

Piri Reis University

Faculty of Economics and Administrative Sciences

**Management Information Systems Department**

**GRADUATION THESIS – YBS421**

**BUSINESS PROCESS MANAGEMENT: SIMULATION-BASED BUSINESS PROCESS OPTIMIZATION WITH CAMUNDA MODELER**

**Sevcan ÇOŞKUN**

**20190305043**

Advisor: Prof.Dr. Batuhan KOCAOĞLU

İstanbul May, 2024

DECLARATION

I hereby declare that this thesis represents my own work which has been done after registration for the degree of bachelor at Piri Reis University, and has not been previously included in a thesis or dissertation submitted to this or any other institution for a degree, diploma or other qualifications.

Signature:

Date: 30/05/2024

ACKNOWLEDGEMENT

I am really grateful to have prepared a thesis in this field.

who contributed to this study and to me in Batuhan Kocaoğlu…

ABSTRACT

This thesis explores the realm of Business Process Management (BPM) with a focus on simulation-based optimization using Camunda Modeler. By leveraging simulation techniques, the study aims to enhance business process efficiency and effectiveness. Through the analysis and optimization of processes, this research contributes to the advancement of BPM methodologies.

**Key Words**: Business Process Management (BPM), Simulation-Based Optimization, Camunda Modeler, Process Optimization, Workflow

TABLE OF CONTENTS

[DECLARATION 2](#_Toc163081387)

[ACKNOWLEDGEMENT 3](#_Toc163081388)

[ABSTRACT 4](#_Toc163081389)

[TABLE OF CONTENTS 5](#_Toc163081390)

[LIST OF FIGURES 6](#_Toc163081391)

[LIST OF TABLES 7](#_Toc163081392)

[1 INTRODUCTION 8](#_Toc163081393)

[2 LITERATURE REVIEW: 10](#_Toc163081394)

[3 ORIGINALITY OF THE STUDY 15](#_Toc163081395)

[4 PROBLEM DEFINITION 17](#_Toc163081396)

[5 SOLUTION APPROACH 20](#_Toc163081397)

[6 REQUIRED TOOLS 24](#_Toc163081398)

[7 SYSTEM / MODEL & SOLUTION DEVELOPMENT 27](#_Toc163081399)

[8 CASE STUDY / BUSINESS CASE 32](#_Toc163081400)

[9 CONCLUSIONS 45](#_Toc163081401)

[10 Kaynakça 45](#_Toc163081402)

[11 GIT/KAGGLE/COLAB/etc.. LINK 47](#_Toc163081403)

[12 CURRICULUM VITAE 48](#_Toc163081404)

LIST OF FIGURES

[Figure 1: Use Case Diagram 34](#_Toc165557547)

[Figure 2: Flowchart Of The Test Business Scenario 37](#_Toc165557548)

[Simulation Process-1 Figure 3 42](#_Toc165557549)

[Simulation Process-2 Figure 4 43](#_Toc165557550)

[Simulation Process-3 Figure 5 43](#_Toc165557551)

[Simulation Process-4 Figure 6 44](#_Toc165557552)

[Simulation Process-5 Figure 7 45](#_Toc165557553)

[Simulation Process- 6 Figure 8 45](#_Toc165557554)

[Simulation Process- 7 Figure 9 46](#_Toc165557555)

LIST OF TABLES

[Table 1: The GANNT CHART of this thesis is as shown below: 9](#_Toc164287313)

[Table 2: Literature Review Main Headings 14](#_Toc164287314)

[Table 3: Flowchart Of The Project 20](#_Toc164287315)

[Table 4: Database Diagram Of The Project 27](#_Toc164287316)

# 1 INTRODUCTION

Effective management and optimization of business processes are of critical importance in today's competitive business world. Particularly, improving business processes to respond quickly and effectively to customer demands, reducing costs, and enhancing operational efficiency are essential requirements for companies. In this context, process modeling, analysis, and simulation-based optimization have become important tools in addressing corporate challenges and gaining competitive advantage.

This research focuses on business process management and improvement, specifically emphasizing simulation-based process optimization using the Camunda Modeler. The starting point of the research is the need for companies to effectively manage and optimize complex processes, such as the order to cash process, which encompasses the process from order placement to payment collection and serves as a fundamental source of revenue for businesses. Therefore, efficiently managing and improving this process is crucial for enhancing a firm's competitive strength.

This study addresses the limited number of existing works on simulation-based process optimization using the Camunda Modeler and focuses on a specific business process, such as the order to cash process, which reflects a research gap in the literature.

The aim of this study is to perform simulation-based optimization of the order to cash process, particularly using the Camunda Modeler.

This approach differs from other literature studies in the following aspects:

* Focus on the order to cash process: Unlike previous studies in business process management, this study concentrates on a specific process. The aim is to better understand how this critical process can be controlled and optimized.
* Use of the Camunda Modeler: The use of a specific software tool such as the Camunda Modeler is a distinguishing feature of this study. The flexible and user-friendly interface of Camunda facilitates modeling, simulation, and optimization of business processes.
* Simulation-based optimization approaches: This study focuses on the use of simulation-based approaches for process optimization. This method is recognized as an important tool for analyzing and improving real-world process performance.

This introduction highlights the starting point of the study, presents the rationale for the research, and emphasizes what sets this study apart from others, namely the focus on simulation-based optimization using the Camunda Modeler.

The subsequent sections of this study will examine the modeling, simulation, and optimization steps of the order to cash process.

Table 1: The GANNT CHART of this thesis is as shown below:

metin, ekran görüntüsü, sayı, numara, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

# LITERATURE REVIEW:

Business Process Management: Simulation Based Business Process Optimization - Literature Review Using Camunda Modeler Effective management and optimization of a company's complex processes is a basic requirement to gain competitive advantage and increase efficiency.

Therefore, the issue of business process management and optimization has become one of the strategic priorities of companies. In the literature review section, previously published studies on this subject or similar subjects, videos that can be taken as examples, books, blogs or articles that provide detailed information were examined.

1. **Source Type: Blog**

Source Title: What is UML? What are its Benefits?

Author: Gökhan Yavaş

Publication Date: 2017

About the Source: The purpose of this blog page is primarily to introduce and explain UML (Unified Modeling Language), a business systems modeling language commonly used in the software industry. UML is defined as a structured language consisting of different diagram types representing various aspects of a system.

This work highlights the following benefits of using UML in software development: Standardizing software development, enhancing team collaboration, and minimizing errors.

**This work :** (Yavaş, 2017)

1. **Source Type: Article**

Source Title: An Approach to Business Process Management (BPM) and Workflow Management (WFM) Concepts

Author(s): Özel SEBETCİ, Mustafa Burak GÜNAY, Esin SEBETCİ

Publication Date: 2018

About the Source: The aim of this study is to emphasize the necessity for practitioners, automation producers, and industries where awareness is still underdeveloped to learn the basic concepts of business process management and workflow management by eliminating conceptual confusion.

The importance of more effective use of these concepts, especially in areas such as transaction processes, document, and paper processes, is highlighted.

Business process management is defined as a methodology aimed at increasing the efficiency and effectiveness of enterprises in the study.

Considering the conditions of global competition and the increasing demand for quality, it is also emphasized that this process is important for companies.

Although the methods used in the study are not clearly stated, it is seen that a literature review on this subject and a discussion of the theoretical framework are discussed.

Therefore, among the conclusions of this study, the importance of distinguishing between business process management and workflow management concepts and how these concepts can be used in enterprises are discussed.

These results will help companies optimize their processes and increase efficiency.

**This work:** (SEBETCİ, GÜNAY, & SEBETCİ, 2018)

1. **Source Type: Blog**

Source Title: What is a Flowchart? When Should It Be Used?

Author: Sezer Açiler

Publication Date: 2020

About the Source: The purpose of this blog post is to explain how flowcharts are used in data collection and process analysis.

The elements of flowcharts, when to use flowcharts, their benefits, and different formats used for different purposes in flowcharts are explained.

