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Designing and Optimizing Business Processes for an Insurance Intermediary: A BPM Lifecycle Approach

Beatriz Isabel Branco e Ragageles

Project Work

presented as partial requirement for obtaining a Master's Degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

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Designing and Optimizing Business Processes for an Insurance Intermediary: A BPM Lifecycle Approach

by

Beatriz Isabel Branco e Ragageles

Project Work presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Information Systems Management.

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STATEMENT OF INTEGRITY

I hereby declare that I have conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, 15th July 2025

Beatriz Ragageles

DEDICATION

I dedicate this thesis to my dear mother, who is currently in Africa trying to make the world a better place, even though, since the day I was born, she has already made mine so much better.

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Although this is an academic work, it would never have been possible without the people who, in different ways, walked this path with me.

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Working and studying at the same time is far from easy. It drains energy, time and sometimes even confidence. But looking back, it left me with no doubt that I've gained resilience, perspective and skills I'll carry for life.

This chapter was literally the hardest. But I'm proud to say: it was worth it!

ABSTRACT

This thesis explores the application of the Business Process Management (BPM) lifecycle at a Portuguese insurance intermediary recognized for its portfolio management information system and its network of over 33 stores across the country. While larger insurance companies often benefit from advanced BPM implementations due to greater resources, smaller firms face challenges such as limited financial and technological capabilities. Using a case study methodology, this research maps the current "as-is" processes using tools such as process flowcharts and Business Process Model and Notation (BPMN), identifying inefficiencies and opportunities for improvement in the company’s processes. The "to-be" processes are designed and tested through simulations or pilot implementations, supported by tools like Bizagi for process modelling. The study concludes that operational efficiency can be significantly enhanced by optimizing processes and improving service quality, making the company more competitive in the market and closer to its customers. The findings are expected to contribute to academic research on BPM in small/medium insurance firms and provide practical solutions for improving process efficiency in similar businesses.

KEYWORDS

Business Process Redesign; Insurance Business; Business Process Management (BPM); Process Improvement; Business Growth; Business Process Management Notation (BPMN); Digital Transformation

Sustainable Development Goals (SDG)

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
AS IS	Current process
BPM	Business Process Management
BPMN	Business Process Model and Notation
BPMS	Business Process Management Systems
BPR	Business Process Reengineering
BVA	Business Value-Added
CMMI	Capability Maturity Model Integration
CV	Curriculum Vitae
DDDM	Data-Driven Decision Making
EPC	Event-driven Process Chains
ERP	Enterprise Resource Planning
HR	Human Resources
HRIS	Human Resources Information System
iBPM	Intelligent Business Process Management
IT	Information Technology
KPI	Key Performance Indicator
LSS	Lean Six Sigma
Max	Maximum value
Min	Minimum value
NVA	Non-Value-Added
PDCA	Plan-Do-Check-Act cycle
PEMM	Process and Enterprise Maturity Model
RPA	Robotic Process Automation
SEI	Software Engineering Institute
SME	Small and Medium-sized Enterprise
TQM	Total Quality Management
TO BE	Proposed future process scenario
UML	Unified Modelling Language
VA	Value-Added

1. INTRODUCTION

Business Process Management (BPM) is the result of a continuous evolution in process management approaches and technologies, gaining significant attention in the last decade (van der Aalst, 2013). As highlighted by Dumas et al. (2018), processes are present in all organizations and play a crucial role in enhancing customer experience, operational efficiency and cost reduction. BPM provides a structured lifecycle approach that includes the phases of identification, discovery, analysis, redesign, implementation and monitoring, enabling organizations to achieve consistent outcomes and capture improvement opportunities (Dumas et al., 2018). The main benefits of BPM include cost and time reduction, improved service quality and the ability to adapt to market changes, enhancing flexibility (vom Brocke & Rosemann, 2015). These features make BPM indispensable for aligning business processes with strategic objectives and sustaining competitiveness (Dumas et al., 2018).

Efficient and optimised processes are fundamental to success in any sector or business. The insurance sector is no exception. However, smaller insurers often face significant challenges in adopting modern BPM practices. According to Vukšić, Vidović and Glavan (2015), process modelling requires significant investments in tools, methodologies and training - resources that tend to be available just to larger companies. Consequently, larger companies can more easily sustain these investments, allowing them to continuously optimise their internal processes. In contrast, smaller ones often lack process maturity due to resource constraints, limited financial and human capital and the absence of advanced technologies or AI-based solutions. These factors hinder their ability to respond effectively to customer needs and comply with regulatory requirements, placing them at a disadvantage compared to larger, more established companies.

Among the support processes in an insurance intermediary, recruitment and onboarding play a crucial role in ensuring that the company attracts and retains qualified professionals essential for delivering high-quality service. Although not directly linked to income generation, inefficiencies in this process can lead to delays in hiring, poor onboarding experiences and increased employee turnover, ultimately affecting the company's productivity and service quality (Kuswanto, 2024) . The most common inefficiencies include prolonged hiring cycles, misaligned job requirements, repetitive back-and-forth communications, delayed access to essential systems and lack of structured onboarding programs. Given that human capital is a key asset in the insurance sector, mainly if it is an insurance intermediary, an ineffective recruitment and onboarding process can indirectly impact operational efficiency and overall business performance. (Bilan et al., 2020; Kuswanto, 2024)

This thesis addresses these challenges by exploring how the BPM lifecycle can be effectively applied to improve operational efficiency in a medium-sized insurance intermediary, whose name remains undisclosed for confidentiality reasons. Specifically, the study focuses on mapping the existing processes ("as-is"), identifying inefficiencies and designing improved "to-be" processes with greater maturity. Additionally, the work aims to test various scenarios through simulations or pilot implementations using tools such as Bizagi.

This research focuses on the recruitment and onboarding process, which plays an essential role in the operational efficiency of insurance intermediaries but is often overlooked. By thoroughly analysing this process, the research aims to identify key inefficiencies, such as hiring delays, unclear role definitions, poor coordination between Operational, HR and IT teams and ineffective onboarding experiences. The goal is to develop a more structured, automated and efficient approach that reduces hiring timelines, improves new employees' integration and reduces process redundancies. This study is expected to contribute to the academic literature by exploring BPM in small/medium insurance companies or intermediaries and to business practice by proposing concrete solutions to improve operational efficiency and process control.

This thesis is structured into six chapters: The first and current chapter introduces the topic, contextualises the problem and presents the objectives and contributions of the work. The second chapter provides a theoretical framework, covering the fundamental concepts of BPM and its applications in the insurance sector. The third chapter describes the methodologies adopted in the study, namely the BPM lifecycle. The fourth chapter presents the empirical research conducted at the insurance intermediary under study, detailing the analyzed and optimised processes. The fifth chapter discusses the results and their implications for the company and the sector. Finally, a concluding chapter outlines the limitations and suggestions for future work or research in this area.

2. THEORETICAL BACKGROUND

2.1. COMPANY & PROCESS DESCRIPTION

The company under study is a medium-sized insurance intermediary specializing in identifying and recommending the most suitable insurance products to meet clients' needs. With 122 employees and over 33 stores nationwide, it operates independently, collaborating with multiple insurance companies to provide impartial advice and cost-effective solutions. Recognised for its portfolio management system, it maintains a strong local presence, ensuring quick and efficient client support.

Given the dynamic nature of the insurance sector, companies must continuously adapt their internal processes to keep up with digital transformation, increasing competition and regulatory demands (Duane, 2022). Companies in this sector must balance offering excellent customer experiences with improving internal processes and encouraging technological innovation. Although most studies focus on customer-oriented processes, internal support operations, such as human resources management, are key to ensuring the sustainability and growth of the business.

Recruitment and onboarding are critical support processes that directly impact an intermediary's ability to deliver high-quality services. The effectiveness of these processes influences hiring timelines, employee retention and overall organizational productivity (Kuswanto, 2024). Delays in recruitment, unclear job roles and ineffective onboarding strategies can lead to skill mismatches, high turnover rates and increased operational costs. As a company operating in a highly regulated industry (Martin F. Grace & Robert W. Klein, 2009), it is also crucial that new hires quickly adapt to compliance requirements and industry-specific knowledge.

This study focuses on identifying inefficiencies in the recruitment and onboarding process, such as prolonged hiring cycles, lack of coordination between HR and operational teams and insufficient support for new employees. By improving this process, the company can enhance team stability, strengthen its brand and improve overall business performance.

This work analyzes a company support process and identifies pain points and opportunities for improvement. The findings will provide a detailed overview of the company's process and serve as a foundation for optimising and restructuring operations, enhancing efficiency and driving continuous improvement.

2.2. BUSINESS PROCESS MANAGEMENT

Business Process Management is a subject that integrates concepts from information technology and management sciences, applying them to the optimisation and control of operational processes within organizations. BPM has gained increasing attention due to its potential to enhance productivity and reduce costs, making it a fundamental approach for organisational efficiency and digital transformation (van der Aalst, 2013).

On the one hand, BPM aims to improve business processes, which, in some cases, may not necessarily require introducing new technologies. A process's mere modelling and analysis can provide valuable insights, enabling organizations to identify improvements that reduce costs and enhance service quality. On the other hand, BPM is often associated with technological tools that facilitate process management, monitoring and automation, ensuring greater consistency and compliance in operations (van der Aalst, 2013)

Beyond productivity gains, BPM plays a strategic role in fostering innovation and transformation within organizations. A process-centered approach not only leads to operational improvements but also facilitates the reconfiguration of inter-organizational value chains, creating opportunities for innovation and continuous improvement (vom Brocke & Rosemann, 2015).

While operational efficiency and process optimisation have been discussed since the Industrial Revolution, BPM as a structured discipline emerged much later, primarily in the 20th century, with Frederick Taylor's Scientific Management (1911) and the development of methodologies such as Lean, Six Sigma and Business Process Reengineering (BPR). (Dumas et al., 2018)

In recent decades, BPM has become increasingly relevant, particularly due to the impact of digital transformation (Stravinskiene & Serafinas, 2020). The literature highlights that digitalization has introduced a new modus operandi for businesses, demanding greater agility, efficiency and automation in processes (vom Brocke & Rosemann, 2015). As a result, traditional BPM practices have evolved into more intelligent and automated approaches, such as Intelligent BPM (iBPM), which integrates Artificial Intelligence (AI), Process Mining and Robotic Process Automation (RPA) to enhance operational efficiency further (W. Van der Aalst, 2016).

2.2.1. BPM History

Business Process Management has its origins in various approaches that, over time, have sought to enhance the efficiency and quality of business operations. From the early studies on work organisation, initiated by Taylor's Scientific Management, to more recent methodologies such as Lean, Six Sigma and intelligent automation, BPM has evolved into an essential method for process optimisation and organisational competitiveness (Harmon, 2010) .

The first systematic studies on organisational efficiency emerged with Frederick W. Taylor, who argued that worker performance could be improved through time and motion studies, task division and work standardisation. Published in 1911, his book The Principles of Scientific Management introduced a methodology that allowed companies to increase productivity and eliminate inefficiencies, laying the foundation for modern process optimisation concepts

(Taylor, 1911). This approach focused on structuring processes and eliminating unnecessary tasks, principles that were later incorporated into BPM (Harmon, 2010) .

During the same period, Henry Ford applied these principles to the automotive industry by introducing the assembly line, a system where each worker performed a specific task continuously. This innovation significantly improved production efficiency, reducing costs and expanding access to automobiles for a wider audience. The concept of sequential and highly organised processes directly influenced how various industries structured their operations (Dumas et al., 2018).

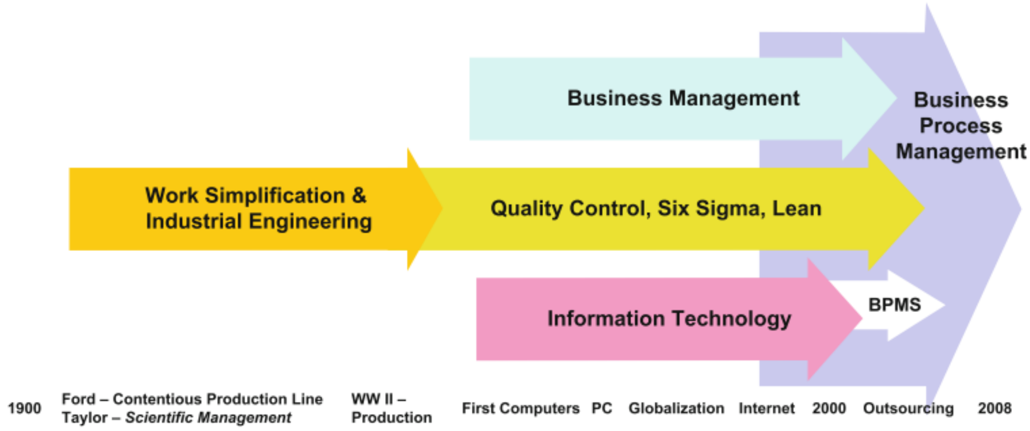

Figure 1 - Evolution of BPM (Harmon, 2010)

From the 1950s onwards, technological advancements and the increasing digitalisation of businesses significantly influenced business processes. The development of digital infrastructures and communication systems introduced profound changes in work organisation and enabled new business models. As companies became more dependent on interconnected systems, process modelling emerged as a crucial practice for understanding and managing the increasing complexity of organizational structures (van der Aalst, 2013).

Two primary intellectual antecedents have shaped BPM. The first is the work of Shewhart and Deming on statistical process control, which laid the foundation for the quality movement and later Six Sigma. These studies emphasised reducing process variability by leveraging metrics and statistical analysis to identify root causes of performance issues and implement corrective actions (Hammer, 2015).

The increasing competitiveness of global markets led to the adoption of Total Quality Management (TQM). This framework placed operational excellence and quality at the core of business strategy (Harmon, 2010) . To support this focus on quality, the need for a structured approach to process improvement became evident, leading to the development of Six Sigma- a data-driven methodology introduced by Motorola in the 1980s, aimed at minimising process variability and defects through rigorous statistical techniques (Salah et al., 2009).

Six Sigma is structured around the DMAIC framework (Define, Measure, Analyze, Improve, Control), which systematically eliminates errors and ensures process consistency with an exceptionally low defect rate (Harmon, 2010). By the early 2000s organizations began integrating Lean and Six Sigma principles, forming Lean Six Sigma, a hybrid methodology that combines Lean's waste elimination approach with Six Sigma's statistical precision, thereby improving both efficiency and process quality (Harmon, 2010).

BPM's second primary intellectual antecedent is Business Process Reengineering (BPR), introduced by Michael Hammer in the early 1990s. (Hammer & Champy, (1993). Hammer argued that organizations should not merely automate inefficient processes but rather reevaluate and completely redesign them to maximise efficiency and eliminate non-value-adding activities. (Hammer, 2015).

According to Hammer (2015), the process design sets performance limits, meaning that a process can only achieve high efficiency if it is originally structured for it. However, despite initial successes, many BPR initiatives failed, with studies reporting failure rates between 50% and 80%. These failures were often attributed to the high risks and implementation challenges associated with radical process redesign (Stravinskiene & Serafinas, 2020).

By the late 1990s and early 2000s, there was a shift in perspective- organizations moved away from radical transformations (BPR) towards a more continuous and holistic approach to process management, leading to the modern concept of BPM. While BPM can be seen as an evolution or "revival" of process-centric approaches introduced by BPR, it emphasises continuous improvements and the structured management of the entire process lifecycle (Stravinskiene & Serafinas, 2020).Harmon (Harmon, 2019) reinforces that BPM has matured into a comprehensive management discipline that not only supports continuous improvement and operational efficiency, but also enables digital transformation, cultural change and strategic alignment

Over time, BPR and BPM converged, shaping BPM into a comprehensive system for managing organisational performance. This system focuses on end-to-end process administration, which means it covers all aspects of a process from its initiation to its completion, ensuring that no part of the process is overlooked or undermanaged (Hammer, 2015).

Today, BPM has transcended its traditional roles of efficiency and compliance, emerging as a key player in business innovation and digital transformation. It empowers companies to redesign their processes, enhancing flexibility and responsiveness to market dynamics, thereby fostering a more competitive edge (vom Brocke & Rosemann, 2015).

The rise of emerging technologies such as Process Mining, Artificial Intelligence (AI) and Robotic Process Automation (RPA) has elevated BPM to a new level, making processes more intelligent, adaptable and data-driven (Harmon, 2010). These technological advancements allow organizations to optimize processes dynamically, reduce execution times and enhance customer experience (W. M. P. van der Aalst et al., 2018).

In the context of BPM, RPA is seen as a complementary tool that can automatically carry out operational steps in a process, increasing efficiency and reducing human error. Some experts characterise RPA as an automation technology that "sits between BPM and AI", as it combines the process perspective of BPM with increasingly intelligent automated capabilities, moving closer to AI (Agostinelli et al., 2020).

Big Data is also a topic that impacts BPM, mainly through the discipline of Process Mining. Process mining tools make it possible to extract, from the records of events in information systems (logs), real models of how processes are being carried out and a rich series of performance indicators. Integrating Big Data analytics into BPM enables organizations to extract valuable insights from both structured and unstructured data related to their processes.

2.2.2. BPM Lifecycle

As discussed in the previous subchapter, BPM has evolved from various approaches that have continuously developed to enhance the efficiency and quality of business processes. This evolution has led to the establishment of a structured lifecycle model, built upon methodologies and widely recognised process management practices. The BPM Lifecycle emerges from the integration of multiple approaches, including scientific management, continuous improvement, reengineering and process automation (Dumas et al., 2018).

One of the key frameworks that influenced the development of this cycle is the PDCA (Plan-Do-Check-Act) cycle, introduced by W. Edwards Deming and that has been extensively applied to standardise and drive the continuous improvement of organisational processes (W. Edwards Deming, 2018)

Beyond emphasising the standardization of processes to prevent recurring errors, PDCA highlights the importance of continuous adjustments and modifications to existing standards (Moen & Norman, 2009). According to Langley et al. (Gerald J. Langley et al., 2009), the PDCA methodology follows a structured improvement model based on three fundamental questions:

- "What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in improvement?"

When applied to process improvement, PDCA consists of four key phases (Moen & Norman, 2009):

- **Plan**: Define objectives and design processes based on data and strategic requirements.

- **Do**: Implement the process as planned, ensuring execution aligns with predefined standards.
- **Check**: Evaluate process performance using indicators to identify inefficiencies and opportunities for improvement.
- **Act**: Apply adjustments based on the results obtained, ensuring a continuous optimisation cycle.

The iterative structure of PDCA closely aligns with the BPM Lifecycle, reinforcing the dynamic and adaptive nature of process management and ensuring that processes can be continuously improved to meet evolving organisational needs (Dumas et al., 2018). Similarly to PDCA, the BPM Lifecycle follows a structured, circular and continuous approach, divided into several stages:

- Process Identification: Understanding existing processes and identifying areas for improvement.
- Process Discovery: Documenting and analysing the current state of the process.
- Process Analysis: Detecting inefficiencies and potential bottlenecks.
- Process Redesign: Defining the optimised process structure (To-Be state).
- Process Implementation: Applying the necessary changes, whether through organisational adjustments, automation or new tools.
- Process Monitoring and Control: Measuring process performance using KPIs and other key metrics. Continuously improving processes, ensuring they remain flexible and adaptable over time.

The integration of PDCA's continuous improvement mindset into the BPM Lifecycle reinforces the need for a systematic cycle of evaluation and enhancement, enabling organizations to increase efficiency and agility in an increasingly competitive and dynamic environment (Dumas et al., 2018).

In the next chapter, focused on methodology, a more in-depth analysis of the BPM Lifecycle will be conducted, exploring its stages in greater detail and examining its practical application within the scope of this project.

2.2.3. BPMN

Process modelling plays a critical role in BPM by providing a structured way to represent business activities and their dependencies. There are multiple notations for modelling business processes, including Petri nets, BPMN (Business Process Model and Notation), UML (Unified Modelling Language) and EPCs (Event-driven Process Chains). These notations share the common characteristic of describing processes as sequences of activities and subprocesses, linked through causal dependencies that define execution order (van der Aalst, 2013).

Among these, BPMN stands out as the most widely adopted standard for business process modelling due to its ability to balance expressiveness and simplicity, making it suitable for both business users and technical analysts. It provides a graphical notation that represents process elements such as events, activities, gateways and artifacts, ensuring that processes can be effectively visualised and communicated within an organisation (Dumas et al., 2018). Given its balance between expressiveness and simplicity, BPMN is the chosen notation for this thesis.

The level of detail and complexity in a process model is determined by its intended purpose. Broadly, process modelling serves two primary objectives:

(1) Organizational Design (Business-Oriented Models): Focuses on understanding and improving business operations and is used by managers, process owners and business analysts to support communication, benchmarking and continuous improvement. Abstracts technical details and prioritises clarity to facilitate comprehension by all stakeholders;

(2) Application System Design (IT-Oriented Models): Used for automation and system implementation, requiring detailed specifications and are developed by system engineers and developers to be deployed in Business Process Management Systems (BPMS) or serve as blueprints for software solutions (Dumas et al., 2018).

Since this thesis is focused on business-oriented process models, the primary concern is ensuring that models are intuitive and easy to interpret, rather than highly detailed representations used for system execution.

