NOVA IMS Information Management School

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Revolutionizing the Food Delivery Sector

A BPM Approach for O2C Optimization

Bruno Teixeira Rodrigues

Project Work

presented as partial requirement for obtaining the Master Degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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REVOLUTIONIZING THE FOOD DELIVERY SECTOR: A BPM APPROACH FOR O2C OPTIMIZATION

by

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

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or 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, July 11th, 2024]

ABSTRACT

The food delivery industry has been experiencing rapid growth, driven by changing consumer habits and the increasing demand for convenience. However, this growth has brought challenges, including the need for greater efficiency, cost reduction, and improved customer satisfaction in a highly competitive environment. Considering this, the primary objectives of this study include addressing these challenges in an Order to Cash process, by increasing productivity, reducing operational costs, enhancing customer satisfaction, and better utilizing the organization's resources, adopting Business Process Management methodologies. By recurring to a qualitative and quantitative analysis, it is possible to identify inefficiencies and bottlenecks, which served as a guide for the development of the redesigned process, the "To-Be" process model. Through a simulation of the "To-Be" process model, it is possible to evaluate the improvements, showing significant reductions in cycle times and resources consumptions, confirming the potential of the proposed changes. Furthermore, the knowledge acquired from this case study can guide Business Process Management projects in the future, helping companies to stay competitive in a rapidly evolving market by leveraging advanced technologies and continuous process improvement.

KEYWORDS

Business Process Management; BPM Lifecycle; BPMN; Food Delivery Sector; Information Management; Process Redesign; Process Optimization

Sustainable Development Goals (SDG):

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

aBPR	Assisted Business Process Redesign
AI	Artificial Intelligence
BPM	Business Process Management
BPMN	Business Process Model and Notation
BPR	Business Process Reengineering
BVA	Business Value-Adding
COE	Center of Excellence
IS	Information Systems
IT	Information Technology
ML	Machine Learning
NVA	Non-Value-Adding
O2C	Order to Cash
PM	Process Mining
PoS	Point of Sale
SMEs	Small and Medium-sized Enterprises
VA	Value-Adding

1. INTRODUCTION

Business Process Management (BPM) is an integrated set of organizational competencies that includes governance, technology, human resources, processes, and cultural aspects, in addition to strategic alignment (Vom Brocke & Mendling, 2018). By facilitating cross-functional process coordination, Castro et al. (2019) highlight that this holistic strategy helps businesses prioritize customer-perceived value. Fundamentally, BPM is a modern managerial paradigm that focuses on using business processes to monitor an organization's activities. These procedures, which consist of quantifiable and structured sets of actions, are carefully designed to produce results that are catered to clients or markets (Dijkman et al., 2016).

BPM is recognized as a worthwhile field, which indicates that it is a domain that has great significance for practitioners. The reason for its importance is that BPM offers methods, strategies, and managerial concepts that make it possible for company processes to be strategically aligned. By implementing BPM, companies can achieve improved business results, maintain compliance, and lay the groundwork for long-term competitiveness (Van Looy, 2021).

As stated by Vom Brocke & Mendling (2018), BPM is applied in different business contexts and across different industries, highlighting the value of BPM techniques across the whole organizations. With this in mind, the context in which the company where the project will be developed is a Portuguese food delivery company, that have been present in its market since 2014, counts with 50 employees and is present in six different locations, enabling take away orders with and without reservation (booked orders and walk in orders, respectively), and home delivery orders, sub-divided into home delivery (delivered by company couriers), uber eats 2P (uber eats orders delivered by company couriers) and uber eats (uber eats orders delivered by uber eats couriers).

Even though the company in the study already had some contact with BPM in the past, the business is not entirely process-oriented. The process that will be studied and developed will be an Order to Cash (O2C). This core process is presumed to have several inefficiencies that reduce productivity, competitiveness, and customer satisfaction across all phases of the process, from order registration, to order processing and, finally delivery.

Following the BPM lifecycle methodology (Dumas et al., 2018), this project focus is to: (1) Produce and describe the “As-Is” model of the O2C process; (2)Get insights on its weaknesses and their impact (through qualitative and quantitative analysis); (3)Produce what-if scenarios to analyse the changes in variables; (4)Produce the “To-Be” model (process redesign).

The output of this project is expected to be a reduction in operating costs, an improvement in customer satisfaction, a reduction in process duration and a better utilization of resources, as well as an improvement in process documentation, contributing to its standardisation. In addition to the practical expectations, it is also anticipated that this project will bridge the gap between academic research and real-world application, demonstrating the value and impact of BPM in the day-to-day running of organisations.

Apart from the introduction, this project report is divided into six sections: theoretical background, framework, results, discussion, limitations and future work, and conclusion. The theoretical background offers a framework based on existing literature and theories, guiding research questions and ensuring academic relevance. The framework chapter details the BPM lifecycle, including process identification, discovery, analysis, and redesign. The results section presents findings from analysing and redesigning the process. The discussion section explores business and theoretical implications. The final two chapters address limitations, suggest future work, and conclude with summaries of the thesis findings.

2. THEORETICAL BACKGROUND

2.1. PROCESS DESCRIPTION

The current project consists of optimizing an O2C process for a Portuguese food delivery company. An O2C is defined as a process that starts when an order is placed by the customer and ends when the customer pays for the order and receives it. This food delivery company intends to develop a BPM Center of Excellence (COE), functioning as a governance mechanism extensively embraced by organizations striving for a uniform and centralized implementation of BPM initiatives (Jesus et al., 2009). A BPM COE contribute to enhancing the service delivery quality by enabling the exchange of knowledge, documentation, processes and procedures, data, resources, experience, and best practices throughout an organization (Bitniowska, 2017).

The food delivery company handles an average of 650 orders a day across all six locations, with a higher volume on Fridays, weekends, holidays, and festive dates. The efficiency problems can be specially noted on the higher volume days, making it difficult to fulfil the orders on time.

Regarding the process flow, the instance starts with an order received (in one of the four available channels – website, call center, physical store, or uber eats), then, the order is registered in the order management system (OutdareGO) and finishes with the order preparation and delivery (in the case of the home delivery channel).

During this process there are different resources, with different functions. In the call center, the call center operators, responsible for receiving and register the orders made by phone. Within the physical store there is the store managers, responsible for the management of each location and its Information Systems (IS), as well as the registration of uber eats and take-away without reservation orders, the chefs responsible for the orders preparation, the packagers that perform the order packaging and the couriers which delivery the home delivery orders.

In order to support the whole process, two systems are used. The ZS rest (PoS (point of sale) system), used to register sales transactions, and the OutdareGO (order management system), where the clients and orders are register, the invoices generated, and the order status changed throughout its processing, changing between “On hold” (order registered and waiting for store acceptance), “Preparing” (order accepted and being prepared), “Prepared” (order waiting to be delivered), “On the way” (order being delivered) and “Delivered” status (order delivered to the final customer).

2.2. BUSINESS PROCESS MANAGEMENT (BPM)

Prior to developing the concept of BPM, it is crucial to comprehend the concept of processes and their function in organizations. As Davenport (1993) stated, business processes involve a sequence of activities or tasks conducted within an organization to attain a specific objective or provide a distinct product or service. These processes may extend across departments within the organization and are often interconnected.

In the late 90's, Davenport (1993) argues that BPM is a cross-organizational, process-oriented approach to business that starts with product inputs and ends with customers and outputs. It requires adopting a horizontal perspective on the business, intentionally diminishing the significance of the functional structure while prioritizing its broad processes (Davenport, 1993).Over the years, new studies and perspectives have been developed, and more recently Dumas et al. (2018), established that BPM represents a holistic strategy for overseeing and enhancing business processes within an organization. It involves the design, analysis, execution, and monitoring of business processes through explicit process models. From Van Der Aalst's perspective, BPM stands as a discipline that synergizes insights from both Information Technology (IT) and management sciences, generating productivity gains and cost reduction when applied to business processes (W. M. P. Van Der Aalst, 2013).

In Vom Brocke et al. (2014) point of view, the main goal of BPM, which integrates business IT viewpoints, is to improve an organization's business operations, having as its ultimate objective the enhancement of the organization efficacy and efficiency, thereby functioning as a significant factor in its overall performance and competitiveness (Vom Brocke et al., 2014).

BPM has achieved great importance in the organization's day to day operations, as it is crucial to achieving higher business results, compliance, and long-term competitiveness, and as it helps organizations to incorporate new technologies into their corporate strategies and business processes (Van Looy, 2021). BPM not only supports business processes but also employs methods, techniques, and software to design, enact, control, and analyse operational processes that encompass humans, organizations, applications, documents, and other sources of information (Pyon et al., 2011).

The complexity of the changing digital environment presents new opportunities and difficulties for IS research. Therefore, the future of BPM lies in understanding and addressing the complexities of the emerging digital world, leveraging complexity science as a theoretical lens, and exploring the coevolution of organizations, IS, and business strategies (Benbya et al., 2020).

2.3. PREVIOUS RESEARCH ON BPM

The roots of BPM can be traced back to 1990 when Michael Hammer introduced the concept of Business Process Reengineering (BPR), as being an approach to the redesigning of existing business processes to achieve significant improvements in performance and efficiency, applied in companies like Ford Motor Company and Mutual Benefit Life, in their accounts payable process and insurance application process respectively (Hammer, 1990).

As shown in Figure 1, and stated by Paim et al. (2008), the foundation of process management is Scientific Management (Taylor, 1911), which is followed by contributions to the process management concept during the 1970s and 1980s, with the Total Quality (Feigenbaum, 1961; Juran, 1974; Deming, 1990), Toyota Production System (Shingo, 1989), Theory of Constraints (Goldratt, 1990), Value Chain (Porter, 1985) and Rummler and Brache methodology (Rummler and Brache, 1995). During the early 1990s, the focal point of process management shifted towards Reengineering (Davenport and Short, 1990). However, by the end of the decade, there was a transition towards process redesign, representing a more comprehensive approach (Paim et al., 2008).

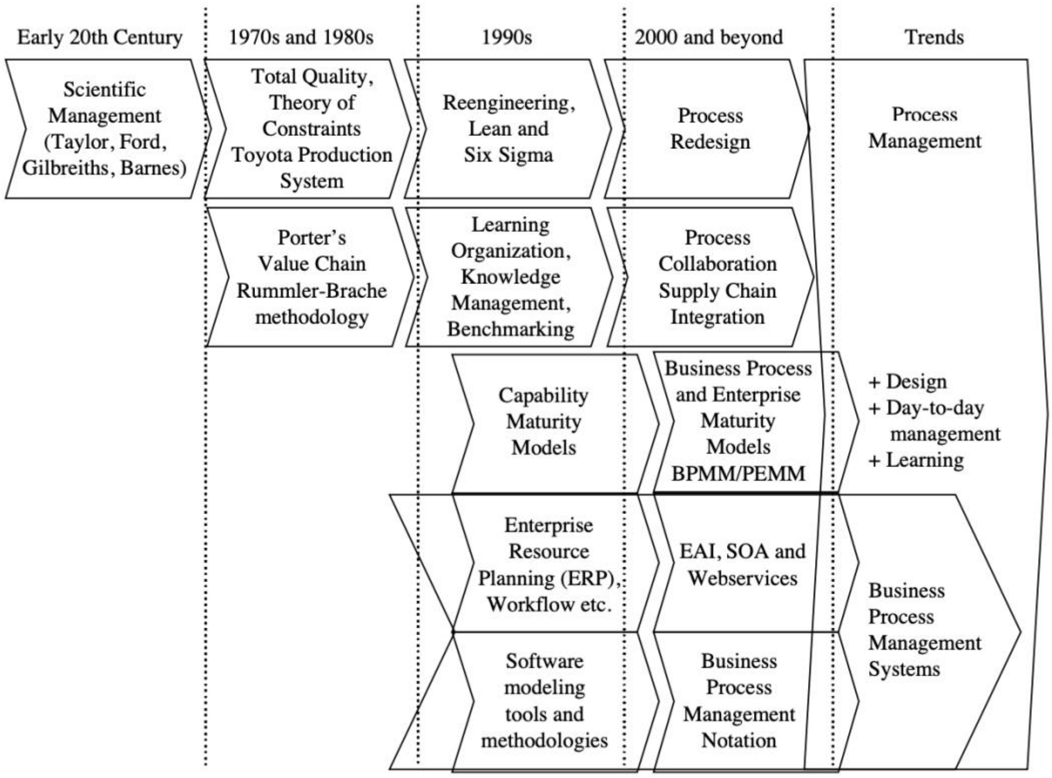

Figure 1 - Process management conceptual timeline (Paim et al., 2008)

Although BPM has existed since the 1990s, this doesn't mean that the discipline hasn't evolved. The adoption of emerging technologies by organizations has created Digital

Innovation (DI) opportunities for BPM, requiring innovation and flexibility in processes, which has resulted in an increase in value for organizations (Van Looy, 2021).

Later on, with the introduction of the industry 4.0, a new paradigm shift in industrial production was created combining advanced digitalization with Internet and future-oriented technologies (Lasi et al., 2014). Integrating the BPM lifecycle into the industry 4.0 allowed a smother transformation in organizational processes, maintaining process excellence (Czvetkó et al., 2022). With the analysis of evidence from the automotive sector in the Slovak economy, it was possible to link various benefits to the application of BPM in the industry 4.0. Among these benefits, the enhancing of business process performance, product and service quality, customer satisfaction, time and cost efficiency, and employees' productivity was notorious (Gažová et al., 2022).

More recent studies take into account business sustainability, combining it with BPM, forming what it is called “Green BPM”. This concept has been implemented in manufacturing Small and Medium-sized Enterprises (SMEs) in Germany, with the goal of reducing environmental impact and improve business sustainability. The outcomes were quite positive, as it contribute to cost reduction, increased process efficiency, improved competitiveness, positive firm image, good customer relations, improved profitability, higher employee satisfaction, and resource saving (Sohns et al., 2023).

Although BPM is a strong discipline, that doesn't mean it doesn't have challenges and problems to solve in its implementation. Looking at the study from Beerepoot et al. (2023) we can identify some of this challenges: the digital transformation challenge, that requires changes in the way BPM is applied due to the high amounts of data generated everyday and the technology advancements, the limited cover of BPM in companies processes, generating process fragments insteed of the entire end-to-end flow, the extreme manual effort demanded for process re-design, making it time-consuming and prone to errors, the lack of objectivity in process discovery hinders effective model creation, leading to subjective representations and inconsistent granularity levels.