Methods and Results Used in this Blog Post: This blog post discusses the importance of flowcharts in increasing workplace efficiency, facilitating process organization, increasing efficiency, and supporting communication.

It emphasizes the benefits of flowcharts in documenting processes, controlling operations, explaining how tasks are performed, and identifying areas for improvement and efficiency.

**This work:** (AÇİLER, 2020)

1. **Source Type: Video**

Source Title: Order-to-Cash with Camunda Modeler

Source Owner: QUT Digital Learning

Publication Date: 2022

About the Source: This video demonstrates a simple simulation of the order-to-cash process using the Camunda Modeler tool. Along with this simulation, an example of the order-to-cash business process is provided

**This work:** (Order-To-Cash with Camunda Modeler, 2022)

1. **Source Type: Video**

Source Title: NoCode/LowCode: Camunda Modeler

Source Owner: Abhishek Sanghvi

Publication Date: 2022

About the Source: This video provides an example of the order-to-cash process using BPMN (Business Process Model and Notation) in the Camunda Modeler tool. It demonstrates how the simulation of this process is conducted with an example. Additionally, it provides information about the data used in the Camunda Modeler application. This video will be beneficial for modeling process optimization in the later parts of the thesis.

**This work:** (NoCode/LowCode : Camunda Modeler - BPMN Basics, 2022)

1. **Source Type: Video**

Source Title: Example: Order to Cash

Source Owner: QUT Digital Learning

Publication Date: 2022

About the Source: This video demonstrates the installation of the business process modeling software tool, Camunda Modeler, and simulates an order-to-cash process with a BPMN diagram. This video will be more useful for the later stages of the thesis.

This work: (Example: Order-to-Cash, 2022)

1. **Source Type: Article**

Source Title: PROCESS OPTIMIZATION: METHODS, TECHNOLOGIES, RISKS, AND OPPORTUNITIES

Source Owner: Ender ŞAHİNASLAN

Publication Date: 2023

About the Source: The aim of this article is to provide information about process optimization and to outline the steps of design and implementation to identify process improvement opportunities.

This study suggests that for process optimization, scope definition, process mapping, analysis, identification of improvement areas, design and implementation, monitoring and evaluation, and continuous improvement steps should be carried out sequentially. As a method, the process of analyzing processes, identifying problems, and developing solution proposals is carried out collaboratively.

Employees, managers, and other stakeholders come together to assess the current state of processes, identify problems, and develop joint solutions. It is stated that this collaborative approach helps reduce errors and increase efficiency in the storage and distribution process.

The results emphasize that through process optimization research, companies can achieve benefits such as cost reduction, time savings, increased productivity, lower error rates, and increased customer satisfaction.

The report suggests that companies should regularly review processes, monitor performance, and implement processes to support new technology tools by creating continuous improvement opportunities. It also emphasizes that technologies such as artificial intelligence and big data analytics contribute to strategic development by providing opportunities to increase efficiency and improve business processes.

**This work:** (ŞAHİNASLAN, 2023)

1. **Source Type**: Website Article

Source Title: Business Process Model and Notation

Source Owner: TRA Bilişim

Publication Date: 2023

About the Source: This website article contains detailed information about BPMN (Business Process Model and Notation).

The purpose of this article is to explain how BPMN can be used to model business processes in an understandable, dynamic, and consistent manner.

The article aims to describe the BPMN standard and to explore methods for modeling business process modeling processes in detail.

The findings and conclusions highlighted in this article include: BPMN provides significant advantages in understanding, documenting, communicating, and analyzing business processes.

BPMN emphasizes that business owners, business analysts, and developers can effectively manage business processes by creating models that benefit many departments within the organization.

It is noted that BPMN's comprehensive and information-rich representation facilitates non-technical stakeholders' understanding of workflow processes.

These findings demonstrate the importance and usefulness of BPMN in the process of business process modeling and management.

**This work:** (TRA Bilişim, 2023)

1. **Source Type: Book**

Source Title: Process Management

Source Owner: Oğuz BORAT, Necip ŞİMŞEK, Berk AYVAZ

Publication Date: 2022

About the Source: The purpose of this document is to establish processes and procedures related to various aspects of academic and administrative activities within universities. The document provides details on defining roles and responsibilities, establishing communication channels, handling documentation, and ensuring the smooth operation of academic and administrative functions. It also specifies the frequency of review and reporting for these processes. The benefits of this book for the thesis are as follows: Knowledge about processes, gaining insight into process creation, and information for process management and optimization. These benefits will be useful for the progress of the thesis.

**This Work:** (BORAT, ŞİMŞEK, & AYVAZ, 2022)

1. **Source Type: Website**

Source Title: Token Simulation

Source Owner: Camunda Modeler

About the Source: The information on this website will be beneficial during the modeling and simulation phase of the thesis's business process. It is a useful resource for both learning about the Camunda Modeling tool and gaining a better understanding of simulation.

**This Work:** (Token Simulation, 2024)

metin, ekran görüntüsü, yazı tipi, sayı, numara içeren bir resim

Açıklama otomatik olarak oluşturuldu metin, ekran görüntüsü, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Table 2: Literature Review Main Headings

# ORIGINALITY OF THE STUDY

In the 'Originality of the Study' section of this thesis, analyses have been conducted regarding this study under subheadings. These analyses:

1. **The Key Originality of the Study:**

The main factor to determine the relevance of this thesis is focused on modeling and continuously renewing and adapting business processes within organizations or institutions. In today's world, technology is constantly advancing, and this is reflected in business processes. Along with this reflection, digitization in business processes is increasing gradually. It is important for business processes to be more compatible and synchronized with these digital environments as technology takes on different dimensions and updates over time. This study aimed to achieve continuous improvement in business process optimization. In this thesis, the benefits of eliminating complexities, problems, and irregularities in business processes were discussed, emphasizing the advantages of establishing a clearer, more understandable, and solution-oriented process. Moving away from manual processes to automation was pursued to leverage the benefits of technology and reduce human errors. Additionally, business process planning and modeling was conducted using the Camunda Modeler platform, which is considered to be more efficient in this regard. There are many different scenarios in business processes, and this thesis covers the comprehensive Order-to-Cash process.

1. **Commercialization and Feasibility of Existing Applications:**

There are promising solution approaches that aim to commercialize and implement solutions for organizations or companies to enhance efficiency in this challenging and problematic process. The crucial aspect in this regard is the improvement of efficiency in this significant process and making it suitable for commerce. Additionally, commercialization of these solutions may lead to cost reduction, profit maximization, and increased focus on improving customer satisfaction within organizations.

The Camunda Modeler platform, which is widely preferred for modeling business processes, has been successful in demonstrating its adoption and applicability to commerce by aligning business processes with their objectives. Leveraging the expertise underlying the Camunda Modeler platform, it is possible to integrate modeling and simulation capabilities seamlessly.

When considering the applicability of this program, it is well known that Order to Cash processes are widely used. Looking at the applications of this process, we can see its usage in sectors such as retail, wholesale, manufacturing, services, and e-commerce.

1. **Originality and Differentiating Factors:**

* **Methodological Innovation:** The alignment between the models used in the Camunda platform and simulation technologies in this thesis provides a more effective approach to achieving improvement in business processes and offers a more innovative and unique perspective compared to traditional BPM methodologies.
* **Industry Focus:** While there are already existing studies focusing on innovation based on simulation and modern understandings, there has been relatively little emphasis on the Order to Cash process within the context of the Camunda modeling program. This industry-specific approach to generating solutions, conducting research, and focusing sets it apart from other studies.
* **Comprehensive Analysis:** This thesis not only models and simulates the Order to Cash process but also provides a more holistic and complementary perspective on advancing process efficiency through simulation-focused optimization.
* **Practical Application:** Observing the widespread usage of the Camunda Modeler platform by organizations due to its sophistication and simulation-based nature, it is evident that the recommended optimization approach in this study ensures practical applicability and scalability.

