University of Milan
Department of Computer Science

Online Delivery Service
Business Process Engineering Project

UNIVERSITÀ
DEGLI STUDI
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Milano 2023

Contents

1 Introduction

When It comes to daily routine there are several services that have recently become a part of our life. Business finds the way to explore new markets, improve logistics and use the modern advances of new technologies. The example of these businesses that is going to be discussed in this work is a food delivery service. Major chains of grocery stores all over the world apply digitalization in their business strategies and send products to the client's address. In 2023 the global food delivery market is worth $150 billion according to McKincey. Examples of grocery chains using modern technology for delivery are Carrefour, Lidl and others. Popular food delivery services are Deliveroo, JustEat, UberEats and many others . Rapidly growing market leads to a competition between companies. It drives the development of technological products such as delivery apps, websites, customer services etc.

Here is the description and a short overview of a business model. Chain of grocery stores provides delivery service using website. Users can look for an item in a list of available products, add it to a bucket list, choose the delivery address and pay using online payment methods. Delivery person (courier) gets a task from the application, accepts it and goes to the closest storage of products dedicated to a company to fulfill the order. Once the order has completed, the courier reaches the destination address and gives the product to the user of the service. This is an example of the order to cash (O2C) process.

The processes in this model can be analyzed in order to improve the overall quality of the service. The quality of a service from the client's side can be measured using the following characteristics:

- Delivery speed
- Quality of delivery
- Courier communication
- Quality of the app
- Packaging
- Sanitary requirements
- Support
- Overall customer satisfaction

The business side consists of the following parts:

- Couriers and recruiting
- Product storages
- Couriers and assets tracking system
- Customer service
- Development and analytics office
- Maintenance

The tracking system helps to check the GPS location of a courier on the way to a customer, calculating the optimal route in a city. Other software capabilities are used In a product storage to optimize a picking up process. The optimal route between the racks can be calculated to decrease the overall time spent by a courier and improve the topology of a storage.

Everything has to be well incorporated in order to get the best results and win the competition on the market with the other companies.

In this work the processes with BPMN diagrams and business model will be discussed as well as the value model. Also the business evaluation will be provided with BPLE. The analysis of business leads to understanding of the steps that are necessary to be performed in order to improve the quality of the service and therefore increase the value and revenue of a business, solve problems and optimize the solutions.

2 Processes

2.1 Grocery store

2.1.1 Delivery

Chain of grocery stores provides delivery service via website and an application. A customer chooses the necessary product in a list of available items completing the bucket, then chooses the delivery address and pays using online payment methods. Delivery person (courier) chooses a task from the application, accepts it if it's suitable for a plan and goes to the company's closest storage of products to fulfill the order. Once the order has completed, the courier reaches the destination address and delivers the product to the customer. Then a new order is chosen and the process repeats again.

2.1.2 Storage management

Storage of the products consists of multiple racks divided by the type of the product (bread rack, milk fridge etc). It consists of different rooms with a topology determined by various factors, such as group of products (dairy products, bakery etc), the optimal storing temperature, frequency of items in the orders and many others. Courier goes through the storage and picks up the necessary items.

2.2 Clients

Clients can access the service via application, using a website or with a direct call to the service center. In the system they have a personal area with orders history, favorite products and other options. The client chooses the products and a delivery address. The client's rating system is provided in order to classify a "bad" client in case of problems and inconveniences from the customer's side.

2.3 Couriers

A courier picks up the products in storage one by one from the list of items. In case of error (e.g. there is no product specified in the order), the courier checks the availability of a product in the other storages. Then in case of absence of a product in all the storages a delivery person communicates with a client and claims that the order can't be completed. If the item is located in a different storage, the order is assigned to another courier that is closer to a target storage. After all the items are collected, the courier scans the

products in a checkout and packs them in a package. The database related to this storage is updated with the changes in quantity of the products. Then the courier leaves the storage to deliver the items to the address specified in the order.

2.4 software

The digital part of the delivery service consists of different engineering solutions including a website and an application for both users and couriers.

2.4.1 Online Service

The website is dedicated to a client. There is a catalog of goods that can be acquired in a store. It consists of a personal area storing the information about a client (e.g. phone number, age, allergic reactions list), orders history, delivery addresses, favorite food, payment methods etc. Once the order is confirmed, a client can track the delivery and communicate with a courier.