A well-structured BPMN model relies on three key aspects: notation, which provides the graphical representation of process elements; syntax, which defines the rules for combining these elements; and semantics, which assigns meaning to each component, ensuring consistency and interpretability. (Dumas et al., 2018) The level of granularity in a BPMN model should be adjusted according to its purpose.

To ensure a foundational understanding of BPMN, the following section outlines its key elements and their roles within process models.

- Events serve as triggers within a process, marking its initiation, completion or intermediate modifications that influence the workflow.
- Activities represent tasks or subprocesses within a process. They are shown as rounded rectangles and capture discrete units of work. Activities are typically labelled using a verb in imperative form followed by a noun (e.g. “Analyse CV”) (Dumas et al., 2018).
- Gateways define decision points within a process and control its flow, including merges, parallel execution, synchronisation and repetition. They are represented as diamond shapes. The most common types include:
  - Exclusive (XOR) Gateways: Represent decision points where only one path is taken.
  - Inclusive (OR) Gateways: Allow multiple paths depending on conditions.

- Parallel (AND) Gateways: Enable tasks to be executed simultaneously (Dumas et al., 2018).

- Flows (also known as arcs) establish the execution order between activities and control nodes (gateways), ensuring a structured sequence of operations (Dumas et al., 2018).
- Artifacts provide additional information about the process. They include data objects, which represent inputs, outputs or stored information related to the process.
- Resources (Pools & Lanes) define responsibilities and organisational boundaries within a process model:
  - Pools represent separate resource entities, such as different organizations or departments.
  - Lanes subdivide pools into more granular categories, such as specific roles or teams responsible for tasks (Dumas et al., 2018).

Each of these elements contributes to the overall clarity, structure and effectiveness of a BPMN model, ensuring that processes are both understandable and executable.

2.2.4. OTHER RELEVANT FRAMEWORKS THAT ARE RELATED TO BPM

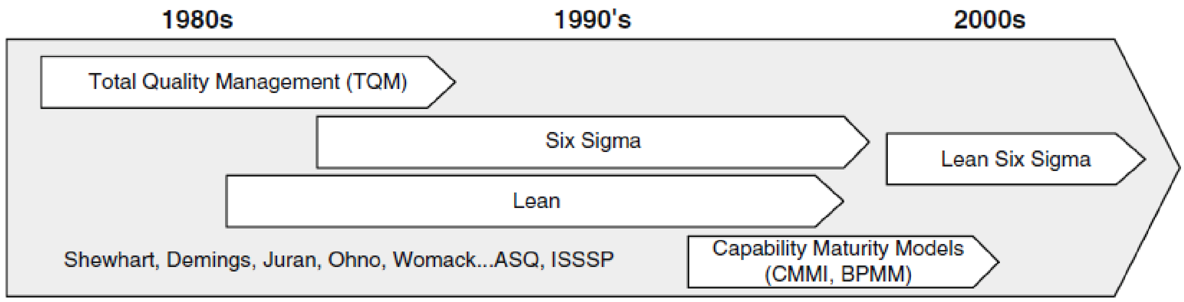

Figure 2 - Quality Control Evolution (Harmon, 2010)

Many management and quality improvement frameworks have impacted business process management and shaped contemporary process optimization techniques. Although BPM has its own methods, it incorporates ideas from other fields, such as Six Sigma, Lean, Operations Management and Total Quality Management (TQM). Every one of these methods offers distinct viewpoints and resources to BPM, strengthening its capacity to optimize operations, boost productivity and match business procedures with strategic goals (Dumas et al., 2018).

BPM combines components from these different frameworks to produce a comprehensive system for ongoing process improvement that strikes a balance between efficiency, quality control and digital transformation (Dumas et al., 2018). The following sections explore key methodologies that have influenced BPM and their relevance in process optimisation.

2.2.4.1. Lean Six Sigma

Six Sigma is a quality management approach originally developed in the manufacturing sector during the 1980s, with Motorola being one of its pioneers(Martínez S et al., 2012). Its primary goal is to reduce process variability and minimise defects or errors in processes, ensuring predictable and high-quality outcomes. This methodology applies statistical tools to measure process performance and systematically reduce variation, following the assumption that defects follow a normal distribution pattern (Taiichi Ohno, 1998).

One of the key challenges in BPM is the lack of a standardised method for identifying inefficiencies and unnecessary steps in a process. This is where Six Sigma techniques are frequently integrated into BPM initiatives to enhance process analysis and optimisation (Conger, 2010).

Six Sigma is structured around the DMAIC cycle (Monday, 2022), which provides a data-driven approach to process improvement:

- Define - Identify the problem and establish objectives.
- Measure - Assess current process performance using data.
- Analyse - Identify root causes of inefficiencies or defects.
- Improve - Implement process improvements based on data analysis.
- Control - Maintain improvements through monitoring and corrective actions.

Regardless of the approach, a typical Six Sigma-driven process improvement initiative follows these steps:

- Map the target business process to understand its structure.
- Identify inefficiencies and remove non-value-adding steps.
- Detect and prioritise key issues impacting performance.
- Analyse root causes using statistical tools.
- Evaluate alternative solutions to improve process effectiveness.
- Redesign the process with optimised workflows.
- Implement continuous monitoring to sustain improvements.

By integrating Six Sigma methodologies into BPM organizations, it reinforces the analytical rigor of process management, ensuring that process optimisation is not a one-time initiative, but an ongoing practice (Conger, 2010).

A widely adopted variation of Six Sigma is Lean Six Sigma (LSS), which combines Lean principles with Six Sigma techniques to enhance efficiency and quality.

- Lean principles- focused on waste elimination and process simplification (Taiichi Ohno, 1998);

- Six Sigma techniques- used for reducing process variation and defects (Martínez S et al., 2012).

Through this hybrid methodology organizations can identify redundant steps that slow down the process, prioritise process inefficiencies based on measurable impact and implement data-driven improvements to enhance operational performance.

While traditional Six Sigma focuses on eliminating defects, Lean Six Sigma aligns more closely with BPM by incorporating process flow optimization and continuous improvement methodologies (Conger, 2010). By integrating Lean Six Sigma techniques, BPM gains stronger analytical capabilities, ensuring that rigorous quality management principles back process redesign and automation efforts.

2.2.4.2. MICHAEL PORTER'S VALUE CHAIN

The Value Chain, introduced by Michael Porter, is a framework for analysing the activities involved in creating a product or service. It helps businesses identify where value is added and how to achieve a competitive advantage (Harmon, 2010).

A company's value chain consists of two types of processes:

- Primary (Core) Processes: These are the operational activities essential to delivering a product or service. They typically include production, selling and delivery.
- Support Processes: These are the ones that enable and sustain the core operations by providing resources and infrastructure. They include: Finance, Human Resources and Information Technology (IT).

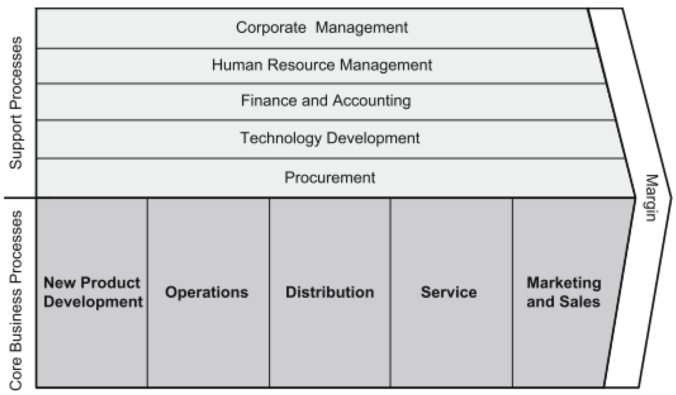

Figure 3 - Michael Porter's Value Chain (Harmon, 2010)

Porter highlighted the difference between core and support processes, pointing out that both are essential for creating value in a business (Harmon, 2010).

Porter defines competitive advantage as a company's ability to outperform rivals in the long term. This advantage is built by optimising the value chain to improve efficiency, innovation or differentiation (Harmon, 2010).

According to Porter, companies improve their activities and processes in two primary ways:

- Operational Effectiveness - Achieving higher efficiency by performing similar activities better than competitors. This is often associated with best practices, standardisation and continuous improvement.
- Strategic Positioning - Gaining a competitive advantage by offering something unique. This means performing different activities from competitors or executing similar activities in a distinct way.

Porter argues that strategy is about making choices. Unlike operational effectiveness, which focuses on improving individual processes, strategy involves aligning and combining activities to create a coherent, long-term competitive position (Harmon, 2010).

The Value Chain framework aligns with Business Process Management (BPM) by emphasising the importance of process optimisation. BPM helps organizations improve both operational effectiveness and strategic positioning by streamlining workflows, eliminating inefficiencies and leveraging technology.

By analysing value chains, companies can identify which processes contribute most to their competitive advantage, ensuring that BPM efforts focus on maximising value creation while maintaining strategic alignment.

2.2.4.3. CMMI

The Capability Maturity Model Integration (CMMI) is a process maturity framework developed by the Software Engineering Institute (SEI), originally designed to assess the maturity of software development processes. CMMI has since evolved into a widely used standard for evaluating process maturity across various industries (Paulk et al., 1993).

CMMI is based on the concept of process maturity, which distinguishes between immature and mature processes. Higher maturity levels indicate better-defined, well-documented and performance-driven processes, improving an organisation's process capability and efficiency (Dumas et al., 2018).

CMMI assesses organizations using a five-level maturity model, where higher levels indicate greater process sophisticatioJohn Jeston & Johan Nelis, 2006; Paulk et al., 1993).eJohn Jeston & Johan Nelis, 2006; Paulk et al., 1993).

Table 1 - CMMI Maturity Levels

Maturity Level	Description	Impact on BPM
Level 1: **Initial**	Processes are unstructured, reactive and unpredictable.	BPM is either absent or applied inconsistently, with projects carried out in an ad hoc manner by individual teams. There is minimal employee involvement and no coordination between process improvement efforts.
Level 2: **Repeatable (or Managed)**	Processes become repeatable and some level of documentation exists.	The organisation begins to formalise BPM, creating initial process documentation and analysis. A process-thinking mindset emerges, but BPM knowledge remains concentrated among external experts.
Level 3: **Defined**	Standardised and structured processes are in place and supported by company-wide policies.	The organisation sees the benefits of BPM and begins to train employees internally. BPM methods and tools have become more sophisticated and knowledge-sharing initiatives (e.g. process repositories or intranets) have been introduced.
Level 4: **Managed (or Quantitatively Managed)**	Performance measurement and data-driven decision-making are integrated into process management.	BPM projects focus on measuring process performance using KPIs. Change management strategies are implemented to ensure the acceptance of processes. A BPM Center of Excellence (CoE) is created to oversee all BPM initiatives. Process orientation extends beyond BPM projects.
Level 5: **Optimising**	Continuous improvement and innovation drive the evolution of processes.	BPM is fully integrated into the organisation's culture. Managers incorporate BPM principles into their daily decision-making. BPM tools and methods are widely accepted and the BPM Center of Excellence is reduced, as process management becomes self-sustaining.

At higher maturity levels organizations standardize and monitor their processes, ensuring alignment with strategic objectives and reinforcing continuous improvement practices (Dumas et al., 2018).

CMMI and Business Process Management (BPM) are closely linked, as both frameworks focus on process standardisation, improvement and maturity development.

A high CMMI maturity level does not automatically translate into superior business performance, it only ensures that processes are structured and documented (Dumas et al., 2018). This is where BPM complements CMMI, as BPM provides practical tools and methodologies for process redesign, automation and continuous improvement.

2.2.4.4. Process Mining

Process mining is a data-driven approach that extracts insights from event logs to analyze real-world process execution. Unlike traditional Business Process Management (BPM) approaches that rely on manually designed process models, process mining enables organizations to uncover the actual workflows taking place within their operations. By bridging the gap between modelled and executed processes, process mining allows businesses to discover, validate and enhance their workflows based on real data (W. Van der Aalst, 2016)

Process mining consists of three fundamental techniques that enable businesses to gain actionable insights from event logs:

- **Discovery** involves automatically generating process models from event logs without relying on predefined assumptions. This enables organizations to visualize how their processes truly function rather than how they were originally designed. It takes an event log and produces a model without using any a-priori information. This transformation converts raw data (event logs contain, at least, timestamps, case IDs, activities) into a structured process model (e.g. a BPMN design with a start event, activities and transitions). The goal is to discover the model.
- **Conformance checking** is used to compare real process execution against predefined models, helping to identify inefficiencies, deviations and compliance issues. It evaluates the alignment between the existing process model and reality by analysing event logs of the same process. This approach detects, locates and explains deviations, measures the severity of these deviations and even identifies potential cases of fraud. The goal is to evaluate the model.
- Finally, **Enhancement** goes beyond analysis by incorporating real-time performance data into existing process models, allowing businesses to detect bottlenecks and optimise workflows for better efficiency. The goal is to improve the model. (W. Van der Aalst, 2016)

Process mining plays a crucial role in extending BPM capabilities by providing fact-based insights, reducing reliance on manually defined workflows that may not accurately reflect actual execution (Dumas et al., 2018). Traditional BPM practices often focus on process modelling techniques such as BPMN and Petri nets, which describe the control flow of processes but do not always capture their real-world execution. By introducing process mining techniques, BPM moves from a static, model-driven approach to a dynamic, data-driven discipline that continuously adjusts based on operational realities.

Process mining completes the BPM lifecycle by transforming it into a continuous, evidence-based improvement framework. While traditional BPM initiatives focus on design, execution, control, measurement and optimisation, process mining strengthens each of these phases by introducing empirical validation and real-time performance analysis (Dumas et al., 2018). This shift ensures that organizations no longer rely on idealised process models, but instead make data-driven decisions based on how processes actually unfold in practice, leading to greater compliance, efficiency and agility (W. Van der Aalst, 2016). This integration ensures that BPM is no longer a static exercise in workflow modelling but an adaptive and evolving discipline that continuously improves based on empirical data.

In conclusion, process mining serves as a key enabler of modern BPM, enhancing process transparency, compliance and efficiency. By leveraging real-time data, it allows organizations to shift from a theoretical, model-driven BPM approach to a more dynamic, evidence-based methodology that fosters continuous process optimisation and business agility (W. Van der Aalst, 2016).

3. METHODOLOGY

This research adopts a case study methodology, focusing on a medium-sized Portuguese insurance intermediary. The study is structured around the BPM lifecycle framework as outlined by Dumas et al. (2018). Although not directly applied, other frameworks and methodologies that we have already explained in the previous chapter, such as Six Sigma, Hammer's Process Reengineering Framework and CMMI, are considered as conceptual references to guide the approach and ensure alignment with the established principles of process improvement. Given the current state of the organisation, which lacks the technological infrastructure and process maturity required for the application of process mining techniques, the BPM lifecycle emerges as the most appropriate methodology for analyzing and improving existing workflows. This approach ensures a complete understanding of the company's workflows, identifies inefficiencies and proposes sustainable improvements aligned with organisational objectives.

The BPM lifecycle consists of six interconnected phases: identification, discovery, analysis, redesign, implementation and monitoring. Below, the application of these phases in the context of this research is described. Figure 4 - The Business Process Management Lifecycle (Dumas et al., 2018) illustrates all the phases described above.

As Michael Hammer once put it: "every good process eventually becomes a bad process", unless it is continually adapted and improved to keep up with the continuously changing landscape of customer needs, technology and competition. This is why the phases of the BPM lifecycle should be seen as circular: the result of monitoring and control feeds back into the discovery phase, which consequently influences the following phases.

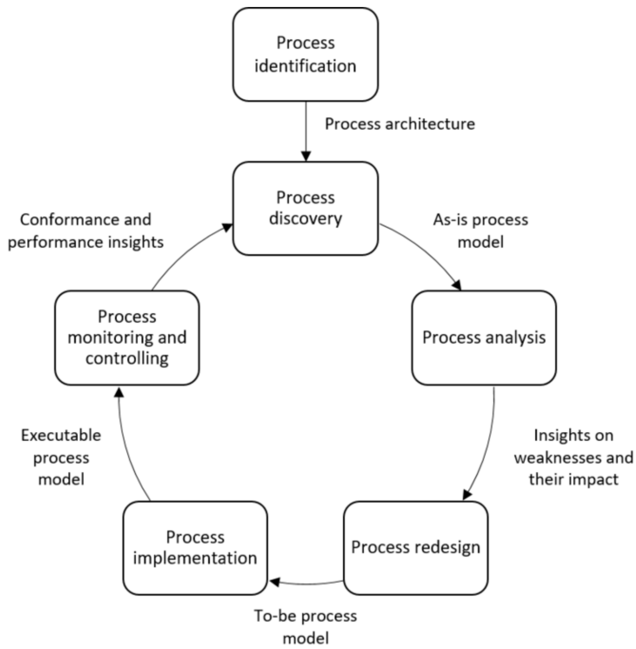

Figure 4 - The Business Process Management Lifecycle (Dumas et al., 2018)

3.1. PROCESS IDENTIFICATION

The first phase of the BPM lifecycle, **Process Identification**, involves clearly defining the business problem and mapping the organisation's processes within a process architecture (Dumas et al., 2018). This phase provides an overview of all business processes and their interconnections, offering a general perspective of the system as a whole.

This phase has two subphases:

> The **designation phase** that aims to identify and enumerate all key processes within the organization, as well as define their boundaries (Dumas et al., 2018). However, defining business processes is inherently complex due to their hierarchical nature, making it difficult to determine the quantity of existing processes, the interdependencies between them and the activities of each process.

Not all the processes hold the same strategic importance, and prioritization is essential for effective process management. (Dumas et al., 2018) The processes can have different scopes, they can be broader and cover multiple functions or narrower and focus on specific tasks, but that does not define their priority. To help on this analysis organizations can leverage Porter's Value Chain Model, which categorizes processes as:

- Core or Primary Processes - Directly contribute to value creation (e.g. customer service, claims processing).
- Support Processes - Enable the execution of core processes (e.g. IT support or HR functions).

This classification helps organizations to capture their blueprint of processes into their process architecture, define priorities and the scope for subsequent BPM phases.

In order to gain a more comprehensive understanding of process identification organizations must evaluate their process maturity and may complete the analysis to the existing processes with the Capability Maturity Model Integration (CMMI) framework previously discussed in the previous chapter. Having that finished, they know if the organization have the necessary processes in place to function effectively and if they are documented, structured and supported by adequate technology.

> The **evaluation** phase that focuses on selecting processes for detailed analysis and potential redesign based on three main criteria:

- Importance - The strategic relevance of the process in terms of profitability, business continuity and operational impact.
- Dysfunction - The extent to which a process experiences frequent errors, inefficiencies or bottlenecks that delay performance.

- Feasibility - The likelihood of successfully managing and improving the process, considering technical, cultural and political constraints.

In general, process management should focus on those where there is a reasonable expectation of benefits.

Further than identifying processes, it is essential to select those that will be analyzed and improved. Dumas et al. (2018) propose assessing process performance and pain points using the Devil's Quadrant Framework, that enables organizations to prioritize process improvements strategically, relying on performance metrics such as:

- **Cost** - Financial efficiency of the process. (E.g. Total cost of policies negotiated per month);
- **Time** - Operational efficiency. (E.g. The average time from initial client contact to policy subscription - cycle time);
- **Quality** - Accuracy and reliability. (E.g. Number of customer complaints due to incorrect policy information);
- **Flexibility** - Assessing the adaptability of a process to changes in demand, regulations or internal requirements. (E.g. How easily an insurance company can adjust underwriting criteria to comply with new policies or client needs).

By using these KPIs organizations can quantify process performance and ensure that improvements align with strategic business objectives. After this phase is completed, we choose the processes to evaluate based on the prioritized process portfolio that came out of this analysis.

3.2. Process Discovery

Once the processes are identified, the study moves to the next phase: **Process Discovery**, where the current state of each relevant process is documented using as-is process modelling. This step is critical for understanding how work is performed in practice. Building an accurate understanding of a process requires choosing the right discovery method. Dumas et al. (2018) describe three main approaches: Evidence-Based Discovery, Interview-Based Discovery and Workshop-Based Discovery. Insights will be gathered through a combination of techniques. These approaches allow for the capture of both explicit and tacit knowledge about workflows, creating a comprehensive understanding of the organisation's operations. The resulting as-is models will be created using BPMN tools such as Bizagi, ensuring clarity and precision (W. Van der Aalst, 2016). Additionally, Six Sigma techniques may be applied to quantify variations in process performance, providing valuable quantitative data to complement the qualitative findings.

Process discovery is considered one of the most subjective phases of BPM, as it requires not only understanding the process but also the ability to model it accurately. The success of this phase depends on capturing the actual execution of the process rather than an idealized or theoretical representation. The output of process discovery is an as-is process model, which serves as the basis for later phases of process analysis and redesign.

