Process analysis - Team project for pv207

Grocery Delivery Service - BuyBread

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Organization overview

BuyBread is a grocery delivery service company that provides groceries to all customers at any given time. Using BuyBread mobile or web application, customers can choose products of their liking and have them delivered according to their needs. Incorporating our advanced warehouse, BuyBread is able to fulfill the market demands with little to none waste. Customer friendly approach makes everyday shopping a stress-free experience. A wide selection of delivery options let customers to fully customize time and place of every delivery. To a doorstep, work or tram stop in the city center on your way home.

Vision

Make a wide selection of high quality and fresh groceries available in any time and any place.

Mission

Provide unique, comfortable and fully customizable delivery experience accessible from customer's smartphone. Deliver in any given time and place to fully satisfy customer's needs. Team up with the best local and foreign suppliers to provide every kind of high quality goods right to your doorstep. Guarantee wide selection of fine dining quality ingredients for incomparable prices.

Goals and objectives

Defined goals and objectives derives and supports the company strategy and vision:

- G1: Become the most reliable grocery delivery service on the market.
    - O1.1: Deliver 99% of orders to match customer's desired time of delivery in interval of 10 minutes.
    - O1.2: Being able to dynamically reschedule delivery time to meet customer requests.
    - O1.3: Guarantee safe delivery with less than 5% chance of flawed goods.
    - O1.4: Guarantee the delivery to any given place.
    - O1.5: Increase orders by 20%
    - O1.6: Hire 12 new drivers to support company growth
- G2: Sustain warehouse performance.
    - O2.1: Keep warehouse stocked to achieve 90 % of offered goods always available
    - O2.2: Manual work takes less than 5 minutes for a single order.
- G3: Keep inventory fresh.
    - O3.1: Have more than 90% of the goods with expiration date not less than 4 days.
    - O3.2: Create promotions to support sales.
- G4: Improve and optimize supply chain processes to establish zero waste approach.
    - O4.1: Meet zero-waste policy with less than 2% of goods disposed without any future added value.
    - O4.2: Optimize the turnover rate of goods in stocks to be less than 4 days.
- G5: Support local suppliers.
    - O5.1: Have more than 50% of products from local suppliers.

Measurement indicators

To reach our targets we defined KPI (Key Performance Indicator) and KRI (Key Result Indicator).

- O1.1: Deliver 99% of orders to match customer's desired time of delivery in an interval of 10 minutes.
    - KPI - Number of missed delivery time windows per week.
    - KRI - Percentage of missed delivery windows in one month.
- O1.2: Being able to dynamically reschedule delivery time to meet customer requests.
    - KPI - Number of succcessfully rescheduled deliveries per week.
    - KRI - Percentage of rescheduled deliveries in one month.
- O1.3: Guarantee safe delivery with less than 5% chance of flawed goods.
    - KPI - Average daily rate of damaged goods at pickup.
    - KRI - Percenage of damaged goods per month.
- O1.4: Guarantee the delivery to any given place.
    - KPI - Number of orders successfuly delivered a day.
    - KRI - Number of orders successfuly delivered in a month.
- O1.5: Increase orders by 20%
    - KPI - Number of successful orders per week
    - KRI - Number of successful orders per month
- O1.6: Hire 12 new drivers to support company growth
    - KPI - Number of hired drivers after interview per month

    - KRI - Number of hired drivers after interview per year
- O2.1: Keep warehouse stocked to achieve 90 % of offered goods always available
    - KPI - Average percentage of available goods in the stock per week.
    - KRI - Average percentage of available goods in the stock per month.
- O2.2: Manual work takes less than 5 minutes for a single order.
    - KPI - Average time of manual work on order per day.
    - KRI - Percentage of orders overreaching the time limit of manual work per month.
- O3.1: Have more than 90% of the goods with an expiration date not less than 4 days.
    - KPI - Average expiration date of goods.
    - KRI - Percentage of goods in stock with an expiration date not less than 4 days.
- O3.2: Create promotions to support sales.
    - KPI - Number of created promotions per week.
    - KRI - Number of sales that used this promotion.
- O4.1: Meet zero-waste policy with less than 2% of goods disposed without any future added value.
    - KPI - Percentage of products sent under disposal agreement per day.
    - KRI - Percentage of disposed products without any future added value per month.
- O4.2: Optimize the turnover rate of goods in stocks to be less than 4 days.
    - KPI - Average turnover rate of goods per month.
    - KRI - Total amount of goods stored longer than 4 days per year.
- O5.1: Have major part of products from local supplier.
    - KPI - Average percentage of products from local suppliers in stocks per week.
    - KRI - Number of days in a month when majority of products are from local suppliers.