2.4.2 App (user and couriers)

The application is divided into two parts: one for the client and one for a delivery person. A client's app has almost the same features as a website. The courier's app has a different interface. Once a courier opens the app, there is a list of orders to be completed ranked in the order depending on the distance to a storage and a client and on the average completion time. A courier can accept the order and proceed to the nearest storage. Inside the storage all the racks are marked with a number depending on a category. For instance C12 corresponds to a 12th rack with chocolate cookies in room C with cookies. The number of a shelf on a rack is also indicated in the app. The optimal route is shown to a courier and it's up to them to decide if they should follow the suggested route or not. As soon as an item is collected, the courier scans the product and puts it in a basket and moves on to the next rack. At the checkout delivery person checks in to show that the job is over. When the order is completed, the courier moves to a destination. The communication with a client is provided via phone call or an app text messages.

2.4.3 Route planning

Route planning is divided into two tasks: indoor and outdoor planning. Outdoor route planning consists of calculation of the optimal distance from a courier's current location to a storage, from a storage to a delivery address

using GPS data. It takes into account the weather conditions, traffic, daytime and many other important factors. The main metric is time spent from the completion of the order by a client to a final delivery. It has to be minimized by the algorithm.

The indoor route planning operates inside the storage. Depending on the list of the items in the order the route is calculated minimizing the time spent in a storage to complete the order. The route is shown to a courier on a map of the storage. The statistics about the orders are stored and then the frequency of racks in the order is taken into consideration. The topology of the storage can be reordered putting racks with more frequent items closer to the exit, decreasing the route length.

2.4.4 Storage DB

The storage database collects the information about orders, outdoor routes, indoor routes. The database is updated after the completion of the order storing the time spent on each order, the length of route, time spent in a product storage and other useful information.

2.4.5 Storage topology optimization

The algorithm considers racks as nodes of a graph and the distance between racks is considered to be a weight of a vertex. The algorithm finds the least possible route length. Another algorithm calculates the optimal positioning of racks in a storage depending on the frequency of appearances of a certain rack in the order. It places the most frequent racks closer to the exit and less frequent further, so the overall route length and therefore time spent to complete one order is decreased.

2.5 Analytics

The information about the order, completion time, user data, storage fulfillment, courier's and user's feedback is a subject of analysis. It reduces costs and improves the quality of the service.

3 Process Identification

3.1 Process Architecture

A house diagram is built to represent the hierarhy of the major processes of the online delivery service. All of them are divided into core, management, and support processes.

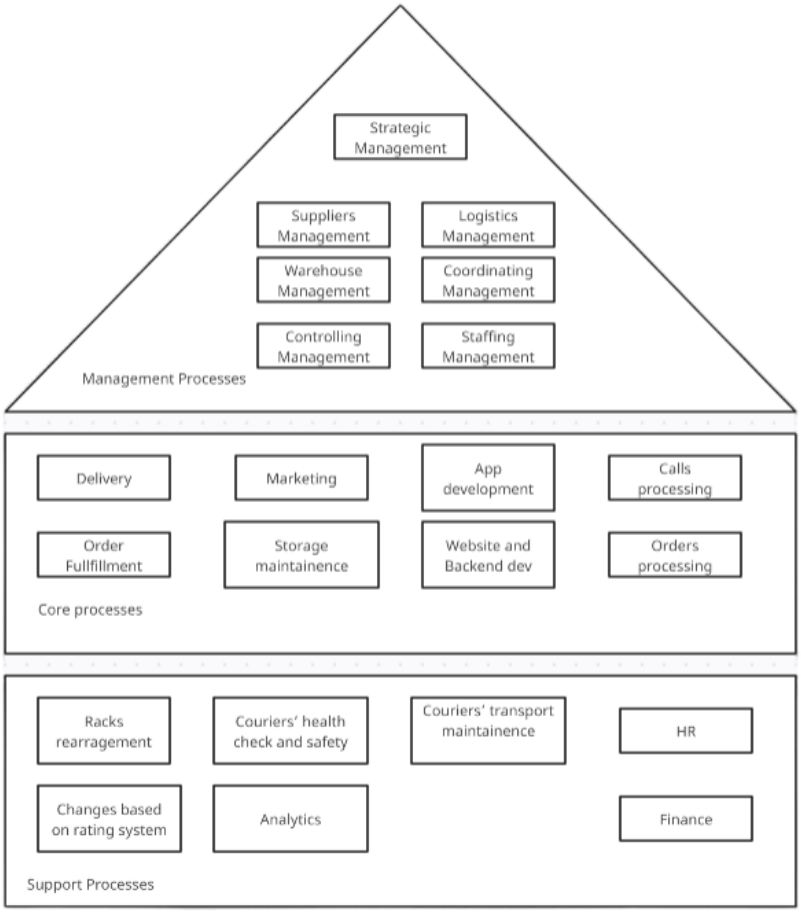

Figure 1 – House Diagram

3.2 Prioritized process portfolio

A prioritized process portfolio is built for the most important processes of the online delivery service. It describes processes in three categories: importance, health, and feasibility.