In order to enhance the quality and effectiveness of business process redesign, which rely mainly on manual effort, creativity and business process expertise, a new concept has been developed – “Assisted Business Process Redesign” (aBPR). aBPR is the process of discovering and developing redesign strategies that attempt to improve process efficiency while meeting predefined performance criteria. This idea combines well-known process redesign patterns with suggestions to facilitate the identification of areas for improvement. The approach considers the process's present state, which is determined by data, documentation, and user-contributed implicit domain knowledge, which is necessary for the current process model to accurately define the activities, control flow, and contextual components in order to facilitate a realistic evaluation of process performance using expert evaluation and simulation experiments (Fehrer et al., 2022).

3. FRAMEWORK - THE BPM LIFECYCLE (DUMAS ET AL., 2018)

The BPM lifecycle refers to the sequential stages involved in the management and optimization of business processes. For instance, ABPMP presents the Deming's Plan Do Check Act (PDCA) Cycle, popularised in the 1950s by Dr. W. Edwards Deming (ABPMP, 2013). While specific frameworks may vary, in this project will be used the framework developed by Dumas et al. (2018).

Dumas et al. (2018) BPM lifecycle integrates various methods and tools designed to identify and manage individual processes, with the intention of making sure that business processes produce favourable results and maximise value for the company. Nevertheless, according to the authors, success of BPM depends on many factors, such as the organisation strategic alignment and governance.

In this project, the implementation of the "To-Be" process model and its subsequent monitoring and control phases are not part of the scope, since the redesign ideas are still in the process of being implemented and time is needed to measure the effects of such changes. As a result, the project framework will only consider the (i) Process Identification, (ii) Process Discovery, (iii) Process Analysis and (iv) Process Redesign phases presented in figure 2.

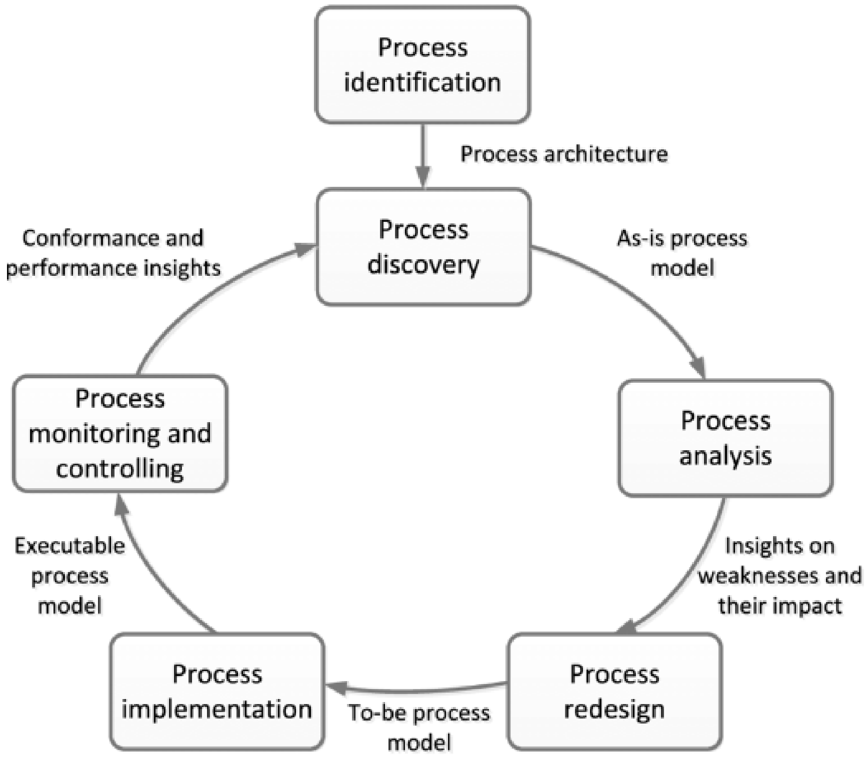

Figure 2 - The BPM Lifecycle (Dumas et al., 2018)

3.1. STAGE I: PROCESS IDENTIFICATION

The BPM lifecycle begins with the Process Identification phase. In this phase a collection of some of the organization business processes are identified and the rules to prioritize which processes should be improved first are defined, having as an output the process architecture, which represents the processes and their interrelations (Dumas et al., 2018).

Understanding the importance of process identification within the strategic context of an organization is crucial. While limited resources prevent most organizations from extensively modelling, analysing, redesigning, automating, and closely monitoring all processes, allocating such resources in this manner would not be cost-effective. By recognizing the significance of process identification, organizations can effectively manage resources, plan strategically, and assess their internal strengths and weaknesses to drive success (Dumas et al., 2018).

According to Dumas et al. (2018), the process identification consists of two distinct phases. The first stage consists of defining the process architecture (designation phase), which aims to understand the organization's processes and how they interact with each other. The evaluation phase, the second stage, is responsible for determining which processes should be prioritized for further analysis and redesign, based on different criteria.

In the first phase, in order to define a process architecture that reflects the complexity of organizations, the authors identify three different steps: (i) categorize processes, (ii) describe the relationships between them, and (iii) present a method for the definition of the process landscape.

The process categorization (i) is made recurring to Michael Porter's Value Chain model, which helps to categorize company processes into core processes (essential processes leading to value creation), support processes (processes that support core processes implementation), and management processes (processes that offer guidance and methodologies for both core and support processes).

In the case of the relationships between processes (ii), there are three categories: sequence (logical sequence between two processes), decomposition (one process is sub-divided in more levels of detail, originating sub-processes), and specialization (different variants of one process).

For the creation of the process landscape (iii) (see figure 3), it is required the participation of the organization stakeholders, in order to ensure the validity of the model. Dumas et al. (2018) describes seven steps to reach the final landscape model: terminology identification, end-to-end processes identification, identification of sequential processes, as well as major management and support processes, processes decomposition, compilation of the processes profile (process boundaries, vision, performance indicators, resources, and process owner), and the final coherence verification.

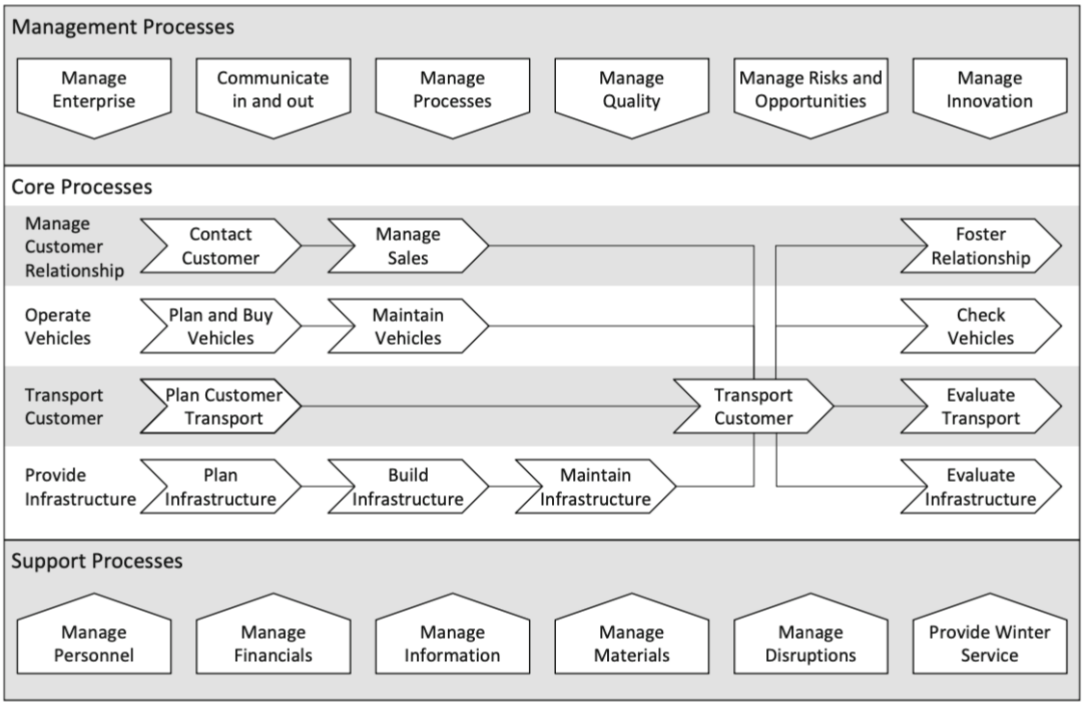

Figure 3 - Process landscape model of Vienna's public transport operator Wiener Linien - Source: (Dumas et al., 2018, p. 48)

In the second phase, each process is mainly accessed based on three different criteria, the strategic relevance of each process to the organization, the health of each process and feasibility of each bpm initiative. Based on the evaluation of the processes considering these 3 criteria, those with the greatest potential are selected, which is the output of this phase.

3.2. STAGE II: PROCESS DISCOVERY

The process discovery is the second stage of the framework. As per Dumas et al. (2018), this phase can be divided into four different tasks: setting definition, which consists in defining the dedicated team for the project, information collection, which includes understanding the process, process modelling, and process model quality assurance, based on predefined criteria.

After identifying the elements of the project discovery team, the information gathering must be carried on, recurring to three different methods: (i) Evidence-based discovery, (ii) Interview-based discovery, and (iii) Workshop-based discovery (Dumas et al., 2018).

The first method, Evidence-based discovery (i), uses different approaches, such as, document analysis, containing all the documentation available about a process, observation, where the process analyst follows the procedures from a single process case, and the automated process discovery, which allows to obtain information from event logs produced by the support systems. The Interview-based discovery (ii) involves interviewing domain experts to gain a detailed understanding of how a process is executed, often uncovering inconsistencies discovered in the Evidence-based discovery (i). Finally, the Workshop-based discovery (iii) requires the participation of multiple participants, efficiently resolving discordant perspectives. This method promotes a collaborative approach, wherein participants collectively develop a preliminary process model.

According to Dumas et al. (2018), each method previously mentioned have their strengths and weaknesses, and can be evaluated according to their objectivity, richness, time consumption, and immediacy of feedback (see table 1).

Table 1 - Relative strengths and weaknesses of process discovery methods - Source: (Dumas et al., 2018, p. 175)

Aspect	Evidence-based	Interviews	Workshops
Objectivity	High	Medium-high	Medium-high
Richness	Medium	High	High
Time consumption	Low-medium	Medium	Medium
Immediacy of feedback	Low	High	High

Upon information gathering completion, the processes can be modelled, using the Business Process Model and Notation (BPMN). Dumas et al. (2018) suggests a 5-step process for modelling: (i) identification of the process boundaries, (ii) identification of activities and events, (iii) identification of resources and their handoffs, (iv) identification of the control flow, and (v) identification of additional elements.

As previously mentioned, the process of collecting and structuring process-related information within a process model typically requires the involvement from at least one process analyst and multiple domain experts. Consequently, it is imperative to ensure the high quality of the resulting model. A process model undergoes scrutiny in terms of three quality dimensions: syntactic (ensuring adherence of a process model to the syntactic rules of the modelling language), semantic (confirming the alignment of a process model with the reality), and pragmatic (usability of a process model) (Dumas et al., 2018).

3.3. Stage III: Process Analysis

After the "As-Is" model is built, the process analysis is the third stage of the BPM lifecycle and involves a qualitative and quantitative analysis of the processes, so they can later be redesigned.

Dumas et al. (2018) identifies various techniques for qualitative analysis, but due to the choices made in this project, the framework will only look at value-added analysis, waste analysis and issue register analysis. Value-added analysis involves a methodical approach to pinpointing redundant steps within a process for removal. This technique consists of dividing tasks into individual steps and analysing their value to the customer, then classifying them as Value-Adding (VA) when the task produces value for the customer, Business Value-Adding

(BVA) when it is a necessary step for the company to function, or Non-Value-Adding (NVA) when the task adds no value to the customer or the company.

The waste analysis is a technique to identify inefficiencies in processes by categorizing waste into (i) Move (wastes related to movement), (ii) Hold (wastes emerging from holding something), and (iii) Overdo (wastes resulting from doing more than is necessary) categories (Dumas et al., 2018).

Move wastes (i) are subdivided into transportation waste, which involves moving materials or documents between locations, and motion waste, referring to the movement of human resources during the process execution, resulting in time waste and delays. In the case of hold wastes (ii), these are subdivided into inventory waste, when the company holds more inventory that necessary, and waiting waste, which happens when unfinished products wait for the next production step. Finally, in the case of overdo waste (iii), it is fragmented into defect waste, which involves correcting, repairing, or compensating for defects in a process, leading to rework, overprocessing waste, referring to unnecessary work performed given the process outcome, and overproduction waste, that occurs when executing a process that does not add value upon completion.

The Issue Register analysis comprises an in-depth analysis of each issue within a business process, evaluating both quantitative and qualitative impacts. It contains records of issues and factors that directly influence business performance, aiding in the identification and documentation of issues impacting the process (Dumas et al., 2018)

The quantitative analysis is a method used to assess business processes quantitatively, focusing on performance metrics such as cycle time, waiting time, and cost. According to Dumas et al. (2018), there are three different quantitative process analysis techniques: (i) flow analysis, (ii) queuing analysis and (iii) process simulation. Although all the techniques bring positive results to the analysis, in this project, due to the lack of fixed arrival rates, (i) flow analysis was not suitable and, due to the complexity of the O2C process and the multiplicity of activities carried out by various resources, (ii) queue analysis was also not suitable for quantitative analysis. Therefore, only (iii) process simulation analysis will be carried out.

Process simulation involves the creation of theoretical scenarios of a process, systematically executing them and documenting each stage. This process generates logs and statistics regarding cycle times and resource utilization, aiding in the identification of bottlenecks and the optimization of resource allocation to enhance process efficiency (Dumas et al., 2018).

3.4. Stage IV: Process Redesign

One of the most important stages in this lifecycle framework is the Process Redesign stage, where enhancements to the original process model are suggested. It is an intentional attempt to go beyond the present scenario, guided by careful research conducted out in earlier phases, in order to achieve a redesigned operational paradigm, sometimes known as the “To-Be” state

(ABPMP, 2013). This stage involves a deliberate break from traditional methods, which calls for a critical assessment of existing techniques and strategies in order to implement revolutionary adjustments.

In the context of process redesign, there are two main strategies: the revolutionary approach and the evolutionary approach. The revolutionary approach involves completely reimagining processes from scratch, while the evolutionary approach focuses on making gradual improvements to existing processes. The decision between these approaches depends on factors like the organization's industry, culture, and goals, requiring a thorough understanding of its operational context (Dumas et al., 2018).