Organization structure

Roles and responsibilities

- CEO
  - Leading the company
  - Create and communicate Vision and mission
- Software developers
  - Develop and deploy software
  - Keep software actual and functional
- Stock manager
  - Create offers for customers
  - Financial management
- Warehouse manager
  - Take care of warehouse
  - Work with Warehouse database
- Warehouse worker
  - Work with goods in the warehouse
  - Prepare orders
- Delivery worker - driver
  - Deliver orders to customers
- Customer support
  - Communicate with customers

Departments

- IT department
  - Developing and deploying software
  - Maintenance
- Warehouse department
  - Keeping warehouse full of fresh goods
  - Working with goods - packing, updating database
- Customer service
  - Service desk
- Human resources
  - Hiring new people
  - Administrative support for the employees
- Financial department
  - Financial management
- Marketing department
  - Create promotion, advertising

Processes

- P1: Order creation
  - O1.5: Increase orders by 20%
- P2: Manage warehouse
  - O2.2: Manual work takes less than 5 minutes for a single order.
- P3: Delivery
  - O1.1: Deliver 99 % of orders to match customer's desired time of a delivery in an interval of 10 minutes.
- P4: Driver hiring process
  - O1.6: Hire 12 new drivers to support company growth
- P5: Optimize supply chain
  - O4.2: Optimize the turnover rate of goods in stocks to be less than 4 days.
- P6: Restock inventory
  - O2.1: Keep warehouse stocked to achieve 90 % of offered goods always available
- P7: Create promotions
  - O3.1: Have more than 90 % of the goods with an expiration date not less than 4 days.
  - O3.2: Create promotions to support sales.
- P8: Handling non-sellable goods
  - O4.1: Meet zero-waste policy with less than 2 % of goods disposed without any future added value.

P1: Order creation

Description

Creation of an order is one of the main procceses that use customer interaction. Customer can choose from wide variety of goods that are stocked and avalaible right now in our warehouse. Customer will compose the list of items he wants to buy. System will check if all items are available in exact time of ordering and then proceeds with order. Customer will be prompted to specify payment options (online payment using credit card or paying cash on the spot) and to specify delivery options. If customer decides to use online payment option we will verify transaction with bank and then finalize the order. User will be notified after succesful order completition. Details of order will be saved into the database and sent to the order management.

Indicators

- KPI: Number of successful orders per week
  - integer [number of successful orders]
  - desired value [500] minimal value [300]
- KRI: Number of successful orders per month
  - integer [number of successful orders]
  - desired value [2000] minimal value [1200]