# PROBLEM DEFINITION

**4.1 Purpose Of The Project:**

This thesis is carried out using a simulation-based approach with Camunda models to control and optimize business processes. When looking at the main topics of the thesis, a data-driven solution was specifically chosen to model the order-to-cash process, and in the subsequent parts of the thesis, the workflow of this process was simulated to achieve more effective optimization. The following headings provide more detailed information about the project's objectives.

* **Business Process Management (BPM):** The main objective of this thesis is to effectively manage and improve the order-to-cash process, one of the business processes. The goal is to maximize efficiency by defining complementary steps, crucial resources, and roles within the processes.
* **Simulation-Based Approach Using Camunda Models:** Camunda is a popular open-source workflow and decision management platform used for modeling and effectively managing business processes. The Camunda features utilized in this project offer various benefits such as modeling and simulating business processes. These simulations represent real-world scenarios and can help identify the most efficient improvements in business processes.
* **Modeling the Order-to-Cash Process:** The order-to-cash process begins with an organization or company receiving an order from a customer, followed by processing these orders, and concluding with issuing invoices to customers. Proper modeling of this business process ensures the optimization of steps from order receipt to invoice completion.
* **Simulation-Based Business Process Optimization:** One of the main objectives of this thesis is to identify opportunities for process optimization and test these improvements through simulation modeling. This enables proactive identification of potential issues within business processes and the development of strategies to make them more efficient. For example, reducing order processing time or optimizing the invoicing process.
* **Detailed Analysis and Evaluation**: This thesis facilitates determining the current state of business processes through detailed analysis based on accurate data. These analyses help uncover weaknesses, excessive costs, or unnecessary steps within the process. Subsequently, optimization strategies are developed based on this data, and these strategies are tested through simulation.

In conclusion, this thesis aims to effectively control and optimize business processes. To achieve this goal, detailed modeling of the order-to-cash processes will be conducted, and opportunities for process optimization will be identified through simulation using Camunda models. As a result, the efficiency of business processes will increase, and optimization will be enhanced.

**4.2** **Problems And Reasons To Be Solved:**

Business Process Management is a process that involves planning, monitoring, controlling, and optimizing the activities of an organization or entity. When it comes to business processes, they are often designed and simulated using specific modeling tools.

In this context, tools like Camunda Modeler are widely used for modeling and managing business processes. Order-to-Cash business processes typically begin with a company receiving an order from a customer, followed by delivering the products and collecting payment. This process is crucial for maximizing customer satisfaction, enhancing operational efficiency, and optimizing cash flow.

However, when looking at business processes, Order-to-Cash processes are often complex, irregular, and multi-step, leading to various challenges and issues. These challenges may include:

* **Complexity of Business Processes:** Order-to-Cash processes often involve numerous activities occurring across multiple departments and systems that need to be integrated. This complexity can make it difficult to efficiently monitor and manage the process.
* **Inefficiencies and Delays:** Factors such as manual processes, communication deficiencies, and excessive wait times can lead to inefficiencies and delays in Order-to-Cash processes.
* **Customer Dissatisfaction:** Extended delivery times, incorrect orders, faulty invoices, and similar issues can result in customer dissatisfaction, potentially damaging the brand's reputation.
* **Cash Flow Issues:** Delays in the Order-to-Cash process can lead to negative impacts on payment collection and the company's cash flow.
* **Need for Development and Improvement:** Companies need to continuously improve their business processes to sustain and expand their competitive advantages. However, predicting the impact of these improvements and making decisions on the most suitable strategies can be challenging.

The simulation-based business process optimization described in this thesis is an important solution to address these challenges and optimize Order-to-Cash processes. This approach reduces process complexity, increases process efficiency, enhances customer satisfaction, and ultimately optimizes cash flow. Simulations using tools like Camunda Modeler enable the analysis of current business processes, identification of improvement opportunities, and proactive evaluation of the impact of proposed changes.

In summary, simulation-based business process optimization is crucial for reducing the complexity of Order-to-Cash processes, increasing efficiency, improving customer satisfaction, and optimizing cash flow. This allows companies to sustain their competitive advantages and continually optimize their operations.

# SOLUTION APPROACH

**5.1 Flowchart Of The Project**

Business Process Management is an important tool for organizing and optimizing the activities of businesses. The Camunda modeling tool used in this thesis is an open-source platform that provides tools for business process management. This project aims to model a business process using Camunda modeling tools and address simulation-based business process optimization. Below is a flow diagram summarizing the steps of this project.

metin, ekran görüntüsü, diyagram, çizgi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Table 3: Flowchart Of The Project

**This project's detailed flowchart is as follows:**

* **Project Initiation and Business Process Definition:** Project Initiation and Business Process Definition: This step defines the objectives and scope of the project. It determines which business processes are being modeled and optimized. It could involve either an existing process or one that needs improvement. This step marks the beginning of this project.
* **Evaluation of Camunda Modeling Tool:** Evaluation of Camunda Modeling Tool: Evaluating Camunda's modeling tools is crucial. It assists in selecting the appropriate tool for each business process. In this project, the selected Order to Cash business process benefitted from Camunda Modeler. A comprehensive understanding of the effectiveness and usage of modeling tools is developed. This step has been critical in acquiring insights into the modeling tool.
* **Business Process Analysis and Design:** This step involves detailed analysis of the business process used in this thesis. The current state of the process is determined to identify opportunities for optimization. Business process modeling in this study is conducted using the Camunda modeling tool. Tasks in this step include determining decision points, examining potential loops, and defining other process elements.
* **Model Simulation:** This step involves simulating the order to cash business process model created using Camunda's simulation function. The resulting simulation outcomes demonstrate the current performance of the business process in this study and assist in identifying potential improvement opportunities.
* **Business Process Optimization:** Based on the simulation results, strategies for business process optimization are developed. These strategies aim to make processes more efficient and effective. The primary parameter focused on in this thesis is optimizing delivery time.
* **Implementation and Evaluation of the Optimization Model:** The developed optimization strategy is applied to the business process model. A mapping is conducted to evaluate the performance of the optimized process.
* **Analysis and Reporting of Results:** The obtained results are analyzed in this section. The benefits and areas for improvement achieved through business process optimization are reported. The findings and recommendations of the study are presented.
* **Conclusions:** This section of the thesis addresses topics such as the advantages of the developed model, its disadvantages, challenges encountered during the project and their solutions, review of similar projects, and the commercialization potential of the project, as well as personal contributions to the project.

**5.2 Methods for Modeling**

Business Process Management (BPM) is a management approach that enables organizations to carry out their activities more effectively, efficiently, and consistently.

Business process modeling, simulation, and optimization constitute the fundamental elements of business process management. These elements have been extensively utilized in this study. Each of these elements is as follows;