The process of Process Redesign requires that specific goals and objectives be defined and incorporated within the Devil's Quadrangle framework (see figure 4). There are four dimensions proposed by this conceptual framework as the foundation for process optimization initiatives - cost, quality, time, and flexibility. By taking these important components of process performance into account, the Devil's Quadrangle acts as a strategic compass, helping organizations define their goals. But it also highlights the trade-offs that are intrinsic to these aspects, highlighting how important strategic balance is to redesign initiatives (van der Kolk & Brand, 1995).

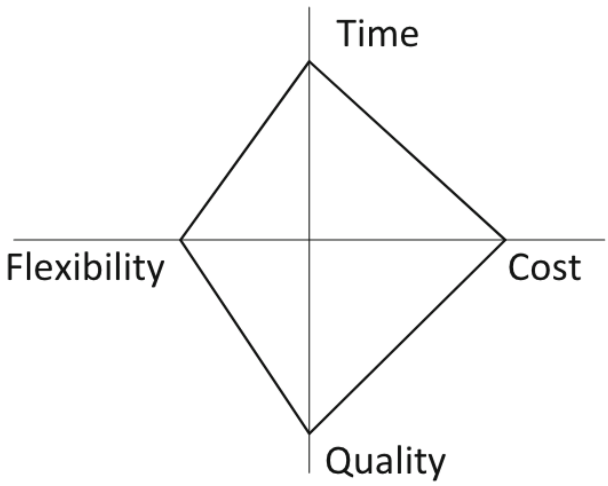

Figure 4 - The Devil's Quadrangle – Source: (Dumas et al., 2018, p. 304)

The Heuristic Process Redesign stands out as a notable option among these several techniques for operationalizing process redesign projects. When interpreted as prescriptive rules based on empirical insights, these heuristics provide a useful road map for implementing process transformations. These heuristics, which are classified as "best practices," cover a wide range of operational domains, including organizational structure, process mechanics, customer interactions, and external interfaces (Reijers & Limanmansar, 2005).

As per Dumas et al. (2018), process redesign heuristics are as efficient as their ability to balance conflicting operational needs, which are summarized in the Devil's Quadrangle.

Through the clarification of the complex relationship between cost, quality, time, and flexibility, companies may adjust their redesign initiatives to maximize results while managing the associated trade-offs.

All things considered, the Process Redesign phase is a critical turning point in the organizational development process that initiates the reengineering of business processes to conform to strategic requirements and operational demands. Organizations can achieve long-term competitive advantage and operational resilience by implementing transformative changes through a strategic synthesis of methodologies, frameworks, and best practices (Dumas et al., 2018).

4. RESULTS

This chapter presents the findings of our study on the O2C process, leveraging the BPM lifecycle as outlined by Dumas et al. (2018).

Our study aims to identify bottlenecks, inefficiencies, and opportunities for improvement within the current O2C process, providing actionable recommendations for optimizing performance. In order to achieve our objectives, Bizagi was used, with its powerful process modelling functions and its process simulation module, which allowed to run multiple simulations and what-if scenarios (Bizagi, 2024).

4.1. PROCESS IDENTIFICATION

At the beginning of the project there were several meetings to define the scope, where the different core processes of the organization were analysed by their current state (health), problems and importance for the organization (strategic importance), as well as the feasibility to implement process optimizations.

Therefore, due to the importance of the O2C process in the revenue cycle of a food delivery company, involving a series of steps from receiving customer orders to the final collection of payments, this was the process chosen jointly with the organization. Effective management of this process is crucial to maintaining operational efficiency and ensuring customer satisfaction, with that in mind, our study aims to identify bottlenecks, inefficiencies and opportunities for improvement in the current O2C process, providing actionable recommendations to optimize performance.

The process categorization was made recurring to Michael Porter’s Value Chain, containing the management, core and support processes (figure 5). The O2C process developed in the scope of this project is contained in the order processing management, a core process for the organization.

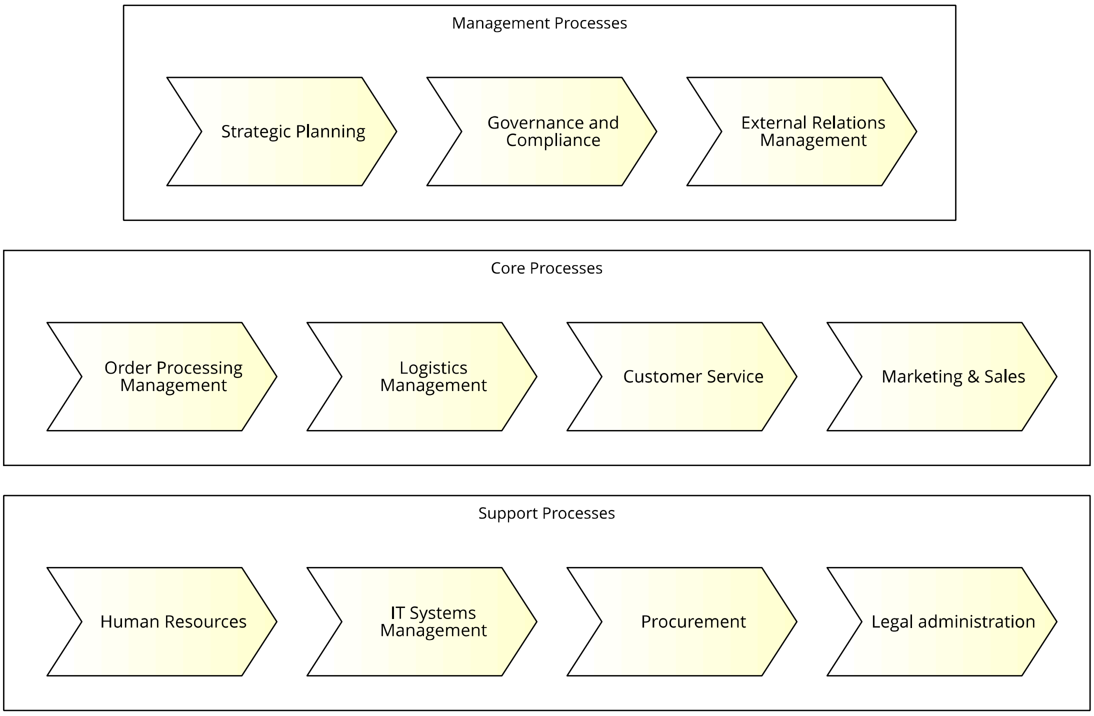

Figure 5 - Value Chain

4.2. PROCESS DISCOVERY

The process discovery stage involves four different stages as outlined in Dumas et al. (2018) BPM lifecycle. The first stage, setting definition, consists in defining the dedicated team for the project, which was done together with the organization. As can be seen in Table 2, there are eight participants from the organization, including the process owner, who in this case is the Chief Operating Officer, plus the Uber Eats Courier who is an external participant, nevertheless important to share the details about Uber Eats deliveries, ensuring the presence of all the key domain experts. Apart from the domain experts, there is also the project manager and the BPM project team which have taken on the role of process analyst.

Table 2 - Project participants

Participant	Role
CEO	Management Team
CTO	Management Team
COO	Process Owner
BPM Team Leader	Project Manager
BPM Team	Process Analysts
Store Manager	Process Participant
Call Center Operator	Process Participant
Chef	Process Participant
Packager	Process Participant
Courier	Process Participant
Uber Eats Courier	External Process Participant

Once the definition of the project participants had been completed, the collection of information began initially through an evidence-based discovery, where the project team began by analysing all the documentation provided by the organisation on the O2C process, the procedures, the IT support systems, their logs, and the roles of the participants. After the first documental analysis, several visits to the various stores were made where the team has collected cycle times and detailed information about how the process was conducted in each store.

Upon the first discovery method, the team pursued an interview-based discovery, where several interviews were conducted with the process domain experts, to document their vision of the process and the description of the activities they conduct. At this stage, the participants in the process were also asked about their ideas of problems and bottlenecks in the process, as well as the systems they used. Lastly, a workshop-based discovery was performed, including all the participants from the interview-based discovery and adding the management team and the process owner, to discuss the entire process and resolve conflicting views of the process.

Following the information collection, the "As-Is" model started to be developed in the BPMN 2.0 notation using Bizagi tools as mentioned. The modelling task was subdivided into the 5-step process presented by Dumas et al. (2018), starting with the identification of process boundaries, that in this case was the "Order received" by the Call Center, Store or Website, as a start event, and the "Order delivered" after the payment as an end event. This step was succeeded by the identification of activities and events that compose the process, and the creation of sub-processes to reduce the complexity of each process layer.

Then the team identified the process resources and their handoffs, where five resources were identified: Call Center Operator, Store Manager, Chef, Packager and Courier. Finally, the control flows and additional elements were identified to enrich the model and ensure its completeness.

The final stage, the process model quality assurance, was ensured by scheduling two meetings with the domain experts and the management team, where in the first session the process model was reviewed and change requests were generated. Following the first meeting, the BPM team made the required changes to the process model, which were validated again by the same quorum in the second meeting, thus guaranteeing the accuracy of the process.

The "As-Is" process model contains three different levels of detail, where the first level can be seen in Figure 6 below, and the second and third levels in Appendix A from Figure A1 to Figure A9.

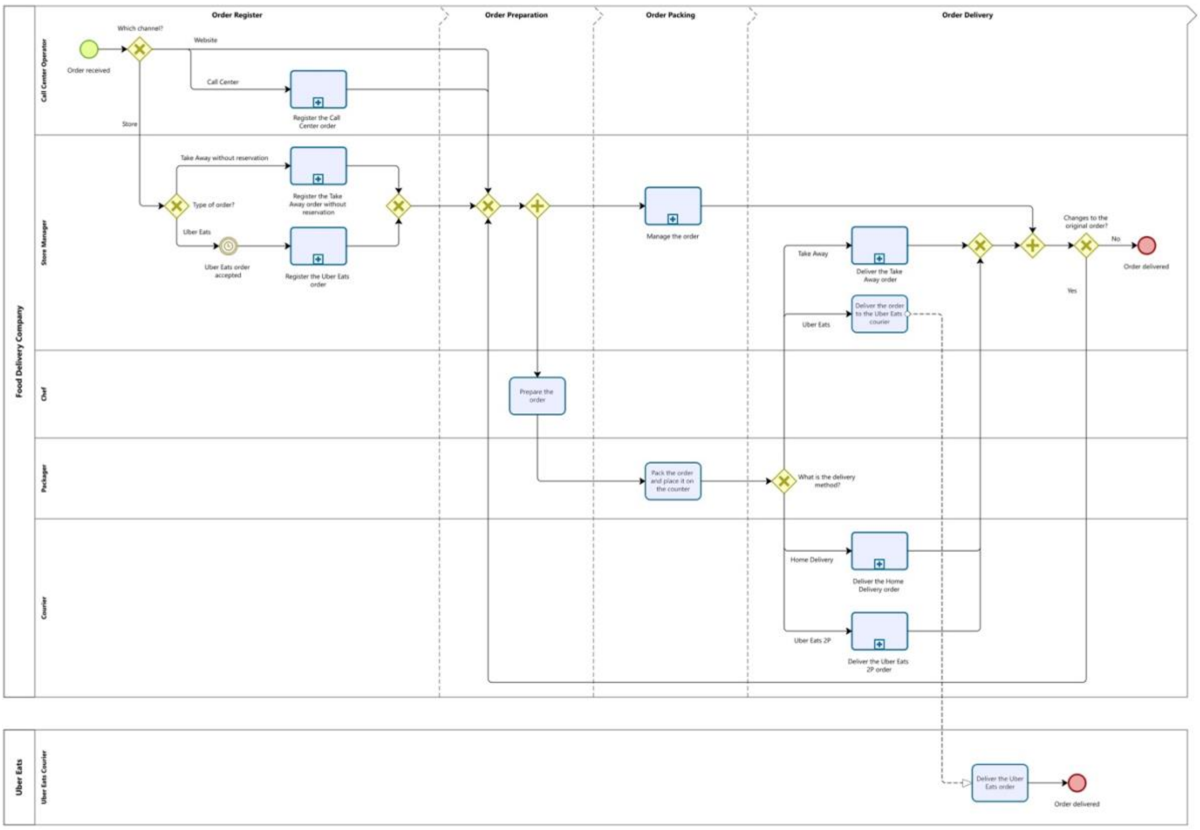

Figure 6 - "As-Is" Process Model: O2C (Level 1)

4.3. Process Analysis

This stage contemplates both a qualitative and quantitative analysis of the current state of the O2C process ("As-Is" model) to identify inefficiencies, bottlenecks, and areas for potential improvement.

4.3.1. Qualitative Analysis

In this section, three different analyses were carried out: *Value-Added*, *Waste Analysis* and *Issue Register.*

Value-Added Analysis

This analysis followed the framework presented, classifying all the activities in the process as VA, BVA or NVA. The results are shown below in Tables 2 to 11.

With this analysis, it was possible to identify some potential bottlenecks, such as the lack of product availability, the delays in store service, the second registration of orders in OutdareGO, the Uber Eats orders registration, the product verification made by the client, the order errors and deliveries.