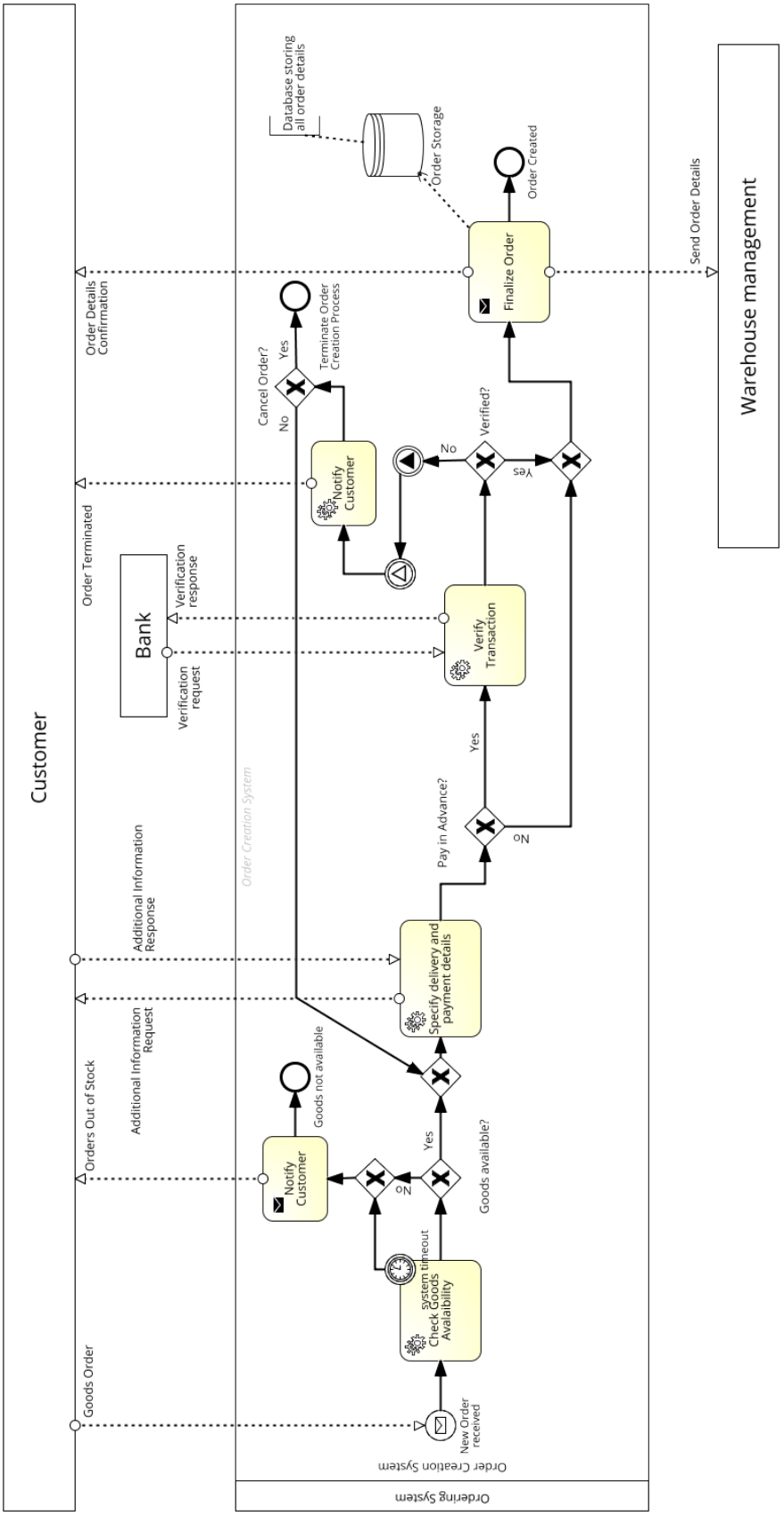
Roles

- Customer
  - Creates order consisting of goods and inputs the payment option and shipping details. Is notified by email in case of failure or success.
- Warehouse management
  - Receives finalized order information
- Bank
  - Verifies transaction
- Ordering System
  - Handles order creation proccess

Data objects

- Order Storage
  - Database storging all order details for statistical and billing purposes

Diagram


Customer
Ordering System
Order Creation System
Warehouse management
Bank
Goods Order
New Order received
Check Goods Availability
system timeout
Goods available?
Yes
No
Notify Customer
Orders Out of Stock
Goods not available
Additional Information Request
Additional Information Response
Specify delivery and payment details
Pay in Advance?
Yes
No
Verify Transaction
Verification request
Verification response
Verified?
No
Yes
Notify Customer
Cancel Order?
Yes
No
Terminate Order Creation Process
Order Terminated
Order Details Confirmation
Finalize Order
Order Created
Order Storage
Database storing all order details
Send Order Details

P2: Manage warehouse

Description

This process covers part of preparing the shipment of individual orders that are result of Order creation process. At its start, the process checks the correctness of the order. If order is valid, it continues with making a reservation (a lock) on the number of ordered items. If order is not valid, an error gets logged and customer is notified via email.
After reservation, system creates two parallel tasks.

- First one is a check whether all items from which we took some amount, are still available in a sufficient amount in the warehouse. If not, system automatically creates and order and warehouse manager is required to sign it. After that, an order for a shipment of new goods is sent to the supplier.
- Second task is aimed at dispatch of the items, so manual task where warehouse worker is required to gather items from inventory is executed. Later manual task where items are packed is completed and both courier and customers are notified.

Indicators

- KPI: Average time of manual work on order per day
  - integer [execution time of the manual work]
  - Desired value: between [0-5] Maximal: [6]
- KRI: Percentage of orders overreaching the time limit of manual work per month
  - integer [percentage of orders]
  - desired value [5 %] maximal [10 %]