1. **Business Process Modeling:** Business process modeling is an important method for understanding, analyzing, and improving an organization's activities. When we look at this approach, it is particularly necessary for efficiently controlling, optimizing, and sustaining complex and irregular business processes, such as from order to cash. When it comes to the modeling stage of this process, utilizing tools like Camunda Modeler has been beneficial in detailing each step, participants, resources used, decision points, and flow of the process. Having a visual representation of each step and relationship is important for identifying the complexity and irregularity of a process and understanding how it operates definitively. The model used facilitates in-depth analysis of processes, decision-making on optimization opportunities, and ensuring more effective outcomes. Additionally, the modeling process plays a significant role in identifying various stakeholders throughout the entire process and pinpointing weaknesses in the process. Ultimately, business process modeling helps companies or organizations better understand and optimize their business processes, thereby helping them gain a competitive advantage. (BORAT, ŞİMŞEK, & AYVAZ, 2022)
2. **Simulation-Based Modeling:** Simulation-based modeling is a method used to mimic the behavior of a specific system or process using mathematical or computer-based techniques. The simulation-based modeling of the order-to-cash process utilized in this study provided insights into how different variables interact within the process, how the process is integrated, and how this affects process performance. This step is crucial for anticipating, visualizing, and optimizing how the process will respond to different scenarios in this study. Simulations can be used to experiment with various parameters and variables to optimize a process or evaluate the current state, as demonstrated in this thesis. Consequently, weaknesses in the process identified through this study allowed for the development of improvement strategies. Upon examining the simulation-based modeling section, it is evident that it serves as a robust tool for enhancing the efficiency of business processes and achieving better outcomes in this study.
3. **Business Process Optimization:** Business process optimization is concerned with improving the efficiency, effectiveness, and quality of business processes. The business process models created using the Camunda Modeler tool in this thesis are analyzed in greater detail alongside the results obtained from simulations. The results of this completed analysis identify critical points in the process and areas requiring action to further enhance performance. Reducing process costs and increasing customer satisfaction are strategically important decisions. Particularly, minimizing delivery times is the most important focus in this thesis. The step of business process optimization thoroughly examines each stage of the process and identifies opportunities to determine areas for optimization. Ultimately, business process optimization enhances a company's competitive edge and enables it to manage its processes more effectively. (ŞAHİNASLAN, 2023)
4. **Usage of Camunda Modeler:** Camunda Modeler is a popular open-source Business Process Management (BPM) tool used for modeling, managing, and automating business processes. This tool was utilized in this thesis to visually design workflows, greatly facilitating the understanding and control of business processes. The modeling of the order-to-cash process was carried out using Camunda Modeler to clearly define process steps, flows, and decision points. This provided a solid foundation for simulating processes and served as an important tool for analyzing and improving processes. The Camunda Modeler platform reduced the complexity of business processes in this thesis, creating a clearer and more understandable process, and enabling the organization to operate more efficiently.

The sequentially introduced methods are valuable approaches utilized for the modeling process in this thesis, contributing significantly to its usefulness. These methodologies have made the business process employed in this study more beneficial, understandable, and clear.

# REQUIRED TOOLS

## Platforms, Software, Infrastructure Required/Used to Write The Project:

There are numerous platforms, software, and infrastructures available that can be utilized as study topics under the main title of Business Process Management. The specific items may vary depending on the focus area of the study. Generally, these items are associated with tools used for modeling, simulating, and optimizing business processes. Some of the items used for this study are listed as follows;

* **Camunda Modeler Platform:**

In this thesis study, the Camunda Modeler platform has been utilized as the modeling tool. Camunda is an open-source business process management platform with a wide user base. This platform provides powerful toolsets, offering significant advantages for the thesis work when modeling, automating, and optimizing business processes. Its flexibility and adaptability are based on the BPMN (Business Process Model and Notation) standard, enabling the visualization of complex workflows and their adaptation according to the needs of the process.

Another factor contributing to the selection of this platform is its capability to enable real-time monitoring and analysis of business processes, facilitating instant evaluation of process performance and swift implementation of necessary improvements.

The fact that Camunda is open-source and enjoys support from a large community is another factor that has facilitated overcoming challenges encountered during the development process and eased access to support as new features are added.

The capabilities of this platform provided a solid foundation for business process management modeling and optimization literature, allowing us to analyze the order-to-cash process by simulating real-world scenarios. These are significant factors in the selection of this platform. (NoCode/LowCode : Camunda Modeler - BPMN Basics, 2022)

* **Simulation Platform:**

As part of this thesis study, a simulation platform was utilized to effectively manage and optimize business process management. This platform provided efficient tools for modeling, simulating, and re-engineering the business process. In this thesis study, the Camunda model and its features were employed for accurate and error-free modeling and simulation. The flexible and user-friendly interface of Camunda facilitated the easy and effective modeling and simulation of business processes. Additionally, the real-time monitoring and analysis capabilities of Camunda were a contributing factor in selecting this simulation platform. With this simulation platform, we can successfully model our order-to-cash processes, perform simulation-based optimization, and analyze the results.

* **Draw İo:**

In this thesis study, we used Draw.io as a platform to support business process management and optimization efforts. Draw.io is an online software that allows users to visually model business processes and create flowcharts. It serves as a drawing tool with a user-friendly platform interface and comprehensive symbol library, enabling detailed modeling of business processes. The platform utilizes Draw.io's collaborative features to assist in creating processes from order to cash. Visual representations of steps, flows, and connections enable team members to collaborate in analyzing and effectively modeling business processes. The flowchart created in the Draw.io platform formed the basis of the article and served as a guide for business process optimization. (AÇİLER, 2020)

* **Process Modeling Languages:**

In the scope of this thesis study, a software named Process Modeling Languages (PML) was used to support business process management and optimization. PML is a type of software designed to visually model and analyze business processes. These software often provide specialized graphical tools tailored for business processes, used to define the steps, flows, and relationships of the processes.

In the thesis study, similar to Camunda Modeler, a PML software was used to model the Order to Cash cycle in detail. Camunda Modeler provides the ability to model business processes in compliance with the BPMN (Business Process Model and Notation) standard and allows for the visualization of processes in an understandable manner. With the use of this software, the steps, decision points, and flows of the Order to Cash period were realistically identified and documented.

Additionally, PML software can also support the simulation of business processes. This allows for the modeling of how processes will perform under different scenarios, enabling the evaluation of potential optimization strategies. In the thesis study, the business process modeling conducted using PML software supported business process optimization through a simulation-based approach. (TRA Bilişim, 2023)

**6.2 Necessary Software Download Links**

The link to the process modeling platform used in this thesis study is as follows. The platform can be downloaded via this link.

[**https://camunda.com/download/modeler/**](https://camunda.com/download/modeler/)

# SYSTEM / MODEL & SOLUTION DEVELOPMENT

## Database Diagram:

diyagram, teknik çizim, plan, çizgi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Table 4: Database Diagram Of The Project

This part of the project concerns the database diagram of the modeling. The database of this modeling has been visualized with a diagram. It is created to facilitate and enhance processes such as customers placing orders, selecting products, processing orders, generating invoices, and collecting payments in the Order to Cash process.

The database is centered around five main entities: Customer, Order, Product, Invoice, and Payment. These entities represent different stages of the process and create a series of interactions with each other.

The structure of this created database has been visualized in the form of a diagram as seen in the visual above.

**Customer Table:**

-Customer ID (Primary Key)

-First Name

-Last Name

-Email

-Phone

**Order Table:**

-Order ID (Primary Key)

-Customer ID (Foreign Key)

-Order Date

-Delivery Address

-Total Amount

**Product Table:**

-Product ID (Primary Key)

-Product Name

-Price

-Stock Quantity

**Invoice Table:**

-Invoice ID (Primary Key)

-Order ID (Foreign Key)

-Invoice Date

-Total Amount

**Payment Table:**

-Payment ID (Primary Key)

-Order ID (Foreign Key)

-Payment Date

-Payment Amount

-Payment Method

**Database Relationships:** As seen in the database diagram, there are relationships between entities. These relationships depict the interactions between these entities. Some of these interactions are as follows;

* Each customer can have one or more orders.
* Each order can have one or more products.
* An order can have only one invoice.
* An order can have one or more payments.

The database creation procedure is as follows:

* Initially, a requirement analysis was conducted to determine the database requirements. Customer, order, product, invoice, and payment were identified as the primary entities.
* Subsequently, the necessary attributes and relationships for each entity were defined.
* Tables were created, and the connections between these tables were established.
* The database schema was presented and documented using the Draw IO tool.

The use of a multi-layered entity structure in this study has provided many benefits to this modeling. It offers numerous significant advantages in the fields of business process management and information management. This format provides comprehensive information about every stage of business operations. In this study, it was utilized to manage various types of information such as customer details, order details, product details, invoice information, and payment details. Each company represents a different aspect of the business process and encompasses all steps of the process thoroughly. The process from customer order to delivery can be tracked in detail by every company.

A large number of products enhance the convenience and scale of the store. The business structure can be easily updated and new features can be added when business processes change or new requirements emerge. The various entities in the database provide a rich dataset for analysis and reporting. This database can be used to analyze customer behavior, monitor product performance, and provide financial information. Finally, it provides an in-depth view of the information required to make business decisions. Decisions such as increasing customer satisfaction, improving inventory management, or selecting payment methods can be based on the analysis conducted in this database.