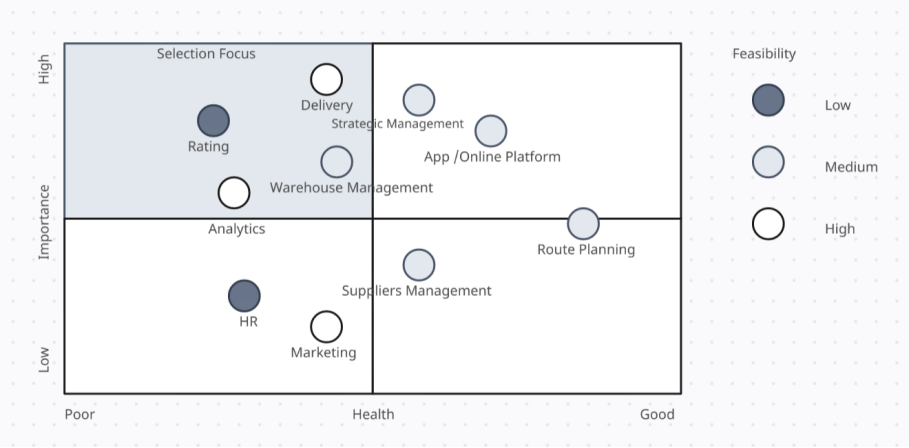

Figure 2 – Process Portfolio

4 Business Process Flow

4.1 BPMN diagram of a service

Here one can see a BPMN diagram of a process. This BPMN-based approach helps streamline the online delivery service, ensuring a smooth and satisfactory experience for both customers and the service provider.