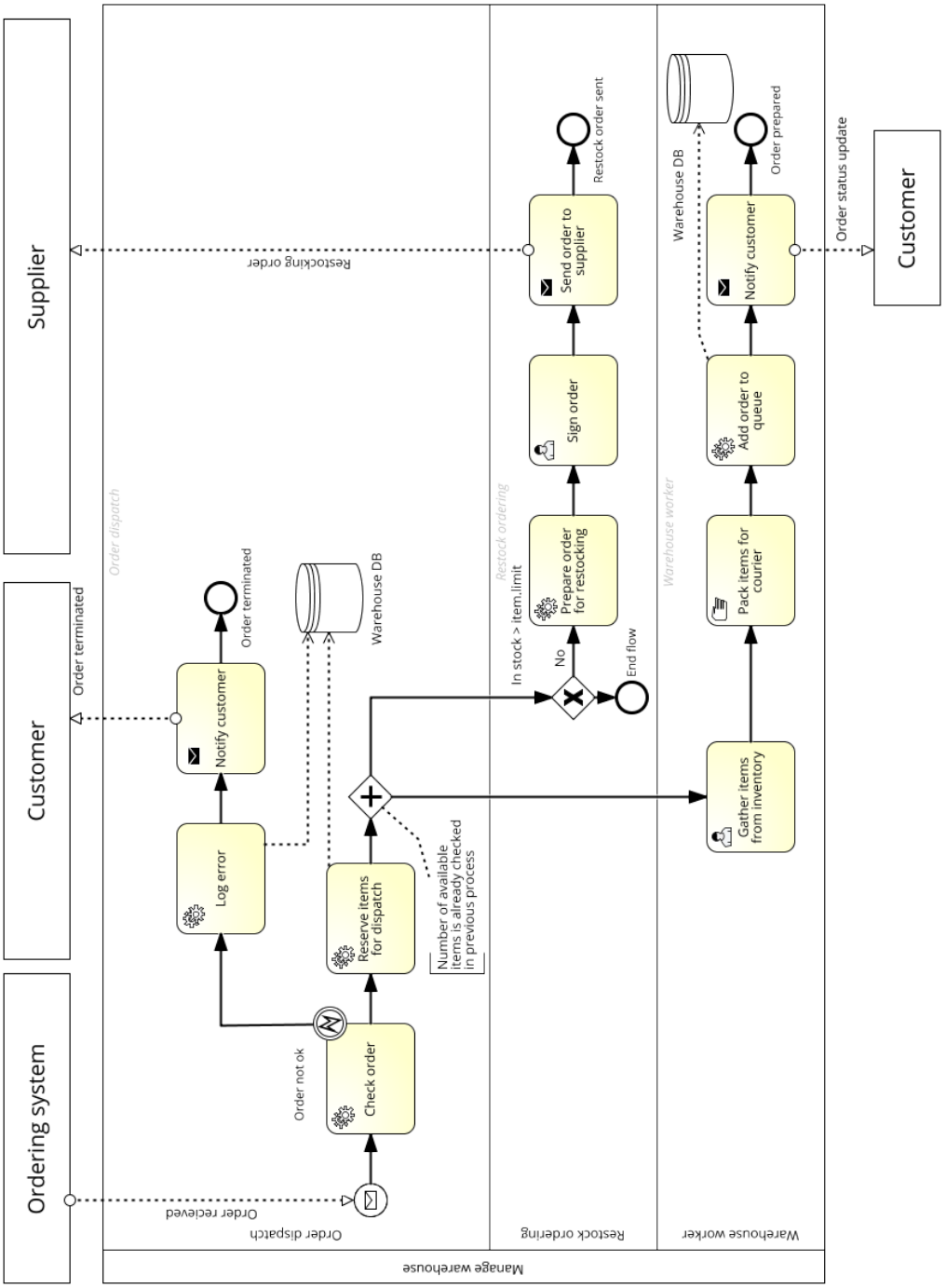
Roles

- Warehouse manager
  - Signs the restocking order.
- Warehouse worker
  - Gets the order items and creates package.
- Customer
  - Is informed if error happens.
- Supplier
  - Receives new restock order.
- Courier
  - Gets order ready message.

Data objects

- Warehouse database
  - Database that holds items in the warehouse and their metadata.

Diagram


Supplier
Customer
Ordering system
Order terminated
Restocking order
Order status update
Customer
Manage warehouse
Order dispatch
Restock ordering
Warehouse worker
Order recieved
Check order
Order not ok
Reserve items for dispatch
Number of available items is already checked in previous process
Log error
Notify customer
Order terminated
Warehouse DB
In stock > item.limit
No
End flow
Prepare order for restocking
Sign order
Send order to supplier
Restock order sent
Gather items from inventory
Pack items for courier
Add order to queue
Notify customer
Order prepared
Warehouse DB

P3: Delivery

Description

This process describes packages delivery within one day. Delivery work is being done from 6:00 till 24:00 by delivery man. Packages are prepared by the system. Plan of delivery is prepared as well. Delivery man loads the car with prepared packages and chooses the first package to be delivered. All the necessary information about packages and customers is in BuyBread System. Delivery man contacts the customer. If customer replies, the package is delivered to his hands. If the order is not paid in advance, delivery man takes the money from customer. If it is not possible to contact customer, package is marked as 'deliver later' and system reschedules delivery time with customer. If the last package in the car is delivered and time is still between 6:00 - 24:00 delivery man can go load the car again after checking if there are any packages left in Package database. If delivery man delivers all packages in car for that day and has worked for more then 9 hours he can pass the car to another delivery man. Process of delivery is done when all the scheduled packages are delivered for that day.