Table 3 - Value-Added Analysis: O2C (Level 1)

Activity	Performer	Classification
Prepare the order	Chef	VA
Pack the order and place in on the counter	Packager	BVA
Deliver the order to the Uber Eats courier	Store Manager	NVA
Deliver the Uber Eats Order	Uber Eats Courier	VA

Table 4 - Value-Added Analysis: Register the Call Center order (Level 2)

Activity	Performer	Classification
Register call in the CC system	Call Center Operator	BVA
Verify customer data	Call Center Operator	BVA
Check if it is a new customer	Call Center Operator	BVA
Ask how he wants the order to be registered	Call Center Operator	NVA
Insert first and last name	Call Center Operator	BVA
Insert phone number	Call Center Operator	BVA
Insert address and postal code	Call Center Operator	BVA
Place order on old phone number	Call Center Operator	BVA
Request delivery time	Call Center Operator	BVA
Insert order into the most appropriate slot	Call Center Operator	BVA
Request the order	Call Center Operator	VA
Inform the customer that the product is not available	Call Center Operator	NVA

Advise and help the customer choose their order	Call Center Operator	NVA
Register the order on OutdareGO	Call Center Operator	VA
Request the number of persons	Call Center Operator	VA
Select the payment method	Call Center Operator	BVA
Request NIF	Call Center Operator	BVA
End call	Call Center Operator	BVA

Table 5 - Value-Added Analysis: Insert channel type (Level 2)

Activity	Performer	Classification
Insert channel type	Call Center Operator	VA
Ask for the delivery address	Call Center Operator	BVA
Insert address in the CC system	Call Center Operator	BVA
Check if the selected store is busy	Call Center Operator	NVA
Warn customer of delay/waiting time	Call Center Operator	NVA
Check if the customer wants to change the channel to Take Away	Call Center Operator	NVA
Ask for delivery store	Call Center Operator	BVA
Insert store into CC system	Call Center Operator	VA

Table 6 - Value-Added Analysis: Register the Take Away without reservation order (Level 2)

Activity	Performer	Classification
Insert first and last name	Store Manager	BVA
Insert phone number	Store Manager	BVA
Identify the customer by phone number	Store Manager	BVA
Request the order	Store Manager	VA
Inform the customer that the product is not available	Store Manager	NVA
Advise and help the customer choose their order	Store Manager	NVA
Register the order in Zs rest	Store Manager	VA
Request the number of persons	Store Manager	VA
Select payment method	Store Manager	BVA
Request NIF	Store Manager	BVA
Receive payment	Store Manager	BVA

Issue and deliver invoice	Store Manager	VA
Register the order on OutdareGO	Store Manager	NVA

Table 7 - Value-Added Analysis: Register the Uber Eats order (Level 2)

Activity	**Performer**	**Classification**
Accept order on the tablet	Store Manager	VA
Fill in the Uber order code	Store Manager	NVA
Insert first and last name	Store Manager	NVA
Register the order on OutdareGO	Store Manager	NVA
Enter address and postal code	Store Manager	NVA
Search postal code by address	Store Manager	NVA
Insert NIF	Store Manager	NVA

Table 8 - Value-Added Analysis: Manage the order (Level 2)

Activity	**Performer**	**Classification**
Change the order status to 'Preparing'	Store Manager	VA
Click on the 'Invoice option in OutdareGO	Store Manager	BVA
Print and put order ticket in the bag	Store Manager	NVA
Put invoice in the bag	Store Manager	NVA
Change the order status to 'Prepared'	Store Manager	VA
Allocate routes to the couriers	Store Manager	BVA
Change order status to 'On the way'	Store Manager	VA
Change order status to 'Delivered'	Store Manager	BVA

Table 9 - Value-Added Analysis: Deliver the Take Away order (Level 2)

Activity	**Performer**	**Classification**
Identify the customer in POS	Store Manager	BVA
Request the order	Store Manager	VA
Inform the customer that the product is not available	Store Manager	NVA
Advise and help the customer choose their order	Store Manager	NVA
Register the order in Zs rest	Store Manager	VA

Request the number of persons	Store Manager	VA
Select payment method	Store Manager	BVA
Request NIF	Store Manager	BVA
Receive payment	Store Manager	BVA
Issue and deliver invoice	Store Manager	VA
Register the order on OutdareGO	Store Manager	NVA
Check the payment status	Store Manager	BVA
Deliver the order	Store Manager	VA
Ask the customer to verify the order	Store Manager	NVA
Deliver missing products	Store Manager	NVA

Table 10 - Value-Added Analysis: Deliver the Home Delivery order (Level 2)

Activity	**Performer**	**Classification**
Go to the order address	Courier	VA
Deliver the order	Courier	VA
Receive payment	Courier	BVA
Return to the store	Courier	BVA

Table 11 - Value-Added Analysis: Deliver the Uber Eats 2P order (Level 2)

Activity	**Performer**	**Classification**
Open the Uber Eats App	Courier	BVA
Go to the order address	Courier	BVA
Deliver the order	Courier	VA
Receive payment	Courier	BVA
Return to the store	Courier	BVA

Table 12 - Value-Added Analysis: Solve the order error (Level 3)

Activity	**Performer**	**Classification**
Call the store and indicate missing products	Courier	NVA
Return to the store	Courier	NVA
Pick up missing items	Courier	NVA

Waste Analysis

In this analysis, we examine the waste present in the O2C process, by scrutinizing each step of the O2C workflow, with the aim of discovering inefficiencies such as delays, errors, redundancies and unnecessary complexities.

Considering the output below it is possible to identify motion waste regarding the movement of the store manager between workstations, inventory waste when there is a shortage of couriers and orders are already prepared waiting for an available resource, defects waste related to unavailability of products, order errors and store delays, over-processing waste mainly related to the order registration and verification, and even over-production waste when the customer cancels the order duo to delays or any other problems.

Table 13 - Waste Analysis: O2C

Category	Type of Waste	Activity
Move	Motion	Movement of the store manager between the counter and the back office
Hold	Inventory	Order waiting for courier
Overdo	Defects	Inform the customer that a product is not available and help them choose a new order
		Return to the store and collection of the missing products by the courier
		Deliver missing order products
		Resolve order errors
		Check if the chosen store is busy and warn the customer of any delays
	Over-Processing	Ask the customer to check the order
		Manual registration of uber eats order information
		Search postal code by address
	Over-Production	Customer gave up on the order

Issue Register Analysis

The Issue Register Analysis allows to document and describe the problems found in the previous analysis. By meticulously examining each entry in the issue register, it is possible to assess the impact of these challenges on the overall process performance and prioritize them based on qualitative and quantitative impact on the organization.

With the analysis of the Issue Register output (Table 14), it is possible to identify that detected problems will lead mostly to customer dissatisfaction, order cancellations, loss of information and errors in orders It is possible to measure the quantitative impact for most of the issues, where it was found that on average order errors account for 3% of daily orders, a value that doesn't seem very high, but in the food delivery industry any error leads to food waste and monetary losses. It is also possible to observe that store delays affect an average of 16% of orders and that the manual registration of Uber Eats orders and the double registration of Take Away orders represents an average of one minute more per issue per order.

Table 14 - Issue Register: O2C

Problem	Priority	Description	Qualitative Impact	Quantitative Impact
Unavailability of products	1	When the customer places the order, one or more products are not available.	Leads the customer to give up on the order.	
Order Errors	2	Orders with incorrect items and/or exchange of orders.	Customer dissatisfaction and possible loss of products.	Affects an average of 3% of daily orders.
Store delays	3	Order delays.	Customer dissatisfaction and possible order cancellation.	Affects an average of 16% of daily orders.
Manual registration of uber eats orders	3	After the orders are accepted by the store manager, the order information must be manually registered in OutdareGO.	Inefficiency and possible loss of information, which leads to errors in orders.	An average of 1 minute is added to the order time.
Double registration of Take Away orders	2	When the customer places the order directly in the store or makes a change to their in-store order, it is registered in PoS and later in OutdareGO.	Inefficiency and possible loss of information, which leads to errors in orders.	An average of 1 minute is added to the order time.

Caption: 1 - Low | 2 - Medium | 3 - High

4.3.2. Quantitative Analysis

This section, the quantitative analysis, involves the systematic analysis of numerical data to measure and evaluate the performance of the O2C process. By analysing key performance indicators (KPIs) such as cycle time, resource consumption, and waiting time, it is possible to identify patterns, trends, and areas for improvement. This data-driven approach provides an objective basis for understanding the efficiency and effectiveness of the current process.

"As-Is" Process Simulation

In the process simulation it was performed a benchmark between two stores, both during normal and busy days, respectively from Monday until Thursday (Normal Scenario) and Friday until Sunday, plus public holidays (Busy Scenario), originating four different simulation scenarios: Store 1 (Normal Scenario), Store 1 (Busy Scenario), Store 2 (Normal Scenario) and Store 2 (Busy Scenario). The collected data refers to the dinner service of these two stores, from 18:30 until 22:30h, and it was divided between normal and busy days due to the volume discrepancy.

All the parameters used during the simulations can be found in Appendix B, from Table B1 to Table B5. The number of resources and their hourly salary for each store for each scenario can be found in Table B1, where we can see that both stores share the same call center, thus maintaining the same number of operators. It is also possible to observe that store 2 has more resources, in order to deal with the increased volume.

The start event frequency and the gateway probabilities can be examined recurring to Table B2 and Table B3, where we can see that it was used a Poisson distribution in order to model the random arrivals of orders. It is also possible to see the increased volume of store 2, as well as the increased volume of busy days comparing to normal weekdays.

Regarding the simulation time metrics, they can be found in Table B4 for the store 1 and Table B5 for store 2. The simulations mainly used truncated Normal Distributions, with a mean time, standard deviation, minimum and maximum value, and constant durations.

In the tables bellow (Table 14 to Table 21) it is showcased the "As-Is" simulations results for each scenario, considering the resource consumption, average cycle time and average waiting time for resource for each process activity. Based on the simulation outputs it is possible to identify an increase of the average process execution time between the normal scenarios and busy scenarios, respectively from 19m 35s to 23m 5s in the store 1, representing an increase of 17.87%, and from 24m 11s to 34m 22s in store 2, representing an increase of 42.11%.

By analysing the outputs, it is also possible to identify two main bottlenecks, the "Deliver the Home Delivery order" and "Deliver the Uber Eats 2P order" activities, which, in addition to having a high average execution time, also have a considerable average waiting time for recourse, which derives from the high courier resource consumption percentage.

Table 15 - "As-Is" Process Simulation: Resource Consumption (Store 1 (Normal Scenario))

Role	Resource Consumption
Store Manager	25.22%
Call Center Operator	1.37%
Chef	15.59%
Packager	15.90%
Courier	49.42%

Table 16 - "As-Is" Process Simulation: Results (Store 1 (Normal Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 1 (Normal)	40	19m 35s	
Register the Call Center order	4	2m 38s	0s
Register the Take Away order without reservation	2	2m 18s	10s
Register the Uber Eats order	21	1m 32s	3s
Manage the order	40	35s	5s
Prepare the order	40	2m 59s	0s
Pack the order and place it on the counter	40	55s	2s
Deliver the Take Away order	8	1m 27s	0s
Deliver the order to the Uber Eats courier	9	20s	0s
Deliver the Uber Eats order	9	9m 57s	0s
Deliver the Home Delivery order	11	15m 31s	0s
Deliver the Uber Eats 2P order	12	18m 2s	38s

Table 17 - “As-Is” Process Simulation: Resource Consumption (Store 1 (Busy Scenario))

Role	Resource Consumption
Store Manager	15.05%
Call Center Operator	2.75%
Chef	17.34%
Packager	20.49%
Courier	70.21%

Table 18 - “As-Is” Process Simulation: Results (Store 1 (Busy Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 1 (Busy)	54	23m 5s	
Register the Call Center order	12	2m 56s	0s
Register the Take Away order without reservation	1	2m 36s	0s
Register the Uber Eats order	15	1m 43s	0s
Manage the order	54	33s	0s
Prepare the order	54	3m 18s	0s
Pack the order and place it on the counter	54	1m 1s	3s
Deliver the Take Away order	10	1m 45s	0s
Deliver the order to the Uber Eats courier	4	22s	0s
Deliver the Uber Eats order	4	13m 14s	0s
Deliver the Home Delivery order	22	18m 14s	55s
Deliver the Uber Eats 2P order	18	20m 8s	1m 10s

Table 19 - "As-Is" Process Simulation: Resource Consumption (Store 2 (Normal Scenario))

Role	Resource Consumption
Store Manager	27.89%
Call Center Operator	1.68%
Chef	14.06%
Packager	17.22%
Courier	65.47%

Table 20 - "As-Is" Process Simulation: Results (Store 2 (Normal Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 2 (Normal)	48	24m 11s	
Register the Call Center order	5	2m 39s	0s
Register the Take Away order without reservation	2	2m 14s	0s
Register the Uber Eats order	23	1m 41s	9s
Manage the order	48	44s	12s
Prepare the order	48	3m 4s	0s
Pack the order and place it on the counter	48	59s	3s
Deliver the Take Away order	5	1m 27s	0s
Deliver the order to the Uber Eats courier	3	21s	0s
Deliver the Uber Eats order	3	11m 24s	0s
Deliver the Home Delivery order	20	17m 19s	49s
Deliver the Uber Eats 2P order	20	18m 19s	22s

Table 21 - “As-Is” Process Simulation: Resource Consumption (Store 2 (Busy Scenario))

Role	Resource Consumption
Store Manager	22.21%
Call Center Operator	3.89%
Chef	20.38%
Packager	32.30%
Courier	89.64%

Table 22 - “As-Is” Process Simulation: Results (Store 2 (Busy Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 2 (Busy)	90	34m 22s	
Register the Call Center order	19	2m 59s	0s
Register the Take Away order without reservation	3	2m 38s	0s
Register the Uber Eats order	23	1m 40s	0s
Manage the order	90	37s	2s
Prepare the order	90	3m 18s	0s
Pack the order and place it on the counter	90	1m 12s	11s
Deliver the Take Away order	17	1m 52s	0s
Deliver the order to the Uber Eats courier	5	23s	0s
Deliver the Uber Eats order	5	9m 46s	0s
Deliver the Home Delivery order	42	32m 15s	13m 40s
Deliver the Uber Eats 2P order	26	31m 17s	10m 51s

What-If Analysis

Following a careful analysis of the “As-Is” process simulation results and the client's objectives, two hypothetical scenarios were produced to assess the feasibility of the changes and their impact on the O2C process.

The first scenario simulates the introduction of OutdareGO's real-time delivery control module in the store 2 during a busy scenario. It is estimated that this module will bring average reductions of 15% in the delivery time of Home Delivery and Uber Eats 2P orders.

With the reduction in delivery times, the average time per order went from 34m 22s to 24m 13s, an average reduction of 10m 9s per order (representing an average decrease of 29.53%) and the resource utilization rates slightly increased for the majority of the resources (see table 22), derived from the increased efficiency of the process, not affecting the average execution times of the activities, with the exception of the courier, where the utilization rate went from 89.64% to 83.82% (representing an average decrease of 5.82%).

This decrease in the average time of the O2C process was mainly driven by the average reduction of 39.58% in the Uber Eats 2P delivery time, from 31m 17s to 18m 54s, and the average reduction of 43.67% in the Home Delivery orders delivery time, from 32m 15s to 18m 10s.

Table 23 - “What-if 1” Process Simulation: Resource Consumption (Store 2 (Busy Scenario))

Role	Resource Consumption
Store Manager	24.43%
Call Center Operator	4.27%
Chef	22.42%
Packager	35.53%
Courier	83.82%

The second scenario simulates the implementation of automation in the registration of Uber Eats orders, leaving only the function of accepting them to the store manager, which is estimated to take only 5 seconds, and the integration of the Uber Eats module into the PoS system (ZS rest) and subsequent integration of PoS with OutdareGO, which is estimated to reduce the time taken to register Take Away orders without a reservation by 40% store 2 during a busy scenario. In addition, the reduction of a store manager is also considered in the scenario.

With the previously mentioned changes, the average time per order went from 34m 22s to 30m 52s, an average reduction of 3m 30s per order (representing an average decrease of 10.18%). This decrease was due to the elimination of the registration time for Uber Eats orders (which takes an average of 1m 40s), with only 5s needed for orders to be accepted. In the case of Take Away orders without a reservation, the average time is reduced from 2m 38s to 1m 38s (representing an average decrease of 38%). With this scenario, it is also possible to reduce 1 store manager at the store 2, which is equivalent to an average annual saving of €13,016/year.