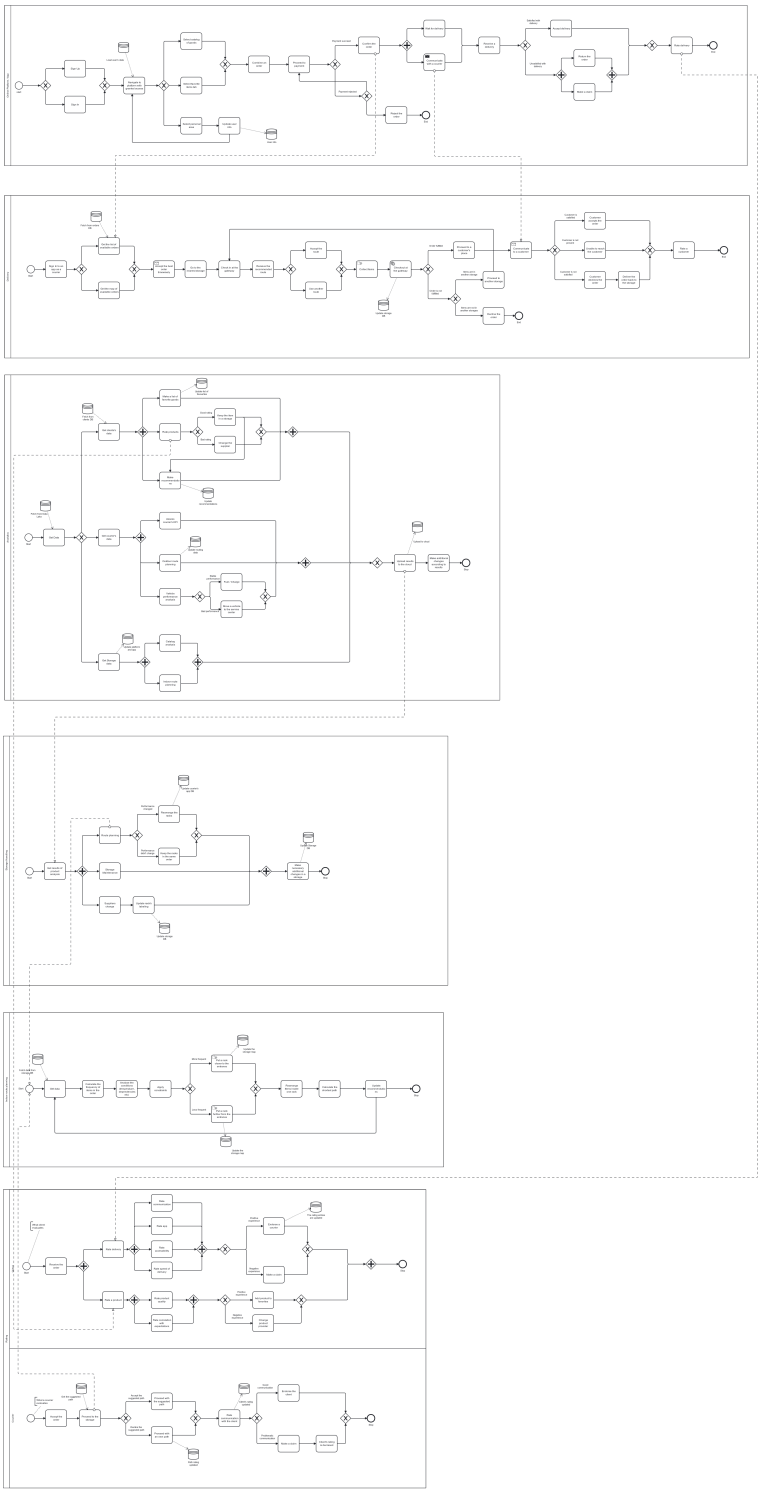

Figure 3 – Full Process Diagram

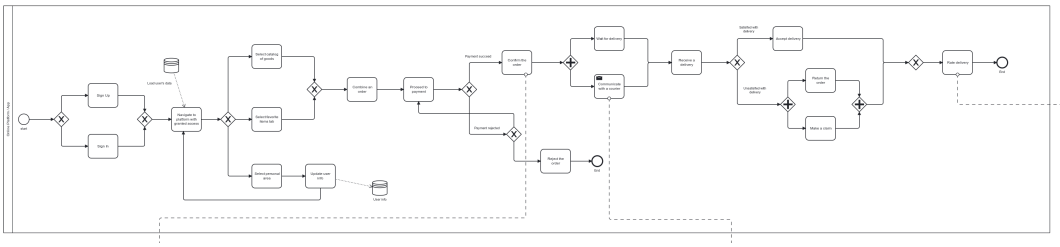

Figure 4 – Online Platform

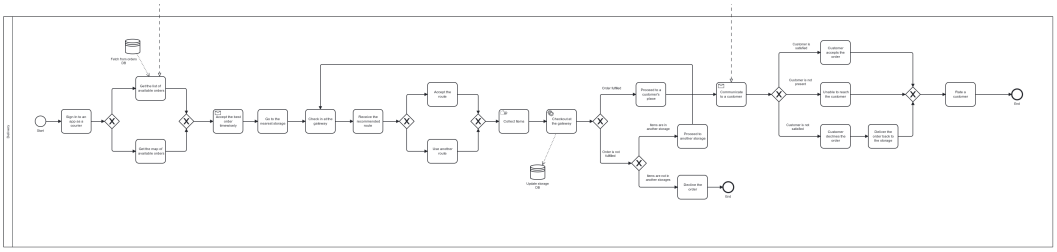

Figure 5 – Delivery

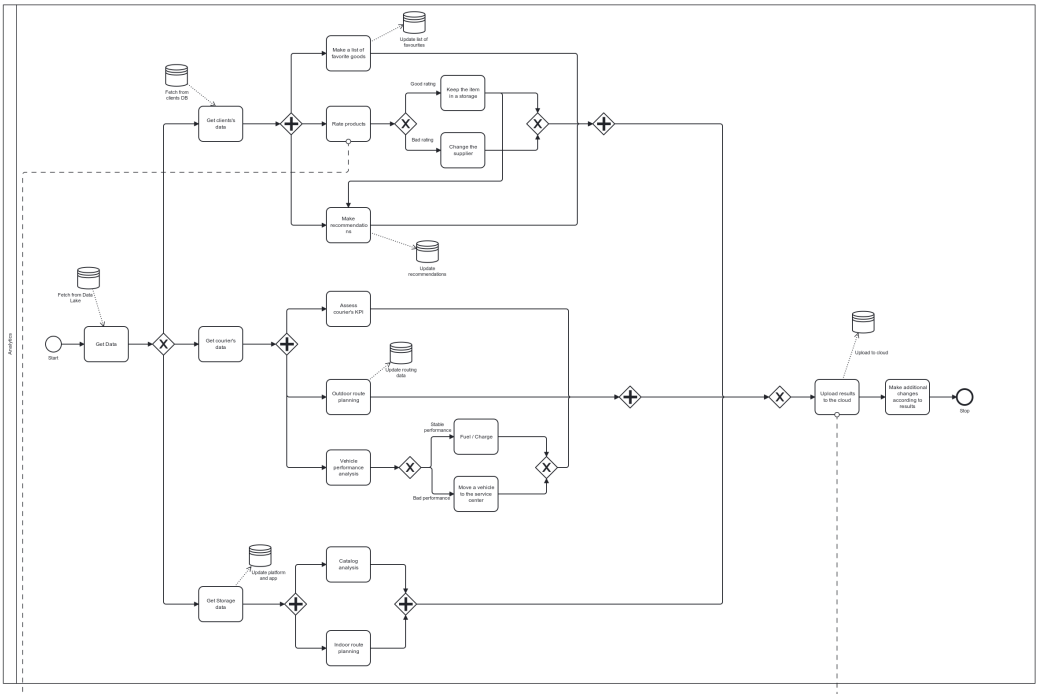