3.2.1. INFORMATION GATHERING

There are three main methods for collect information. (Dumas et al., 2018):

- **Evidence-based Discovery**: Relies on existing documentation, direct observations and automated process discovery techniques, which involves extracting event logs from information systems to reconstruct the process flow. These methods are useful as a preliminary step before engaging with domain experts, as it allows analysts to gain an initial understanding of how a process should operate.
- **Interview-based Discovery**: Involves direct engagement with domain experts to gain a deeper understanding of process execution. Interviews allow analysts to clarify uncertainties, validate information from document analysis and capture aspects of the process that may not be formally documented. However, since process knowledge is often dispersed across multiple stakeholders, it is essential to interview multiple stakeholders to obtain a complete view.
- **Workshop-based Discovery**: Brings together multiple stakeholders in structured sessions to collectively map out process workflows. This approach facilitates discussion, aligns different perspectives and ensures that diverse roles are represented in the process discovery effort. Workshops typically require a facilitator to guide discussions and a modelling expert to document findings in real time using BPMN tools. While workshops can be time-intensive, they provide a comprehensive and validated understanding of the process, making them particularly valuable for complex workflows that involve multiple departments or cross-functional interactions.

3.2.2. DESIGNING THE MODEL

Once sufficient information has been gathered, the process model must be structured systematically to ensure clarity and usability. Dumas et al. (2018) propose a five-step approach to constructing a process model:

- The first step in process modelling involves **defining the scope** of the process by identifying the events that trigger its execution and the outcomes that indicates its completion. Establishing clear process boundaries is critical for maintaining focus and ensuring that all relevant activities are included while avoiding unnecessary complexity.
- Once the process boundaries are established, the next step is to **identify the core activities** that are part of the process. This involves distinguishing between value-

adding tasks and supporting activities while recognizing decision points and events influencing process flow.

- **Assigning responsibilities** to different roles and departments is essential for understanding how work is distributed across the organization. Identifying handover points, where responsibility switches from one actor to another, provides insight into **process dependencies** and potential areas for inefficiency.
- The control flow represents the logical **sequencing of activities**, specifying how tasks are ordered, where decisions are made and how parallel or sequential execution takes place. This step ensures that the process model accurately reflects the real-world execution of tasks.
- To enhance the process model, additional elements such as **data objects, exception handlers and system interactions** can be integrated in order to put it more detailed.

Finally, to ensure that the resulting process model is both accurate and useful, it must meet several quality criteria: semantic (to ensure that represents the reality), syntactic (ensures conformation with BPMN rules) and pragmatic (to make sure that the process is readable by the stakeholders). Dumas et al. (2018) also propose Seven Process Modelling Guidelines that include minimizing unnecessary elements, using structured flows, avoiding complex decision points and ensuring that process activities are labelled with clear verb-object descriptions, to enhance model comprehensibility and ensure that it serve as a valuable tool for process analysis and redesign.

The process discovery phase is a crucial step in BPM, providing the basis for following improvement initiatives. By combining multiple discovery techniques, engaging with stakeholders and following a structured modelling approach organizations can develop accurate and reliable as-is process models. Ensuring model quality through validation and best practices enhances the effectiveness of process analysis and facilitates successful BPM implementations.

3.3. PROCESS ANALYSIS

The Process Analysis phase builds on the models developed during discovery phase by systematically identifying inefficiencies, bottlenecks and other operational challenges within the as-is processes. This phase works as an intermediary between understanding the current state and envisioning improved workflows.

A combination of qualitative and quantitative techniques will be employed to assess process performance and prioritize areas for improvement.

3.3.1. Qualitative Analysis

Qualitative process analysis focuses on understanding inefficiencies from a process perspective, incorporating expert knowledge and stakeholder experiences. This approach provides contextual insights that quantitative metrics alone cannot capture.

Dumas et al. (2018) propose several techniques for qualitative process analysis, including value-added analysis, waste analysis, issue documentation and root cause analysis, but on this study we will only explore the first three methods. These methods help structure the analysis and ensure that issues are systematically identified, documented and prioritized.

3.3.1.1. Value-Added Analysis

Value-added analysis is a technique used to identify unnecessary steps in a process to eliminate inefficiencies. It requires breaking down a process into its individual steps and determining their contribution to customer value.

Each process step is classified into one of these three categories:

- Value Adding (VA) Steps - Directly contribute to a positive customer outcome. A step is considered VA if the customer would be willing to pay for it or if its removal would reduce the perceived value of the process outcome.
- Business Value Adding (BVA) Steps - Do not provide direct value to the customer but are necessary for business operations. These steps may be required for compliance, revenue collection or risk mitigation.
- Non-Value Adding (NVA) Steps - Neither add customer value nor are required for business operations. These are pure inefficiencies that should be eliminated.

By applying this classification organizations can identify process components that should be optimized, automated or removed to improve efficiency.

3.3.1.2. Waste Analysis

Waste analysis complements value-added analysis by identifying inefficiencies from a negative perspective. Instead of classifying steps based on their value, this approach focuses on detecting all sources of waste within the process.

According to Dumas et al. (2018), three major categories of waste can be identified:

- Move Waste - Inefficiencies caused by unnecessary movement of materials, documents or employees. In digital environments, this includes excessive switching between applications.
- Hold Waste - Waste resulting from delays and waiting times. This includes inventory waste (work-in-progress cases) and waiting waste (when process participants or resources remain inactive).
- Overdo Waste - Waste arising from defects, overprocessing or overproduction.

- Defect waste occurs when rework is required due to errors;
- Overprocessing waste involves performing unnecessary tasks beyond what is required;
- Overproduction waste refers to executing an entire process instance that was unnecessary.

By analyzing these different forms of waste organizations can identify and eliminate inefficiencies that slow down processes and increase costs.

3.3.1.3. ISSUE REGISTER

Identifying and classifying inefficiencies is not enough, the issues must be documented and prioritized to ensure they are addressed effectively. This is normally achieved through an Issue Register, which records process problems in a structured format.

The issue register will include key details such as the name of the issue, the description to explain the issue, the priority level relative to others, the qualitative impact (that describes how the issue affects customer satisfaction, employee efficiency or organizational reputation), the quantitative impact (with an estimation of time or revenue loss) and a possible resolution to mitigate or resolve the issue. This structured documentation ensures that issues are identified and analyzed systematically and that the most critical inefficiencies receive priority attention.

3.3.2. QUANTITATIVE ANALYSIS

While qualitative techniques provide contextual insights, quantitative process analysis enables organizations to measure inefficiencies more objectively using data-driven methods. Dumas et al. (2018) describe three key techniques for quantitative analysis: flow analysis, queueing analysis and simulation. For the context of this thesis, we will focus on the simulation method as it is the one with less limitations (it allows to do an evaluation of time, cost and resources dimensions).

3.3.2.1. SIMULATION

Process simulation allows organizations to test process changes in a virtual environment before implementing them in practice. By simulating different process scenarios organizations can assess the potential impacts of process improvements before execution, the effects of workload variations on process performance and the bottlenecks that may emerge under different conditions.

As Bill Gates famously stated: "The first rule in any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency." (Dumas et al., 2018). Simulation helps prevent inefficient automation by validating process improvements before implementation.

The insights gained from the simulation phase will inform the design of improved to-be processes in the next stage.

3.4. PROCESS REDESIGN

After analysing the inefficiencies and challenges in the as-is processes, the next step in the BPM lifecycle is **Process Redesign**, also referred to as the **Process Improvement** phase. The goal of this phase is to create to-be models that optimise efficiency, reduce costs and improve overall business performance. The redesign process will be iterative, involving feedback cycles with stakeholders to validate and refine proposed changes to guarantee that the solutions are not only theoretically sound but also practical for implementation.

Decision-making during this phase will be guided by the Devil's Quadrangle framework, which evaluates the variations between cost, quality, time and flexibility to ensure aligned and effective outcomes (Dumas et al., 2018) without unintentionally introducing inefficiencies elsewhere.

A redesigned process aims to achieve one or more of the following objectives:

- Reducing execution **time**;
- Minimizing operational **costs**;
- Enhancing process **quality**;
- Increasing **flexibility/adaptability**.

Each improvement initiative must be evaluated against these four dimensions to maintain a balanced redesign strategy because usually enhancing one dimension often impacts others.

According to Dumas et. al (2018), process redesign can be approached at three levels of abstraction:

- **Methods**: frameworks that define how redesign should be approached (e.g. Six Sigma, Lean, BPR);
- **Techniques**: defined procedures that are used to apply a method in practice for achieving specific redesign tasks;
- **Tools**: software applications that support the execution of the techniques, such as BPMN modelling tools and automation platforms.

By selecting appropriate methods, techniques and tools organizations can systematically apply process improvements that are data-driven and strategically aligned.

Process redesign approaches can also be categorized into two primary strategies: **Transactional Redesign Methods** that increment improvements that aim to eliminate inefficiencies while preserving the overall structure of the existing process and **Transformational Redesign Methods**, which are more radical changes that challenge fundamental process assumptions and create entirely new workflows. (Davenport, 1993)For this study, a transactional method called **Heuristic Process Redesign** was selected, as it provides an analytical approach to process improvement without requiring a complete process reengineering.

Heuristic Process Redesign consists of structured principles aimed at improving processes incrementally through pointed modifications. The key heuristics applied in this research are include:

- At task-level:
    1. **Activity Elimination** - Removing Unnecessary Steps - removing non-value-adding activities, particularly excessive control steps, helps streamline workflows and reduce processing costs;
    2. **Composition / Decomposition** – Breaking down complex tasks into smaller, manageable steps (decomposition) or consolidating related tasks into a single step (composition), to improve efficiency and clarity;
    3. **Triage** - Splitting Tasks into Alternative Versions - assigning specialised teams to specific categories of cases in order to improve processing time and quality;
    4. **Activity Automation** - Leveraging Technology - automation of repetitive or rule-based activities can reduce costs and increase processing speed.
- At flow-level:
    1. **Re-sequencing** - Re-order tasks - for example, put knock-out checks first to identify problems early or postpone expensive tasks that may end up not being necessary until the end, it’s not about doing the work or not, it’s about when we do it;
    2. **Parallelism** - Performing Activities in Parallel - reduces lead time by eliminating unnecessary waiting periods, allowing multiple activities to progress concurrently.
- At process-level:
    1. **Specialization and Standartization** - Dividing responsibilities across specialised roles (specialization) or combining similar processes and pooling resources (standardization) helps balance workload, reduce redundancy and improve focus. For instance, processes may be split by customer type or region, or unified to reduce duplication of resources;
    2. **Resource Optimization** - Ensuring that similar resources are shared effectively across tasks avoids bottlenecks and inactive time. This includes allocating tasks based on skill sets, chaining or batching similar tasks and aligning workload distribution across available staff;

3. **Communication Optimization**- Automating and structuring communication channels, such as integrating messaging platforms, tracking interactions and controlling the type and timing of exchanges, reduces delays and improves responsiveness. For example, using asynchronous updates for routine information and synchronous calls only for time-sensitive issues;
4. **Process Automation** - Using technology to replace manual, paper-based or fragmented steps with digital workflows, including intranet sharing, self-service portals, automated decision-making and real-time tracking.

There are more heuristics but for this project we will focus on these ones that already provide a structured framework for identifying opportunities for process improvement without requiring radical transformations.

In short, successful process redesign requires careful stakeholder engagement and iterative feedback loops to ensure that proposed changes are practical and effective. By applying heuristic principles and evaluating trade-offs using the Devil's Quadrangle organizations can implement well-balanced improvements that align with business goals.

Additionally, redesign efforts should be supported by BPM tools that facilitate process modelling, automation and real-time monitoring, ensuring that changes deliver measurable performance gains.

3.5. PROCESS IMPLEMENTATION & MONITORING

It is essential to clarify that this project will conclude at the redesign phase and will not extend to the **Process Implementation** or **Process Monitoring** stages. Implementing the redesigned processes and the subsequent evaluation of their outcomes would require additional time and resources that exceed the scope of this research. In addition, advancing to these phases would require additional coordination with the company to determine an appropriate timeline for change and continuous post-implementation assessment. However, the study ensures that the proposed process improvements are both actionable and adaptable, while allowing the organisation to implement and monitor them at an appropriate pace.

4. EMPIRICAL STUDY

This chapter presents the findings of the research regarding the Recruitment and Onboarding processes at the selected insurance intermediary company. The methodology described in the previous chapter was applied, using the theoretical background previously established.

4.1. PROCESS IDENTIFICATION

The company under study has several business processes, both core and support, that allow it to operate efficiently and serve its clients.

In line with Porter's value chain framework (Harmon, 2010), the company's operations are structured across a set of primary and support activities that jointly contribute to service delivery and value creation. The primary activities encompass the entire client lifecycle, from lead management and client advisory, to policy issuance, followed by post-sales support and policy renewal. These activities are directly involved in generating revenue and maintaining customer relationships. The support activities provide the necessary infrastructure and resources that enable operational efficiency and strategic alignment. These include procurement, administrative and financial management, human resource management, information technology (IT) and legal and compliance. Together, these foundational processes ensure stability, regulatory compliance, and the scalability of the company's operations, ultimately contributing to its overall margin.

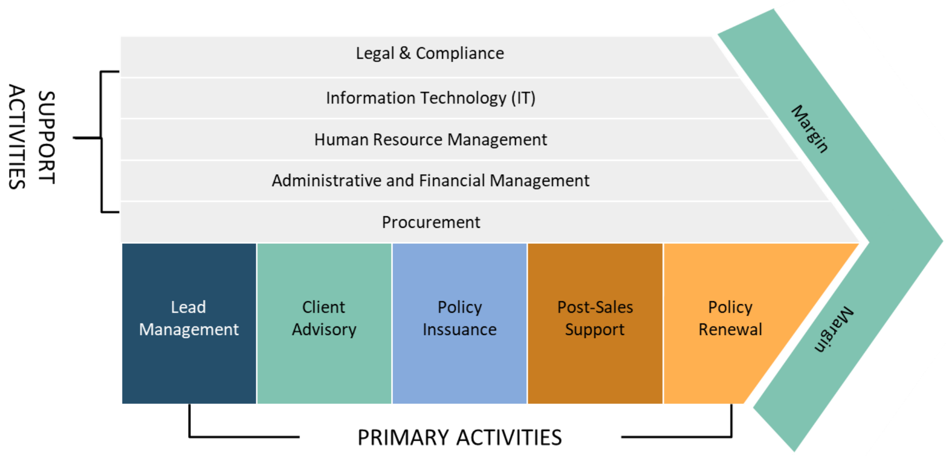

Figure 5 - Company's Value Chain

During the initial phase of this research, the main problems reported by the company were analysed. Following this, the most relevant processes were mapped and their interconnections were identified. As highlighted by Dumas et al. (2018), not all processes have the same level of strategic importance, which requires careful prioritisation when selecting a process for improvement.

After considering the company's challenges and strategic objectives, the **Recruitment and Onboarding** processes were selected for this study. Although they are support processes and not directly linked to revenue generation, they have a significant impact on the organisation's ability to attract, integrate and retain qualified employees. Because they affect multiple departments and influence the organisation's operational capacity, any inefficiencies in these processes can cause delays, disruptions and additional costs. Furthermore, support processes often receive less attention from management, increasing the risk of hidden inefficiencies. For these reasons, analysing and improving the Recruitment and Onboarding processes was considered essential.

4.2. PROCESS DISCOVERY

The process discovery phase aimed to understand and document how the Recruitment and Onboarding processes currently operate (as-is). To achieve this, two primary methods were applied. First, interviews were conducted with the HR team and with one of the operational departments that frequently require new hires. Second, available documentation related to the onboarding process was reviewed. However, this documentation was limited and fragmented, which made the interviews the primary source of information.

After gathering the necessary data, the process models were created following the methodology described by Dumas et al. (2018). The first step was to define the scope, encompassing all activities from identifying a hiring need to completing the onboarding process and the final evaluation six months later. Next, the core activities and responsibilities of each participant were identified, along with the dependencies between different departments. The process flow was then structured to reflect the sequence of tasks, decision points and waiting times between areas. Finally, information objects and other details were added to ensure the accuracy of the models.

The **Recruitment** process starts when a department identifies the need to hire a new employee and prepares a report justifying the need, specifying the required skills and outlining the necessary conditions, which is then submitted to the HR team. The HR team reviews the request and, if necessary, requests additional information. Once the request is complete, the HR team defines the candidate profile and submits it to the HR manager for approval. If approved, the HR manager checks whether internal resources are available to manage the recruitment. If so, the job posting is published on recruitment platforms. Otherwise, an external recruitment team is contracted to carry out all recruitment phases and provide a shortlist of candidates.

When recruitment is handled internally, the HR team reviews applications, analyses CVs, conducts initial interviews and prepares a shortlist of candidates. This list is sent to the requesting department, which selects candidates for a second interview. Approved candidates are communicated to the HR team. Once a candidate is selected, HR contacts the individual to discuss the offer. If the candidate accepts, they provide the necessary documents and the

HR team prepares the employment contract. After verifying the documentation, the contract is signed and the Recruitment process is completed.

The **Onboarding** process starts immediately after the contract is signed. The HR team defines the new employee's profile and requests IT support to prepare the necessary equipment and system access. On the employee's first day, the HR team conducts a welcome session, delivers the prepared materials, provides initial training and monitors the employee's integration into the new team.

The final part of the onboarding process involves a six-month Continuous Evaluation period. The HR team defines evaluation criteria and shares an evaluation plan with the new employee. Monthly check-ins are held, feedback is gathered and recorded and if any performance issues are identified, action plans are developed. After six months, a final evaluation takes place. If both the employee and the company agree and the assessment is positive, the employee's status is changed to permanent and the onboarding process is over.

Table 2 - Processes Participants and Main Responsibilities

Participant	**Process**	**Responsibilities**
Requesting Department	Recruitment	• Identify the need for a new employee • Define required skills and conditions • Participate in candidate selection
Hiring Area Manager (not represented on the models but implicit on the Requesting Department role)	Recruitment & Onboarding	• Conduct second-round interviews • Provide feedback during continuous evaluation
HR Team	Recruitment & Onboarding	• Review recruitment requests • Define candidate profiles • Manage job postings and applications • Conduct interviews • Formalise contracts • Organise onboarding sessions • Monitor integration • Lead continuous evaluation
HR Manager	Recruitment	• Approve recruitment requests and candidate profiles • Select the strategy of recruitment (internal or external team)
External HR Team (in cases that the internal HR team is not available)	Recruitment	• Conduct sourcing, screening and first-round interviews • Deliver candidate shortlist and report to internal HR
IT Area	Onboarding	• Prepare equipment and system accesses

		• Provide technical support during onboarding
New Employee	Onboarding	• Participate in onboarding activities • Engage in monthly check-ins • Complete the probation period evaluation

The *as-is* models representing the **Recruitment** (R) and **Onboarding** (O) processes, including the subprocesses: Review Applications and Shortlist Candidates (R), Formalize the Contract (R), Continuous Evaluation (O) and Mensal Check-in (O), were designed following the BPMN 2.0 notation and developed using the Bizagi tool.

The *as-is* process models contain three different levels of detail, where the first level can be seen in the Figures: Figure 6 - As-Is Recruitment Process (Level 1) and Figure 7 - As-Is Onboarding Process (Level 1) below and the second and third levels in Appendix A - AS-IS Processes Model.

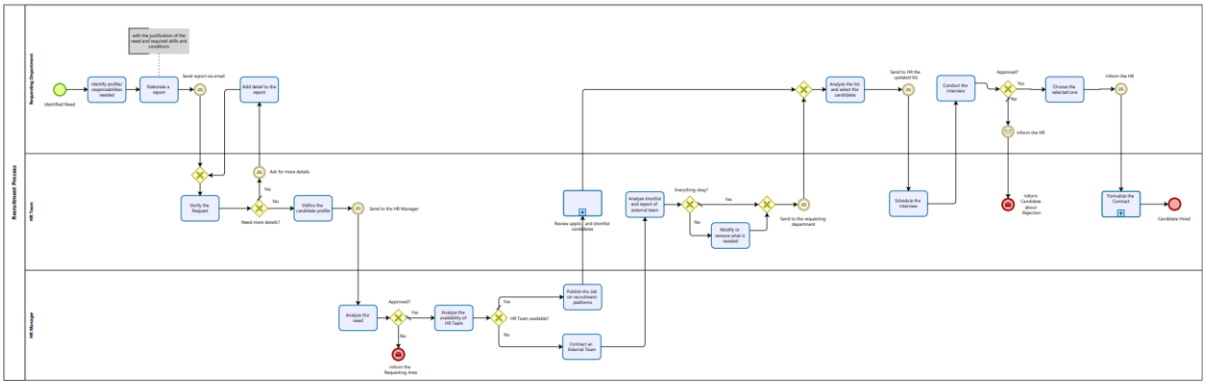

Figure 6 - As-Is Recruitment Process (Level 1)

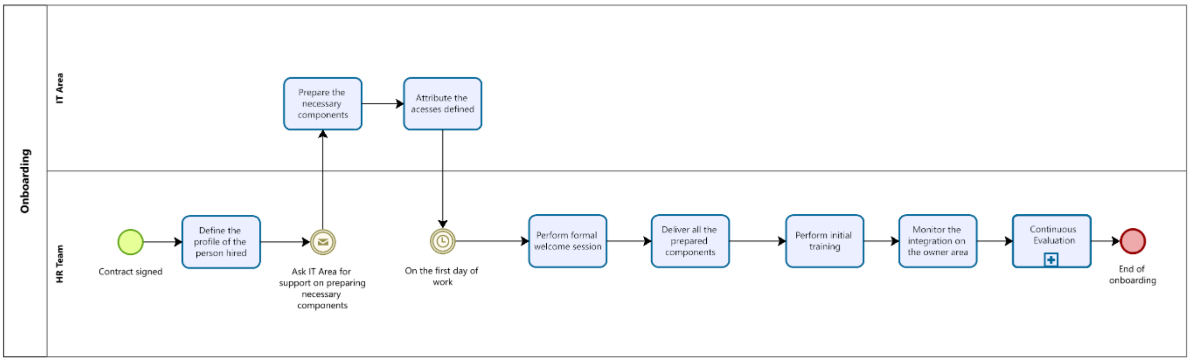

Figure 7 - As-Is Onboarding Process (Level 1)

4.3. Process Analysis

4.3.1. Qualitative Analysis

The qualitative analysis focused on identifying inefficiencies and improvement opportunities in the as-is Recruitment and Onboarding processes based on the information gathered during the discovery phase. The techniques applied were value-added analysis, waste analysis and the creation of an issue register, following the methodology previously described.

