactively, thus maintaining a competitive edge in fast-evolving markets.

The theoretical structure and fundamental idea of this research begin with managerial accounting, which leads to management reporting, then to business analysis and forecasting, all enhanced and streamlined by IPA technologies, ultimately guiding the decision-making that occurs daily within companies. As described in chapter 2.4, decision-making involves evaluating various data to select the most suitable option that meets the needs of companies, as detailed by Bhattacharyya (2010, chapter 11). From examining all the case studies, we observe that IPA improve and support decision-making in all three companies, by for example enhancing predictive accuracy, streamlining operational processes and giving more rapid response when thinking about decision. As discussed by Axson (2010, 145) in chapter 2.4.1, effective management reporting involves delivering the right information at the right time, which in turn enhances a company's decision-making capabilities. The study of these case studies shows that IPA technologies, by accelerating the process and optimizing management reporting to include broader data analysis, enable management to see a clearer picture of operations and, as previously mentioned, the potential for effective forecasting. This layered analytical approach directly supports decision-making by providing a powerful framework that helps managers choose the best course of action among various alternatives. For instance, in all case studies, the use of AI to analyse large amounts of data has led to effective process optimization and increased profit.

By comparing these practical outcomes with the theoretical frameworks, this study not only validates the transformative potential of IPA in management reporting but also provides a nuanced understanding of the challenges and strategic considerations that companies must address to fully leverage these advanced tools in their operations.

Based on my personal opinion after conducting this research, studying both the theoretical aspects and practical examples through real case studies, I would advise companies to utilize Intelligent Process Automation (IPA) technologies in management reporting. We can clearly see their effectiveness in optimizing company processes and facilitating more accurate and efficient decision-making. While the advantages can be discussed for a very long time, it is also important to consider the disadvantages when thinking about integrating these technologies. A major downside is

the substantial investment required, which can vary depending on the specific needs, the effectiveness of the technology desired, and the extent of data analysis required. Such investments are often sizable for small companies, as seen by the example of Company C. However, as demonstrated in case study #3, even small companies can gradually afford these new technologies by implementing them with available sources and need. Integrating IPA technologies is a complex and lengthy process, but after examining these case studies and conducting interviews with the individuals described in chapter 4.1.3, and asking interview questions found in appendix 1, especially asking each company, when now they are able to see the efficiency of IPA technologies in management reporting, knowing how much their companies has invested and how much time was spent on full integration, would they invested in this integrations they have? The answer was similar for all companies, as they all answered yes, they would invest. For example, Company B, answer was, as mentioned in chapter 5.2.5, that their investment paid off within three years. Certainly, smaller companies have fewer opportunities to invest large sums of investments, but as shown by Company C, it is a gradual process that also led them to gain more benefits and efficiency compared to the drawbacks. Therefore, I would advise companies to truly consider whether it is necessary, perhaps by analysing their operational processes and truly understanding if there is a need. As it was mentioned in chapter 2.4.1, by Axson (2010, 145), for making effective decisions, based on the information company needs to know actually what information it needs. Here is the same concept can be applied, company needs to know in order to make decision to integrate do they actually need that. They need to really analyse their operational processes, including data collection, processes, and see, is it reasonable to invest in integration of IPA and make a decision. I hope that my research will help a company gain insights into how IPA and its technologies are affecting management reporting.

6.2 Answering research question and IQ's

This chapter aims to address the primary research question and its associated investigative questions based on the entire research. While chapter 6.1.1 has already explained how the outcomes of the case studies align with the theoretical framework, this chapter provides a concise summary of the answers to the research question and investigative questions.

Research Question (RQ):
How do Intelligent Process Automation (IPA) technologies transform management reporting, and what are their implications for enhancing business operations?

Investigative Questions (IQs):

1. **IQ 1:** How do Artificial Intelligence (AI), Machine Learning (ML), and robotics, as components of Intelligent Process Automation (IPA), transform management reporting processes?
2. **IQ 2:** What benefits and challenges in business operations can be attributed to the integration of these technologies in management reporting?
3. **IQ 3:** How do these technological advancements influence decision-making in companies through improved business analytics and forecasting?