Indicators

- KPI: Number of missed delivery time windows per week.
    - number [total amount of missed delivery windows]
    - Desired value: < all windows / 100 [1 out of 100 widnows]
- KRI: Percentage of missed delivery windows in one month.
    - percentage [missed / total amount]
    - Desired value: [< 1 % per month] Maximal value: [5 %]

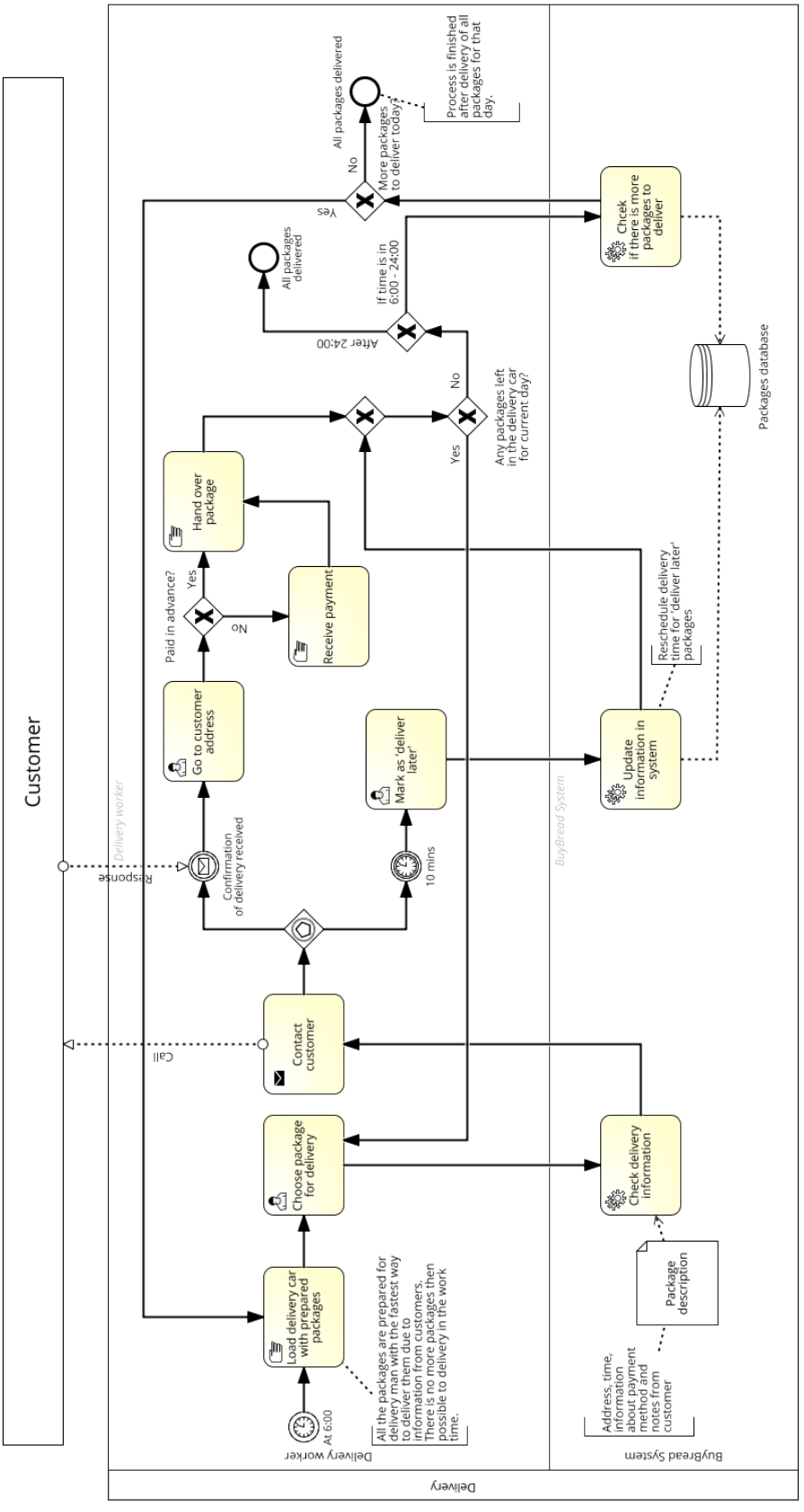
Roles

- Customer
    - Specifies the person which made order. Delivery man contacts customer while delivering package.
- Delivery man
    - Delivering the packages, communicate with customer and receiving payment from customer. Working with BuyBread System to check delivery information and packages database.
- BuyBread System
    - Keeping the information about packages and customers. Processing updates when packages are being rescheduled.