Figure 6 – Analytics

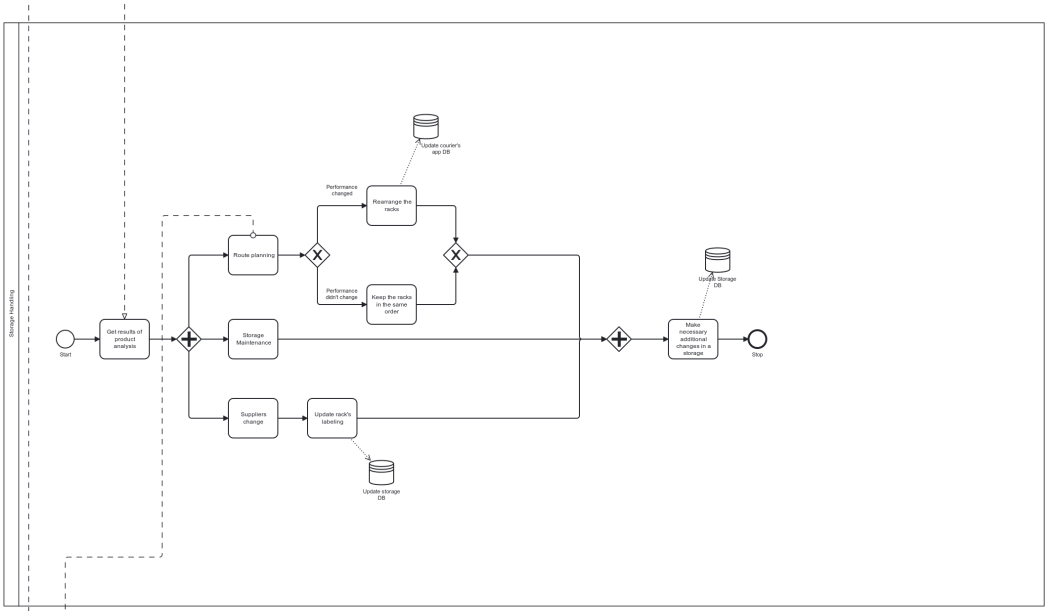

Figure 7 – Storage Handling

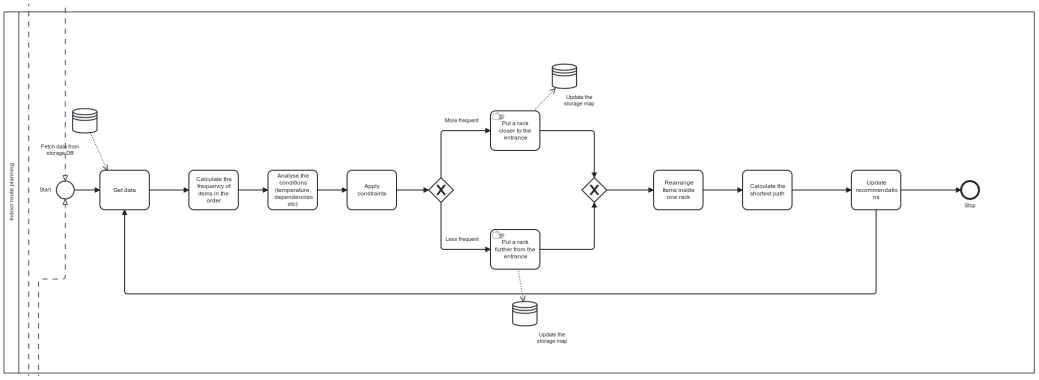

Figure 8 – Indoor Route Planning

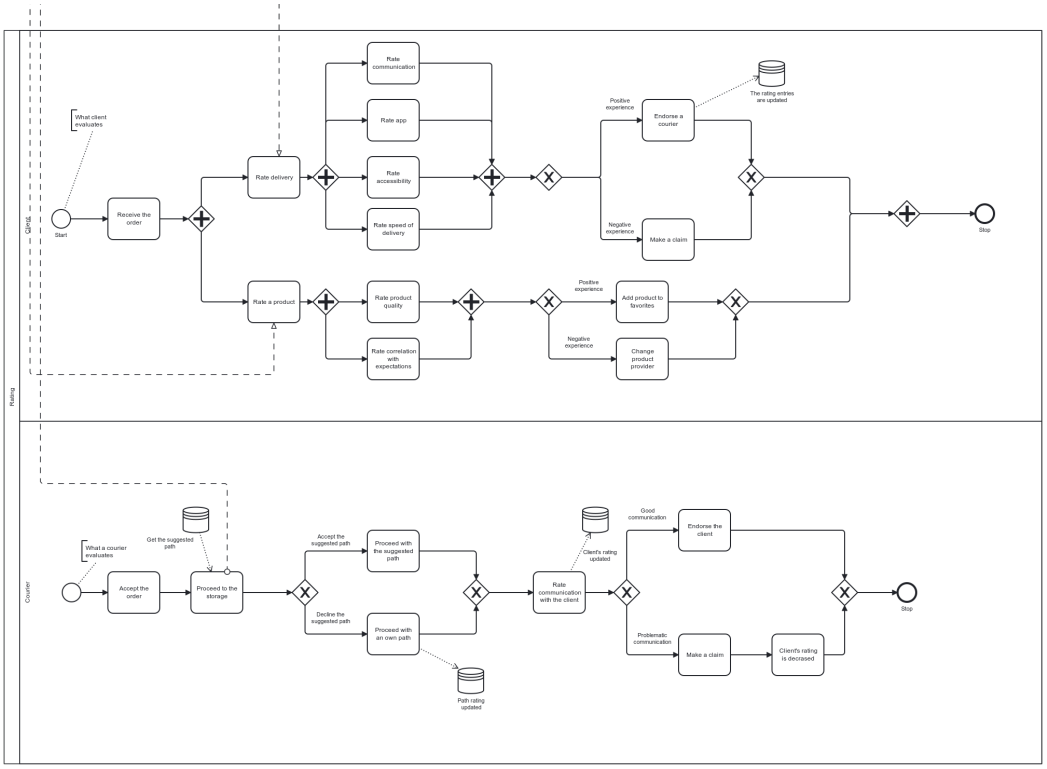

Figure 9 – Rating

4.2 BPMN diagram of suprocesses

Here one can see several subprocesses of online service. Most of them are related to an app or an online platform. They allow for better process management because changes or updates can be made to individual subprocesses without impacting the full process.