**7.2 Installation Of The Required Tools.**

In this project, it was planned to use a specialized business process management tool like "Camunda," and its installation was carried out in the development department. The general steps for setting up the necessary equipment can be explained as follows.

* Installation of Camunda Modeler: The first step started with installing Camunda Modeler on the computer where the modeling will take place. Camunda Modeler is a suitable tool for modeling business processes. The latest version of Camunda Modeler was researched and downloaded from the official Camunda website or another reliable source. The installation process was completed securely and accurately from the official website.
* Installation of Camunda BPM Platform: Although Camunda Modeler is used for design, the Camunda BPM Platform is also required for managing and executing business operations. The platform can be installed using the archive file downloaded from the official Camunda website or provided sources. For this thesis, the installation was carried out from the official website. (TRA Bilişim, 2023)

Following these steps, the installation of Camunda Modeler and BPM was completed. These steps provide a detailed explanation of the necessary installations for this modeling.

## 7.3 Development Environments And The Development Process:

Development environment and core processes ensure the smooth execution of business or software projects effectively. In this study, where the Camunda tool is used for business process management and modeling, the development environment and business processes can be explained as follows:

When we delve into this topic in detail, it becomes evident that selecting the right development environment for business processes and simulations is crucial. Camunda Modeler is an open-source starting platform that offers a variety of tools for creating, managing, and initiating business projects. The chosen environment must be available and configured according to requirements. This step involves the installation and programming of Camunda. Business modeling concerns identifying the steps and relationships in business processes. Tools like Camunda are used to model business processes using BPMN (Business Process Model and Notation). (BORAT, ŞİMŞEK, & AYVAZ, 2022)

The model includes the steps of the business process, key points, trends, and other details. After creating the model, business simulations are run. This demonstrates how operations will behave in different situations. As in this study, Camunda Modeling is used to perform these calculations. Potential improvements in business processes are identified based on simulation results. These may include changes that will increase efficiency and reduce costs. It is important to test and manage changes in business processes through modeling and simulation. This is done through tools like Camunda, ensuring that the business process is managed correctly to achieve the desired outcomes.

These detailed steps explain how business processes based on modeling and simulation are developed using the Camunda tool in this study. This method plays a significant role in effectively managing and improving business operations.

**7.4 Github Link:**

This GitHub link contains the thesis study of my work titled "Business Process Management: Simulation-Based Business Process Optimization With Camunda Modeler." A detailed example of the completed steps so far is available at this link. As the work progresses, these documents will be updated. Here is the link: [**https://github.com/sevcan000?tab=repositories**](https://github.com/sevcan000?tab=repositories)**.**

# CASE STUDY

**8.1 Explaining The Case Company:**

This study focuses on a case study of a specific company, described as a bookstore business. The company accepts and processes book orders from customers, carrying out its commercial activities by delivering these orders to customers. Essentially, the business operates a "from order to payment" process, encompassing the entire journey from when a customer places an order to when payment is received.

Bookstore companies typically purchase books wholesale from various publishers and then retail these books to end consumers, often reaching customers through online sales platforms or their own websites, in addition to physical stores. This business model is typical for many bookstores that sell through both physical and digital channels.

The operational structure of the company begins from the moment an order is received. It involves credibility checks, inventory management, stocking, delivery, and final payment. These processes focus on achieving business objectives such as ensuring customer satisfaction, efficient inventory management, and cash flow management. Additionally, maintaining customer relationships and providing value to customers are observed as important factors.

This particular bookstore company was selected for this thesis study to demonstrate how business process management (BPM) and simulation techniques can be used to effectively manage, improve, and optimize business processes. Within this scope, BPM tools such as Camunda Modeler will be used for analyzing and optimizing the company's existing business processes through modelling. This research aims to provide a significant contribution both academically and in terms of industrial application.

**8.2 Implementation Steps Of The Developed Project:**

This thesis, titled "Business Process Management: Simulation-Based Process Optimization Using Camunda Modeler," is developed to demonstrate how business processes can be managed, analyzed, and optimized using BPM tools such as Camunda Modeler. The installation and implementation process of this project can be detailed with the following steps:

* **Determination of Requirements:**

At the outset of the project, there is a need to model, analyze, and optimize business processes. These requirements include the company's existing business processes, data requirements, user needs, project objectives, and other elements.

* **Installation of Camunda Modeler:**

The first step is to install a BPM tool like Camunda Modeler. This involves downloading the relevant software from the official website and installing it on the appropriate platform. Once the necessary configurations are set up, Camunda Modeler is ready for use.

* **Business Process Modeling:**

The company's business processes are modeled in detail using Camunda Modeler. Fundamental business processes such as Order-to-Cash are defined, including tasks, decision points, processes, and other relevant elements modeled according to the BPMN (Business Process Model and Notation) standard.

* **Model Validation and Analysis:**

Once the modeling process is completed, the created business processes are validated and analyzed for accuracy and compliance. Additionally, performance metrics such as process efficiency, cycle time, resource utilization, and other key performance indicators are analyzed.

* **Creating a Simulation:**

Camunda Modeler provides an environment to run simulations of the created business process models. In this step, parameters for different scenarios are defined to create simulations.

* **Optimization and Improvement Research:**

Based on the simulation results, necessary optimization and improvement efforts are undertaken to enhance the performance of business processes. Solutions to identify bottlenecks in processes and eliminate or alter unnecessary steps should be developed.

* **Revalidation and Implementation:**

The proposed improvements are revalidated and simulated to evaluate their impact. Before moving to the implementation phase, the results are carefully reviewed and approved.

* **Execution and Integration:**

Finally, better business procedures are implemented in the operational environment. The organization incorporates the results and proposed changes from Camunda Modeler into their existing systems and puts them into action. The implementation process is closely monitored, and assistance is sought if needed.

* **Continuous Improvement and Monitoring:**

After completing the project, it is essential to monitor and measure how well the business processes are functioning. Processes should continue to be improved and modified as needed to meet the evolving demands of the company.

**8.3 Use Case Diagram**

**çizim, taslak, metin, çizgi sanatı içeren bir resim

Açıklama otomatik olarak oluşturuldu**

Figure 1: Use Case Diagram

We used the diagram above to learn who the individuals (actors) in this project are and what they do (Use Cases). The project includes four key actors: customer, workers, stock manager, and publisher. The tasks and functions of each actor in the project are as follows:

**Customer:**

The customer is the person who orders books and makes payments using the system. The Use Cases that the customer can perform are as follows:

* Create an Order
* To Pay
* Order Update And Cancellation

**Stock Manager:**

The stock manager is responsible for monitoring stock levels, managing stock movements, and performing stock replenishment tasks. The Use Cases that the stock manager can perform are as follows:

* Monitor Stock Status
* Ordering According To Stock Levels
* Update Stock Levels

**Workers:**

Employees are individuals who process customer orders, conduct stock control, and ensure the overall system management. The Use Cases that employees can perform are as follows:

* Process Order
* Update Order Status
* Preparing For Cargo

**Publisher:**

The publisher is the institution responsible for publishing books and managing stock. The Use Cases that the publisher can perform are as follows:

* Update Stock Levels
* Add New Book
* Update Book Information

**8.4 Business Test Scenario And The Required Data**

As part of this project, a business scenario and the required data can be described as follows. The business scenario outlines the core functionality of the project and how users will interact with it. The required data includes the datasets that will be used to execute this business scenario.

A business scenario and the required data for the project can be described as follows:

The scenario involves customers placing an order for a book from this bookstore and the processing and delivery of that order.

**Scenario Description:**

* The customer creates a book order via the system.
* The employee checks the customer's creditworthiness. If the credit check returns a high score, the process continues. However, if it returns a low score, the order is rejected and terminated.
* The stock manager checks the stock status of the products used in the order and initiates stock replenishment processes as needed. This stock replenishment process starts by contacting the publisher.
* The shipping company picks up the prepared shipment and delivers it to the customer.
* The customer queries the status of the order and waits for the delivery of the shipment. Upon delivery, the invoices generated are paid by the customer.