Data objects

- Package description
    - Keeps information about customer. His address, number, time to deliver, payment methods and notes from customer about delivery.
- Package database
    - Contains records of orders for that day. Processing updates with 'deliver later' packages. Create schedule for delivery man by locations and delivery time.

Diagram


Customer
Delivery
Delivery worker
BuyBread System
Buybread System
Delivery worker
Call
Response
At 6:00
Load delivery car with prepared packages
All the packages are prepared for delivery made with the fastest way to deliver them due to information from customers. There is no more packages then possible to delivery in the work time.
Choose package for delivery
Contact customer
Confirmation of delivery received
10 mins
Go to customer address
Mark as 'deliver later'
Paid in advance?
Yes
No
Receive payment
Hand over package
Any packages left in the delivery car for current day?
Yes
No
After 24:00
If time is in 6:00 - 24:00
All packages delivered
More packages to deliver today?
Yes
No
All packages delivered
Process is finished after delivery of all packages for that day.
Check delivery information
Package description
Address, time, information about payment method and notes from customer
Update information in system
Reschedule delivery time for 'deliver later' packages
Chcek if there is more packages to deliver
Packages database

P4: Driver hiring process

Description

This process shows our steps in accepting a new BuyBread team member - a driver. A candidate for a position must meet certain conditions and qualifications. First of all, he has to send his CV, which is then evaluated by a recruiter. After that, if the applicant is eligible for the job, an interview is arranged. During the interview, the recruiter explains to the applicant our work standards and requirements and asks about his experiences. Based on his responses and behavior he is accepted or denied. The candidate must also provide documents to all the necessary qualifications (e.g., a minimum B category driving license). If the interview is successful, the candidate is included in the Newbie program, the database of employees is updated and a mechanic prepares a new car.

Indicators

- KPI: Number of hired drivers after interview per month
  - integer [number of hired drivers]
  - desired value [5 out of 10] minimal value [1 out of 10]
- KRI: Number of hired drivers after interview per year
  - integer [number of drivers]
  - desired value [12] minimal value [6]