The resource utilization has remained practically unchanged (as can be seen in table 23), with the exception of the percentage use of the store manager, which has risen to 32.75%, from 22.21% (representing an average increase of 10.54%) due essentially to the reduction from two resources to one, although this does not contribute to an increase in the average process time.

Table 24 - "What-if 2" Process Simulation: Resource Consumption (Store 2 (Busy Scenario))

Role	Resource Consumption
Store Manager	32.75%
Call Center Operator	4.19%
Chef	20.94%
Packager	33.10%
Courier	90.21%

4.4. Process Redesign

In this section, we focus on the redesign phase of the O2C process, based on the knowledge gained in our previous qualitative and quantitative analyses.

Resorting to the utilization of heuristics, it is possible to propose practical redesign solutions that enhance overall process performance, transforming analytical findings into actionable strategies.

4.4.1. Heuristic Process Redesign

Throughout this stage three different heuristics were used to reformulate the O2C process. The first heuristic was the task elimination, where five different activities were eliminated from the process, starting with the "Register the Uber Eats order" subprocess, elimination that it is possible due to an integration of the Uber Eats system with the PoS system (Zs rest) and a subsequent integration with OutdareGO. Resorting to automation once again the activity "Register the order in OutdareGO" done in the Take Away order without reservation registration and Take Away order delivery was eliminated with the introduction of OutdareGO's delivery control and courier management module. Both this automations will be further explained later in this chapter.

The three other task eliminations are related to ensuring the quality of orders, one of the main constraints of the process that has a major impact on customer satisfaction, and for this reason a new task has been introduced: “Ensure the order quality” performed by the packager. This task will minimize errors in orders, eliminating the need to ask the customer to check the order and have tasks to deliver missing products. With this changes it is possible to eliminate the sub-process “Solve the order error”, and the tasks “Ask the customer to verify the order” and “Deliver missing products” in the Take Away order delivery.

Furthermore, the second proposed heuristic is the task decomposition, in which the “Pack the order and place it on the counter” activity performed by the Packager was decomposed into two activities, incorporating the order quality assurance activity as well.

The third heuristic implemented was the process automation, where two solutions previously mentioned were applied. The first solution contemplates the integration of ZS rest with Uber Eats which increases the productivity of the organization, not only by eliminating billing errors but also by avoiding the dispersion of information across several devices, eliminating the need to use a tablet and reducing estimated operation time by 90%. By integrating the PoS (ZS rest) system with OutdareGO, it is possible to automate the collection of information on Uber Eats and Take Away orders without a reservation, minimizing order errors and increasing the efficiency of the process.

Finally, as a last automation, the integration of OutdareGO's delivery control and courier management module, allowing the store manager to assign orders to couriers based on their geographical location, and to view the position of each courier in real time. The module also has an Android mobile application for the couriers which allows them to see the route for the orders, identify the customer and mark the orders as delivered so that the operation has feedback on the status of an order in real time.

4.4.2. “To-Be” Process Model

Incorporating the improvements and optimizations identified during the analysis and redesign phases, a “To-Be” model was developed, containing two different levels of detail, where the first level can be seen in Figure 7 below, and the second levels in Appendix C from Figure C1 to Figure C7.

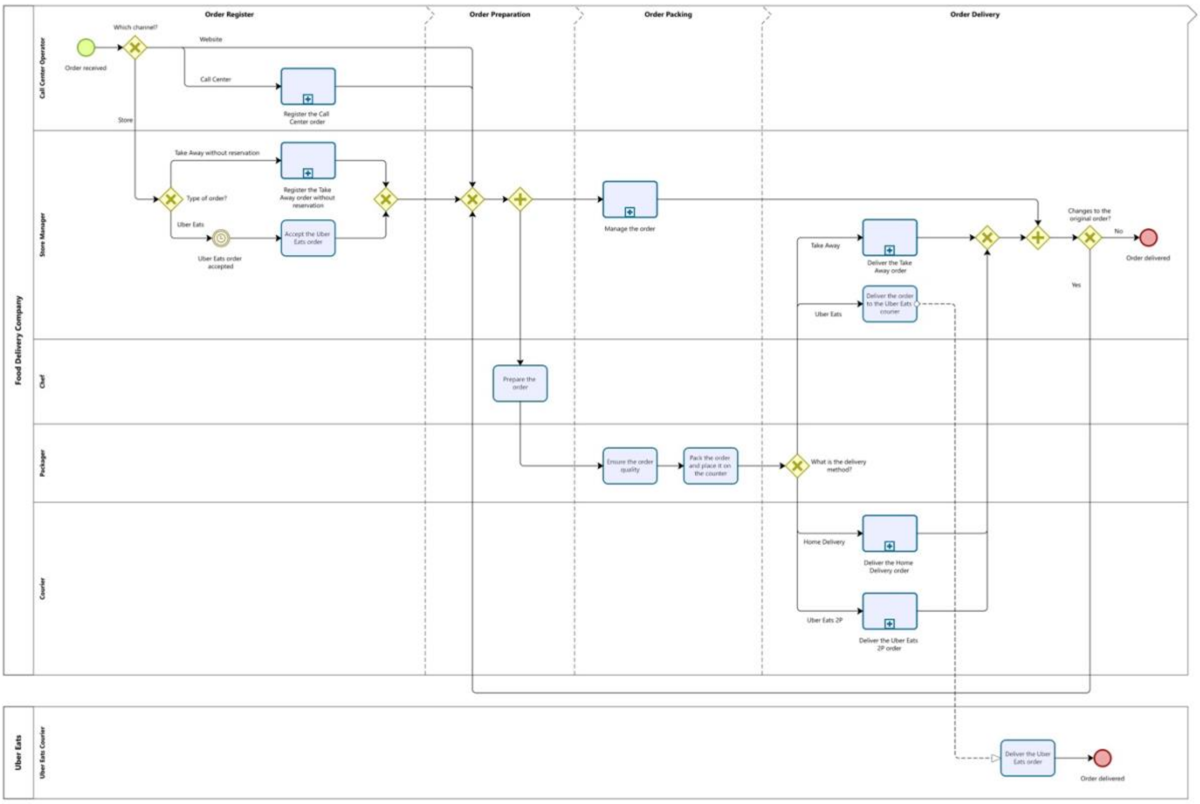

Figure 7 - “To-Be” Process Model: O2C (Level 1)

“To-Be” Process Simulation

The O2C “To-Be” process model simulation aims to validate the proposed improvements and optimizations by replicating the desired future state of the O2C process in a controlled environment. Through this simulation, we can assess the impact of the changes on key performance indicators, such as cycle time, resource consumption, and waiting time, ensuring that the “To-Be” model achieves its intended benefits. This approach allows us to identify potential issues and adjust the proposed strategies.

For this simulation all the parameters and scenarios used for the “As-Is” simulation were adopted, except for the cycle times which were affected by the changes introduced, and that can be consulted in Appendix B, Table B6 and Table B7. Maintaining the same parameters, apart from cycle times, allows the analysis to focus on the changes implemented.

“To-Be” simulations results can be seen in the tables bellow (Table 25 to Table 32), where it is possible to analyse the new metrics contemplating the changes previously presented. By analysing the outputs, the store managers and couriers resource utilization reduction is highlighted, as well as the reduction in the overall process cycle time across the different scenarios. The improvement in the cycle time of the process is essentially due to the reduction in the time taken to register the order in the store the reduction in the delivery time for Home Delivery and Uber Eats 2P orders, validating effectiveness of the changes introduced by the team.

Table 25 - “To-Be” Process Simulation: Resource Consumption (Store 1 (Normal Scenario))

Role	Resource Consumption
Store Manager	13.93%
Call Center Operator	1.62%
Chef	14.89%
Packager	17.55%
Courier	44.11%

Table 26 - “To-Be” Process Simulation: Results (Store 1 (Normal Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 1 (Normal)	40	17m 27s	
Register the Call Center order	4	2m 30s	0s
Register the Take Away order without reservation	2	1m 32s	0s
Accept the Uber Eats order	21	5s	0s
Manage the order	40	31s	1s
Prepare the order	40	2m 52s	0s
Ensure the order quality	40	25s	0s
Pack the order and place it on the counter	40	55s	1s
Deliver the Take Away order	8	1m 16s	0s
Deliver the order to the Uber Eats courier	9	20s	0s
Deliver the Uber Eats order	9	9m 57s	0s
Deliver the Home Delivery order	11	14m 4s	11s
Deliver the Uber Eats 2P order	12	15m 42s	0s

Table 27 - “To-Be” Process Simulation: Resource Consumption (Store 1 (Busy Scenario))

Role	Resource Consumption
Store Manager	9.71%
Call Center Operator	2.70%
Chef	17.53%
Packager	26.27%
Courier	62.87%

Table 28 - “To-Be” Process Simulation: Results (Store 1 (Busy Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 1 (Busy)	54	19m 53s	
Register the Call Center order	12	2m 51s	0s
Register the Take Away order without reservation	1	1m 41s	0s
Accept the Uber Eats order	15	5s	0s
Manage the order	54	3m 17s	0s
Prepare the order	54	33s	0s
Ensure the order quality	54	25s	0s
Pack the order and place it on the counter	54	1m 1s	1s
Deliver the Take Away order	10	1m 22s	0s
Deliver the order to the Uber Eats courier	4	22s	0s
Deliver the Uber Eats order	4	11m 58s	0s
Deliver the Home Delivery order	22	15m 8s	19s
Deliver the Uber Eats 2P order	18	17m 28s	7s

Table 29 - "To-Be" Process Simulation: Resource Consumption (Store 2 (Normal Scenario))

Role	Resource Consumption
Store Manager	14.34%
Call Center Operator	1.61%
Chef	14.51%
Packager	22.32%
Courier	56.45%

Table 30 - "To-Be" Process Simulation: Results (Store 2 (Normal Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 2 (Normal)	48	20m 26s	
Register the Call Center order	5	2m 30s	0s
Register the Take Away order without reservation	2	1m 37s	0s
Accept the Uber Eats order	23	5s	0s
Manage the order	48	37s	5s
Prepare the order	48	3m 8s	0s
Ensure the order quality	48	25s	0s
Pack the order and place it on the counter	48	59s	1s
Deliver the Take Away order	5	1m 34s	0s
Deliver the order to the Uber Eats courier	3	21s	0s
Deliver the Uber Eats order	3	11m 24s	0s
Deliver the Home Delivery order	20	13m 45s	0s
Deliver the Uber Eats 2P order	20	16m 32s	11s

Table 31 - “To-Be” Process Simulation: Resource Consumption (Store 2 (Busy Scenario))

Role	Resource Consumption
Store Manager	16.40%
Call Center Operator	4.23%
Chef	23.87%
Packager	43.06%
Courier	83.65.%

Table 32 - “To-Be” Process Simulation: Results (Store 2 (Busy Scenario))

Activity	Completed Instances	Average Execution Time (mm ss)	Average Waiting Time for Resource (mm ss)
O2C Process - Store 2 (Busy)	90	23m 30s	
Register the Call Center order	19	2m 59s	0s
Register the Take Away order without reservation	3	1m 43s	0s
Accept the Uber Eats order	23	5s	0s
Manage the order	90	35s	0s
Prepare the order	90	3m 33s	0s
Ensure the order quality	90	25s	0s
Pack the order and place it on the counter	90	1m 12s	3s
Deliver the Take Away order	17	1m 38s	1s
Deliver the order to the Uber Eats courier	5	23s	0s
Deliver the Uber Eats order	5	9m 00s	0s
Deliver the Home Delivery order	42	17m 51s	2m 4s
Deliver the Uber Eats 2P order	26	19m 39s	1m 53s

5. DISCUSSION

5.1. THEORETICAL IMPLICATIONS

Through the outputs previously generated, this project contributes to the expansion of BPM literature by presenting a practical case of the application of BPM techniques in retail, more specifically in the food delivery industry.

From previous research in the field of BPM, it is possible to retrieve some success cases in which the Dumas et al. (2018) BPM lifecycle framework was used, bringing several positive results for companies. In the case of SAP, Reisert et al. (2018) points out that in late 1990's SAP experienced issues with its internationally dispersed functional configuration, which increased the time for development and decision-making processes, resulting in customer dissatisfaction. As part of their solution, SAP established the Productivity Consulting Group (PCG) to emphasize the value of BPM in work environments, in order to improve transparency in important roles, processes, and responsibilities (Reisert et al., 2018). Another significant BPM application is the case of Siemens, which, due to its worldwide presence in 190 countries, has faced commercial problems due to local management based on the needs of the business units. To overcome this problem, Siemens has implemented a worldwide process standardization policy (Woliński & Bala, 2018). In the case of Deutsche Bahn, the lack of an integrated system for managing regulatory obligations was identified, which resulted in inefficiencies and errors in reporting. The solution passed by developing a web application with a core of BPM to control transitions of responsibility and ensure data quality (Rau et al., 2018).

As in the cases previously presented where BPM and the Dumas et al. (2018) framework was used, this project also contributes to the validation of the framework by presenting a practical case of success in the food delivery industry.

5.2. PRACTICAL IMPLICATIONS

In this section, we discuss the practical implications of our findings and proposed enhancements to the O2C process.

Although there was no implementation phase, the practical implications were developed based on the results of the simulation of the "To-Be" model, with the main objective of bridging the gap between academic research and real-world application, demonstrating the value and impact of the proposed changes on everyday business practices.

As can be seen in Table 33, the Store Manager resource consumption decreased considerably in all scenarios, leaving a clear margin to analyse a possible reduction in resources during the Busy scenarios, since utilization is now 15.05% in Store 1 and 22.21% in Store 2. With the incorporation of quality assurance into the packager's activities, the use of resources has increased slightly, but has not yet affected the overall cycle time of the process. What contributed most to increasing the efficiency of the process was the reduction in the courier resource utilization, which decreased on average more than 5% across all scenarios.

Table 33 - Process Simulation: “As-Is” vs “To-Be” Resource Consumption Variation

	Store 1		Store 2	
Role	**Utilization Variation - Normal Scenario**	**Utilization Variation - Busy Scenario**	**Utilization Variation - Normal Scenario**	**Utilization Variation - Busy Scenario**
Store Manager	-11,29%	-5,34%	-13,55%	-5,81%
Call Center Operator	+0,25%	-0,05%	-0,07%	+0,34%
Chef	-0,70%	+0,19%	+0,45%	+3,49%
Packager	+1,65%	+5,78%	+5,10%	+10,76%
Courier	-5,31%	-7,34%	-9,02%	-5,99%

Regarding O2C cycle times, there was a significant reduction in all scenarios, with greater emphasis on Busy scenarios. Based on Table 34, Store 1 (Normal Scenario) recorded a 10.89% reduction in overall cycle time, Store 1 (Busy Scenario) a 13.86% reduction, Store 2 (Normal Scenario) a 15.51% reduction and, finally, Store 2 (Busy Scenario) recorded the greatest reduction of 31.62%, allowing us to conclude that this is the scenario with the most room for improvement.