6.2.1 Answering the Research Question (RQ)

How do Intelligent Process Automation (IPA) technologies transform management reporting, and what are their implications for enhancing business operations?

Intelligent Process Automation (IPA) technologies efficiently transform management reporting by enhancing data accuracy, efficiency, and decision-making capabilities. The integration of Artificial Intelligence (AI), Machine Learning (ML), and robotics enables real-time data processing, predictive analytics, and automated reporting. This transformation leads to more informed and agile business operations, improved decision making, optimized resource allocation, reduced operational costs, and enhanced competitive advantage.

6.2.2 Answering Investigative Question 1

How do Artificial Intelligence (AI), Machine Learning (ML), and robotics, as components of Intelligent Process Automation (IPA), transform management reporting processes?

Artificial Intelligence (AI), Machine Learning (ML), and robotics significantly transform management reporting processes by automating data collection, analysis, and reporting. AI analyse large datasets to provide predictive insights, while machine learning models continuously improve data accuracy. Robotics automate repetitive tasks such as data entry and reconciliation.

For instance, Company A in the forest industry uses an AI-based price forecasting model to predict future product prices with high accuracy, integrating various data sources through a report for real-time updates. This model helps the company adjust pricing, reducing financial losses and optimizing production schedules. Company B, a logistics provider, employs AI for forecasting and inventory management, leading to more precise order placements and reduced food wastage across its restaurant chain. Company C, a sustainable clothing retailer, leverages AI and robotics for inventory management and sales trend analysis, enabling dynamic stock adjustments and cost-effective purchasing decisions.

6.2.3 Answering Investigative Question 2

What benefits and challenges in business operations can be attributed to the integration of these technologies in management reporting?

Benefits:

The integration of IPA technologies in management reporting significantly enhances efficiency and accuracy. Automating data collection and analysis reduces human error and speeds up reporting cycles. In this way, it improves decision-making, optimizes processes, and enhances overall business operations. For instance, Company A's AI-based price forecasting model allows for quick, precise market data analysis, improving pricing strategies and reducing losses. Company B benefits from automated predictive forecasting and inventory management, minimizing food wastage and enhancing profitability. Company C’s AI-driven stock management system dynamically adjusts inventory levels based on real-time sales, ensuring cost-effective purchasing and improved profitability. The automation of these processes frees up employees' time, allowing them to focus on more strategic tasks and decision-making.

Challenges:

However, implementing IPA technologies presents challenges. High initial costs can be a significant barrier, especially for smaller companies. Integration complexity is another issue. Aligning new technologies with existing systems requires substantial effort and expertise. Company A faced difficulties standardizing and cleaning data for AI compatibility. Data dependency is critical, as the effectiveness of AI models relies on high-quality data. Incomplete or poor-quality data can lead to inaccurate insights.

User adoption is also challenging. Training staff to use new technologies is essential. Company B needed comprehensive training programs to build trust in the AI system. Employees who are used to traditional methods may resist changes; therefore, companies must demonstrate the value of new systems to ensure a smooth transition and adoption.

6.2.4 Answering Investigative Question 3

How do these technological advancements influence decision-making in companies through improved business analytics and forecasting?

Technological advancements in IPA significantly influence decision-making by providing accurate, timely, and actionable insights. The integration of Artificial Intelligence (AI), Machine Learning (ML),

and robotics in management reporting allows businesses to base their decisions on comprehensive business analysis rather than intuition or incomplete information.

These technologies enhance business analytics and forecasting capabilities, leading to better decision-making. For instance, Company A's AI model enables pricing decisions based on predictive insights from into market trends with supportive AI created report with business analytics and predictive forecasting, helping the company maintain a competitive edge. Company B's AI-driven forecasts improve optimized operational efficiency by aligning supply with fluctuating need demand. Similarly, Company C uses AI to analyse sales trends and supplier data, optimizing inventory levels and enhancing profitability through effective and supportive decision-making. These technologies enable businesses to anticipate market changes, optimize resource allocation, and respond swiftly to emerging opportunities and challenges, ultimately leading to more effective and strategic decision-making processes, by providing more comprehensive management report.