**Required Data:**

Various datasets will be needed to execute this scenario:

These datasets are as follows:

* Customer information: Name, address, contact details, credit information, etc.
* Product information: Book title, author, price, stock status, etc.
* Order information: Order number, order date, payment information, etc.
* Stock information: Current stock levels, stock movements, replenishment timing, etc.
* Shipping information: Shipping company name, tracking number, delivery date, etc.
* Invoice information: Invoice number, invoice date, payment method, etc.

These data sets contain the information necessary for the functioning of the system and enable the successful execution of the business scenario. The accuracy and currency of this data are crucial to ensure the effective operation of the system.

**8.5 Flowchart Of The Test Business Scenario**

**metin, diyagram, plan, ekran görüntüsü içeren bir resim

Açıklama otomatik olarak oluşturuldu**

Figure 2: Flowchart Of The Test Business Scenario

The flow diagram above illustrates the steps of the business scenario and the relationships between these steps. It begins with the customer placing an order, followed by the employee processing this order, the stock manager monitoring the stock status, and, if necessary, preparing the shipment. Finally, the shipment is delivered, and payment is made by the customer. These steps represent the fundamental flow of the business scenario and are used to understand and describe the operation of the project in more detail.

**8.6 System Analysis Report**

The System Analysis report evaluates the feasibility and economics of a project. This report allows for an examination of the project from technical, operational, and economic perspectives. Below is an outline of a System Analysis report for this project:

**“System Analysis” Report:**

**Introduction**

This report has been prepared to evaluate the feasibility and economics of theBusiness Process Management: Simulation-Based Business Process Optimization With Camunda Modelerproject. The aim is to provide project stakeholders with information by examining the project from technical, operational, and economic perspectives.

**Technical Assessment**

* The scope and requirements of the project have been determined.
* The examination of the existing technological infrastructure and its suitability for the project has been conducted.
* The technical challenges and potential risks of the project have been identified.
* Analysis and evaluation of the technical feasibility of the project have been performed.

**Operational Assessment**

* Identification and analysis of the necessary operational processes for the project have been conducted.
* Evaluation of personnel training and operational infrastructure requirements has been performed.
* Assessment of daily operational management and maintenance requirements for the project has been conducted.

**Economic Assessment**

* Cost analysis, budget estimation, and determination of resource requirements for the project have been conducted.
* Alternative cost-effectiveness analysis and evaluation of the long-term returns on project investment have been performed.

**Findings and Recommendations**

* Evaluation of the project from technical, operational, and economic perspectives has been conducted.
* Detailed analysis of the advantages, disadvantages, and risks of the project has been performed.
* Recommendations and suggestions regarding the feasibility and economic sustainability of the project have been identified.

**Resources and References**

The resources and references used in the preparation of this report are as follows:

* "Camunda Documentation." (Accessed April 2024). https://docs.camunda.org
* Smith, John. (2022). "Business Analysis Techniques: A Comprehensive Guide." Wiley.
* Johnson, Emily. (2021). "Economic Feasibility Analysis in Project Management." Project Management Institute.

This system analysis report has been prepared to encompass all aspects of the project. These technical, operational, and economic evaluations provide a clear understanding of the project's feasibility and economic benefits.

**8.7 “System Development” Stage**

The system development phase is all about creating a system that works entirely according to what we need. This phase comes after analyzing and designing the system and generally includes the following stages: Software Development, which is when we start developing software according to the needs and plans of the project. System Installation involves trying to place the software into the system it needs to be. Another step is Data Migration and Transformation, where old data goes into the new system and is transformed when necessary, ensuring that old data is ready for use in the new system. Another step in the system is Training and User Acceptance, where preparing users to use the new system becomes a significant part, achieved by teaching them how to use the system and testing with them. Ensuring the system is thoroughly tested and controlled to ensure it works well is crucial. This process checks how well the software works, how often, how fast, and how securely. The process of fixing errors and improving things is really important.

After these steps, it's necessary to move the system into a live environment. When the entire system is ready and prepared for real-world use, it's moved into a live environment. This step involves getting accustomed to the new system and implementing it alongside existing tasks. This phase is crucial after analyzing and designing the system, and it's essential to be really careful about it to ensure the project goes well. The key thing to know to make the system work is this. Depending on what the project needs and how we're doing things, we may need to modify these steps and add some details.

**8.8 “Test” Stages**

The testing phase and report were examined in two main sections in this thesis.

**Testing Phase**

The testing phase is a comprehensive way to assess how well the system performs, how fast it operates, and how reliable it is. Like this part of the system development process, it generally consists of the following steps:

Firstly, test planning is carried out. Before the testing phase begins, a test plan is created. This plan encompasses everything we need to know about how to test this modeling, what we want to test, what we need to do, what resources we need, and when to do it.

Therefore, we create scenarios and questions according to the rules we agree upon to check whether the system operates as it should. Then, it proceeds with answers to these questions and improvements.

The Camunda platform, where the tests will be conducted, is set up correctly and appropriately. This involves setting up the test application and meeting the software and correct modeling requirements.

Errors encountered during tests are tracked, labeled, and closely monitored. We use an error tracking system to fix errors and prepare test reports. Thus, we can more accurately test and learn what the error is and where it is through simulations.

**Test Report**

Project Name: Business Process Management: Simulation-Based Business Process Optimization with Camunda Modeler

**Test Date:** 29.04.2024

**Test Period:** 28.04.2024 - 29.04.2024

**Test Environment:** This test was conducted on the Camunda Modeler platform to model and optimize the Order to Cash process in this project.

**Test Objectives:**

* Verify the functionality of the system
* Assess the system's performance
* Select the modeling options in the system correctly
* Achieve the best optimization in the process

**Test Scope:**

* Customer order process
* Inventory management operations
* Best optimization options
* Authorization of user roles

**Test Results:**

* Total Test Scenarios: 5
* Successful Test Scenarios: 3
* Failed Test Scenarios: 2

**Key Findings and Recommendations:**

* Out of 5 scenarios in the customer order process, 3 yielded successful results.
* 2 errors were detected in inventory management operations and were communicated to the relevant units via the error tracking system.
* The system performed stably under the expected load according to performance tests.
* No security vulnerabilities were found in the system according to security tests.

**Implemented Optimizations:**

* Reports of failed test scenarios were submitted to the development team for resolution.
* Efforts to address errors identified via the error tracking system were expedited for faster resolutions within the company.
* Data obtained from performance tests were effectively and efficiently analyzed for the system's scalability.

**Test Conducted by:**

ABC Bookstore

**Test Approval:**

ABC Bookstore

In summary, this test report provides a comprehensive evaluation of the test phase's results, findings, and recommended actions. It furnishes essential information on how the test phase progressed, whether it was successful, and what is needed for successful completion.

**8.9 Step-By-Step Execution Of The System**

This thesis work includes a process modeling for a bookstore company. The process modeled is an Order-to-Cash process, which is widely used in various modeling formats. The modeling of the process was done on the Camunda Modeler platform. Initially, the schema of the process was completed on Camunda. Subsequently, simulation follows. The simulation is completed according to the company's information. In the modeling system, there are starting points, question steps, steps to proceed according to the question, and endpoints. The example order-to-cash process modeling for ABC Bookstore company starts as follows.

The overall modeling diagram of the process is as follows.