4.3.1.1. Value-Added Analysis & Waste Analysis

In the qualitative analysis, each activity in the process models was reviewed and classified based on its contribution to the process outcomes (Value-Added Analysis) and on the identification of inefficiencies (Waste Analysis). For this analysis, all tasks were disintegrated step by step and ordered. Then, they were classified according to the following categories: VA (Value-Added), BVA (Business Value-Added) and NVA (Non-Value-Added).

Several non-value-adding activities were identified, particularly repetitive requests for missing documents, delays in approvals and waiting times between process steps. Some business value-adding activities also presented improvement opportunities, such as simplifying document checks and streamlining communication between departments.

The waste analysis revealed multiple sources of inefficiency, including unnecessary transfers of information between departments (move waste), delays in obtaining approvals or scheduling interviews (hold waste) and redundant document verification tasks (overdo waste).

The detailed classifications for each process and subprocess are presented in Tables 3 to 8.

Table 3 - Qualitative Analysis for Recruitment Process

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Identify the profile/ responsibilities needed	VA	--	The process starts at this point, when the area defines what type of employee they need. This directly creates value by triggering the recruitment process.
Elaborate a report	BVA	--	The HR need this report to evaluate the request.
Send report via email*	NVA	Move - Transportation	The report is sent manually by email. It does not add value and could be replaced by an automatic system.
Verify the request	BVA	--	The process stops while the HR team confirms if the

			request is valid and complete.
Ask for more details*	NVA	Overdo - Defects	HR requests missing information that should have been included in the initial request. It causes rework.
Add detail to the report	NVA	Overdo - Defects	Additional time is spent correcting and completing the request form.
Define the candidate profile	BVA	--	Internal step required to proceed with sourcing but does not create perceived value.
Send to the HR Manager*	NVA	Move-Transportation	Manual sending of the report for approval. This is a data transfer via email that could be automated.
Analyze the need	BVA		The process waits for the HR Manager's decision to proceed.
Inform the requesting Area*	NVA	Move-Transportation	This is a notification that does not add value to the process outcome.
Analyze the availability of the HR Team	BVA		The process is paused while the HR manager confirms whether the internal team is available to handle the recruitment steps.
Publish the job on recruitment platforms	BVA	--	A step is needed to move forward with candidate sourcing, although it is not directly visible to the final user.
Contact an external team	BVA	--	External option for recruitment when HR is unavailable. It supports the process internally.

Analyze the shortlist and report of the external team	BVA	--	The HR Team checks the candidate list quality provided by the external team.
Modify or remove what is needed	BVA	--	Although this is a rework that occurs due to misalignment or poor filtering by the external team, it remains necessary due to the need for verification of deliverables from external partners. Ensuring compliance and accuracy is essential, particularly when relying on third-party outputs. Therefore, this activity should be retained as a necessary control step.
Send to the requesting department*	NVA	Move-Transportation	The candidate list is manually transferred by email with no value added.
Analyze the list and the selected candidates	VA	--	A decision point that directly influences the hiring outcome, defining who will move forward in the process.
Send to the HR the updated list*	NVA	Move-Transportation	Repetitive sending of information via email. It's a purely administrative task and no value is added.
Schedule the interview	BVA	Hold-Waiting	The employee waits while availability is confirmed between HR and the requesting area. This waiting time does not stem from the execution of the task itself, but rather from the coordination effort required between different actors. The delays caused by the lack of streamlined coordination can extend the

			overall process unnecessarily.
Conduct the interview	VA	--	Core assessment activity that directly adds value to the process.
Inform the HR*	NVA	Move-Transportation	The area informs HR of the outcome. It is a manual step that adds no direct value.
Inform candidate about rejection	BVA	--	While it does not create direct value for the candidate or end customer, it is an important business practice to maintain the company's professional image and ensure proper closure of the process.
Choose the selected one	VA	--	This activity directly determines the outcome of the recruitment process by selecting the person who will fill the open position.
Inform the HR*	NVA	Move-Transportation	The area informs HR of the outcome. It is a manual step that adds no direct value.

Table 4 - Qualitative Analysis for Review Applications and Shortlist Candidates Subprocess

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Application Received	BVA	Move - Transportation	Necessary checkpoint to initiate the candidate's evaluation. The application is received on the platforms or via email. Without this, the process cannot proceed, even if it does not directly add perceived value.
Analyze the CV	VA	--	CV analysis filters the candidates and directly

			supports the decision of who proceeds.
Contact to schedule an interview	BVA	Hold - Waiting	Delays often occur while coordinating schedules with candidates and interviewers. This waiting time does not stem from the execution of the task itself, but rather from the coordination effort required between different actors. The delays caused by the lack of streamlined coordination can extend the overall process unnecessarily.
Conduct the interview	VA	--	Core activity that evaluates the candidate's fit for the position.
Add the profile to the shortlist of candidates	VA	--	The list of selected candidates is necessary to proceed to the next step.
Shortlist of Candidates sent to the Requesting Area*	NVA	Move - Transportation	The list is manually transferred via email. It does not create value and could be automated.

Table 5 - Qualitative Analysis for Formalize the Contract Subprocess

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Contact the Selected Candidate	BVA	--	The HR team contacts the chosen candidate to confirm interest and proceed. Important for business, but not value-adding to the candidate.
Inform the candidate about conditions	VA	--	This directly impacts the candidate’s decision to accept

			the offer. It is essential for finalising the hiring.
Request internal approval for salary adjustments	BVA	Hold - Waiting	The process waits while salary changes are reviewed and approved by internal stakeholders.
Inform Candidate (in case of rejection)	BVA	--	Feedback is necessary, but it does not add direct value. It is an ethical and procedural obligation.
Inform the candidate about the new conditions	VA	--	The updated offer is communicated. Important for alignment but not value-adding from the candidate's perspective.
Confirm candidate acceptance and request required documents	BVA	--	Once the candidate accepts, documentation is needed to proceed with contract finalization. An essential internal step to formalise the employment relationship, but the perceived value is administrative.
Request missing documents	NVA	Overdo - Defects	This occurs due to initial omissions. It is rework that delays the process unnecessarily.
Verify all the documentation	BVA	--	HR team ensures that all legal and administrative documentation is correct. It's a critical activity in terms of compliance but not important for the candidate.
Finalize contract with joining date defined	VA	--	Marks the end of the recruitment process with a signed agreement. Clear value is delivered to both the candidate and the company.

Table 6 - Qualitative Analysis for Onboarding Process

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Define the profile of the person hired	BVA	--	Used to identify what access and tools the new employee needs. It supports the internal setup of onboarding resources. It is necessary for coordination, but not perceived as value by the employee.
Ask the IT Area for support on preparing the necessary components*	BVA	Hold - Waiting	The process waits for IT confirmation and resource availability to move forward.
Prepare the necessary components	BVA	Hold - Inventory	IT prepares the equipment and access before the person arrives. If it's done too early, resources can become inactive.
Attribute the access defined	BVA	--	Ensures the new employee can log in and access required systems. Necessary but not value-adding from the employee's perspective.
Perform a formal welcome session	VA	--	Integrates the employee into the company. It has direct value and impact on the onboarding experience.
Deliver all the prepared components	VA	--	Provides employees with the necessary tools and equipment to perform their job duties effectively. This is value-adding.
Perform initial training	VA	--	Helps the employee become familiar with tasks and expectations, supporting

			successful adaptation and long-term performance.
Monitor the integration in the owner's area	BVA	--	The HR team follows up with the owner team to check on the progress of the integration. Necessary for support but not directly value-adding.

Table 7 - Qualitative Analysis for Continuous Evaluation Subprocess

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Definition of evaluation criteria	BVA	--	Defines the rules by which the employee will be evaluated, based on their role and profile. Necessary for internal consistency.
Share the plan with the person in scope*	BVA	--	Communicates the expectations for the evaluation period. Necessary but not value-adding.
Update Excel with report data	NVA	Move - Transportation	Manual task of recording feedback data. It does not change the process outcome, it only transfers the data collected to a file and this could be automated.
Perform final evaluation	VA	--	Concludes the probation period and determines if the employee will be retained. Directly impacts the outcome.
Meet with the person to inform	VA	--	A key step in communicating the final result and collecting feedback. Value-adding for both sides.

Meet with the person and the owner of the area	VA	--	Ensures team alignment in the decision-making process. Valuable for transparency, collaboration and improvement.
Convert the employee to permanent status	VA	--	Marks the final outcome of the onboarding process. It is the point of value delivery to both the organization and the employee.

Table 8 - Qualitative Analysis for Mensal Check-in Subprocess

Activity	VA/BVA/NVA Classification	Waste Classification	Justification
Invite sent to the person in scope*	BVA	Hold - Waiting	The person waits for the meeting to be scheduled and it's normal to have delays on those types of tasks that require coordination.
Schedule a meeting with the manager of the person in scope	BVA	Hold - Waiting	There may be delays while aligning agendas between HR and the owner team manager.
Gather feedback from the person in scope	VA	--	Collecting performance input is essential for guiding development and supporting decisions.
Analyze the feedback	VA	--	The HR team reviews the input to identify the strengths and weaknesses of each employee.
Draw up an action plan for the next month	VA	--	Proposes concrete steps for employee development. Value is created by translating feedback into improvement.
Prepare a report	BVA	Move - Transportation	Manual documentation of the gathered feedback. It does not directly affect the process

			outcome, but it's necessary for internal control. However, it could be automated.
Share the report with the employee and the team manager	VA	--	Delivers structured feedback to the employee and the team, directly supporting improvement and alignment.

* Although not explicitly represented as activities, many of the highlighted events could be portrayed equivalently as activities. Given that, they encompass key handovers in the process, we deemed it relevant to consider them for analysis and inclusion in future assessments and the construction of the TO BE.

While it is standard practice to apply waste analysis primarily to Non-Value-Adding (NVA) activities, this study also extends that analysis to selected Business-Value-Adding (BVA) steps. This is justified because, although BVA tasks are necessary from a business or compliance standpoint, they can still exhibit inefficiencies such as delays, manual rework or excessive handling. Certain BVA activities, such as approvals, scheduling or documentation control, may generate waiting times or unnecessary handovers, which introduce avoidable delays or complexity.

In this research, waste analysis was applied to BVA steps only when an apparent inefficiency was observed, ensuring an improved perspective that respects the business need for these activities while identifying points for optimization.

4.3.1.2. Issue Register

All identified inefficiencies were documented in an issue register, which included the description of each issue, its priority and the potential impact on process performance. This register served as the foundation for defining improvement priorities in the redesign phase.

The issues identified during the analysis were prioritised based on a combined logic of urgency and ease of implementation. Rather than strictly ranking issues by their quantitative impact alone, the prioritisation also considered the feasibility of addressing each issue in the short term. For example, while certain delays such as those related to scheduling constraints, may significantly affect process timelines, they are often difficult to eliminate due to their dependency on human availability and coordination. As such, these were assigned a lower priority, not because they lack importance, but because there is limited room for immediate intervention.

This approach ensures that the most actionable and impactful improvements are highlighted first, enabling the organisation to focus its efforts on changes that are both highly relevant and realistically achievable, aligning with the principles of continuous process improvement.

Table 9 - Issue Register

Issue	Priority	Description	Data & Assumption	Qualitative Impact	Quantitative Impact
Manual email communications	**2**	Several back and forth of information are done manually by email.	Occurs in nearly all the recruitment cycles (the estimation is having more than 20 email exchanges per hire).	The process becomes slower, creating bottlenecks.	The estimation is 1 day per cycle for email handling.
Rework in recruitment request	**1**	HR often needs to ask for missing or unclear details from the requesting department.	This happens in around 60% of the recruitment requests submitted monthly (approximately 8 to 12 cases).	This generates delays in the process and affects the employee's start date.	The estimation is an additional 1 to 2 days per case, increasing HR workload.
Waiting for internal approvals	**3**	The process often gets stuck waiting for approval from the HR Manager or salary validation.	This typically occurs in 100% of cases for HR manager approval and in 30% of cases where special salary conditions are involved.	It creates uncertainty and slows down decision-making, which may lead to candidate disengagement.	The estimation is a delay of 2 to 3 days per approval stage.
Delays in scheduling interviews and onboarding	**4**	It is often difficult to coordinate availability between HR, managers and IT.	This is reported in more than half of the cases, especially when coordination involves multiple people.	This results in onboarding delays and affects the perception of the organisation by the new hire and may	The estimated delay is 1 to 3 days per case.

				cause dropouts.	
Redundant documentation updates	**5**	Information already collected is re-entered manually into Excel or other reports.	This occurs in almost every continuous evaluation cycle, resulting in 10 to 15 updates per month.	This task does not alter the process and unnecessarily consumes time.	The estimation is a waste of 30 to 60 minutes per update.
Misalignment with the external recruitment team	**7**	Candidate shortlists sent by the external team often fail to align with internal expectations.	This occurs in approximately 1 out of 5 externally managed recruitments, according to HR feedback.	It increases internal work and reduces confidence in the outsourcing process.	The estimation is 1 to 2 hours spent per candidate list for corrections.
Missing or incomplete candidate documentation	**8**	Candidates do not always send all the required documents for hiring.	This occurs in approximately 25% to 35% of the contracts prepared.	This leads to back-and-forth with the candidate and delays contract finalisation.	The estimated loss is 1 to 2 days per case due to rework and follow-up.
Delay in IT equipment and access preparation	**6**	Sometimes, IT does not prepare the equipment or access before the employee starts.	This is estimated to occur in 20% of onboarding cases, based on feedback from HR and IT.	As a result, the employee may start work without the necessary tools.	The estimated delay is 0.5 to 1 day in the onboarding process.
Inconsistent monthly evaluations	**9**	The format and quality of assessments differ depending on the manager.	This happens in almost every follow-up process, especially when HR is not closely involved.	It weakens performance tracking and leads to employee dissatisfaction.	The impact is difficult to quantify but has long-term effects on development.

4.3.2. Quantitative Analysis

After understanding how the process works and where value is lost through the qualitative analysis, this second part focuses on the numbers. The goal of the quantitative analysis is to measure the actual duration of tasks, the frequency of delays and identify areas where time or resources may be wasted. This helps confirm what was observed qualitatively, now with concrete data to support it. It also allows us to estimate the real impact of the identified problems, such as the number of days lost waiting for approvals or redoing tasks. These insights are crucial for making more informed decisions during the redesign phase and ensuring that the improvements truly address what matters the most.

4.3.2.1. Simulation

To complement the qualitative analysis, a simulation was conducted to gain a deeper understanding of how time affects the overall performance of the Recruitment and Onboarding processes. Given the company's characteristics and the average effort required in each case, a time-based perspective was selected.

RECRUITMENT PROCESS

Time Analysis

For the Recruitment process, a duration of up to **45 working days** was considered, reflecting common delays associated with manual tasks, approvals and interdepartmental coordination, while also allowing the tracking and analysis of each candidate's journey from initiation to conclusion, enabling a comprehensive representation of the process flow.

It's important to refer that in the configuration of the normal distribution used for activity durations, a minimum value (Min) and a maximum value (Max) were defined to ensure simulation accuracy. The minimum value was set to 0 to prevent the generation of negative durations, which are not realistic in a process context. The maximum value was set to 1.000.000, a sufficiently large number to ensure that the entire range of the distribution is covered, avoiding truncation of higher values while not limiting the model's flexibility.

For simulation purposes, an adapted version of the Recruitment process was created in Bizagi. Specifically, the subprocess *Formalize the Contract* was adjusted to better reflect the distinction between active work and waiting periods. In the original process model, timers related to approvals and document delivery were embedded within the subprocess, potentially causing these delays to be interpreted as resource workload. To avoid this misrepresentation, the timers were relocated outside the subprocess boundary, into the main Recruitment process where the subprocess is called. The total expected duration of these waiting periods (e.g. days awaiting salary approval or document submission) was calculated and included as one intermediate timer event on the Recruitment process. This modelling decision ensures that such delays are classified as *waiting time* rather than task execution time, thereby improving the accuracy of the simulation in reflecting actual resource allocation and process performance. For this analysis, we considered these processes:

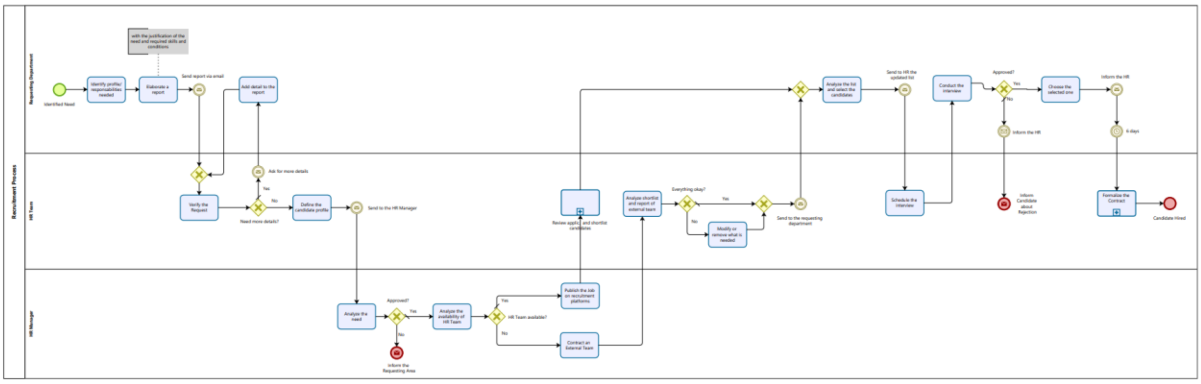

Figure 8 - As-Is Recruitment Process adapted for simulation purpose

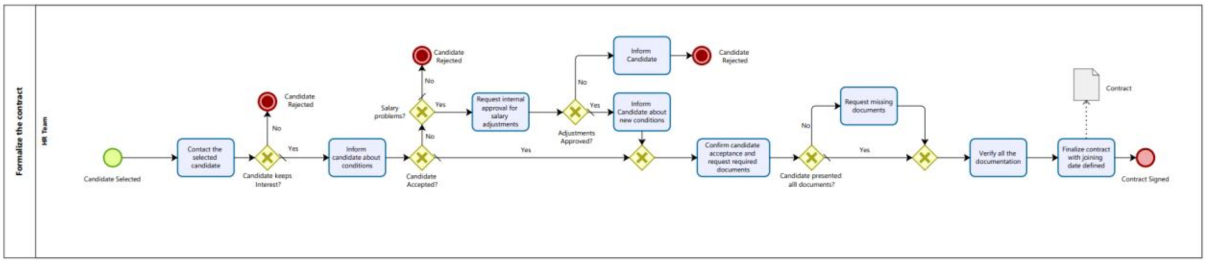

Figure 9 - As-Is Formalize Contract Subprocess adapted for simulation purpose

Table 10 - Time Analysis for Recruitment Process

Activity	Type of Distribution	Parameters	Justification
Identified Need	**Poisson**	1 / λ = 4320 Max. Arrival count= 5 needs	The need arises randomly and independently from previous ones. To configure the arrival patterns in the simulation, we applied a Poisson distribution to model both the identification of recruitment needs and the reception of candidate applications. Based on company data, we assumed an average of 5 recruitment needs (max arrival counts) across a 45-working-day simulation period. Considering that each working day has 8 hours (480 minutes), this results in 1 new hiring need every 9 days, or every 4320 minutes. Therefore, the interarrival time is set as 1/λ = 4320 minutes.