Table 34 - Process Simulation: “As-Is” vs “To-Be” Cycle Time Variation

Scenario	Average Cycle Time “As-Is”	Average Cycle Time “To-Be”	Variation (%)
Store 1 (Normal Scenario)	19m 35s	17m 27s	-10,89%
Store 1 (Busy Scenario)	23m 05s	19m 53s	-13,86%
Store 2 (Normal Scenario)	24m 11s	20m 26s	-15,51%
Store 2 (Busy Scenario)	34m 22s	23m 30s	-31,62%

In terms of cost reduction, the analysis was carried out keeping all resources, although there is room for resource reductions, considering the cycle time reduction and the hourly rates of resources. Resorting to Table 35 it is possible to see that Store 1 will be able to save up to 9.621,85€ and up to 20.644,95€ in Store 2, representing respectively a reduction of 12.03% and 22.06% in total annual costs.

Table 35 - Process Simulation: Financial Analysis

	Store 1		Store 2	
	Normal Scenario	**Busy Scenario**	**Normal Scenario**	**Busy Scenario**
Estimated Annual Cost Reduction	-5 018,11 €	-4 603,74 €	-8 612,14 €	-12 032,80 €

6. LIMITATIONS AND FUTURE WORKS

Although there was rigorous analysis and extensive data collection, this project had some limitations. Firstly, the client has six stores in total, spread across the country, which made it impossible to visit and analyze all the stores, meaning that the data collected was mainly from the two stores that were used for the simulation, and that the observed practices may not be followed in the other stores.

Secondly, the process modeler and simulator used, Bizagi, has some limitations. It doesn't account for the fact that the courier carries more than one order in each delivery, which results in additional cycle time due to the courier's waiting time, but on the other hand, it also doesn't account for the time it takes the courier to return to the store after delivering the order, which decreases the total time waiting for a courier.

The simulation also presented some limitations regarding the resource utilization for all scenarios, which does not represent the reality of all resources, since the call center operator not only receives order calls, but also complaints, requests for information, among other calls, and the store manager, in addition to O2C tasks, has complementary management tasks that are not directly linked to the process.

The project also presented a third limitation related to the utilization of only one framework, Dumas et al. (2018) BPM lifecycle, which is a very complete framework and one of the most recognized in the field. Nevertheless, there are many other frameworks that could be used and present different project outputs.

Finally, the implementation of the "To-Be" process model and its subsequent monitoring and control were not part of the project's scope, limiting the analysis of the project's results. This phase would be an important continuation of this project, in order to analyse the improvements made and make adjustments in the event of low effectiveness.

Future research should investigate the integration of advanced technologies, such as Artificial Intelligence (AI) and Machine Learning (ML), into BPM frameworks. These technologies can provide predictive analytics, automate routine tasks, and enhance decision-making processes, thereby further improving process efficiency and effectiveness. This combination of AI and ML with BPM can be done through the implementation of Process Mining (PM) techniques, which will allow to bridge the gap between data-driven insights and process optimization, by analysing IS event logs in order to deliver fact-based insights and boost process improvements (W. Van Der Aalst, 2016).

Following this project scope, involving the integration phase, pursued by a monitoring and controlling phase, is an important step in evaluating the results and optimising the changes presented.

7. CONCLUSIONS

The main goal of this thesis was to use the BPM lifecycle framework developed by Dumas et al. (2018) to optimise the O2C process for a Portuguese food delivery company. The objectives of this optimisation were to increase productivity, lower operational expenses, improve customer satisfaction, and make better use of the organization's resources. By focusing on these objectives, the study aimed to address both theoretical and practical gaps in the current literature and practice of BPM.

This thesis contributes significantly to the BPM literature by demonstrating the application of the BPM lifecycle framework in a real-world setting, more specifically within the food delivery industry. Integrating recent advancements in digital innovation and Industry 4.0 paradigms, it highlights how these can be leveraged to enhance BPM initiatives. Furthermore, the study provides empirical evidence on the benefits and challenges of implementing BPM in dynamic and high-demand environments such as the food delivery industry, thereby extending the understanding and applicability of BPM principles in this context.

The findings generated from the detailed modelling and analysis of the process revealed several critical insights, uncovering inefficiencies, particularly during peak times. Qualitative and quantitative analysis identified key concerning points, such as high resource consumption by the couriers, and bottlenecks in the order registration and delivery stages, where significant delays were observed during busy periods, providing a clear understanding of where improvements were needed.

In the process redesign phase, using the heuristic process redesign method, changes were proposed, including the elimination of tasks, the integration of order quality assurance into the packaging process and the implementation of process automation to deal with inefficiencies in the registration and delivery of orders. Simulation of the redesigned process indicated a reduction in resource consumption and an improvement in process efficiency, confirming that the redesigned process can lead to considerable cost reductions and improved customer satisfaction. In addition, the outputs contribute to better documentation and standardisation of the process, contributing to the organisation's overall strategic objectives.

In conclusion, this thesis demonstrates the practical and theoretical value of the BPM lifecycle framework by Dumas et al. (2018) in optimizing the O2C process of a Portuguese food delivery company. The study's findings validate the effectiveness of BPM techniques in enhancing operational efficiency and improving customer satisfaction. The theoretical implications extend the existing BPM literature by providing a case study of successful application in the food delivery industry, aligning with previous research that showcases BPM's versatility across various sectors. These outcomes emphasize the importance of continuous process optimization and the strategic implementation of BPM initiatives to achieve long-term competitiveness and operational excellence.

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APPENDIX A - “AS-IS” PROCESS MODEL

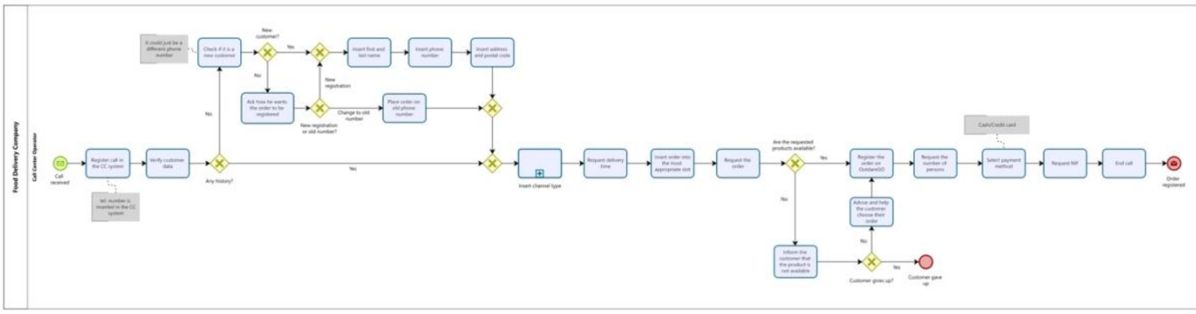

Figure A1 - “As-Is” Process Model: Register the Call Center order subprocess (Level 2)

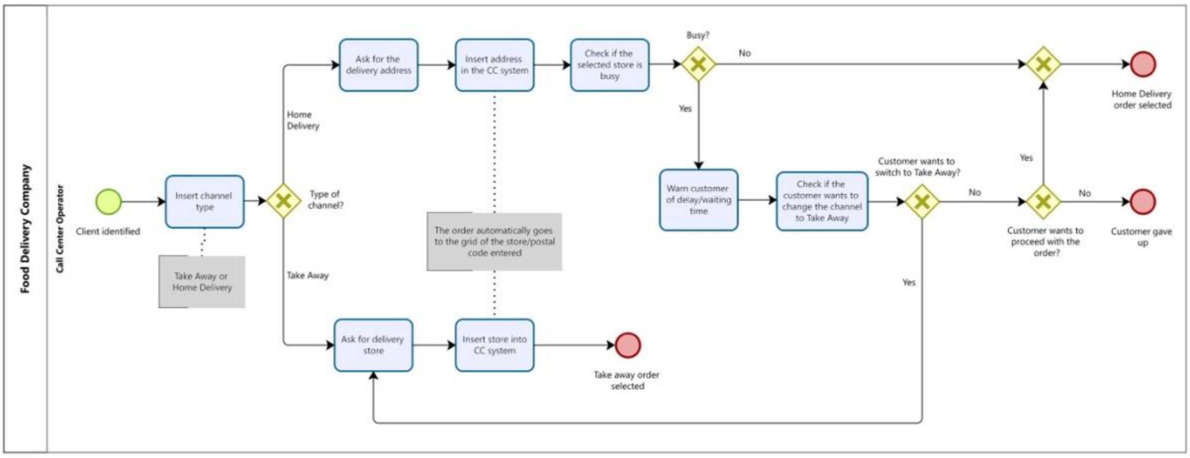

Figure A2 - “As-Is” Process Model: Insert channel type subprocess (Level 2)

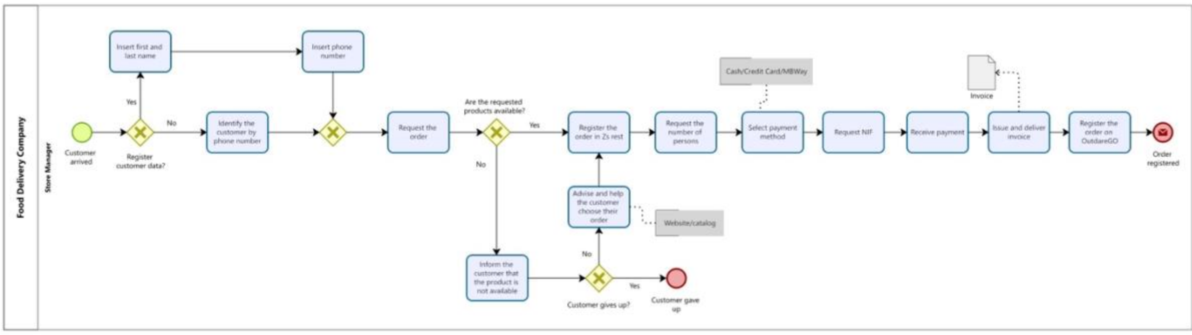

Figure A3 - “As-Is” Process Model: Register the Take Away without reservation order subprocess (Level 2)

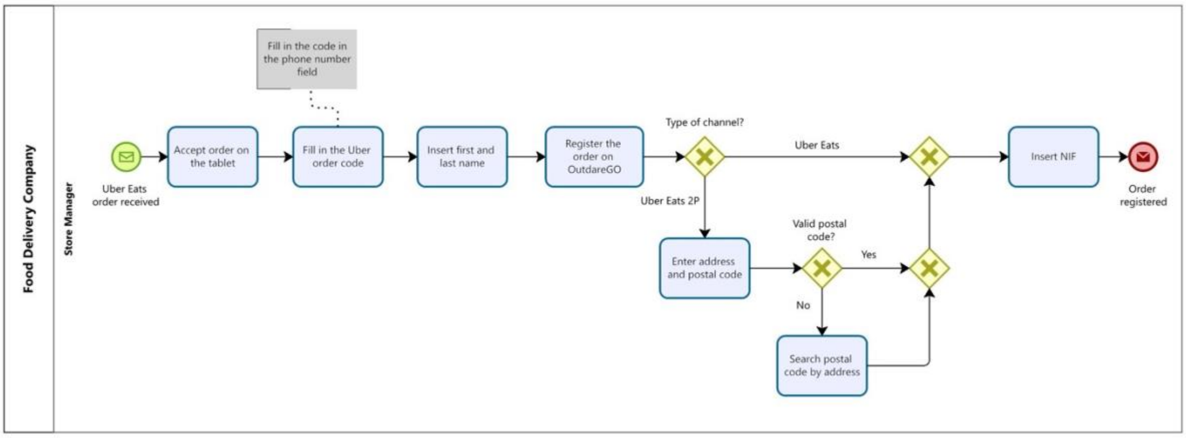

Figure A4 - “As-Is” Process Model: Register the Uber Eats order subprocess (Level 2)

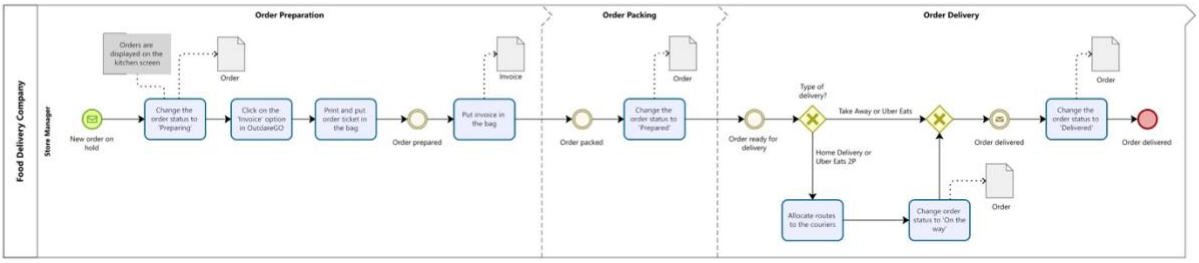

Figure A5 - “As-Is” Process Model: Manage the order subprocess (Level 2)