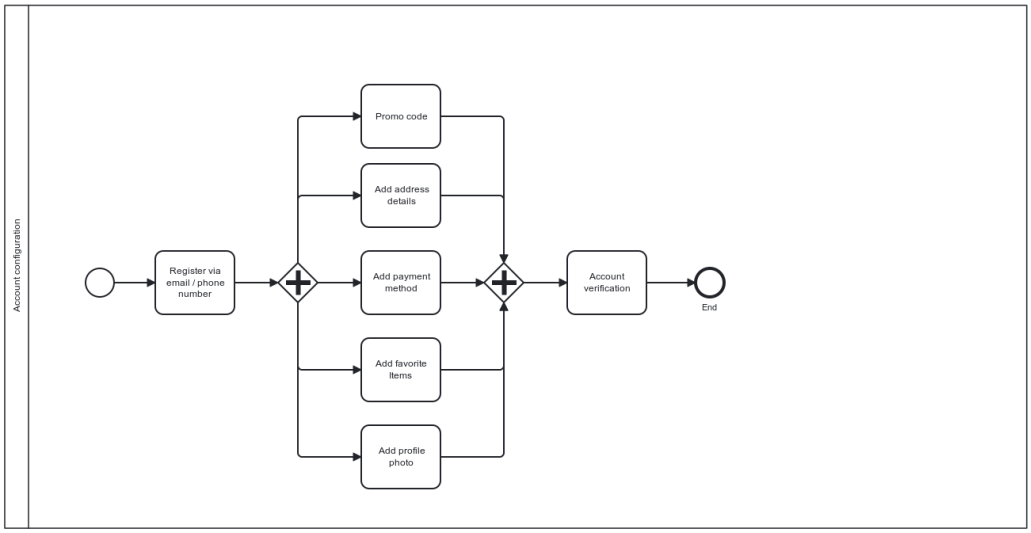

Figure 10 – Account Configuration

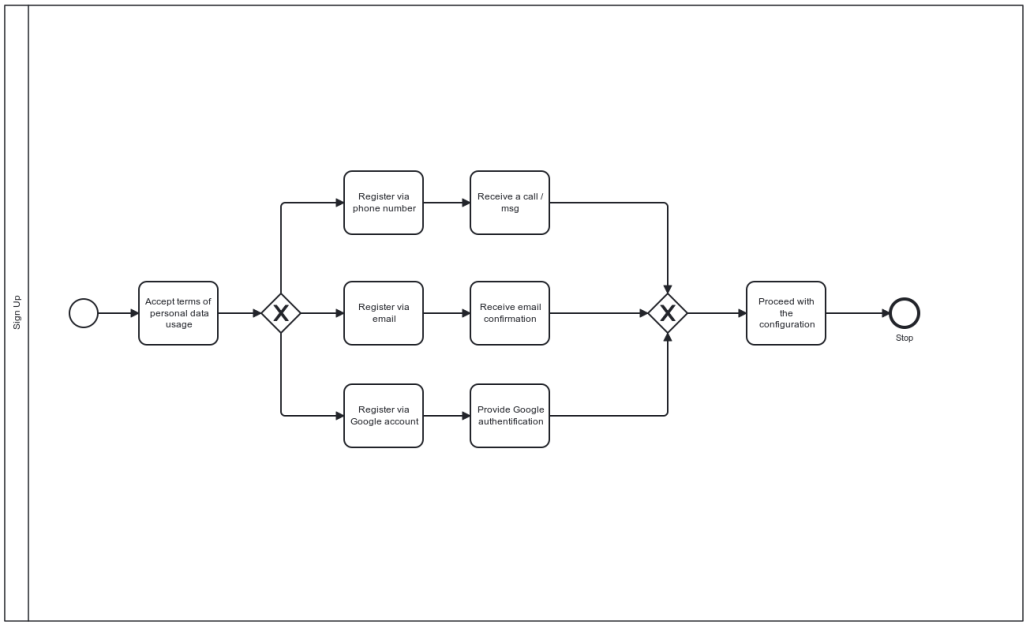

Figure 11 – Sign Up

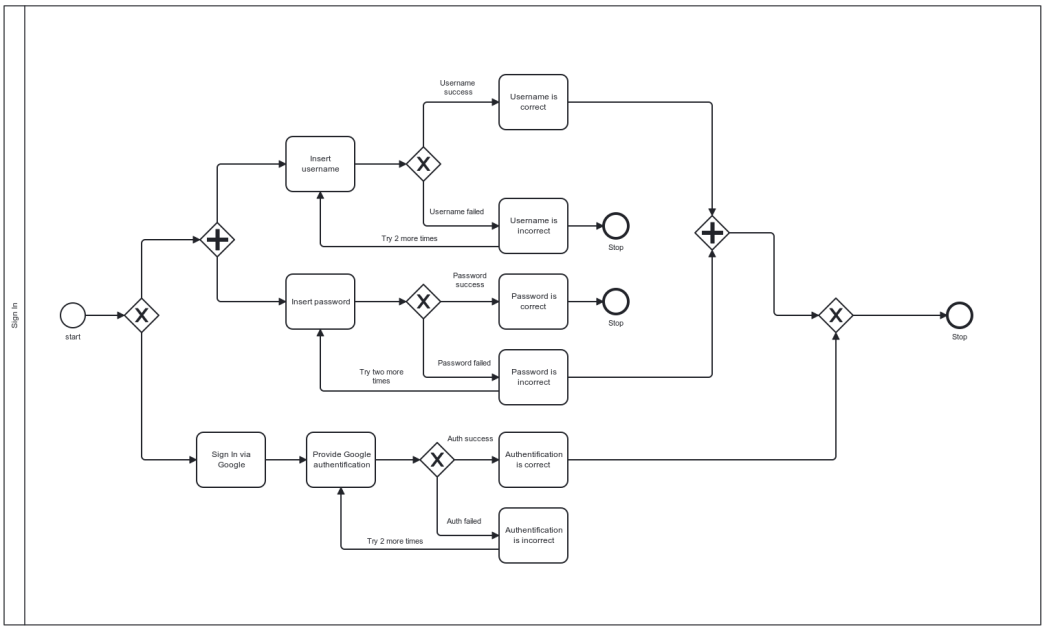

Figure 12 – Sign In

5 Value Model

5.1 Value Model

The $e3$ value model represents how actors exchange value by providing services. The $e3$ value model helps business understand the dependencies and interactions between the value proposition, value configuration, and value network.

- \Courier Accepts orders from a platform/app published by clients and goes to the storage to get the necessary items. Courier ships the order to a client and proceeds with the next order.
- \Customer Uses a platform/app to combine the order and pays for it. After waiting for a delivery, a customer collects the order from a courier.
- \Platform/App Is used by a client to share the information about items in a stock and the information about the order. Platform / App is used by a courier to show the list of available orders and communicate with a customer. The app navigates a courier inside the storage and outside on the way to a customer's location.
- \Storage The items are stored in a storage that gives the access to couriers to complete the order. The items in a storage are supplied from a goods provider.
- \Goods Provider Sends products to a storage and gets money from the delivery company.

5.2 Value Model Diagram

Value model diagram provides a visual representation of how value is created, delivered, and captured within a business context.