Identify the profile/ responsibilities needed	**Negative Exponential Distribution**	λ= 45 min	It involves human analysis and decision-making, which may vary depending on the specific case.
Elaborate a report	**Negative Exponential Distribution**	λ = 35 min	It may vary depending on the complexity and clarity of the need. For example, a more complex request requires a more detailed report, increasing the time spent.
Verify the request	**Truncated Normal**	μ = 30 σ = 10 Min=0 Max=1.000.000	Information verification is a repetitive but not entirely static task.
Need more details? (Gateway)	N.A.	Yes - 70% No - 30%	Since the request is submitted via email and there is no standardized form, it is common for data to be missing.
Add detail to the report	**Negative Exponential Distribution**	λ = 20	The detail level and complexity of the request influence the effort required. There are no predefined templates and each department may submit requests in different formats, leading to variability in corrections.
Define the candidate profile	**Negative Exponential Distribution**	λ = 45	It depends on the level of detail required and the complexity of the request and always involves analysis, as there are no defined templates and each area can submit the details as it wishes.
Analyze the need	**Negative Exponential Distribution**	λ = 30	It may vary depending on the complexity and clarity of the need.
Approved? (Gateway)	N.A.	Yes - 80% No - 20%	Most requests are legitimate, but some are blocked due to lack of urgency or resource/budget constraints.
Analyze the availability of the HR Team	**Truncated Normal**	μ = 20 σ = 5 Min=0 Max=1.000.000	Availability check is based on workload and task assignment. This is relatively standardized and involves checking a shared task-tracking Excel file.

HR Team available? (Gateway)	N.A.	Yes – 60% No – 40%	The company has limited resources (a small HR Team to ~120 employees). The HR team often relies on outsourcing, especially during peak periods or when they are managing other responsibilities such as payroll processing.
Publish the job on recruitment platforms	**Truncated Normal**	μ = 15 σ = 5 Min=0 Max=1.000.000	All requirements and candidate profiles are already defined and tailored to the position, so all that it's needed is to publish the position following a standard routine, ensuring that execution time remains stable.
Review applications and shortlist candidates	**Negative Exponential Distribution**	λ = 86,75	Variable, depending on the number and quality of candidates and the report submitted. CT=20+0,35*15+0,9*60+0,5*15=86,75 These values are derived from the following breakdown: • Analyze the CV: 20min • Fit on the profile: YES - 35%; NO - 65% • Contact to schedule interview: 15min • Keep interest: YES – 90%; NO – 10% • Conduct the interview: 60min • Pass the interview: YES- 60%; NO-40% • Add the profile to the shortlist of candidates: 15min
Contact an external team	**Truncated Normal**	μ = 25 σ = 10 Min=0 Max=1.000.000	There are predefined recruitment partners. The process is relatively standardized, with minimal variation in execution.
Analyze the shortlist and report of the external team	**Negative Exponential Distribution**	λ = 60	Analysis of external candidate reports is highly variable. Time depends on candidate quality and the thoroughness of the external team's assessment.
Everything okay? (Gateway)	N.A.	Yes - 70% No - 30%	Since they are usually predefined partners with whom they have worked before, reports tend to be in line with what is intended and expected.
Modify or remove what is needed	**Negative Exponential Distribution**	λ = 30	Variable, depending on the number and quality of candidates and the report submitted.

Analyze the list and the selected candidates	**Negative Exponential Distribution**	λ = 60	Variable, depending on the number and quality of candidates and the report submitted.
Schedule the interview	**Truncated Normal**	μ = 15 σ = 5 Min=0 Max=1.000.000	It may involve variable waiting times or even require multiple attempts to successfully schedule the meeting. However, the time associated with this task is not considered highly variable, as the estimated duration already includes a buffer to account for potential follow-up calls or coordination efforts.
Conduct the interview	**Negative Exponential Distribution**	λ = 60	Interview duration is highly variable. It depends on the candidate's profile, the depth of questions, and the overall flow of the conversation.
Approved? (Gateway)	N.A.	Yes - 30% No - 70%	In the final interview stage, candidates are usually well-aligned with the job requirements. The approval rate is high, especially in internal recruitment with few candidates per position.
Choose the selected one	**Negative Exponential Distribution**	λ = 30	It represents a decision-making activity whose duration varies significantly depending on the number and quality of the shortlisted candidates, since it depends a lot on human judgment. This step may require alignment between team members, review of previous interview notes or even discussion with the HR team.
Formalize the Contract	**Truncated Normal**	μ = 89,7 σ = 10 Min=0 Max=1.000.000	Requires data and documentation verification but follows a well-defined routine. CT=15+0,9*25+0,8*((10+[0,85*(20+30)]+ [0,15*(10+20+30)]+ 0,2*0,25*(15+0,25*10+ 0,75*(15+10+[0,85*(20+30)]+[0,15* (10+20+30)]≈89,7min These values are derived from the following breakdown: • Contact the selected candidate: 15min • Candidate Keep interest: YES - 90%; NO - 10% • Inform candidate about conditions: 25min • Candidate accepted: YES - 80%; NO - 20% • Salary problems: YES - 25%; NO - 75%

			• Request internal approval for salary adjustments: 15min • Adjustments Approved: YES - 75%; NO - 25% • Inform Candidate (in case of rejection): 10min • Inform Candidate about new conditions: 15min • Confirm candidate acceptance and request required documents: 10min • Candidate present all documents: YES - 85%; NO - 15% • Request missing documents: 10min • Verify all the documentation: 20min • Finalize the contract: 30min (includes signature and setting of start date)

Resource Analysis

In the AS-IS simulation scenario, **one** resource was allocated to each activity based on the lane structure defined in the process model. This approach ensures consistency between the process logic and its simulation execution.

Resources assigned to all process:

- **HR Manager**: 1
- **HR Team**: 2
- **Requesting Department**: 1 Manager
  (composed of several people, but only one manager places the request)

It is important to note that the simulation assumes exclusive dedication of each resource to the task at hand, which does not reflect the actual operational context. In reality, resource availability is constrained by multitasking, overlapping responsibilities, and competing priorities. This simplification was necessary to ensure the feasibility of the simulation but should be considered when interpreting the results, especially regarding resource bottlenecks and workload distribution.

Table 11 - Resource Analysis

Activity	Resource
Identify the profile/ responsibilities needed	**Requesting Department**
Elaborate a report	**Requesting Department**
Verify the request	**HR Team**

Add detail to the report	**Requesting Department**
Define the candidate profile	**HR Team**
Analyze the need	**HR Manager**
Analyze the availability of the HR Team	**HR Manager**
Publish the job on recruitment platforms	**HR Manager**
Review applications and shortlist candidates	**HR Team**
Contact an external team	**HR Manager**
Analyze the shortlist and report of the external team	**HR Team**
Modify or remove what is needed	**HR Team**
Analyze the list and the selected candidates	**Requesting Department**
Schedule the interview	**HR Team**
Conduct the interview	**Requesting Department**
Choose the selected one	**Requesting Department**
Formalize the Contract	**HR Team**

Comparative Analysis: As Is vs. What If Scenarios

Table 12 - Comparative Table on Simulation Results

Activity	Scenario	Instances Started	Instances Completed	Avg. Time	Total Time
Recruitment Process	AS IS	5	2	**10h24m54s**	1d20h33m4s
	whatif1	16	8	**9h38m40s**	6d51m55s
	whatif2	5	2	**6h5m33s**	1d7h32m25s

	whatif3	5	2	**5h35m9s**	1d5h18m10s
	whatif4	16	8	**7h18m49s**	4d8h52m50s
Identify the profile/ responsibilities needed	AS IS	5	5	40m16s	3h21m22s
	whatif1	16	16	36m26s	9h43m6s
	whatif2	5	5	40m16s	3h21m22s
	whatif3	5	5	13m25s	1h7m7s
	whatif4	16	16	12m8s	3h14m22s
Elaborate a report	AS IS	5	5	53m30s	4h27m31s
	whatif1	16	16	45m18s	12h4m48s
	whatif2	5	5	30m34s	2h32m52s
	whatif3	5	5	30m34s	2h32m52s
	whatif4	16	16	25m53s	6h54m10s
Verify the request	AS IS	17	17	28m18s	8h1m18s
	whatif1	50	50	28m7s	23h26m23s
	whatif2	7	7	14m48s	1h43m39s
	whatif3	7	7	14m48s	1h43m39s
	whatif4	25	25	13m28s	5h36m54s
Add detail to the report	AS IS	12	12	25m55s	5h11m5s
	whatif1	34	34	21m 55s	12h25m20s
	whatif2	2	2	11m22s	22m44s
	whatif3	2	2	11m22s	22m44s
	whatif4	9	9	12m47s	1h55m6s
Define the candidate profile	AS IS	5	5	57m51s	4h49m15s
	whatif1	16	15	49m13s	12h18m18s
	whatif2	5	5	57m51s	4h49m15s
	whatif3	5	5	57m51s	4h49m15s
	whatif4	16	15	49m13s	12h18m18s
Analyze the need	AS IS	5	5	26m44s	2h13m40s
	whatif1	15	15	31m23s	7h50m48s
	whatif2	5	5	26m44s	2h13m40s
	whatif3	5	5	26m44s	2h13m40s
	whatif4	15	15	31m23s	7h50m48s
Analyze the availability of the HR Team	AS IS	4	4	14m21s	57m25s
	whatif1	12	12	16m47s	3h21m25s
	whatif2	4	4	14m21s	57m25s
	whatif3	4	4	14m21s	57m25s
	whatif4	12	12	16m47s	3h21m25s
Publish the job on recruitment platforms	AS IS	3	3	15m56s	47m48s
	whatif1	6	6	17m38s	1h45m48s
	whatif2	3	3	15m56s	47m48s
	whatif3	3	3	15m56s	47m48s
	whatif4	6	6	17m38s	1h45m48s
	AS IS	3	3	1h2m23s	3h7m10s

Review applications and shortlist candidates	whatif1	6	6	1h13m40s	7h22m5s
	whatif2	3	3	1h2m23s	3h7m10s
	whatif3	3	3	1h2m23s	3h7m10s
	whatif4	6	6	1h13m40s	7h22m5s
Contact an external team	AS IS	1	1	25m4s	25m4s
	whatif1	6	6	30m51s	3h5m10s
	whatif2	1	1	25m4s	25m4s
	whatif3	1	1	25m4s	25m4s
	whatif4	6	6	30m51s	3h5m10s
Analyze the shortlist and report of the external team	AS IS	1	1	14m28s	14m28s
	whatif1	6	6	1h32m28s	9h14m51s
	whatif2	1	1	14m28s	14m28s
	whatif3	1	1	14m28s	14m28s
	whatif4	6	6	1h32m28s	9h14m51s
Modify or remove what is needed	AS IS	0	0	0	0
	whatif1	2	2	27m54s	55m48s
	whatif2	0	0	0	0
	whatif3	0	0	0	0
	whatif4	2	2	27m54s	55m48s
Analyze the list and the selected candidates	AS IS	4	4	17m10s	1h8m43s
	whatif1	12	12	47m8s	9h25m45s
	whatif2	4	4	17m10s	1h8m43s
	whatif3	4	4	17m10s	1h8m43s
	whatif4	12	12	47m8s	9h25m45s
Schedule the interview	AS IS	4	4	8m58s	35m53s
	whatif1	12	12	13m36s	2h43m22s
	whatif2	4	4	8m58s	35m53s
	whatif3	4	4	8m58s	35m53s
	whatif4	12	12	13m36s	2h43m22s
Conduct the interview	AS IS	4	4	1h53m28s	7h33m54s
	whatif1	12	12	1h35m4s	19h49s
	whatif2	4	4	1h53m28s	7h33m54s
	whatif3	4	4	1h53m28s	7h33m54s
	whatif4	12	12	1h35m4s	19h49s
Choose the selected one	AS IS	1	1	5m5s	5m5s
	whatif1	5	5	36m19s	3h1m39s
	whatif2	1	1	5m5s	5m5s
	whatif3	1	1	5m5s	5m5s
	whatif4	5	5	36m19s	3h1m39s
Formalize the Contract	AS IS	1	1	1h33m13s	1h33m13s
	whatif1	5	5	1h25m16s	7h6m22s
	whatif2	1	1	1h33m13s	1h33m13s
	whatif3	1	1	1h33m13s	1h33m13s
	whatif4	5	5	1h25m16s	7h6m22s

Table 13 - Resource Utilization on Simulations

Scenario	Resource Utilization
AS IS	1.47% HR Manager 3.08% HR Team Member 7.30% Requesting Department Manager
What If 1	1.49% HR Manager 2.98% HR Team Member 6.08% Requesting Department Manager
What If 2	1.51% HR Manager 2.07% HR Team Member 5.17% Requesting Department Manager
What If 3	1.51% HR Manager 2.07% HR Team Member 4,41% Requesting Department Manager
What If 4	1.49% HR Manager 2.19% HR Team Member 4,03% Requesting Department Manager

AS IS

In the AS-IS scenario, we simulated the recruitment process using realistic parameters. The arrival of new hiring needs was modelled using a Poisson distribution, assuming a new need every nine working days (mean = 4 320 minutes) with a maximum of five arrivals in total. Each task had a distribution that matched its nature: more variable tasks like interviews followed a Negative Exponential distribution, while more structured ones like verification used a Truncated Normal.

The simulation showed that only **2 out of 5 (40%) hiring processes were completed** within the 45 working days. The outcome observed is a direct consequence of the Poisson process used to simulate the arrival of hiring needs. In a Poisson distribution, events (in this case, staffing needs) occur randomly over time. As a result, it's entirely plausible and expected that some of the latest hiring requests occur closer to the end of the simulation window.

In our specific case, the final hiring need was probably triggered on the 45th day, the very last day of the simulation. Naturally, this means that its corresponding process could not be completed within the timeframe as the simulation ends before it has time to run its course. We could have chosen to remove the time constraint and allow all hiring processes to reach completion, regardless of how long that would take. However, we intentionally limited the simulation to 45 working days to mirror a realistic operational window, such as a quarterly planning cycle, a project deadline, or a maximum acceptable time-to-hire target in real-world organizational contexts. This allows us to evaluate not only the dynamics of the process, but also its efficiency under time constraints, which is often a key performance indicator in HR and operations. In essence, the incomplete processes don't indicate a flaw in the model, they reflect realistic time limitations and the stochastic nature of the system we are modelling.

The average cycle time per completed instance was approximately 10h25m, with particularly long durations observed in tasks such as *Conduct the Interview* (1h53m), *Formalize the Contract* (1h33m) and *Define the Candidate Profile* (57m). These tasks are **heavily dependent on human involvement and lack standardization**, which contributes to the overall process inefficiency.

Despite these issues, **resource utilization remained low**:

- 1.47% for the HR Manager;
- 3.08% for HR Team Members;
- 7.30% for the Requesting Department.

These values reflect the **part-time engagement of these roles**, especially given the low number of process completions.

WHAT IF 1 – Increase the load to 20 instances

In the What-If 1 scenario, the only change introduced was an **increase in the maximum arrival count to 20 hiring needs**, simulating a more demanding workload. In this case, **eight out of sixteen instances were completed (50%)** within the same time window. Interestingly, the average cycle time slightly improved to 9h39m, suggesting that **the process absorbs a higher load without losing significant efficiency**. Although this might seem counterintuitive, several factors help explain it: with more frequent requests, process resources are utilized more consistently, reducing idle time and improving overall flow efficiency; the randomness of the Poisson arrival process may have caused requests to cluster earlier in the simulation, giving more processes a chance to start and finish sooner; and stochastic variability in the simulation may have contributed to slightly better performance in this particular run. Overall, the results suggest that the process can handle higher demand without a major loss in efficiency, but the time window remains a constraint, showing that not just process capacity, but also the timing of arrivals, plays a crucial role in performance outcomes.

However, maximum execution times increased, with one instance taking over 13h49m, highlighting that **some activities may accumulate delays under pressure**. The total execution time grew to 6 days, reflecting the higher number of completions and sustained resource engagement.

Activities such as *Review applications and shortlist candidates*, *Conduct the interview* and *Formalize the Contract* continued to demand substantial time, confirming their role as potential bottlenecks.

A newly observed activity exhibited a substantial increase in average execution time between the AS-IS and What-If 1 scenarios, **rising from 14 minutes to 1 hour and 32 minutes**. This severe escalation is likely attributed to **resource contention and increased task complexity under higher process volume**. In the AS-IS scenario, with fewer process instances, resource availability remained largely unchallenged, allowing the task to be completed swiftly. However, in the What-If 1 scenario, the greater number of simultaneous process instances appears to have introduced delays, potentially due to queue formation, prioritization issues, or longer processing due to cumulative complexity. This suggests that the activity in question is sensitive to workload increases and may become a bottleneck under pressure, warranting further analysis and potential optimization.

Resource utilization remained relatively balanced, with a slight increase for the HR Manager (1.49%) and stable or slightly reduced values for the HR Team (2.98%) and the Requesting Department (6.08%).

Overall, **the simulation shows that the process can scale to handle higher volumes** but also reveals the **need to optimize decision-heavy tasks** and **introduce automation** or support mechanisms to prevent performance degradation in high-demand scenarios.

With only 5 instances (AS IS), **a single long task can heavily skew the average**. In What If 1, with 16 instances, the average gets more stable due to the **Law of Large Numbers**. The average time got **closer to the true distribution mean** as the number of cases increased.

The results confirm that while the **current recruitment process can absorb increased demand** to a certain extent, it does so by **stretching resource availability** and exposing inefficiencies in tasks at later stages. These insights should guide future redesign efforts.

WHAT IF 2 – Automation of Some Tasks

Based on As-is Scenario with these changes:

Table 14 - Changes on What IF Scenario 2

Activity	Type of Distribution	Parameters	Justification
Elaborate a report	**Negative Exponential Distribution**	~~λ = 35 min~~ λ = 20 min	Given the adoption of standardized templates, the report preparation process is now more streamlined and requires less time,

			as the structure and required fields are predefined.
Verify the request	**Truncated Normal**	~~μ = 30~~ μ = 15 ~~σ = 10~~ σ = 5 Min=0 Max=1.000.000	The verification task has been simplified, as the use of templates ensures that most structural and content requirements are already met. The focus now lies primarily on validating the coherence and completeness of the submitted information.
Need more details? (Gateway)	N.A.	~~Yes - 70%~~ YES - 40% ~~No - 30%~~ NO - 60%	With the introduction of structured report templates, the likelihood of incomplete or unclear requests has decreased, reducing the need for follow-up clarification.
Add detail to the report	**Negative Exponential Distribution**	~~λ = 20~~ λ = 10	As reports are now submitted in a standardized format, the frequency and complexity of revisions have diminished, leading to a shorter average completion time for this task.

The transition from the AS-IS scenario to What If 2 involved partially automating some early tasks in the recruitment process, specifically *Elaborate a Report, Verify the Request* and *Add Detail to the Report*. **These changes led to a clear improvement in overall process efficiency**.

The average cycle time per completed instance dropped from 10h25m to 6h05m, mainly due to time reductions in the automated tasks.

- Elaborate a Report went from 53 minutes to 30 minutes;
- Verify the Request dropped from 28 minutes to 14 minutes;
- Add Detail to the Report was reduced from around 26 minutes to just 11 minutes.

These improvements not only made the process faster but **also reduced the workload on the teams involved**. The HR Team's utilization dropped from 3.08% to 2.07% and the Requesting Department also saw a decrease in effort, as some of their initial work was simplified or automated.

Although both scenarios had the same number of initiated processes (5) and completed the same number (2), What If 2 Scenario achieved this with **much less time and effort**. The main takeaway here is that **automating structured, repetitive tasks early in the process can have a big impact on execution time and resource efficiency**, even without enhancing throughput.

WHAT IF 3 – Automation of Some More Tasks

Based on What If 2 Scenario with this change:

Table 15 - Changes on What IF Scenario 3

Activity	Type of Distribution	Parameters	Justification
Identify the profile/ responsibilities needed	**Negative Exponential Distribution**	~~λ= 45 min~~ λ = 15 min	This task now relies on a predefined set of profiles, allowing the responsible party to select the most suitable option rather than defining the role from scratch. Although the activity still involves human judgment, it is significantly faster and more structured due to the availability of standardised role definitions.

The only change between these two scenarios was the automation of the Identify the Profile/Responsibilities Needed activity. The average time for this task dropped from 40 minutes to around 13 minutes, thanks to the use of predefined profiles and templates.

Even though it's **just one task**, this change led to a meaningful impact. The **average process time fell again**, from 6h05m to 5h35m, bringing the process even closer to high efficiency. **Resource usage** from the Requesting Department **also decreased** from 5.17% to 4.41%, since they are responsible for this task.

What this really shows is how **automating tasks with high human variability**, especially those based on judgment or case-by-case decisions, **can produce quick wins**, particularly when the work can be guided by **pre-approved templates or examples**.

The number of started and completed instances stayed the same, but everything was done **faster** and with **less pressure** on the people involved.

WHAT IF 4 – Automation + More Load

In this comparison, the only change (based on What If 3 Scenario) was **increasing the maximum number of recruitment requests** (Max Arrival Count) **from 5 to 20**, simulating a situation with higher demand, the same adjustment used in What If 1 but now on automated tasks.

With this change, 16 processes were started, compared to only 5 in the previous scenario. Still, the average time per process only increased slightly, from 5h35m to 7h18m, which shows that the process can scale up reasonably well, especially with automation in place. Moreover, when comparing What If 4 to What If 1 (both with the same maximum arrival count), we observe that the average time per process **decreased by approximately 2 hours**. This indicates that the improvements introduced in the earlier stages of the process are having a meaningful impact, **reducing overall workload** and **streamlining execution** even under higher demand.

This confirms that automation helped free up operational capacity, even under more pressure. **There were no signs of overload or severe bottlenecks**, which suggests the **process can handle busier periods**, as long as the current improvements are maintained.