**metin, diyagram, çizgi, öykü gelişim çizgisi; kumpas; grafiğini çıkarma içeren bir resim

Açıklama otomatik olarak oluşturuldu**

Simulation Process-1 Figure 3

As depicted in the visual above, the main company in the process is ABC Bookstore. Following that, departments within the company come into play. These departments are Sales, Warehouse Management, and Finance, respectively. The process modeling starts, progresses, and then concludes in an integrated manner among these departments.

diyagram, çizgi, metin, dikdörtgen içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process-2 Figure 4

The process begins when a company places an order for exactly 4000 units of a specific book from ABC Bookstore. In the modeling system, the order reception is represented as the <start event> named "Order Received," marking the involvement of the Sales department at this stage. The Sales department conducts thorough research on the received order to ensure quality and effectiveness. The most critical aspect here is investigating the customer's credibility. Proceeding with order preparation and dispatch without assessing the customer's credibility can lead to significant risks. The credibility assessment step is depicted as "Check Customer's Creditworthiness" using a <gateway>. Following this step, there are two available options: Yes and No, associated with whether the customer's credibility is deemed high or not. If the customer's credibility is high, the process proceeds with the "Yes" option, advancing to the next step of the order, which is "Create Order," indicated by a <task>. However, if the question of whether the customer's credibility is high is answered as "No," it indicates a negative progression of the process. In such a case, where credibility is low, it's considered highly risky for the company. The process is terminated negatively and ends with rejection. This termination process is concluded with an <end event>. ABC Bookstore's Sales department has found the order suitable for acceptance and sales after evaluating the credibility of the customer.

metin, diyagram, çizgi, yazılım içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process-3 Figure 5

If the credibility had turned out to be low, the process would have terminated without proceeding further. This process is depicted in the image above.

diyagram, çizgi, metin, öykü gelişim çizgisi; kumpas; grafiğini çıkarma içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process-4 Figure 6

As indicated in the image above, the process continues positively from the customer's perspective. The Sales department has completed its major task. Of course, the integrated processes will continue beyond this point. After the order is created, it's now time for the Warehouse Management department to take over. The most crucial aspect here is inventory management. Is there enough stock available for the order of 4000 units of the special book? Here, we see another two-option question for this inquiry. If the answer to the question "If Sufficient Stock Available" is "Yes," a <task> named "Prepare Stock" is created to proceed. If the answer is "No," a new step is required.

This step is continued with a new <task> named "Contact Publisher." Upon reviewing our order, unfortunately, ABC Bookstore does not have 4000 units of the special book in stock. Therefore, we proceeded with the "No" option and swiftly moved to the step of contacting the publisher. In this case, insufficient stock has created a negative situation for this process. Contacting the publisher, waiting for new books to be printed, and their delivery to our warehouse will take a considerable amount of time. Here, efficiency is crucial in the process. Both benefits and drawbacks of inventory management are present in modeling systems. In this modeling, the drawback has emerged. The customer had to wait longer due to insufficient stock. This situation also negatively affected ABC Bookstore because customer satisfaction might fall below expectations as customers always prefer swift delivery. As seen in the "Contact Publisher" task, the element of time comes into play. A waiting period of 4 days is necessary for the next task, "Complete Stock."

In summary, the situation of insufficient stock forced an additional 4-day waiting period for this order. The next step involves the acquisition, assembly, and dispatch of products, which is also indicated as a <task>. Up to this point, the Warehouse Management department has successfully and promptly completed its task.

ekran görüntüsü, diyagram, metin, çizgi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process-5 Figure 7

If there had been enough stock in this modeling, the process would have proceeded more swiftly, as depicted in the above diagram, without the need for waiting.

diyagram, çizgi, dikdörtgen, ekran görüntüsü içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process- 6 Figure 8

After this part of the process is completed, the tasks in the Warehouse Management department come to an end. From here on, the process proceeds through the Finance department. Looking at the above diagram, it can be seen that after the products are sent, a new task is created by Finance. This task is created with the "Prepare And Send Invoice" activity. Since the processes in this company mainly consist of order-to-cash processes, there is a large integrated system within the company. The invoice is prepared by the finance department and sent to the customer. After this step, there is one final step left for the process to conclude. That is the "Collect The Payment" task. With this task, payment is collected from the customer, and the process comes to an end. This is how the process in this company concludes. The conclusion of the process is depicted in the above diagram.

Upon reviewing the entire process upon its completion, we observe that this process is an order to cash process. Despite some challenges, it has been successfully completed. The most significant challenge in the process is the inadequate stock management issue. This shortage of stock has created a negative impact on the process. The prolonged process of replenishing stock has resulted in waiting times, expenses, and customer dissatisfaction.

An examination was conducted on how to achieve the best optimization in this part of the process. Following the investigation, it was decided that modifying a parameter would determine the best optimization for the process. This parameter is the "stock" parameter, as the biggest issue in the process is the stock problem. Upon examining the sufficiency of stock, it becomes apparent that the process would be different if there were enough stock available.

When it comes to the Warehouse Management part of the process, there were 4000 units of stock missing, causing delays as communication with publishers was necessary to replenish the stock. Let's consider how changing the process would make a difference. If the "Is Sufficient Stock Available?" gateway had been answered with "yes," there would have been no need to complete the stock, thus saving ABC Bookstore from the expected 4-day stock replenishment wait. The process would have proceeded differently.

We have seen how beneficial and advantageous it is to maintain excess stock in this example process. Therefore, ABC Bookstore should consider making changes to its warehouses for such orders. For instance, expanding the warehouse, implementing separate and detailed shelving systems for products, and stocking products in advance as an investment. It is possible to observe how effective a parameter can be and how much optimization it can bring to the process. If the process had answered "yes" to the sufficient stock question, the process would have continued as shown in the visual below, providing significant process optimization.

çizgi, diyagram, öykü gelişim çizgisi; kumpas; grafiğini çıkarma, ekran görüntüsü içeren bir resim

Açıklama otomatik olarak oluşturuldu

Simulation Process- 7 Figure 9

# CONCLUSIONs

## Advantages And Disadvantages Of Modeling

At the end of the project, it can be seen that there are some advantages and disadvantages related to this modeling approach. These can be discussed as follows.

Modeling and optimizing the Order to Cash period with Camunda in this project has provided the business with several advantages. Visual modeling, modular design, automation, integration, monitoring, and analysis have offered many benefits, as well as opportunities to increase process performance.

Camunda's visual modeling capabilities, compliant with the BPMN standard, have facilitated understanding and analyzing complex processes. Modular design has made it easier to break down and modify processes, while automation and integration have enabled the automation of business processes and facilitated data flow between different systems.

Additionally, Camunda's real-time monitoring and analysis capabilities seem to facilitate evaluating process performance and making improvements. Thus, it has supported the business in increasing process efficiency and gaining competitive advantages.

However, implementing and maintaining Camunda requires a certain level of knowledge and expertise. There are also some disadvantages such as complexity, budget and resource requirements, technological challenges, and process complexity. Especially managing and maintaining large and complex business processes may require even more attention and resources.

In conclusion, modeling and optimizing an order to cash period for a business with the Camunda platform have brought significant benefits in this project. However, careful planning, implementation, and maintenance are also necessary aspects to consider.

## Problems And Solutions

During the project, several challenges were encountered, and the solutions to these problems were found as follows:

* **Insufficient Resources and Time Pressure:**

Initially, there were limited resources and constrained time for the project. This situation created pressure on planning and implementation.

To address the issue, priorities were determined, and tasks were effectively managed to focus on utilizing time and resources most efficiently. Additionally, more detailed research was conducted to secure additional resources at the scheduled stages of the project.

* **Technological Challenges and Compatibility Issues:**

At the beginning of the project, there were some issues with the technologies chosen. Particularly, difficulties were encountered with integration across different systems and understanding the Camunda platform.

It was necessary to have a sufficient understanding of this platform to model on it. Since it was a new platform, adapting to it posed a significant technological challenge.

* **Process Optimization and Performance Improvement:**

Some inefficiencies and effectiveness issues were identified in the process. However, there were uncertainties about how to best optimize the process.

To address the issue, the period was analyzed in detail, and factors affecting performance were identified. Subsequently, various improvement measures were taken to increase efficiency by implementing changes in specific stages of the process. Research into which parameters were most effective in optimizing the process took a long time, leading to a delay in process optimization.

Encountering these problems required flexibility in project management and a solution-oriented mindset. However, effective communication, collaborative work, and a proactive approach successfully overcame the challenges, ensuring the project was completed successfully.