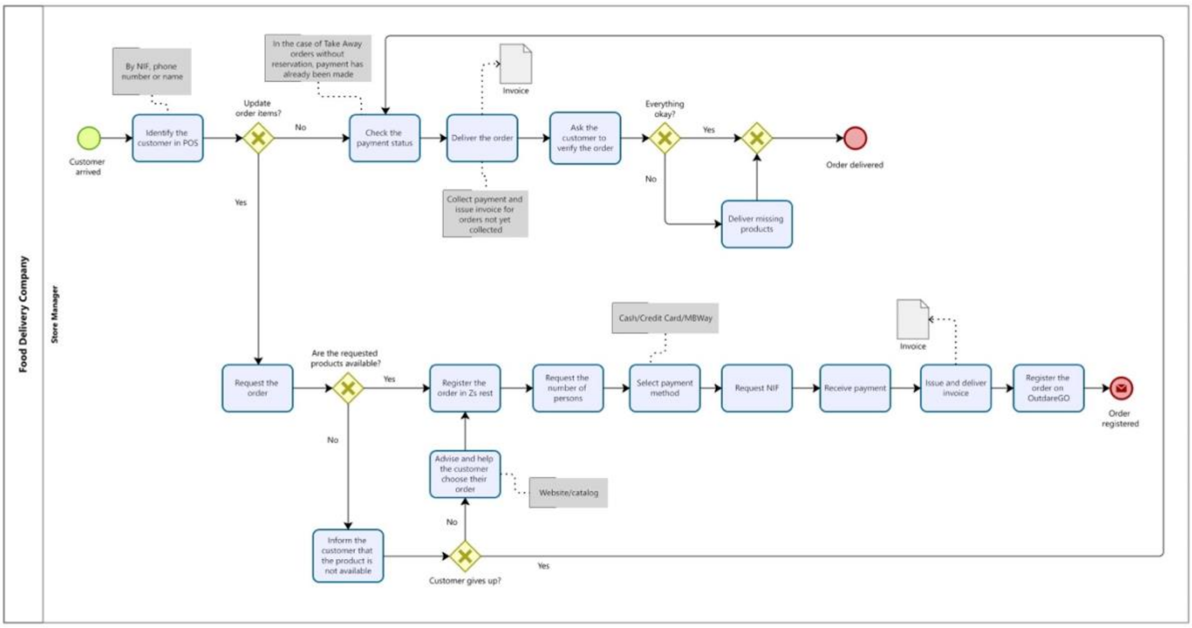

Figure A6 - “As-Is” Process Model: Deliver the Take Away order subprocess (Level 2)

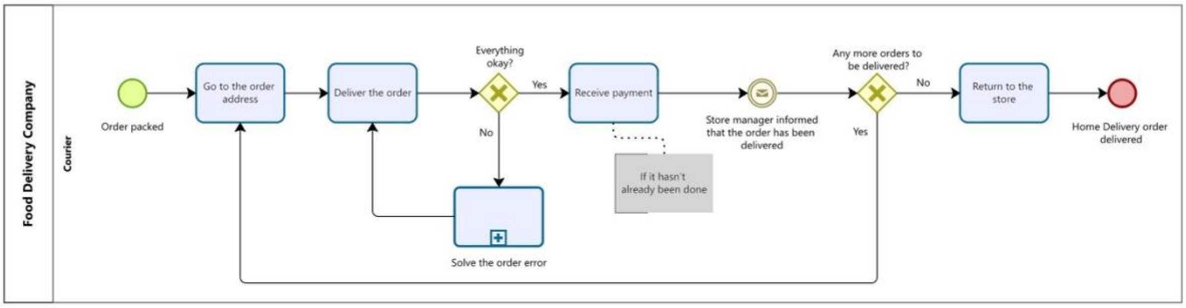

Figure A7 - “As-Is” Process Model: Deliver the Home Delivery order subprocess (Level 2)

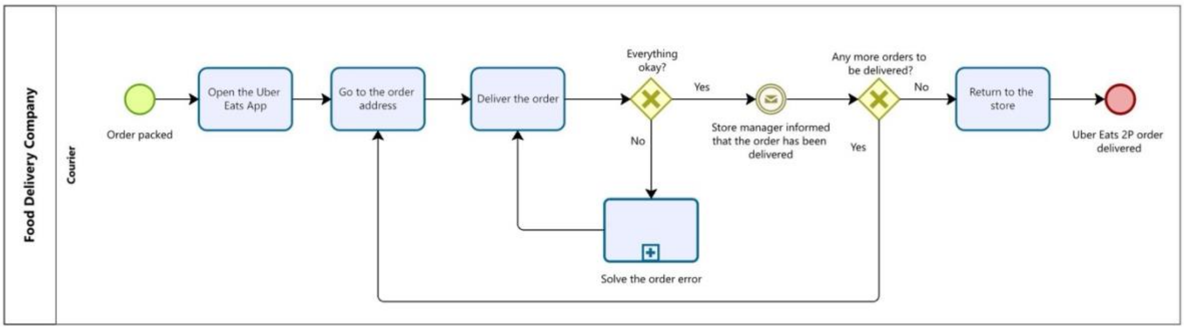

Figure A8 - “As-Is” Process Model: Deliver the Uber Eats 2P order subprocess (Level 2)

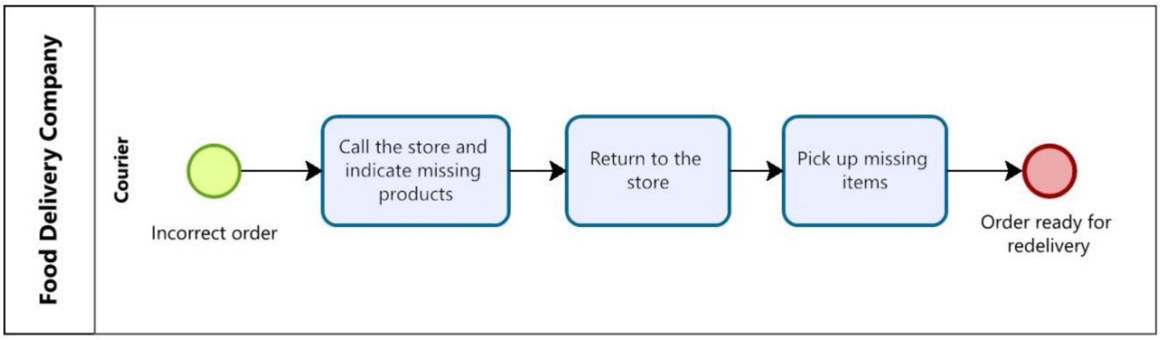

Figure A9 - “As-Is” Process Model: Solve the order error subprocess (Level 3)

APPENDIX B - PROCESS MODEL SIMULATION PARAMETERS

Table B1 - "As-Is" Process Simulation: Resources

	Store 1			Store 2		
	Normal Scenario	Busy Scenario		Normal Scenario	Busy Scenario	
Role	**Number of Resources**		**Costs / Hour**	**Number of Resources**		**Costs / Hour**
Store Manager	1	2	5,5€	1	2	5,8€
Call Center Operator	3	5	4,5€	3	5	4,5€
Chef	3	4	5,7€	4	5	5,9€
Packager	1	1	5,0€	1	1	5,0€
Courier	3	4	6,3€	4	5	6,1€

Table B2 - "As-Is" Process Simulation: Start Event Frequency

	Store 1		Store 2	
	Normal Scenario	Busy Scenario	Normal Scenario	Busy Scenario
Start Event (Poisson Distribution)	**Arrival Interval (mm ss)**			
Orders Received				
Mean	5m 57s	4m 29s	5m 2s	2m 40s
Max Arrival Count	40	54	48	90

Table B3 - “As-Is” Process Simulation: Gateways’ Execution Probability

	Store 1		Store 2	
	Normal Scenario	**Busy Scenario**	**Normal Scenario**	**Busy Scenario**
Gateway	**Probability**			
Which channel?				
Website	34%	48%	38%	50%
Call Center	9%	22%	10%	21%
Store	57%	30%	52%	29%
Type of order?				
Take Away without reservation	7%	2%	8%	12%
Uber Eats	93%	98%	92%	88%
What is the delivery method?				
Take Away	19%	19%	10%	19%
Uber Eats	22%	8%	6%	6%
Home Delivery	28%	40%	41%	47%
Uber Eats 2P	31%	33%	43%	28%

Table B4 - “As-Is” Process Simulation: Parameters (Store 1)

	Store 1	
Activity	**Normal Scenario**	**Busy Scenario**
Register the Call Center order	Truncated Normal Distribution with a Mean of 2m 19s; STDev of 1m 18s; Minimum of 37s and Maximum of 7m 11s	Truncated Normal Distribution with a Mean of 2m 33s; STDev of 1m 26s; Minimum of 41s and Maximum of 7m 54s
Register the Take Away order without reservation	Truncated Normal Distribution with a Mean of 2m 23s; STDev of 47s; Min of 1m 50s and Max of 2m 57s	Truncated Normal Distribution with a Mean of 2m 37s; STDev of 52s; Min of 2m 1s and Max of 3m 15s
Register the Uber Eats order	Truncated Normal Distribution with a Mean of 1m 3s; STDev of 40s; Min of 31s and Max of 3m 35s	Truncated Normal Distribution with a Mean of 1m 9s; STDev of 44s; Min of 34s and Max of 3m 57s
Manage the order	Constant of 30s	Constant of 33s
Prepare the order	Truncated Normal Distribution with a Mean of 2m 36s; STDev of 1m 23s; Min of 1m 30s and Max of 6m	Truncated Normal Distribution with a Mean of 2m 52s; STDev of 1m 31s; Min of 1m 39s and Max of 6m 36s
Pack the order and place it on the counter	Truncated Normal Distribution with a Mean of 50s; STDev of 9s; Min of 45s and Max of 1m	Truncated Normal Distribution with a Mean of 55s; STDev of 10s; Min of 49s and Max of 1m 6s
Deliver the Take Away order	Truncated Normal Distribution with a Mean of 1m 31s; STDev of 56s; Min of 30s and Max of 2m 41s	Truncated Normal Distribution with a Mean of 1m 40s; STDev of 1m 2s; Min of 33s and Max of 2m 57s
Deliver the order to the Uber Eats courier	Constant of 20s	Constant of 22s
Deliver the Uber Eats order	Truncated Normal Distribution with a Mean of 11m 35s; STDev of 6m 34s; Min of 4m 7s and Max of 22m 46s	Truncated Normal Distribution with a Mean of 14m 40s; STDev of 10m 32s; Min of 4m 42s and Max of 46m 18s
Deliver the Home Delivery order	Truncated Normal Distribution with a Mean of 16m 30s; STDev of 9m 12s; Min of 10m and Max of 23m	Truncated Normal Distribution with a Mean of 18m 9s; STDev of 10m 7s; Min of 11m and Max of 25m 18s
Deliver the Uber Eats 2P order	Truncated Normal Distribution with a Mean of 18m; STDev of 6m 29s; Min of 10m and Max of 25m	Truncated Normal Distribution with a Mean of 19m 48s; STDev of 7m 8s; Min of 11m and Max of 27m 30s

Table B5 - “As-Is” Process Simulation: Parameters (Store 2)

	Store 2	
Activity	**Normal Scenario**	**Busy Scenario**
Register the Call Center order	Truncated Normal Distribution with a Mean of 2m 19s; STDev of 1m 18s; Minimum of 37s and Maximum of 7m 11s	Truncated Normal Distribution with a Mean of 2m 33s; STDev of 1m 26s; Minimum of 41s and Maximum of 7m 54s
Register the Take Away order without reservation	Truncated Normal Distribution with a Mean of 2m 30s; STDev of 49s; Min of 1m 56s and Max of 3m 6s	Truncated Normal Distribution with a Mean of 2m 44s; STDev of 54s; Min of 2m 7s and Max of 3m 24s
Register the Uber Eats order	Truncated Normal Distribution with a Mean of 1m 6s; STDev of 42s; Min of 33s and Max of 3m 46s	Truncated Normal Distribution with a Mean of 1m 12s; STDev of 46s; Min of 36s and Max of 4m 7s
Manage the order	Constant of 32s	Constant of 35s
Prepare the order	Truncated Normal Distribution with a Mean of 2m 44s; STDev of 1m 27s; Min of 1m 35s and Max of 6m 18s	Truncated Normal Distribution with a Mean of 2m 59s; STDev of 1m 35s; Min of 1m 43s and Max of 6m 54s
Pack the order and place it on the counter	Truncated Normal Distribution with a Mean of 53s; STDev of 9s; Min of 47s and Max of 1m 3s	Truncated Normal Distribution with a Mean of 58s; STDev of 10s; Min of 52s and Max of 1m 9s
Deliver the Take Away order	Truncated Normal Distribution with a Mean of 1m 36s; STDev of 59s; Min of 32s and Max of 2m 49s	Truncated Normal Distribution with a Mean of 1m 45s; STDev of 1m 4s; Min of 35s and Max of 3m 5s
Deliver the order to the Uber Eats courier	Constant of 21s	Constant of 23s
Deliver the Uber Eats order	Truncated Normal Distribution with a Mean of 11m 17s; STDev of 1m 37s; Min of 10m 9s and Max of 12m 26s	Truncated Normal Distribution with a Mean of 11m 50s; STDev of 6m 27s; Min of 4m 22s and Max of 25m 26s
Deliver the Home Delivery order	Truncated Normal Distribution with a Mean of 17m 20s; STDev of 9m 39s; Min of 10m 30s and Max of 24m 9s	Truncated Normal Distribution with a Mean of 18m 59s; STDev of 10m 34s; Min of 11m 30s and Max of 26m 27s
Deliver the Uber Eats 2P order	Truncated Normal Distribution with a Mean of 18m 54s; STDev of 6m 48s; Min of 10m 30s and Max of 26m 15s	Truncated Normal Distribution with a Mean of 20m 42s; STDev of 7m 27s; Min of 11m 30s and Max of 28m 45s

Table B6 - “As-Is” Process Simulation: Parameters (Store 1)

	Store 1	
Activity	**Normal Scenario**	**Busy Scenario**
Register the Call Center order	Truncated Normal Distribution with a Mean of 2m 19s; STDev of 1m 18s; Minimum of 37s and Maximum of 7m 11s	Truncated Normal Distribution with a Mean of 2m 33s; STDev of 1m 26s; Minimum of 41s and Maximum of 7m 54s
Register the Take Away order without reservation	Truncated Normal Distribution with a Mean of 1m 26s; STDev of 28s; Min of 1m 6s and Max of 1m 46s	Truncated Normal Distribution with a Mean of 1m 34s; STDev of 31s; Min of 1m 13s and Max of 1m 57s
Accept the Uber Eats order	Constant of 5s	Constant of 5s
Manage the order	Constant of 30s	Constant of 33s
Prepare the order	Truncated Normal Distribution with a Mean of 2m 36s; STDev of 1m 23s; Min of 1m 30s and Max of 6m	Truncated Normal Distribution with a Mean of 2m 52s; STDev of 1m 31s; Min of 1m 39s and Max of 6m 36s
Ensure the order quality	Constant of 25s	Constant of 25s
Pack the order and place it on the counter	Truncated Normal Distribution with a Mean of 50s; STDev of 9s; Min of 45s and Max of 1m	Truncated Normal Distribution with a Mean of 55s; STDev of 10s; Min of 49s and Max of 1m 6s
Deliver the Take Away order	Truncated Normal Distribution with a Mean of 1m 22s; STDev of 50s; Min of 27s and Max of 2m 25s	Truncated Normal Distribution with a Mean of 1m 30s; STDev of 55s; Min of 30s and Max of 2m 39s
Deliver the order to the Uber Eats courier	Constant of 20s	Constant of 22s
Deliver the Uber Eats order	Truncated Normal Distribution with a Mean of 11m 35s; STDev of 6m 34s; Min of 4m 7s and Max of 22m 46s	Truncated Normal Distribution with a Mean of 14m 40s; STDev of 10m 32s; Min of 4m 42s and Max of 46m 18s
Deliver the Home Delivery order	Truncated Normal Distribution with a Mean of 14m 2s; STDev of 7m 49s; Min of 8m 30s and Max of 19m 33s	Truncated Normal Distribution with a Mean of 15m 26s; STDev of 8m 36s; Min of 9m 21s and Max of 21m 30s
Deliver the Uber Eats 2P order	Truncated Normal Distribution with a Mean of 15m 18s; STDev of 5m 31s; Min of 8m 30s and Max of 21m 15s	Truncated Normal Distribution with a Mean of 16m 50s; STDev of 6m 4s; Min of 9m 21s and Max of 23m 23s