Important Key Takeaways

In the simulations with a low number of process instances, such as the AS-IS and What If 2 and 3 scenarios, the activity *Modify or Remove What is Needed* consistently shows zero occurrences. This outcome is not due to a modelling error, but rather to the probabilistic structure of the process.

Specifically, this activity is only triggered when the gateway *Everything OK?* is answered with "No", which has a probability of 30%. In low-volume simulations (with 5 started instances), this branch may simply not be activated due to randomness, especially given the relatively low likelihood and the presence of multiple earlier gateways that also filter cases.

Therefore, the absence of data for this activity in smaller-scale scenarios reflects the natural variability of stochastic simulations and reinforces the importance of testing with higher volumes when analysing low-probability paths.

In conclusion, the simulation results confirm that automating early-stage tasks, such as reporting, request verification and profile identification, has a strong and measurable impact on both process efficiency and resource optimization. In particular, the automation of the *Identify Profile/Responsibilities* task proved especially beneficial, significantly reducing the workload for the requesting department by introducing structure and standardization. These targeted improvements not only shortened the average processing time per instance but also enhanced the scalability of the process. Even when the workload was tripled, the recruitment process maintained consistent performance without overwhelming key resources. Lastly, as more process instances were simulated, the average execution times stabilized, reflecting the effects of the law of large numbers and further reinforcing the robustness and reliability of the model.

ONBOARDING PROCESS

Although the Onboarding process and its respective subprocesses were fully modelled and analysed during the qualitative phase of this study, they were not included in the simulation phase due to limitations in the simulation tool. Bizagi's simulation engine does not support loop structures, which are critical for accurately representing the *Mensal Check-in* subprocess. This subprocess consists of recurring monthly activities over a six-month period and excluding this cycle would compromise the representativeness and reliability of the simulation results.

Moreover, the Onboarding process is inherently continuous and characterised by multiple, asynchronous start events triggered by different operational initiatives. For example, the IT team may deliver equipment and grant access on the employee's first day, which can occur several weeks or even months after the contract has been formalised. This temporal variability introduces additional complexity that cannot be reliably captured in simulation tools designed for linear, time-bounded workflows.

Given these constraints, it was concluded that simulating the Onboarding process would not generate meaningful or accurate insights.

4.4. PROCESS REDESIGN

Improving business processes involves more than simply identifying inefficiencies, it requires a structured and strategic approach to rethinking how work is done. Following the diagnosis and analysis of the current ("AS IS") processes presented in the previous chapters, this section focuses on redesigning the key processes under study. The goal is to reduce waste, improve execution time, ensure better use of resources and increase the value delivered to both internal stakeholders and final users. The redesign phase plays a critical role in the Business Process Management (BPM) lifecycle, acting as the bridge between identifying performance gaps and implementing tangible, sustainable improvements.

To assess the impact of the proposed process redesigns, each heuristic was analysed using the Devil's Quadrangle framework, which considers four critical performance dimensions: **Time**, **Cost**, **Quality** and **Flexibility**. A colour-coded system was adopted to visually summarize whether each dimension **Improves (green)**, has an **Ambiguous effect (yellow)**, **Worsens (red)**, or **No Effect (blue)**. This classification was applied qualitatively based on the nature of the change (e.g. automation, standardization, task elimination) and the context and maturity level of the organization.

Caption:

Improves	Ambiguous	Worsens	No Effect

The analysis that follows details which heuristics were considered applicable, how they would alter the process logic and what benefits or trade-offs are expected in terms of time, cost, quality and flexibility. This visual analysis complements the narrative interpretation of each redesign decision and provides a holistic view of how each change contributes to process performance. This structured evaluation supports the construction of an optimized TO BE model aligned with the company's operational maturity and strategic objectives.

4.4.1. HEURISTICS ANALYSIS

1. Several manual tasks, such as *Send report via email, Inform HR, Send to Requesting Area* in the recruitment process and *Share the plan with the person in scope* in the continuous evaluation process, can be eliminated through system automation. With the implementation of a workflow-based platform, once a task is completed, the system can automatically trigger the next activity and notify the relevant stakeholders. This removes the need for manual email exchanges, improves traceability and ensures that no information is lost. It also reduces waiting times and the need for manual follow-ups.

   Similarly, all status changes during the recruitment process can automatically generate system-triggered notifications to candidates, such as updates when they do not advance to the next stage. This improves the overall communication experience, ensures consistency and eliminates unnecessary steps.

   Applicable heuristics: Process Automation, Communication Optimization, Task Elimination

Time		Cost		Quality		Flexibility	
• Time improves due to automatic task routing and reduced delays. • Cost is ambiguous because of initial system investment. * • Quality improves thanks to consistent and traceable communications. • Flexibility worsens as the rigid system flow may limit spontaneous interaction.							

   ***Note:** From a cost perspective, the investment may appear ambiguous at first, as it concentrates in the early stages of deployment. However, the automation of activities ensures significant efficiency gains, reduction of manual effort and improved process consistency over time. This shift from manual to automated execution not only reduces operational costs in the long run but also enhances scalability and accuracy, making the transformation a strategically valuable initiative.

2. Tasks such as *Add Detail to the Report* and *Verify the Request* within the recruitment process can be partially automatable. The system can validate whether all required fields are correctly filled and verify structural completeness. However, qualitative review by an HR professional remains necessary, particularly for free-text content that requires interpretation. Therefore, while these activities are not fully eliminated,

automation significantly reduces the workload and the number of instances looping through manual validation.

Applicable heuristic: Process Automation (Partial)

<table>
<tr><th>Time</th><th></th><th>Cost</th><th></th><th>Quality</th><th></th><th>Flexibility</th><th></th></tr>
<tr><td colspan="8">• Time improves as system-driven validation of required fields and structure reduces the need for manual checks in many cases.
• Cost improves slightly, as the automation is limited in scope and requires relatively low development effort to implement basic rule-based validations.
• Quality is preserved, as critical assessments still rely on human judgment, ensuring accuracy and contextual interpretation where needed.
• Flexibility is only slightly affected, since although the system introduces fixed validation rules, the continued involvement of HR professionals ensures that the process remains adaptable to non-standard cases.</td></tr>
</table>

3. The task *Identify the Profile* was initially considered for automation through intelligent suggestions of standard descriptions and responsibilities based on historical data. However, given the current maturity level of the organization and the higher investment such a feature would require, it was concluded that a more feasible approach would be to allow users to select a predefined role from a standardized list and adapt it if necessary. This solution balances consistency and flexibility, while significantly reducing manual effort from the Requesting Department without requiring complex system capabilities.
   Likewise, *Elaborate the Report* can be simplified through the use of structured templates that auto-populate with predefined information such as role, urgency and location, minimizing manual input from HR.

Applicable heuristics: Standardization, Process Automation

<table>
<tr><th>Time</th><th></th><th>Cost</th><th></th><th>Quality</th><th></th><th>Flexibility</th><th></th></tr>
<tr><td colspan="8">• Time improves through reuse of existing profiles.
• Cost is ambiguous due to setup effort and system configuration and reduced resources’ effort.
• Quality improves via consistency across requests.
• Flexibility is ambiguous since it’s more rigid with a template but can improve as users can adapt templates to each case.</td></tr>
</table>

4. The task *Define the Candidate Profile* on the recruitment process can be eliminated, as the necessary parameters are already included in the system. After the HR team reviews and validates the information during the *Verify the Request* step, the profile becomes automatically ready for publication, removing the need for a separate, full definition of the candidate profile.

   Applicable heuristics: Task Elimination

Time		Cost		Quality		Flexibility	
• Time improves by removing a repetitive manual task, as predefined profiles eliminate the need to recreate role descriptions from scratch. • Cost is ambiguous, since while operational effort is reduced, it requires prior investment in configuring and maintaining the standardized profiles in the system. • Quality remains unaffected, as the profiles have already been validated during earlier stages and can still be adapted when needed, ensuring fit-for-purpose outputs. • Flexibility is also maintained, since the predefined profiles do not constrain runtime decision-making, users retain the ability to make contextual adjustments if necessary.							

5. With system integration, there is no longer a need to "send" the shortlist manually to the requesting department on the review applications and shortlist candidates subprocess. Stakeholders can access it directly through the platform. This eliminates a redundant communication step and improves flow. A similar optimization applies in the Mensal Check-In subprocess, where the report can be shared via system access rather than email.

   Applicable heuristics: Task Elimination, Communication Optimization

Time		Cost		Quality		Flexibility	
• Time improves by removing handovers. • Cost is ambiguous due to system implementation. • Quality improves through consistent availability of the information. • Flexibility worsens due to reliance on platform configuration.							

6. Automation in the Formalize the Contract subprocess offers significant improvements:
    a. The system can validate documentation automatically and block advancement if documents are missing (*eliminating the need for "Request Missing Documents"*);
    b. Contract templates can be auto generated with pre-filled data (e.g. role, agreed conditions), allowing for electronic signature and storage;
    c. Approvals can be managed via internal digital workflows.

Applicable heuristics: Process Automation, Communication Optimization, Task Elimination

Time		**Cost**		**Quality**		**Flexibility**	
• Time improves with faster validations, approvals and pre-filled contracts. • Cost is ambiguous due to investment in digital workflow tools. • Quality improves through controlled templates and e-signatures. • Flexibility worsens due to predefined document flows.							

7. Since candidate profiles are predefined during the recruitment phase, the *Attribute the Accesses* activity within the onboarding process can be fully automated. Once the contract is formalized, the system can automatically associate the individual with the appropriate user group, thereby triggering the provisioning of access rights and IT components without manual intervention. System-generated notifications also replace the need for manual requests to the IT team. These actions, consolidated into a single automated task, can run in parallel with the *Prepare Necessary Components* activity, effectively reducing lead time and improving Onboarding process.

Applicable heuristics: Process Automation, Resource Optimization, Parallelism

Time		**Cost**		**Quality**		**Flexibility**	
• Time improves by triggering access automatically and parallel tasks. • Cost is ambiguous due to integration setup. • Quality improves as access errors are minimized. • Flexibility worsens as the process depends on group-based roles already defined on the system.							

8. In the Continuous Evaluation subprocess, *replacing Excel files* with a centralized evaluation platform enables the automation of monthly updates, secure storage of evaluation records and system-generated milestone alerts (e.g. final evaluations after six months). Additionally, evaluations will now be aligned with predefined role profiles, enabling a more standardized and structured assessment process. This promotes consistency across evaluations and ensures that performance criteria are tailored to the expectations associated with each role. As a result, the task of manually *defining evaluation criteria* for each case can be eliminated, since these are now embedded within the system based on the assigned profile.

   Applicable heuristics: Standardization, Process Automation, Communication Optimization, Task Elimination

Time	(green)	Cost	(yellow)	Quality	(green)	Flexibility	(red)

- Time improves through automated reporting, milestone tracking and easier access to historical records.
- Cost is ambiguous, considering potential expenses for platform acquisition and configuration.
- Quality improves through central records, traceability and alignment with role-specific expectations.
- Flexibility slightly worsens, as the platform enforces structure and reduces the ability to adjust evaluation formats ad hoc, though this trade-off increases comparability and fairness across roles.

4.4.2. To-Be Redesign

Based on the detailed analysis of inefficiencies and improvement opportunities across the processes, a series of targeted redesign actions were implemented in the TO BE model. These improvements focused on the automation of manual activities, the elimination of redundant steps, the standardization of inputs and outputs and the integration of system-supported communication and validation mechanisms.

The redesigned process leverages workflow-based automation, system-triggered notifications, predefined templates and modular HR tools to reduce manual effort, improve data consistency and ensure better information traceability. As a result, many previously time-consuming tasks were either fully eliminated or significantly simplified.

All these changes culminate in the proposed To-Be models outlined below.

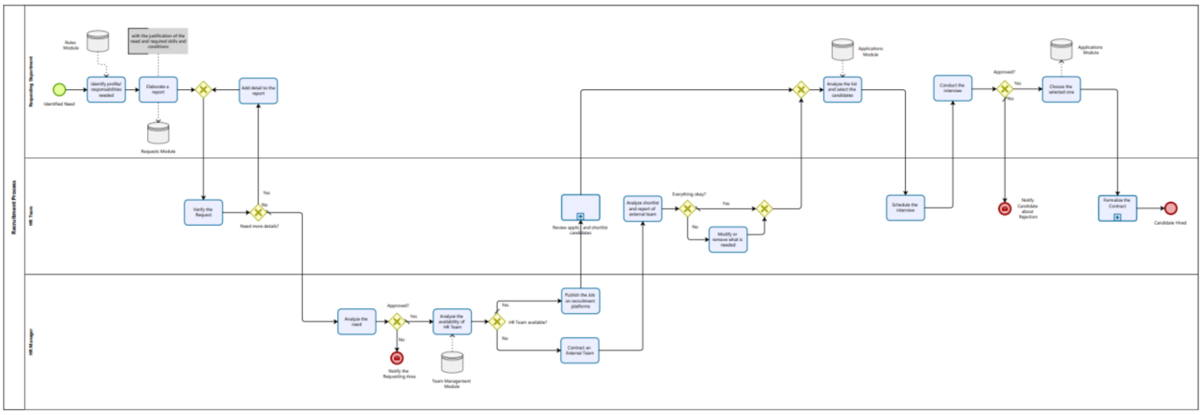

Figure 10 - To-Be Recruitment Process (Level 1)

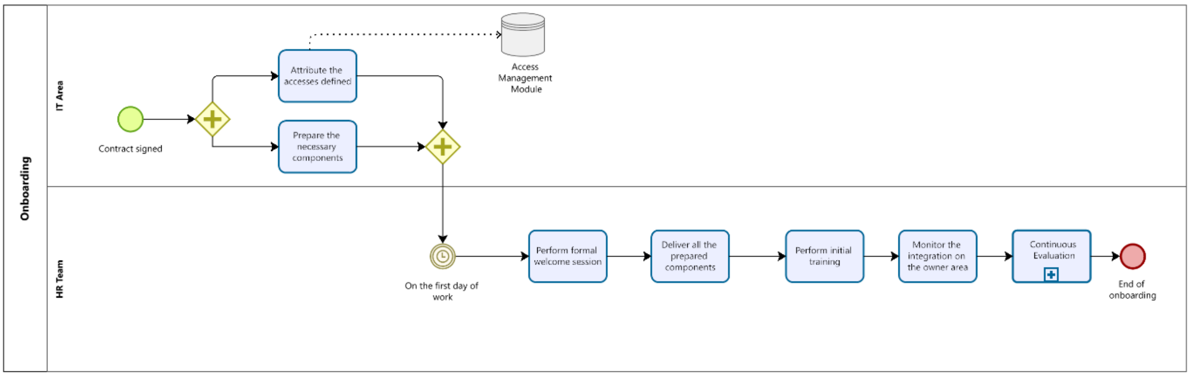

Figure 11 - To-Be Onboarding Process (Level 1)

In the TO BE model, only the Recruitment subprocess was simulated due to the limitations previously justified. Nevertheless, all activities classified as Non-Value Adding were eliminated and the Business-Value Adding activities were reviewed and adjusted to better align with the organization's operational and technological needs. Based on these changes, it can be concluded that the proposed improvements represent a significant improvement in the efficiency and consistency of the processes.

4.4.3. SIMULATION OF THE TO BE SCENARIO

Following the identification of inefficiencies and improvement opportunities in the AS IS model, a TO BE process was designed based on a set of redesign heuristics. This new model incorporates multiple optimization strategies such as automation of manual tasks, elimination of redundant activities, standardization of inputs through templates and the use of system-based validations and notifications. The objective was to streamline the recruitment process, reduce manual workload, improve response times and ensure greater consistency and traceability across process instances.

To assess the impact of the redesigned process, a discrete-event simulation was carried out using the same structural assumptions and patterns applied in the AS IS model. However, changes were introduced in task durations, distribution types and gateway probabilities to reflect the redesigned logic and expected efficiency gains. The simulation aimed to quantify the effects of the proposed changes in terms of execution time, resource utilization and process flow continuity for the Recruitment Process.

Table 16 - Time Analysis for To-Be Recruitment Process

Activity	Type of Distribution	Parameters	Justification
Identified Need	**Poisson**	1 / λ = 4320 Max. Arrival count= 5 needs	The need arises randomly and independently from previous ones. To configure the arrival patterns in the simulation, we applied a Poisson distribution to model both the identification of recruitment needs and the reception of candidate applications. Based on company data, we assumed an average of 5 recruitment needs (max arrival counts) across a 45-working-day simulation period. Considering that each working day has 8 hours (480 minutes), this results in 1 new hiring need every 9 days, or every 4320 minutes. Therefore, the interarrival time is set as 1/λ = 4320 minutes.
Identify the profile/ responsibilities needed	**Truncated Normal**	μ = 10 σ = 2 Min=0 Max=1.000.000	In the What-if Scenario 3, the use of predefined profile sets has already reduced the activity duration from 45 minutes to 15 minutes. However, considering that in the TO BE process all roles are now defined in the system and there are more effective ways to search for them, we could further reduce the time required. In this improved scenario, the task would consist only of selecting the most appropriate profile and making small adaptations when necessary. Since the activity has become more standardized and predictable, we have changed the distribution from exponential to normal.
Elaborate a report	**Truncated Normal**	μ = 15 σ = 5 Min=0 Max=1.000.000	The report is generated using structured templates that auto-populate key fields (e.g. role, location). This reduces manual input and standardizes outputs. The remaining effort consists of brief customization and validation. As a result, the activity becomes more

			predictable and less influenced by variability in request complexity.
Verify the request	**Truncated Normal**	μ = 10 σ = 2 Min=0 Max=1.000.000	With automated structural validation and defined templates, most corrections are avoided. Human effort is now focused only on qualitative aspects, making the activity more consistent and less exposed to large variations.
Need more details? (Gateway)	N.A.	Yes - 20% No - 80%	The system performs automatic validations to ensure data completeness and structure. Although semantic or context-specific inconsistencies may still require human review, most basic errors are eliminated upfront. As a result, the need to return the request for correction is significantly reduced, improving overall process efficiency and flow continuity. **Note:** The reduction in correction needs is even greater than what was tested in What-if Scenario 2, due to the additional implementation of automated system checks that go beyond the use of templates alone.
Add detail to the report	**Truncated Normal**	μ = 7 σ = 3 Min=0 Max=1.000.000	The system now provides predefined structures and validates required fields. Free-text content still needs human input, but overall complexity and rework are significantly reduced. Since the effort has become more predictable, a normal distribution better reflects the new behaviour.
Analyze the need	**Negative Exponential Distribution**	λ = 30	It may vary depending on the complexity and clarity of the need/profile.
Approved? (Gateway)	N.A.	Yes - 80% No - 20%	Most requests are legitimate, but some are blocked due to lack of urgency or resource/budget constraints.
Analyze the availability of the HR Team	**Truncated Normal**	μ = 20 σ = 5 Min=0 Max=1.000.000	Availability check is based on workload and task assignment. This is relatively standardized and involves **checking the team management module on the system**.
HR Team available? (Gateway)	N.A.	Yes – 60% No – 40%	The company has limited resources (a small HR Team to ~120 employees). The HR team often relies on outsourcing, especially during peak

			periods or when they are managing other responsibilities such as payroll processing.
Publish the job on recruitment platforms	**Truncated Normal**	μ = 15 σ = 5 Min=0 Max=1.000.000	All requirements and candidate profiles are already defined and tailored to the position, so all that it's needed is to publish the position following a standard routine, ensuring that execution time remains stable.
Review applications and shortlist candidates	**Negative Exponential Distribution**	λ = 86,75	Variable, depending on the number and quality of candidates and the report submitted. CT=20+0,35*15+0,9*60+0,5*15=86,75 These values are derived from the following breakdown: • Analyze the CV: 20min • Fit on the profile: YES - 35%; NO - 65% • Contact to schedule interview: 15min • Keep interest: YES – 90%; NO – 10% • Conduct the interview: 60min • Pass the interview: YES- 60%; NO-40% • Add the profile to the shortlist of candidates: 15min
Contact an external team	**Truncated Normal**	μ = 25 σ = 10 Min=0 Max=1.000.000	There are predefined recruitment partners. The process is relatively standardized, with minimal variation in execution.
Analyze the shortlist and report of the external team	**Negative Exponential Distribution**	λ = 60	Analysis of external candidate reports is highly variable. Time depends on candidate quality and the thoroughness of the external team's assessment.
Everything okay? (Gateway)	N.A.	Yes - 70% No - 30%	Since they are usually predefined partners with whom they have worked before, reports tend to be in line with what is intended and expected.
Modify or remove what is needed	**Negative Exponential Distribution**	λ = 30	Variable, depending on the number and quality of candidates and the report submitted.
Analyze the list and the selected candidates	**Negative Exponential Distribution**	λ = 60	Variable, depending on the number and quality of candidates and the report submitted.