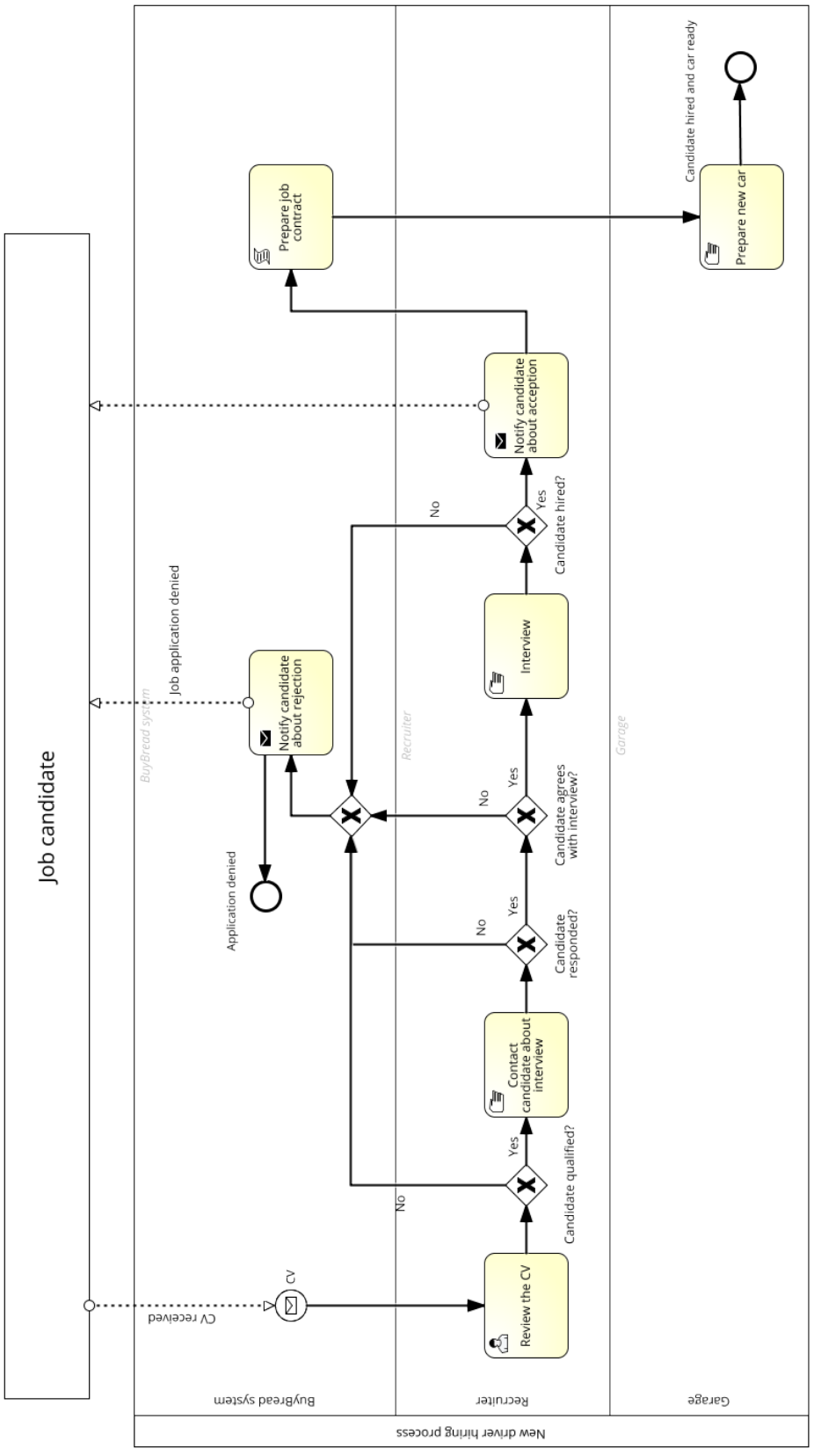
Roles

- Recruiter
  - Evaluates job application and interviews the candidate
- Job applicant
  - Applies for a job
- Mechanic
  - prepares car for a new driver

Data objects

- Employees database
  - contains data about all BuyBread employees

Diagram


Job candidate
CV received
CV
Review the CV
Candidate qualified?
Yes
No
Contact candidate about interview
Candidate responded?
Yes
No
Candidate agrees with interview?
Yes
No
Interview
Candidate hired?
Yes
No
Notify candidate about acception
Prepare job contract
Prepare new car
Candidate hired and car ready
Notify candidate about rejection
Job application denied
Application denied
BuyBread system
Recruiter
Garage
New driver hiring process

P5: Optimize supply chain

Description

This process provides optimization of goods in Warehouse. Statistics of all goods are stored in Warehouse Database. If Database does not reply in 5 minutes this proces is aborted. Stock manager works with this statistics to reach our goal of selling every item at maximum of 4 days. This prevents Warehouse from being overstacked and from goods to expire. Stock manager sets the contract with supplier while trying to order what is needed and reduce orders of goods that are not needed. He sends orders to supplier based on data from Warehouse Database.

Indicators

- KPI - Average turnover rate of goods per month.
  - integer [number of days in warehouse]
  - desired value: [<4] maximum value [5]
- KRI - Total amount of goods stored longer than 4 days per year.
  - integer [percentage of goods stored longer than 4 days]
  - desired value [<3 %] maximum value [5 %]