6.2.5 Overall conclusion

The integration of Intelligent Process Automation (IPA) and its technologies has a transformative impact on management reporting and business operations. By automating data collection, analysis, and reporting through Artificial Intelligence (AI), Machine Learning (ML), and robotics, companies can significantly enhance efficiency, accuracy, and decision-making capabilities. The case studies of Companies A, B, and C, provided in chapter 5, demonstrate that these technologies enable more precise and timely insights, leading to better strategic planning, optimized resource allocation, and improved profitability.

However, the implementation of IPA technologies also presents challenges, including high initial costs, integration complexity, data dependency, and user adoption hurdles. Despite these challenges, the benefits of IPA technologies in terms of streamlined processes, cost reductions, and enhanced decision-making far outweigh the drawbacks.

Overall, IPA technologies offer a substantial advantage in today's competitive business environment. By leveraging advanced data analytics and forecasting capabilities, businesses can anticipate market changes, respond swiftly to opportunities, and make more informed decisions, thereby gaining a competitive edge and driving long-term success.

6.3 Validity, reliability, and relevance of this study

In this research, dedicated to analysing the impact of Intelligent Process Automation (IPA) technologies on management reporting, validity, reliability and relevance were critically important to ensure the accuracy and credibility of the data obtained.

Validity in research means checking how well the study measures what it is supposed to measure and if the results truly represent the reality of the phenomenon being studied. In qualitative research, validity focuses on the credibility and trustworthiness of the findings. It is about making sure that the methods used in the research capture the true essence of what is being studied in a way that is convincing to both the participants and the audience. Internal validity is achieved through techniques like using multiple sources of data, getting feedback from participants (member checking), and spending enough time with the study subjects to understand their perspectives. External validity means considering whether the findings can be applied to other settings or groups. (Puusa, Juuti & Aaltio 2020, chapter 11.) In this research, validity was ensured by carefully collecting and analysing theoretical data through different academic sources and fulfilling them with practical through in-depth interviews and case studies from company practices. When the case studies were ready, they were reviewed and approved by the interviewees to ensure a clear understanding of the processes and to avoid any misunderstandings for the reader. This approach allowed for an accurate reflection of how Intelligent Process Automation (IPA) technologies affect managerial reporting processes, thereby ensuring the study's conclusions are valid.

Reliability in qualitative research, also known as dependability, means ensuring that the research process is consistent and stable over time. It checks if the research findings are consistent and can be repeated in similar situations. Reliability is ensured by being systematic and transparent in how data is collected and analysed. This includes clearly detailing the research design, methods of data collection, and data analysis procedures. (Puusa, Juuti & Aaltio 2020, chapter 11.) In this study, reliability was maintained by using a consistent approach to data analysis and providing a clear description of the data collection process and its analysis, including how participants were selected, interviewed and how outcome data was structured. This transparency is crucial because it allows other researchers to replicate the study and verify the results.

The relevance of the study was ensured by focusing on modern technological trends and their role in managerial accounting and reporting. Examining the effects of implementing the latest technologies, such as Artificial Intelligence (AI), Machine Learning (ML) and robotics, allowed for a reflection of the current state of the industry and provided relevant recommendations for companies looking to optimize their reporting processes.

In my opinion, this research turned out to be quite informative due to the use of high-quality academic sources and real company case studies. This approach allowed the study to develop a concept of assessing the transformation of management reporting through both theoretical analysis and case study comparisons. Main theory concepts were confirmed in practice, which, in my view, makes this concept particularly strong, as theory validated by practice is more effective.

One of the key findings of this research is the recognition of the substantial benefits that Intelligence Process Automation (IPA) technologies can bring to management reporting, including enhanced efficiency, accuracy, and strategic decision-making. However, the study also revealed significant challenges, such as the high costs of implementation, the need for continuous data quality management, and the necessity for ongoing technical support. These findings highlight the importance of a thoughtful and well-planned approach to technology integration, considering both the immediate benefits and the long-term implications for business operations. Again, the use of this concept of examining strengths and weaknesses has led to a comprehensive analysis.

Despite the positive aspects of this research, several limitations and areas for improvement were identified. For example, one major critique is the limited number of case studies, with only three extensive ones presented. To more confidently answer the research question, it would have been beneficial to include a larger number of companies to understand whether they all use different methods of transforming management reporting under the influence of IPA. Additionally, the study focused primarily on large and medium-sized companies already using IPA technologies, potentially overlooking the unique challenges faced by small businesses or those that have not yet implemented IPA technologies. Future research should aim to cover a broader range of companies to ensure a comprehensive understanding of IPA technology integration across various business sizes and sectors.