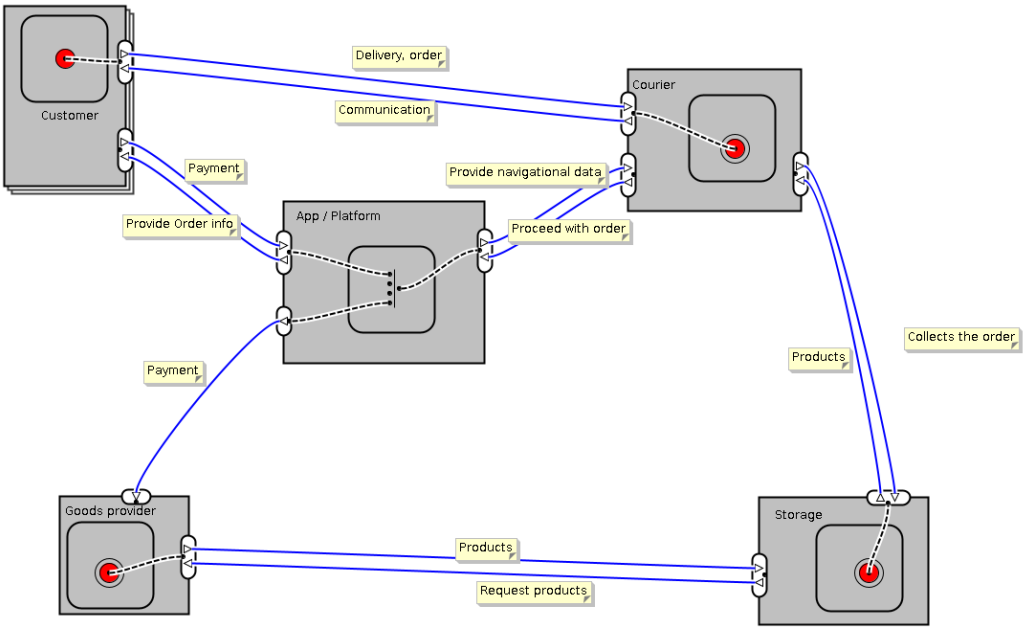

Figure 13 – Value Model

6 Business Evaluation

The goal of a business evaluation is to get a comprehensive understanding of the organization's strengths, weaknesses, opportunities, and threats (SWOT analysis) in order to drive strategic decision-making and improve performance of the organization.

6.1 Critical Success Factor (CSF)

A CSF represents a critical factor or activity that makes possible the successful execution of the processes of a company, that is necessary to achieve the company's goal.

For a described online delivery service the CSF are the following:

- Number of orders: the largest part of a revenue of a company comes from payments for orders.
- Time of delivery: since the goal of delivery is to provide goods for customers without clients spending time on going to a grocery store, the speed of delivery is sufficiently important for the service. Also fast delivery increases the possible number of orders per day.
- Quality of delivery: when it comes to a service, the customers need to have a good quality application, communication, and support.
- Application and a website platform quality: a stable app with user friendly UI helps to ensure that a customer will use it again.
- Quality of items provided: the quality of goods is sufficiently important because the delivered items will be used later by a client.
- Wide storage network: a strong connectivity between storages is a critical factor for a delivery service since it allows a courier to spend less time on the way to a storage and after to a client.

6.2 Key Goal Indicators (KGI)

KGI refers to an important long-term goal of a company that has to be achieved. Other metrics should lead to achieving this goal.

- Increase the number of permanent users over time: This goal describes the overall number of people who used the service over a specific period of time. For example, the number of users in one month should be increased over time.

- Expand the delivery network: The delivery can be started in major cities but it can be extended to smaller cities and towns building the necessary connections and storage infrastructure for it.
- Expand the providers network: Strong business partnership with goods providing companies helps to establish reliable suppliers with a good quality products

6.3 Key Performance Indicators (KPI)

These are important quantifiable indicators that lead to a desired goal. It keeps focus on strategic improvement and helps to analyze the performance of a company.

- Number of new clients over a period of time: success if increases.
- Number of orders over a period of time: success if increases.
- Average time spent to perform one order: success if decreases.
- Growth in revenue: success if increases.
- App rating in an app store: success if increases.
- Average delivery rating: success if increases.
- Number of new cities in a network: success if increases.
- Number of new storages in a network: success if increases.
- Number of orders performed by a courier over a period of time (courier's performance): success if increases.

7 Conclusion

Overall, the business process analysis shows the advantages of the online delivery service, including its customer-centric approach, optimized resource allocation, and efficient order processing. The analysis of the process alongside a BPMN and value diagrams helps to understand the connections between processes and value transferring between actors. It helps to construct and maintain the business, gather the statistics with analytical tools and measure KPI in order to achieve goals specified in KGI. The model of online delivery service is used in several businesses but in order to get the most out of it it's necessary to make a process analysis and improve the quality of a service and get better results than other players in a market. Smart solutions including application, route planning, storage optimization and other digital mechanisms lead to the increase in the performance and quality of the service.