Schedule the interview	**Truncated Normal**	μ = 15 σ = 5 Min=0 Max=1.000.000	It may involve variable waiting times or even require multiple attempts to successfully schedule the meeting. However, the time associated with this task is not considered highly variable, as the estimated duration already includes a buffer to account for potential follow-up calls or coordination efforts.
Conduct the interview	**Negative Exponential Distribution**	λ = 60	Interview duration is highly variable. It depends on the candidate's profile, the depth of questions, and the overall flow of the conversation.
Approved? (Gateway)	N.A.	Yes - 30% No - 70%	In the final interview stage, candidates are usually well-aligned with the job requirements. The approval rate is high, especially in internal recruitment with few candidates per position.
Choose the selected one	**Negative Exponential Distribution**	λ = 30	It represents a decision-making activity whose duration varies significantly depending on the number and quality of the shortlisted candidates, since it depends a lot on human judgment. This step may require alignment between team members, review of previous interview notes or even discussion with the HR team.
Formalize the Contract	**Truncated Normal**	μ = 76,38 σ = 10 Min=0 Max=1.000.000	Requires data and documentation verification but follows a well-defined routine. CT=15+0,9*25+0,8*(10+20+**15**)+ 0,2*0,25*(**10**+0,25*10+ 0,75*(15+10+20+**15**))≈76,38min These values are derived from the following breakdown: • Contact the selected candidate: 15min • Candidate Keep interest: YES - 90%; NO - 10% • Inform candidate about conditions: 25min • Candidate accepted: YES - 80%; NO - 20% • Salary problems: YES - 25%; NO - 75% • **Request internal approval for salary adjustments: 10min (The activity is now executed directly through the system, which centralizes the request and provides a standard approval flow)** • Adjustments Approved: YES - 75%; NO - 25%

			• Inform Candidate (in case of rejection): 10min • Inform Candidate about new conditions: 15min • Confirm candidate acceptance and request required documents: 10min • Verify all the documentation: 20min • **Finalize the contract: 15 min (The contract is auto-generated with pre-filled data and signed electronically, eliminating manual steps. This reduces the time as only a brief review and some information are required)**

Table 17 - Resource Utilization

Activity	Resource
Identify the profile/ responsibilities needed	**Requesting Department**
Elaborate a report	**Requesting Department**
Verify the request	**HR Team**
Add detail to the report	**Requesting Department**
Analyze the need	**HR Manager**
Analyze the availability of the HR Team	**HR Manager**
Publish the job on recruitment platforms	**HR Manager**
Review applications and shortlist candidates	**HR Team**
Contact an external team	**HR Manager**
Analyze the shortlist and report of the external team	**HR Team**
Modify or remove what is needed	**HR Team**
Analyze the list and the selected candidates	**Requesting Department**
Schedule the interview	**HR Team**

Conduct the interview	**Requesting Department**
Choose the selected one	**Requesting Department**
Formalize the Contract	**HR Team**

5. RESULTS AND DISCUSSION

5.1. THEORETICAL IMPLICATIONS

This case study offers meaningful implications for Business Process Management (BPM) theory by situating a BPM project in a context that differs from most prior studies. Many documented BPM initiatives involve large and more mature organizations and focus on core, customer-facing processes like claims handling or production workflows. In contrast, the present project applied the BPM lifecycle (Dumas et al., 2018) to a medium-sized insurance intermediary's HR process, an internal support function. This focus addresses a noted gap in literature: although BPM research often emphasizes primary processes, support processes such as human resources are fundamental to long-term organizational success.

Previous work on the insurance sector has largely focused on front-office improvements and the digital transformation of established companies, while our study shows that back-office processes in smaller companies also have a decisive influence on performance. By targeting recruitment and onboarding, we respond to calls in the literature to extend BPM's scope beyond revenue-generating operations and into human capital management, which is known to impact productivity and service quality (Bilan et al., 2020; Kuswanto, 2024). This comparative perspective underlines that BPM's benefits are not exclusive to big corporations or core processes, supporting the view that even mid-sized companies can leverage BPM for strategic advantage. According to Vukšić et al. (2015), smaller insurers often struggle with process optimization due to limited resources and expertise. Our project provides a counterpoint by showing that a structured BPM approach, when carefully scaled to the organization's context, can overcome these constraints.

Moreover, the project's approach and outcomes extend existing BPM knowledge by illustrating how classical BPM frameworks can be successfully adapted to different organizational settings. We followed the BPM lifecycle model outlined by Dumas et al. (2018), demonstrating its practical applicability in a mid-sized enterprise environment. This confirms that the BPM lifecycle's phases remain effective even outside large corporate backgrounds.

Importantly, we adhered to BPM principles such as context awareness and stakeholder involvement. Dumas et al. (2018) emphasize that BPM initiatives should be fitted to the organizational context rather than applied as a one-size-fits-all recipe. In line with this principle, our project was adapted to the company's specific needs and limitations. This adaptive application of BPM theory is a notable contribution: it shows that BPM methodologies are flexible and can yield results in less mature, resource-constrained settings when appropriately customized. The success of the redesign (including reduced hiring cycle times and improved onboarding consistency) reinforces the argument that even modest process improvements can translate into significant organizational benefits, reflecting a wider BPM literature on process efficiency and business performance.

Finally, this work contributes to the broader BPM and process improvement literature by providing an empirical example of process transformation in the insurance industry's HR domain. Prior research has highlighted the importance of aligning internal processes with strategic goals, especially under pressures of digital change.

Our findings encourage this view, showing that streamlining HR processes can enhance agility and service quality in a competitive, regulated sector. Furthermore, the project's recommendations, such as integrating a dedicated HR management tool with the existing ERP system, reinforce theoretical concepts about BPM success factors. Hammer's Process and Enterprise Maturity Model (PEMM) suggests that adequate IT infrastructure, clear process ownership and defined metrics are critical enablers of sustained improvement. In line with this, the redesigned process introduced automation infrastructure, reassigned process responsibility and established measurable indicators for performance. This supports the idea that process redesign must be embedded in organizational capability to ensure long-term results. (Hammer, 2007)

In sum, this case study broadens the empirical evidence base for BPM by documenting how a comprehensive BPM effort can be executed in a mid-sized firm and in a support-process context. It validates that fundamental BPM concepts, from lifecycle methodology to the emphasis on process metrics (qualitative and quantitative), hold true across different scales and domains. By doing so, the project advances the literature on BPM in two ways:

- By exploring BPM applications in a smaller insurance intermediary (an area previously under-represented in case studies);
- By highlighting the often "ignored" impact of HR process improvement on organizational performance.

These theoretical insights encourage researchers and practitioners to apply BPM more holistically, ensuring that even support functions are included in process optimization initiatives for comprehensive organizational development.

5.2. PRATICAL IMPLICATIONS: AS-IS VS. TO-BE ANALYSIS

Table 18 - Comparative Time Analysis As Is vs. To Be

Activity	Scenario	Instances Started	Instances Completed	Avg. Time	Total Time
Recruitment Process	AS IS	5	2	**10h24m54s**	1d20h33m4s

	TO BE	5	5	**4h7m49s**	20h39m6s
Identify the profile/ responsibilities needed	AS IS	5	5	40m16s	3h21m22s
	TO BE	5	5	9m20s	46m40s
Elaborate a report	AS IS	5	5	53m30s	4h27m31s
	TO BE	5	5	14m5s	1h10m26s
Verify the request	AS IS	17	17	28m18s	8h1m18s
	TO BE	5	5	8m54s	44m32s
Add detail to the report	AS IS	12	12	25m55s	5h11m5s
	TO BE	0	0	0	0
Define the candidate profile	AS IS	5	5	57m51s	4h49m15s
Analyze the need	AS IS	5	5	26m44s	2h13m40s
	TO BE	5	5	26m44s	2h13m40s
Analyze the availability of the HR Team	AS IS	4	4	14m21s	57m25s
	TO BE	4	4	23m51s	1h35m25s
Publish the job on recruitment platforms	AS IS	3	3	15m56s	47m48s
	TO BE	2	2	16m18s	32m36s
Review applications and shortlist candidates	AS IS	3	3	1h2m23s	3h7m10s
	TO BE	2	2	1h10m46s	2h21m33s
Contact an external team	AS IS	1	1	25m4s	25m4s
	TO BE	2	2	20m26s	40m53s
Analyze the shortlist and report of the external team	AS IS	1	1	14m28s	14m28s
	TO BE	2	2	1h9m18s	2h18m36s
Modify or remove what is needed	AS IS	0	0	0	0
	TO BE	0	0	0	0
Analyze the list and the selected candidates	AS IS	4	4	17m10s	1h8m43s
	TO BE	4	4	36m3s	2h24m15s
Schedule the interview	AS IS	4	4	8m58s	35m53s
	TO BE	4	4	14m44s	58m56s
Conduct the interview	AS IS	4	4	1h53m28s	7h33m54s
	TO BE	4	4	46m14s	3h4m58s
Choose the selected one	AS IS	1	1	5m5s	5m5s
	TO BE	1	1	10m11s	10m11s
Formalize the Contract	AS IS	1	1	1h33m13s	1h33m13s
	TO BE	1	1	1h36m18s	1h36m18s

The simulation results reveal a **significant improvement in overall process performance** when transitioning from the AS IS to the TO BE scenario. The average total duration of the recruitment process per instance decreased from 10h24m in the AS IS to 4h07m in the TO BE scenario. This reduction reflects the positive impact of several process redesign measures.

At the individual task level, several activities show a marked reduction in execution time in the TO BE model. For example, *Identify the profile/responsibilities needed* was reduced from 40m to under 10m, *Elaborate the Report* from 53m to 14m and *Verify the request* from 28m to approximately 9m. These improvements are directly associated with the introduction of structured data fields, predefined profiles and automatic completeness checks, which reduce manual effort and variability.

However, the TO BE model also shows increased average durations in some downstream activities, such as *Analyze the shortlist and report of the external team* as the most problematic, *Analyze the selected candidates* and *Schedule the interview*. While at first these increases may appear counterintuitive, they are a natural outcome of the improved upstream process quality.

Even though the simulation parameters for these tasks remained stable (in terms of distributions and instance count), the reduction in rework and early exits from the process results in more process instances reaching the later stages. In the AS IS scenario, many instances were redirected early due to missing information or invalid requests. In contrast, the TO BE model ensures that a greater proportion of cases proceed efficiently through the full process, increasing the volume and visibility of downstream tasks.

Additionally, the concentration of process flow in later stages can lead to temporary resource contention (e.g. when multiple cases require HR input at the same time), which may slightly inflate the observed average durations, even if the configured task durations remain unchanged.

In summary, the simulation confirms that the TO BE scenario successfully improve the recruitment process, reducing overall time and manual effort while ensuring greater consistency and completeness. The increased duration of some activities should be interpreted not as inefficiency, but as a reflection of improved process continuity, standardization and decision support.

Table 19 - Comparative Resource Utilization As Is vs. To Be

Scenario	Resource Utilization
AS IS	1.47% HR Manager 3.08% HR Team Member 7.30% Requesting Department Manager
TO BE	1.75% HR Manager 1.39% HR Team Member 2.64% Requesting Department Manager

Although the TO BE process significantly reduced the overall time and effort required to complete the recruitment process, the simulation results show a slight increase in the HR Manager's utilization (from 1.47% to 1.75%) and a notable decrease in the utilization of both the HR Team Member (from 3.08% to 1.39%) and the Requesting Department Manager (from 7.30% to 2.64%).

This shift can be explained by the redistribution of responsibilities in the redesigned process. In the TO BE scenario:

- Automation and standardization eliminated many manual and repetitive tasks previously handled by HR team members and the requesting department. Tasks such as sending emails, filling in reports from scratch, and manually coordinating status updates were either eliminated or fully automated.
- Structured workflows and predefined templates reduced the need for extensive back-and-forth communication, particularly affecting the Requesting Department Manager, whose role is now more focused on validation than creation or coordination.
- On the other hand, the HR Manager's slightly increased utilization is likely due to their role being more concentrated on higher-value decision points that remain manual (e.g. approvals, choose if external or internal team). Since the process is now more efficient, more cases reach those decision points efficiently, thus increasing their frequency of involvement.

Overall, the TO BE model leads to a reduction in total workload by automating operational tasks and eliminating manual handovers. While the HR Manager's utilization slightly increases, this reflects a shift towards more frequent, but less time-intensive, strategic interventions. As a result, roles such as the HR Team Member and the Requesting Department Manager experience a substantial decrease in involvement and the overall effort across the process is significantly reduced.

5.3. Financial Analysis

To complement the simulation-based performance assessment, a financial analysis was conducted to evaluate the economic viability of the proposed TO BE model. While process efficiency and user experience are critical success factors, understanding the financial implications, both in terms of initial investment and long-term cost savings, is essential to support decision-making and justify the implementation.

Implementing the redesigned process requires an upfront investment in technology and change management. This includes the setup of workflow automation tools, system integrations, digital approval mechanisms and the development of templates and validations. In addition, training efforts may be necessary to support adoption and ensure proper usage. This section outlines the main components of this initial investment.

In 2024, it was announced that the company would implement the Iluni, an Integrated Insurance Management Software, across its operations, optimizing core business functions and data management. However, Iluni's native modules do not yet include HR modules such as workflow automation, structured templates, access provisioning and continuous evaluation. To achieve the TO BE model's desired level of automation and efficiency within HR, it is therefore necessary to consider complementary solutions compatible with Iluni through standard integration mechanisms such as APIs or middleware platforms.

The solutions analysed vary in scope, pricing and complexity, ranging from lightweight HR suites to full-featured enterprise-grade platforms. The selection criteria focused on the following capabilities:

- Automation of recruitment and onboarding workflows;
- Predefined role templates and document generation;
- Electronic signature and digital approval routing;
- System-triggered notifications and status updates;
- Performance management;
- Compatibility with Iluni ERP via standard connectors.

The following table summarizes the most relevant options, their key features, estimated costs and integration feasibility with the existing Iluni environment.

Table 20 - HR Complementary Solutions Comparison

Solution	Key Functionalities	Integration with Iluni ERP	Estimated Cost (Setup + Year 1)*
Zoho People	• Custom workflows for recruitment and onboarding; • Predefined document templates and automation; • Built-in e-signature tools; • Leave, attendance and performance management; • Notifications and status tracking.	• REST API available for standard data exchange; • Integration via middleware for systems without native connectors; • Easy to configure and suitable for smaller-scale implementations	• **Setup cost:** estimated between €5 000 and €8 000 • **Licensing cost:** €3 × 100 users × 12 months = €3600/year • **Total Year 1 Cost:** €8 600 - €11 600
SAP SuccessFactors	• End-to-end recruitment and onboarding automation; • Job profile and contract templates; • Digital signature integration; • Learning and performance management; • Role-based access and HR analytics.	• APIs available through SAP Business Technology Platform (BTP); • Integration with third-party systems using SAP Integration Suite; • Requires configuration but ensures enterprise-	• **Licensing cost:** $33 × 100 users × 12 months = $39 600 ≈ €37 224/year • **Setup cost:** 100% to 125% of annual licensing = €37 224 - €46 530 • **Total Year 1 Cost:** €74 448 - €83 754

		grade data security and alignment.	
Workday HCM	• Full employee lifecycle management (recruit to retire); • Digital hiring processes with automated contracts; • Workflow triggers and task orchestration; • Goal setting, performance reviews and feedback cycles; • Advanced reporting and analytics.	• REST and SOAP APIs provided; • Integration is possible through Workday Studio or middleware platforms; • Strong data governance and flexibility but requires more effort to implement.	• **Licensing cost:** \$38 × 100 users × 12 months = \$45 600 ≈ €42 864/year • **Setup cost:** Assumed to be 100% of annual licensing = €42 864 • **Total Year 1 Cost:** €85 728

***Assumptions made to support the cost estimation:**

- The company has approximately 100 users requiring access to the HR system.
- Annual licensing costs are calculated using publicly available average price ranges per user.
- Setup costs include configuration, template creation, training and basic integration with Iluni ERP.
- Currency conversion used: 1 USD ≈ 0.94 EUR.
- The estimation was based on available pricing data from vendor websites and industry sources. For Zoho People and SAP SuccessFactors Core HR, the pricing was taken directly from their official websites, using values updated for 2025. (SAP, 2025; Zoho People, 2025)However, since the SAP Core HR package alone did not cover the set of functionalities required for the To-Be process, particularly those related to recruitment and onboarding, we considered the Talent Management add-on package to provide an equivalent scope. For this reason, the final pricing estimation for SAP (with Talent Management) and Workday was based on figures published in a 2024 industry article, which offered comparable pricing benchmarks for both platforms.(Ungashick, 2024a, 2024b)

The cost estimates presented in this analysis assume a mid-tier licensing package (e.g. Zoho Premium, SAP Core HR), offering a balanced set of functionalities for recruitment, onboarding and performance management. However, actual costs may vary depending on several factors, including the selected feature package, the implementation partner, external consulting involvement and integration or middleware fees.

Considering the investment required to achieve the desired level of automation in HR processes, three complementary solutions were analysed: Zoho People, SAP SuccessFactors and Workday HCM. The estimated Year 1 costs vary significantly, ranging from approximately €8 600 to over €85 000 depending on the platform.

From a functional perspective, all three solutions support the key requirements identified in the TO BE model, including workflow automation, predefined templates, digital signatures and performance management. However, when evaluating feasibility and suitability for a mid-sized insurance intermediary, several practical factors must be considered.

Given that the company does not operate within a SAP ecosystem and has a moderate level of digital maturity, enterprise-grade solutions such as SAP SuccessFactors and Workday HCM may introduce unnecessary complexity, long implementation timelines and disproportionately high costs. These platforms, while powerful, are more appropriate for large-scale organizations with advanced IT structures and larger budgets.

On the other hand, Zoho People offers a lighter and more accessible alternative, providing all core functionalities at a fraction of the cost and with simpler integration via standard APIs or middleware. Its total cost for the first year, including licensing and setup, remains below €12000, making it the most cost-effective and proportionate option for this company's context.

Beyond financial considerations, the redesigned process significantly improves operational efficiency. Simulation results show a notable reduction in workload across key roles: resource utilization dropped from 7.3% to 2.6% for the requesting department and from 3.1% to 1.4% for the HR team. This means less time spent on manual, repetitive tasks and more time available for strategic or value-added activities.

Moreover, adopting a digital HR system enhances visibility and control. Employees and managers can now track the process status at any time, reducing dependency on email chains and avoiding lost or delayed communications. Tasks are clearly assigned, deadlines are monitored and notifications are automatic, creating a more transparent and accountable environment.

In conclusion, implementing a solution like Zoho People not only ensures financial sustainability and ease of integration but also empowers the organization with better process visibility, fewer errors and improved collaboration, ensuring, ensuring the right balance between capability, effort and investment.

5.4. LIMITATIONS AND FUTURE RESEARCH

While this study provides valuable insights into process improvement within the HR domain, several limitations must be recognized.

First, although the Onboarding process and its subprocesses were fully analysed and modelled during the qualitative phase, they were not included in the simulation phase. This was primarily due to technical constraints associated with the Bizagi simulation engine. Bizagi does not support loop structures, which are essential to faithfully representing the Mensal Check-in subprocess. Since this subprocess involves recurring monthly activities over a six-month period, excluding repetition would compromise both the accuracy and usefulness of the simulation results.

Moreover, the Onboarding process is non-linear and asynchronous by nature, with multiple starting points triggered by different operational teams. For example, IT-related activities such as equipment delivery and access provisioning may occur on the employee's first working day, which could take place weeks or even months after contract formalization. This type of temporal variability introduces a level of complexity that exceeds the capabilities of typical process simulation tools, which are designed for linear and well-defined flows.

As highlighted by Dumas et al. (2018), simulation assumes that process participants behave mechanically. However, people are not robots, they are subject to distractions, varying energy levels, multitasking, interruptions and they adapt differently to new ways of working. These human factors cannot be easily captured by simulation models. In our case, additional limitations of the Bizagi tool include its sequential logic (requiring one activity to be completed across all instances before proceeding) and its inability to simulate asynchronous flows, which further reduces the realism of the model.

Furthermore, stochastic behavior means that simulation results may vary across runs, even under identical configurations. The reliability of the output is also highly dependent on the accuracy of the input data, and poor data quality can severely affect results. In our simulations, waiting times and variation in execution times were not modelled precisely, for example, a task performed in 30 seconds today may take 2 minutes tomorrow, but simulations rely on average or fixed values that overlook this variability.

Beyond simulation-specific constraints, the study was also limited by the reliance on a specific modelling tool. While this tools offer advanced process visualization and analysis features, its use may not be feasible in all organizational contexts, particularly in companies with different technical infrastructures or maturity levels (W. Van der Aalst, 2016).

Another important limitation is the exclusion of the implementation and monitoring phases. This study focused on process analysis and redesign, stopping short of assessing the actual deployment and long-term performance of the TO BE model. Although the study outlines actionable recommendations and system requirements, the success of implementation will ultimately depend on the company's internal leadership, change management capabilities and resource availability (Dumas et al., 2018).

Finally, as in most BPM initiatives, some constraints emerged from the data and the process identification phase itself. Despite efforts to clearly define scope and involve relevant stakeholders, challenges such as ambiguous process boundaries, inconsistencies between documentation and actual practice, and data constraints may have affected the precision of certain process representations. These issues are widely acknowledged in BPM literature, particularly in the context of evidence-based discovery and stakeholder engagement. (Dumas et al., 2018; W. Van der Aalst, 2016)

Future Work From an academic perspective, this research contributes to the growing body of BPM literature in the context of small and medium-sized enterprises, a segment often underrepresented in empirical BPM studies. It reinforces the adaptability of the BPM lifecycle to organizations with constrained resources and highlights the potential of human-centric, low-tech improvements to drive process maturity.