Another critique is the limited variety of academic sources, which affected the depth of theoretical and overall analysis. Me, the author, encountered difficulties due to the lack of quantity of high-quality sources specifically on management reporting. This shortage impacted the theoretical aspects, which could have been more extensive and well-rounded. The reliance on a limited number of academic sources regarding IPA also meant that conclusions were based on few references. Given that IPA technology is relatively new, as discussed in chapter 3, where it is noted by Langmann and Turi (2022, 81-82), that IPA is considered a new advancement from RPA, the dependency on quality data from a limited number of academic sources can be understanded.

After reviewing the strengths and areas for potential criticism, it can be understood that this work has focused on the concept of how managerial reporting is transformed, and the basic theoretical foundation is reinforced with examples from three real companies, real examples from their daily operations, which lends credibility to the claim that companies indeed use IPA. This research cannot assert that "many" companies use it, but it confirms that “there are companies that use IPA technologies” in management reporting. Additionally, this research highlights the significant benefits of IPA and potential challenges. Building conclusions on that and taking into account the fact that companies already use it, which, in my opinion, makes this work quite credible in its frame.

6.4 Own reflection on the writing and learning of this research

Reflecting on my personal journey throughout this research, I have realised significant gains in both theoretical knowledge and practical understanding of the business world. The process of exploring the aspects of Intelligent Process Automation (IPA) technologies within management reporting provided profound insights, improving my research skills. The challenge of selecting a unique and relevant topic, navigating complex technologies that are underrepresented in academic literature, and planning comprehensive research methodologies have all substantially contributed to my academic growth.

Particularly, tackling real-world case studies exposed me to the complication of data analysis and decision-making processes in various corporate settings. Each obstacle I encountered—be it in the theoretical framework, the integration of new technologies, or the challenges of conducting interviews—served to strengthen my resolve and enhance my capabilities as a researcher.

The initial phase of my thesis, which began in earnest in March 2024, involved a deep review of potential topics that would not only pique my interest, but also offer tangible contributions to the field of business technology. The lack of widespread academic discourse on such topics posed a significant challenge in describe the scope of my research. This phase was critical as it laid the foundation for the subsequent structural planning of the thesis, where I outline the main theoretical components, devised the research methodology, and planned for the eventual presentation of my findings.

The actual writing process took approximately two months and involved a comprehensive analysis of both theoretical concepts and empirical data gathered through interviews. The important need of using only quality academic resources in this research, initially slowed my progress, highlighting the importance of selecting credible and substantial sources to support the whole research.

To summarise, the entire development and writing process, which lasted around three months, was not just a precise academic exercise, but also a personal adventure of discovery. It has significantly sharpened my intellectual and academic skills. Despite the difficulties of finding enough good academic sources, the high-quality ones I used gave me valuable insights. These helped me complete a thorough and well-informed thesis. This experience has not only strengthened my academic skills, but also set me up for future research projects in business technologies.

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Appendices

Appendix 1. Interview questions

1. Can you describe how Intelligent Process Automation (IPA) technologies have been implemented in your management reporting processes?
2. What specific role do IPA technology, e.g. Artificial Intelligence (AI), Machine Learning (ML), and robotics plays in your current reporting systems?
3. How have these technologies changed the ways you create or analyse your management reports?
4. What improvements have you noticed in your business operations after integrating IPA technologies into your reporting processes?
5. Have you encountered any issues or failures when implementing these technologies in management reporting? Could you elaborate?
6. How have advancements in IPA technology influenced decision-making processes in your organization?
7. Can you provide an example of an important decision that was facilitated by the information obtained through these advanced reporting tools?
8. In your opinion, how has the use of artificial intelligence and machine learning in reporting changed your business's response to market changes or challenges?
9. Now that you have implemented this technology in your management reporting and are aware of both the costs incurred and the benefits gained, if you could go back to the moment when you were deciding whether to implement this technology, would you still choose to proceed with its implementation?