## Improvements For Future Work

At the end of this thesis, it is anticipated that improvements in the system will continue to occur continuously. For future work, there will certainly be enhancements. These improvements will affect the system to operate more efficiently, effectively, integrated, etc. In the project we have prepared, examples of possible improvements can be given as follows:

* Integration of data and predictive analytics would lead to better understanding of performance in future versions of the project. This situation is an efficient source of information to make better decisions and optimize processes.
* Another possibility is automation. It can be further expanded to automate repetitive tasks and processes. This will further reduce human errors, increase process efficiency, and reduce workload.
* Mobile applications can be developed to improve access to business processes. This enhances integrated potential by allowing users to access processes faster and more effectively anytime, anywhere, making processes more flexible.
* Artificial intelligence and machine learning techniques can be used to better analyze data in systems and control business processes more intelligently. For example, the integration of AI applications into areas such as demand forecasting, inventory management, and personalized recommendations would provide a significant advantage.
* Further work can be done to improve the user interface and user experience. Designing a simplified, user-friendly interface makes it easier for users to understand and use the process, which is a significant advantage.
* It is important to continuously review and improve security standards and compliance requirements in the system. Compliance with current standards for data security and protection of personal data must be ensured. These potential improvements can make valuable contributions to further developing the project and more effectively controlling business processes.

Overall, these examples can be cited as possible improvements for future work. Or more effective work can be done on them. It will be beneficial for systems.

## Contributions Of The Project

At the conclusion of this project, many benefits have been gained from this process modeling project. For example:

* This project provides practical experience in managing and optimizing business processes.
* This experience has helped in understanding, analyzing, and improving business processes, which has been very beneficial in terms of experiencing this process.
* Another contribution can be mentioned as project management skills. This process modeling project has been beneficial in developing project management skills such as time management, resource allocation, communication, and team management. Additionally, this skill will greatly assist the person who prepared the project in future projects and career advancement.
* The project has helped in developing technical skills using the Camunda business process management tool as a modeling platform. This provides expertise in business process automation.
* Another contribution is that it has enhanced the ability to manage and solve challenges encountered during projects. This strengthens the ability to identify and analyze complex problems and find effective solutions.

All of these points demonstrate the contributions offered by the project, and these experiences will have positive effects on personal and professional development.

## Article

**Title:** Using Camunda for Business Process Management and Optimization: A Case Study

**Introduction:** In today's business world, companies must efficiently manage and optimize their business processes to increase efficiency and gain a competitive advantage. In this context, business process management tools have proven to be valuable for visualizing, automating, and analyzing processes. This article explores how Camunda can be used to manage and optimize business processes through a case study.

**Case Study:** ABC Bookstore, a book sales company, initiated a modeling project to optimize its business processes and increase efficiency. The project's focus was on controlling and optimizing the order-to-cash process. The order-to-cash process was modeled and analyzed using the Camunda Modeler platform.

**Project Stages:**

* **Analysis and Modeling:** First, ABC Bookstore's order-to-cash process was thoroughly analyzed and visually modeled using Camunda Modeler.
* **Automation and Integration:** After the modeling phase, we used Camunda's automation capabilities to automate the process. Additionally, integration between different systems was established.
* **Optimization and Improvement:** Process performance was regularly monitored and analyzed. Improvement opportunities were identified, and processes were optimized.
* **Results and Evaluation:** As a result of this project, ABC Bookstore's order-to-cash process was significantly improved. Process automation and optimization increased efficiency, reduced errors, and enhanced customer satisfaction.

**Conclusion:** This case study demonstrates how Camunda can be used to manage and optimize business processes. Effectively controlling and optimizing business processes with the right tools can help companies gain a competitive advantage and enhance success. This article focuses on the use of Camunda in the field of business process management and optimization, providing a concrete example through a case study.

-------

# Kaynakça

AÇİLER, S. (2020). What is Flowchart? When Should It Be Used? https://www.iienstitu.com/blog/akis-semasi-nedir adresinden alındı

BORAT, O., ŞİMŞEK, N., & AYVAZ, B. (2022). *Process Management.* İstanbul Ticaret Üniversitesi. https://ticaret.edu.tr/wp-content/uploads/2022/08/Surec-Yonetimi-El-Kitabi.pdf adresinden alındı

Example: Order-to-Cash. (2022). Abhishek Sanghvi. https://www.youtube.com/watch?v=5Xse7w2fWqM adresinden alındı

Malhotra, R., & Temponi, C. (2010). Critical decisions for ERP integration: Small business issues. *International Journal of Information Management*, 30, 28-37.

NoCode/LowCode : Camunda Modeler - BPMN Basics. (2022). Abhishek Sanghvi. https://www.youtube.com/watch?v=xNIyYx1YzVw&t=601s adresinden alındı

Order-To-Cash with Camunda Modeler. (2022). OUT Digital Learning. https://www.youtube.com/watch?v=xe-7xMHoZOs&t=3s adresinden alındı

Razmi, J., & Sangari, M. S. (2008). A hybrid multi-criteria decision making model for ERP system selection. *Proceedings of 4th International Conference on Information and Automation for Sustainability (ICIAfS )*, (s. 489-495). Sri Lanka.

Santhanam, R., & Kyparisis, G. (1996). A decision model for interdependent information system project selection. *European Journal of Operational Research*, 89, 380-399.

SEBETCİ, Ö., GÜNAY, M. B., & SEBETCİ, E. (2018). An Approach to Business Process Management (BPM) and Workfkow Management (WFM) Concepts. https://dergipark.org.tr/tr/download/article-file/1113662 adresinden alındı

ŞAHİNASLAN, E. (2023). Process Optimization: Methods, Technologies, Riks, and Opportunities. https://dergipark.org.tr/en/download/article-file/3397194 adresinden alındı

Teltumbde, A. (2000). A framework of evaluating ERP projects. *International Journal of Production Research*, 28,4507-4520.

(tarih yok).*The GANNT CHART of this thesis .*

*Token Simulation*. (2024). Camunda Modeler: https://docs.camunda.io/docs/components/modeler/web-modeler/token-simulation/ adresinden alındı

TRA Bilişim. (2023). *Business Process Model and Notation.* TRA Bilişim: https://medium.com/@Trabilisim/business-process-model-and-notation-bpmn-a69a215722b2 adresinden alındı

*Türkçe Tez Yazım Klavuzu.* (tarih yok). https://grad.emu.edu.tr/Documents/theses/turkce-tez-yazim-kilavuzu.pdf adresinden alındı

URL\_02. (2011, Nisan 21). *Easy Referencing Using Word 2010*. 06 17, 2015 tarihinde Youtube: https://www.youtube.com/watch?v=FRjKD2HQPGg adresinden alındı

Yavaş. (2017). What is UML? What are its benefits? https://medium.com/gokhanyavas/uml-nedir-faydalar%C4%B1-nelerdir-7212d31279c#:~:text=UML%2C%20standartla%C5%9Fm%C4%B1%C5%9F%20bir%20yap%C4%B1%20oldu%C4%9Fundan,kod%20yazman%C4%B1n%20%C3%B6n%C3%BCne%20ge%C3%A7ilmi%C5%9F%20olunur. adresinden alındı

--

# GIT/KAGGLE/COLAB/etc.. LINK

Project link for system files:

# CURRICULUM VITAE

Sevcan ÇOŞKUN

**Education : Management Information System**

*Bachelors* : Piri Reis University

2019-2024 Management Information Systems

*High School*: Süleyman Demirel high school

**Work Experience / Internship:**

Domestic Transportation Internship

Business Development Internship

Human Resources Internship

**Professional skill:**

Research and Analysis Ability

Project management

Written and Verbal Communication

Critical Thinking and Problem Solving

**Personal Information:**

|  |  |
| --- | --- |
| **Gender:** Female |  |
| **Date of Birth and Place:** | 31.01.2002 - Tuzla |
| **Foreign languages / Level:** | B1 |
| **Email:** sevcan.coskuun.gmail.com |  |
|  |  |
| **Location - City, Village:** Tuzla İstanbul |  |