5.4.1. FUTURE WORK

This project focused on analyzing and improving recruitment and onboarding processes, but there are still several areas that could be explored in the future. One important next step would be to simulate the Onboarding process, which was not included in the simulation due to technical limitations in the tool used. If more advanced simulation tools become available, ones that support cycles and flexible workflows, it would be valuable to simulate the Onboarding process to better understand its impact and identify further improvements.

Another important area for future work is the implementation and monitoring of the redesigned process. While this study provides clear models and recommendations, the success of the changes depends on how well the company can apply them in real life. Future studies could follow the implementation phase and evaluate how effective and sustainable the changes are over time and how employees adapt to the new way of working.

Future work could also expand the scope to include other HR processes, such as training and development, compensation and benefits, workforce planning or HR analytics. These processes are often closely linked to recruitment and onboarding and optimizing them together could bring greater benefits.

By exploring these areas, future projects can build on this work and contribute more to both the academic field and real-world practice in business process management.

6. CONCLUSIONS

This thesis demonstrates how the structured application of the Business Process Management lifecycle can significantly improve internal operations in a medium-sized insurance intermediary. Through the detailed analysis and redesign of the Recruitment and Onboarding processes, the study showed that even support functions, often overlooked in BPM initiatives, can produce substantial gains in efficiency, responsiveness and quality of service.

By applying both qualitative and quantitative methods, including value-added and waste analysis, heuristic redesign principles and simulation-based validation, it was possible to identify critical inefficiencies and propose realistic, low-disruption improvements. The To-Be models presented not only reduced process duration and resource usage but also opened the way for increased standardization, transparency and better employee experiences. The simulation results validated the effectiveness of the proposed changes, illustrating that targeted automation and process simplification can deliver measurable operational gains, even with limited technological investment.

From an academic perspective, this research contributes to the growing body of BPM literature in the context of small and medium-sized enterprises, a segment often underrepresented in empirical BPM studies.

From a practical standpoint, the recommendations outlined in this study are actionable and tailored to the company's current technological and organizational reality. Although implementation and monitoring were beyond the scope of this project, the redesigned models and simulated impacts provide a solid foundation for future operational improvements. If adopted, these changes could free up valuable HR and managerial time, reduce hiring lead times and improve employee integration and retention, critical success factors for companies in a competitive, people-driven sector such as insurance intermediation.

Finally, this work opens avenues for further research and application. Future studies could expand the BPM initiative to other support or core processes, implement the redesigned models in practice and explore the integration of emerging tools like HRIS platforms or RPA. The alignment between BPM and digital transformation remains a promising path for smaller firms aiming to professionalize their internal operations without compromising flexibility or customer proximity.

In conclusion, the research confirms that structured process management is not a luxury reserved for large corporations. On the contrary, for medium-sized players navigating increasing complexity, BPM offers a powerful lever for achieving operational excellence and strategic agility.

BIBLIOGRAPHICAL REFERENCES

Agostinelli, S., Marrella, A., & Mecella, M. (2020). *Towards Intelligent Robotic Process Automation for BPMers*. https://www.researchgate.net/publication/338401505_Towards_Intelligent_Robotic_Process_Automation_for_BPMers

Bilan, Y., Mishchuk, H., Roshchyk, I., & Joshi, O. (2020). Hiring and retaining skilled employees in smes: Problems in human resource practices and links with organizational success. *Business: Theory and Practice*, *21*(2), 780–791. https://doi.org/10.3846/btp.2020.12750

Conger, S. (2010). Six Sigma and Business Process Management. Em *Handbook on Business Process Management 1* (pp. 127–148). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-00416-2_6

Davenport, T. H. (1993). *Process Innovation: Reengineering Work Through Information Technology - Thomas H. Davenport - Google Livros*. https://books.google.pt/books?hl=pt-PT&lr=&id=kLlIOMGaKnsC&oi=fnd&pg=PR9&dq=Reengineering+Work+through+Information+Technology&ots=_9jOZAgyzf&sig=lPyjNcplRNKxLuWewdTlTMH5jiQ&redir_esc=y#v=onepage&q=Reengineering%20Work%20through%20Information%20Technology&f=false

Duane, A. (2022). *Digital Disruption of the Insurance Industry: The Incumbents Perspective International Journal of Economics, Commerce and Management DIGITAL DISRUPTION OF THE INSURANCE INDUSTRY IN EUROPE: THE INCUMBENTS PERSPECTIVE*. https://www.researchgate.net/publication/361617898_Digital_Disruption_of_the_Insurance_Industry_The_Incumbents_Perspective

Dumas, M., Rosa, M. La, Mendling, J., & Reijers, H. A. (2018). *Fundamentals of Business Process Management*. https://link.springer.com/content/pdf/10.1007/978-3-662-56509-4.pdf

Gerald J. Langley, Ronald Moen, K. M. N., Thomas W. Nolan, Clifford L. Norman, & Lloyd P. Provost. (2009). *The Improvement Guide: A Practical Approach to Enhancing Organizational Performance*. https://books.google.pt/books?id=kE4aEnZgBO8C&pg=PA22&hl=pt-PT&source=gbs_selected_pages&cad=1#v=onepage&q&f=false

Hammer, M. (2007). *The Process Audit*. Harvard Business Review. https://hbr.org/2007/04/the-process-audit

Hammer, M. (2015). What is business process management? *Handbook on Business Process Management 1: Introduction, Methods, and Information Systems*, 3–16. https://doi.org/10.1007/978-3-642-45100-3_1

Hammer, M., & Champy, J. (1993). *REENGINEERING THE CORPORATION A MANIFESTO FOR BUSINESS REVOLUTION*. https://books.google.pt/books?hl=pt-PT&lr=&id=mjvGTXgFl6cC&oi=fnd&pg=PA1&dq=REENGINEERING+THE+CORPORATION+A+MANIFESTO+FOR+BUSINESS+REVOLUTION.&ots=QNCSsmm8B9&sig=92i1ygQaeUmtedXaD0Ic01Ddcro&redir_esc=y#v=onepage&q=REENGINEERING%20THE%20CORPORATION%20A%20MANIFESTO%20FOR%20BUSINESS%20REVOLUTION.&f=false

Harmon, P. (2010). The Scope and Evolution of Business Process Management. Em *Handbook on Business Process Management 1* (pp. 37–81). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-00416-2_3

Harmon, P. (2019). *Business process change: a business process management guide for managers and process professionals*. https://books.google.com/books?hl=en&lr=&id=S-WKDwAAQBAJ&oi=fnd&pg=PP1&ots=pH2DVZY0F8&sig=jmJJ9kQA2SGiFmCbl3hNB0BSiWo

John Jeston, & Johan Nelis. (2006). *Business Process Management: Practical Guidelines to Successful Implementations*. https://industri.fatek.unpatti.ac.id/wp-content/uploads/2019/03/Business-Process-Management-Practical-Guidelines-0750669217-1.pdf

Kuswanto, A. (2024). Insurance Human Capital Development: Literature Review. *East African Scholars Journal of Economics, Business and Management*, *7*(03), 72–85. https://doi.org/10.36349/easjebm.2024.v07i03.007

Martin F. Grace, & Robert W. Klein. (2009). *The Future of Insurance Regulation: An Introduction*. https://www.brookings.edu/wp-content/uploads/2016/07/futureofinsuranceregulation_chapter.pdf

Martínez S, Errasti A, & Ja, A. (2012). *Lean-Six Sigma approach put into practice in an empirical study*. http://www.adingor.es/congresos/web/uploads/cio/cio2012/EN_10_Lean_Management_and_Continuous_Improvement/691-698.pdf

Moen, R., & Norman, C. (2009). *Evolution of the PDCA Cycle*. https://www.researchgate.net/publication/228475044_Evolution_of_the_PDCA_cycle

Monday, L. M. (2022). Define, Measure, Analyze, Improve, Control (DMAIC) Methodology as a Roadmap in Quality Improvement. *Global Journal on Quality and Safety in Healthcare*, *5*(2), 44–46. https://doi.org/10.36401/jqsh-22-x2

Paulk, M. C., Curtis, B., Chrissis, M. B., & Weber, C. V. (1993). *Capability Maturity Model SM for Software, Version 1.1*. https://www.researchgate.net/publication/258968273_Capability_Maturity_Model_for_Software_Version_11

Salah, S., Carretero, J. A., & Rahim, A. (2009). Six Sigma and Total Quality Management (TQM): similarities, differences and relationship. *International Journal of Six Sigma and Competitive Advantage*, *5*(3), 237–250. https://doi.org/10.1504/IJSSCA.2009.028095

SAP. (2025). *SAP CORE HR Pricing*. https://www.sap.com/products/hcm/pricing.html

Stravinskiene, I., & Serafinas, D. (2020). The Link between Business Process Management and Quality Management. *Journal of Risk and Financial Management*, *13*(10). https://doi.org/10.3390/jrfm13100225

Taiichi Ohno. (1998). *Toyota production system: beyond large-scale production*. https://books.google.pt/books?id=7_-67SshOy8C&printsec=frontcover&redir_esc=y#v=onepage&q&f=false

Taylor, F. W. (1911). *The principles of scientific management*. http://strategy.sjsu.edu/www.stable/pdf/Taylor,%20F.%20W.%20(1911).%20New%20York,%20Harper%20&%20Brothers.pdf

Van der Aalst, W. (2016). Process mining: Data science in action. Em *Process Mining: Data Science in Action*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-49851-4

van der Aalst, W. M. P., Bichler, M., & Heinzl, A. (2018). Robotic Process Automation. *Business & Information Systems Engineering*, *60*(4), 269–272. https://doi.org/10.1007/s12599-018-0542-4

Vesna Bosilj Vukšić, Darija Ivandić Vidović, & Ljubica Milanović Glavan. (2015). *Information Technology for Business Process Management in Insurance Companies*. https://www.academia.edu/127271759/Information_Technology_For_Business_Process_Management_In_Insurance_Companies

vom Brocke, J., & Rosemann, M. (2015). Handbook on business process management 1: Introduction, methods, and information systems. *Handbook on Business Process Management 1: Introduction, Methods, and Information Systems*, 1–727. https://doi.org/10.1007/978-3-642-45100-3

W. Edwards Deming. (2018). *Out of the Crisis*. https://books.google.pt/books?hl=pt-PT&lr=&id=RTNwDwAAQBAJ&oi=fnd&pg=PR7&dq=Out+of+the+Crisis+deming&ots=V2pph4FaO0&sig=GvdJenHHLtuKGzDJ797DqmcWriw&redir_esc=y#v=onepage&q&f=false

Wil M.P. van der Aalst. (2013). Business process management: a comprehensive survey. *Wiley Online Library*, *2013*. https://doi.org/10.1155/2013/507984

Zoho People. (2025). *Zoho People Pricing*. https://www.zoho.com/people/zohopeople-pricing.html

APPENDIX A - AS-IS PROCESSES MODEL

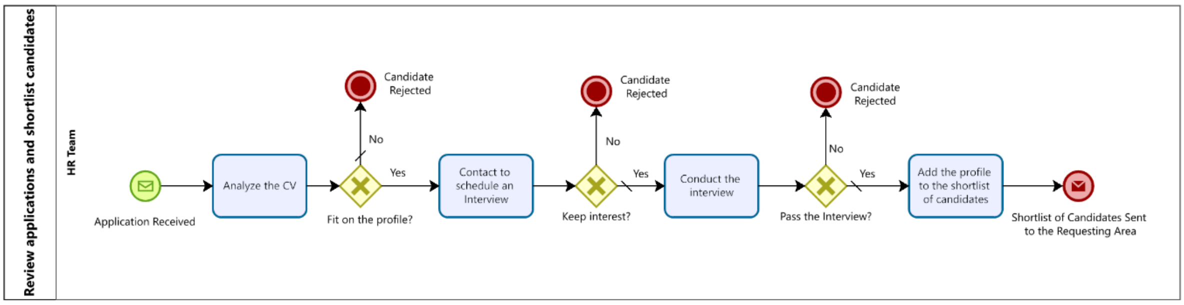

Figure 12 - As-Is Review Applications and Shortlist Candidates Subprocess (Level 2)

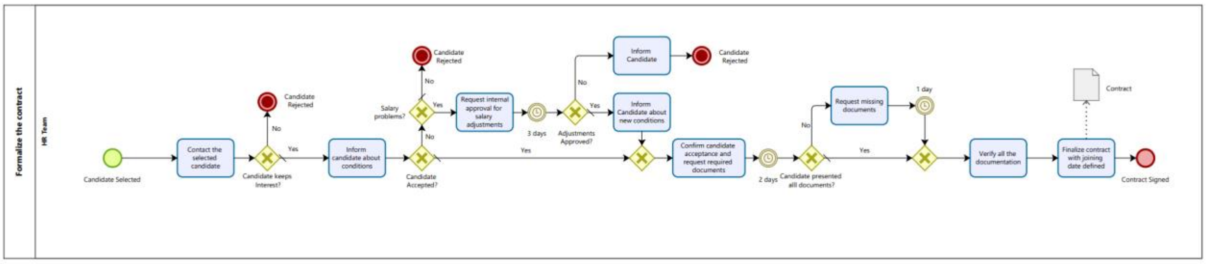

Figure 13 - As-Is Formalize the Contract Subprocess (Level 2)

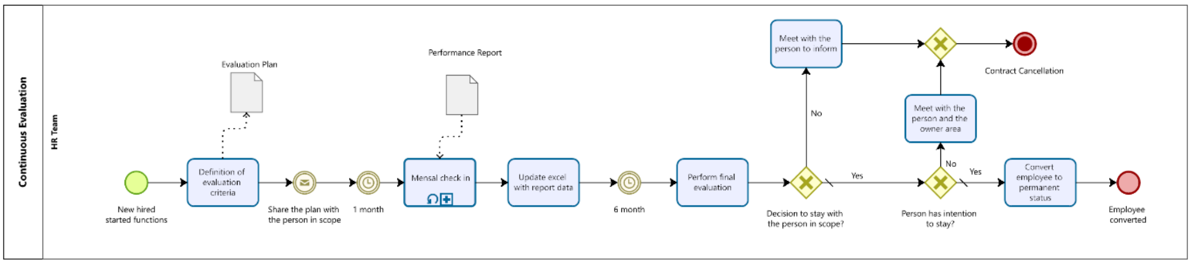

Figure 14 - As-Is Continuous Evaluation Subprocess (Level 2)

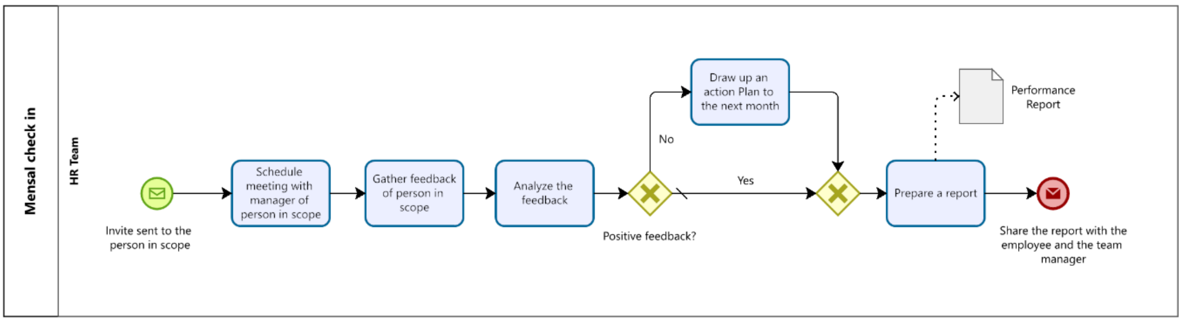

Figure 15 - As-Is Mensal Check-in Subprocess (Level 3)

APPENDIX B – TO-BE PROCESSES MODEL

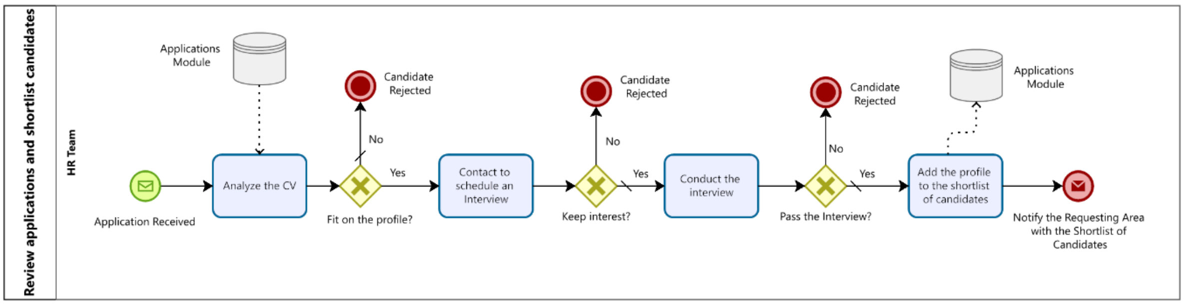

Figure 16 - To-Be Review Applications and Shortlist Candidates Subprocess (Level 2)

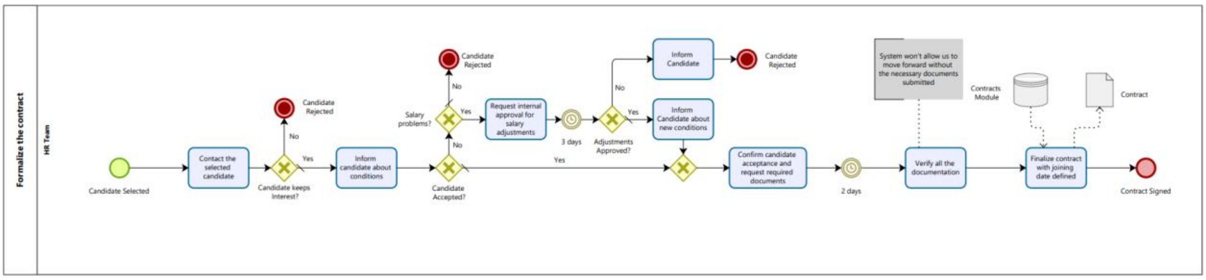

Figure 17 - To-Be Formalize the Contract Subprocess (Level 2)

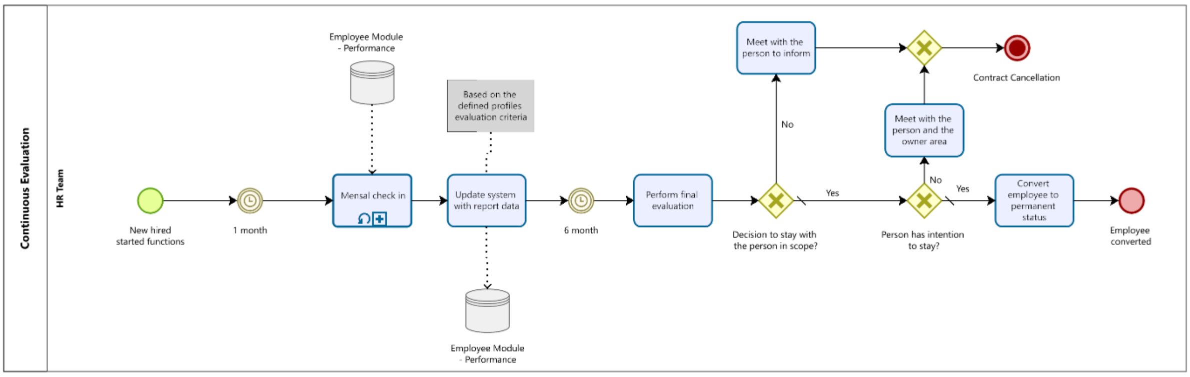

Figure 18 - To-Be Continuous Evaluation Subprocess (Level 2)

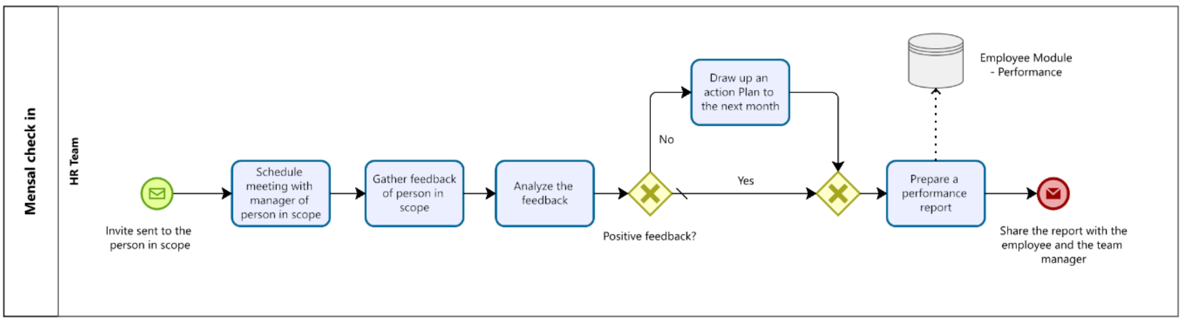

Figure 19 - To-Be Mensal Check-in Subprocess (Level 3)

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