Table B7 - "As-Is" Process Simulation: Parameters (Store 2)

	Store 2	
Activity	**Normal Scenario**	**Busy Scenario**
Register the Call Center order	Truncated Normal Distribution with a Mean of 2m 19s; STDev of 1m 18s; Minimum of 37s and Maximum of 7m 11s	Truncated Normal Distribution with a Mean of 2m 33s; STDev of 1m 26s; Minimum of 41s and Maximum of 7m 54s
Register the Take Away order without reservation	Truncated Normal Distribution with a Mean of 1m 30s; STDev of 30s; Min of 1m 9s and Max of 1m 52s	Truncated Normal Distribution with a Mean of 1m 39s; STDev of 32s; Min of 1m 16s and Max of 2m 2s
Accept the Uber Eats order	Constant of 5s	Constant of 5s
Manage the order	Constant of 32s	Constant of 35s
Prepare the order	Truncated Normal Distribution with a Mean of 2m 44s; STDev of 1m 27s; Min of 1m 35s and Max of 6m 18s	Truncated Normal Distribution with a Mean of 2m 59s; STDev of 1m 35s; Min of 1m 43s and Max of 6m 54s
Ensure the order quality	Constant of 25s	Constant of 25s
Pack the order and place it on the counter	Truncated Normal Distribution with a Mean of 53s; STDev of 9s; Min of 47s and Max of 1m 3s	Truncated Normal Distribution with a Mean of 58s; STDev of 10s; Min of 52s and Max of 1m 9s
Deliver the Take Away order	Truncated Normal Distribution with a Mean of 1m 26s; STDev of 53s; Min of 28s and Max of 2m 32s	Truncated Normal Distribution with a Mean of 1m 34s; STDev of 58s; Min of 31s and Max of 2m 47s
Deliver the order to the Uber Eats courier	Constant of 21s	Constant of 23s
Deliver the Uber Eats order	Truncated Normal Distribution with a Mean of 11m 17s; STDev of 1m 37s; Min of 10m 9s and Max of 12m 26s	Truncated Normal Distribution with a Mean of 11m 50s; STDev of 6m 27s; Min of 4m 22s and Max of 25m 26s
Deliver the Home Delivery order	Truncated Normal Distribution with a Mean of 14m 44s; STDev of 8m 12s; Min of 8m 55s and Max of 20m 32s	Truncated Normal Distribution with a Mean of 16m 8s; STDev of 8m 59s; Min of 9m 46s and Max of 22m 29s
Deliver the Uber Eats 2P order	Truncated Normal Distribution with a Mean of 16m 4s; STDev of 5m 47s; Min of 8m 55s and Max of 22m 19s	Truncated Normal Distribution with a Mean of 17m 36s; STDev of 6m 20s; Min of 9m 46s and Max of 24m 26s

APPENDIX C - "TO-BE" PROCESS MODEL

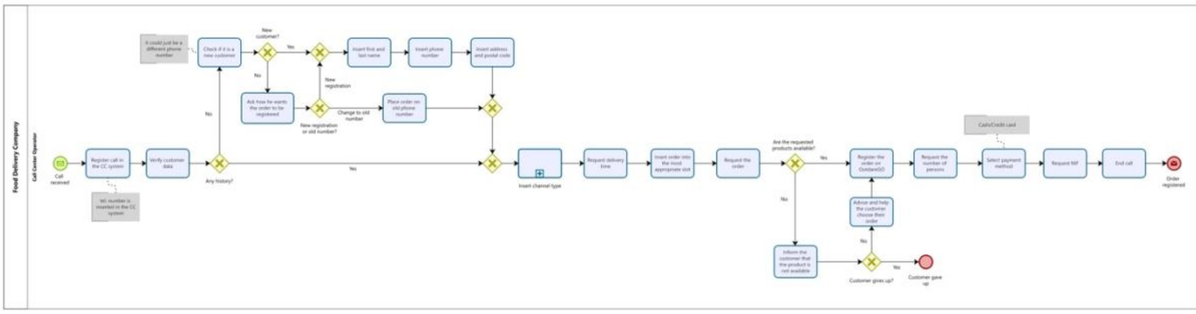

Figure C1 - "To-Be" Process Model: Register the Call Center order subprocess (Level 2)

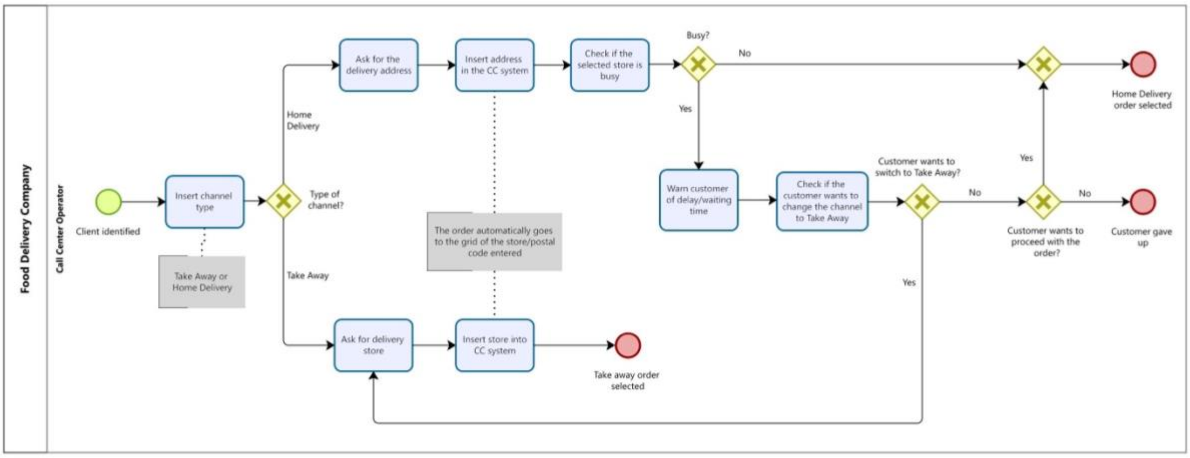

Figure C2 - "To-Be" Process Model: Insert channel type subprocess (Level 2)

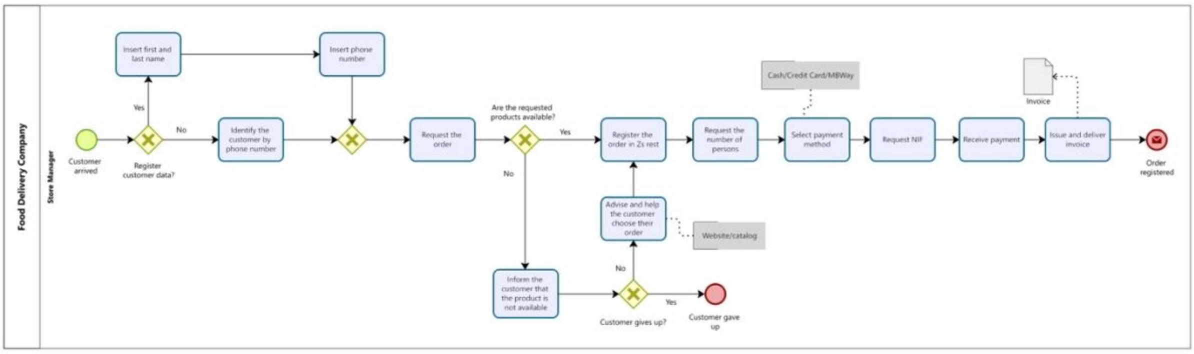

Figure C3 - "To-Be" Process Model: Register the Take Away without reservation order subprocess (Level 2)

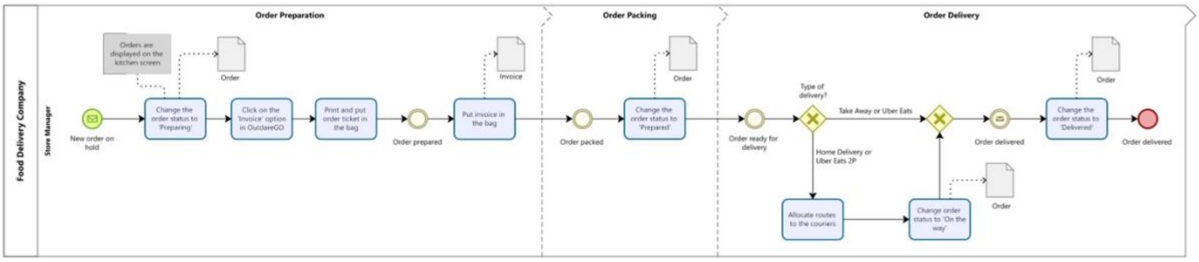

Figure C4 - “To-Be” Process Model: Manage the order subprocess (Level 2)

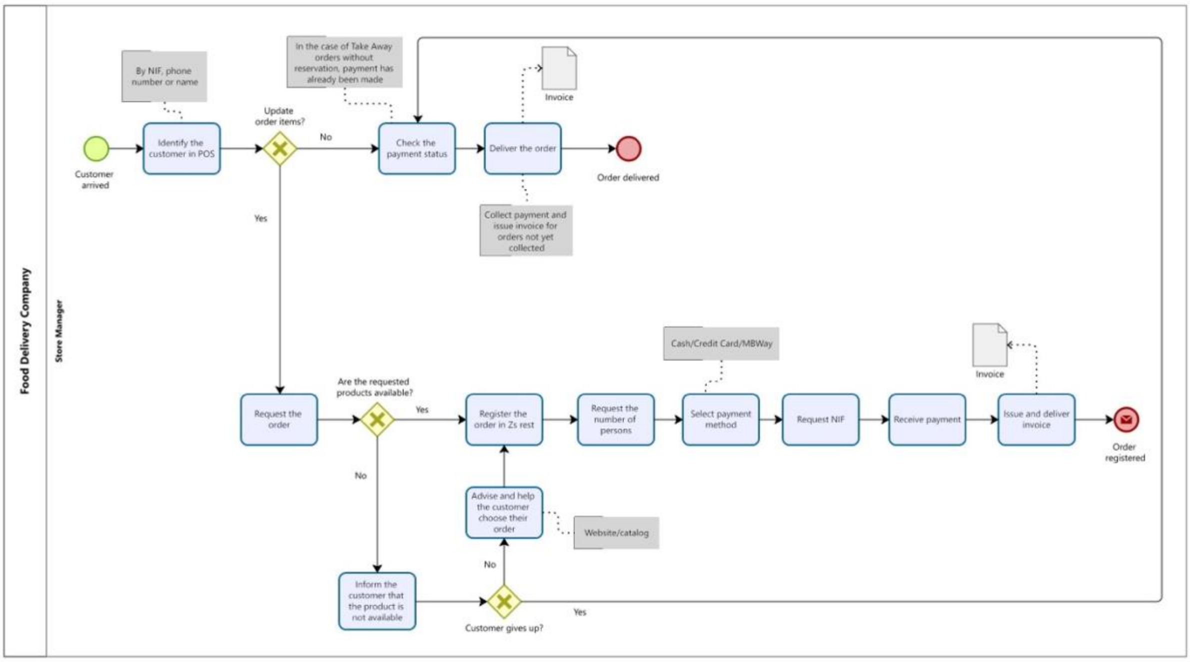

Figure C5 - “To-Be” Process Model: Deliver the Take Away order subprocess (Level 2)

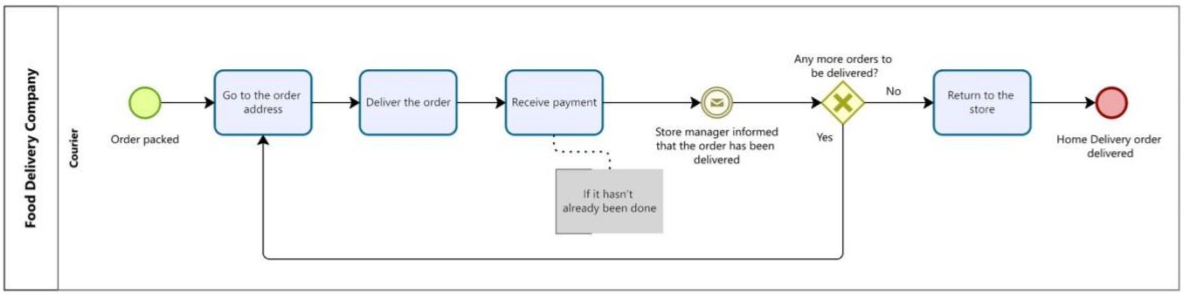

Figure C6 - “To-Be” Process Model: Deliver the Home Delivery order subprocess (Level 2)

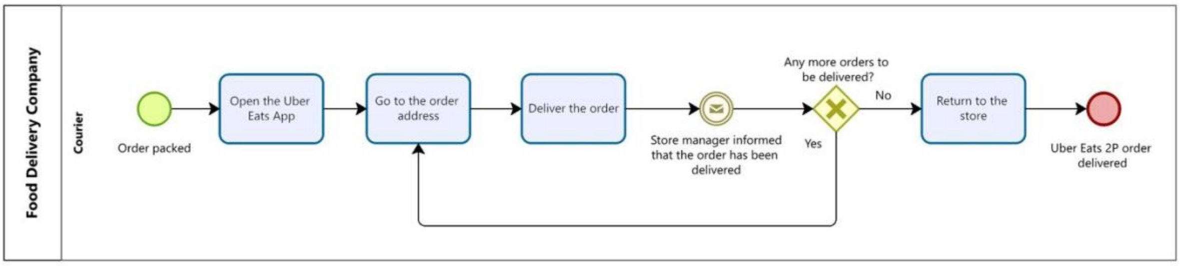

Figure C7 - “To-Be” Process Model: Deliver the Uber Eats 2P order subprocess (Level 2)

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