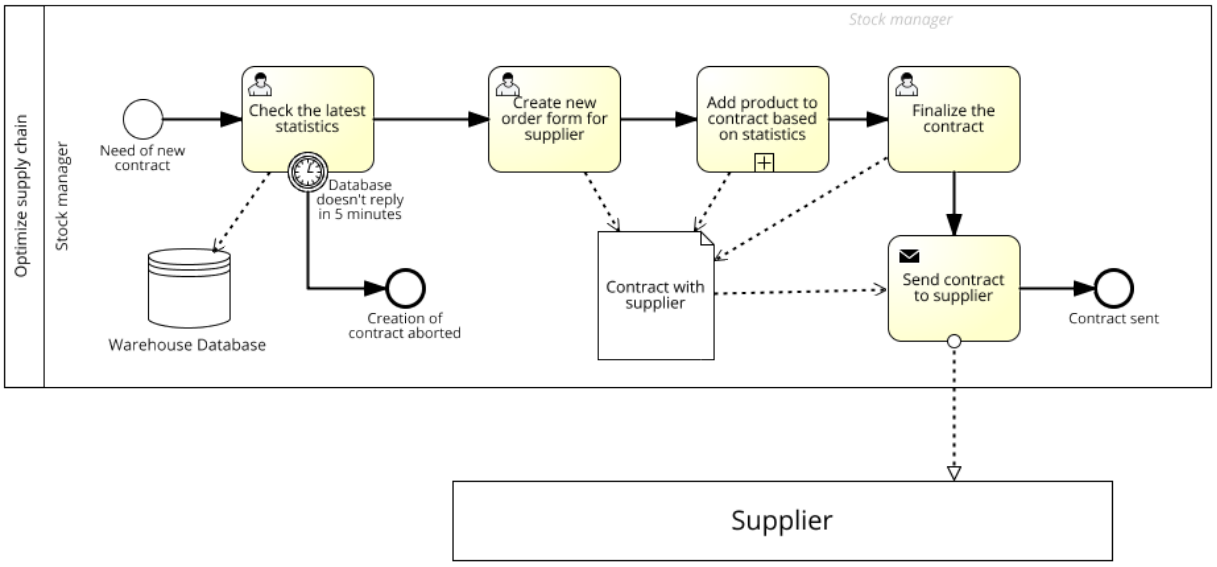
Roles

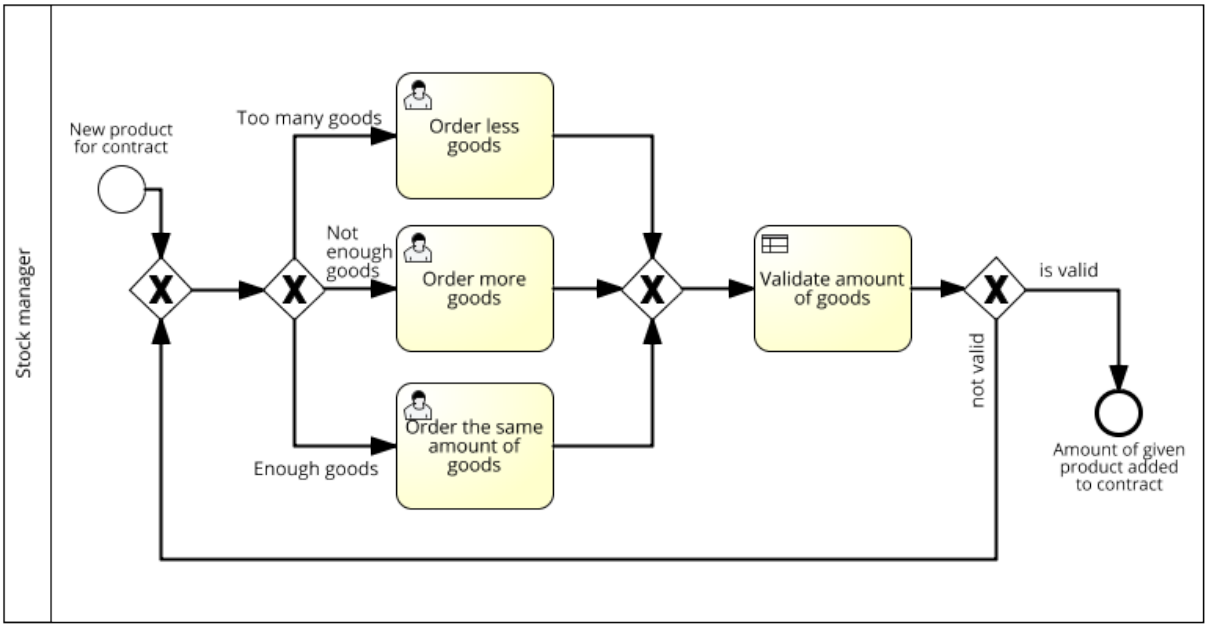
- Stock manager
  - Person taking care about stocks in warehouse, reacting to given statistics and communicating with suppliers.
- Supplier
  - Supplier is the person which supply our warehouse with goods. There can be more different suppliers.

Data objects

- Warehouse Database
  - Database that holds items in the warehouse and their metadata. It contains statistics about goods.
- Order for supplier
  - Order created for supplier, contains data about ordered goods

Diagram


Optimize supply chain
Stock manager
Stock manager
Need of new contract
Check the latest statistics
Database doesn't reply in 5 minutes
Create new order form for supplier
Add product to contract based on statistics
Finalize the contract
Warehouse Database
Creation of contract aborted
Contract with supplier
Send contract to supplier
Contract sent
Supplier


Stock manager
New product for contract
Too many goods
Order less goods
Not enough goods
Order more goods
Order the same amount of goods
Enough goods
Validate amount of goods
is valid
not valid
Amount of given product added to contract

P6: Restocking inventory

Description

The process shows the restocking of products in our warehouse after goods are delivered to warehouse. A BuyBread employee checks the order, if the goods are ok. If not, he returns the goods. Then a new order is generated and sent to a supplier. If the order is ok, it is taken over and restocked in the warehouse. The warehouse database is updated. After that, the invoice for the order is paid and the invoice database is updated too. By watching the number of returned orders (due to damaged or wrong amount or types of delivered goods) by one supplier, we can choose the most reliable ones. Also we are checking average percentage of goods availability.

Indicators

- KPI: Average percentage of available goods in the stock per week
    - integer [percentage of available goods]
    - desired value [95 %] maximum value [80%]
- KRI: Average percentage of available goods in the stock per month
    - integer [percentage of available goods]
    - desired value [90 %] minimum value [80 %]

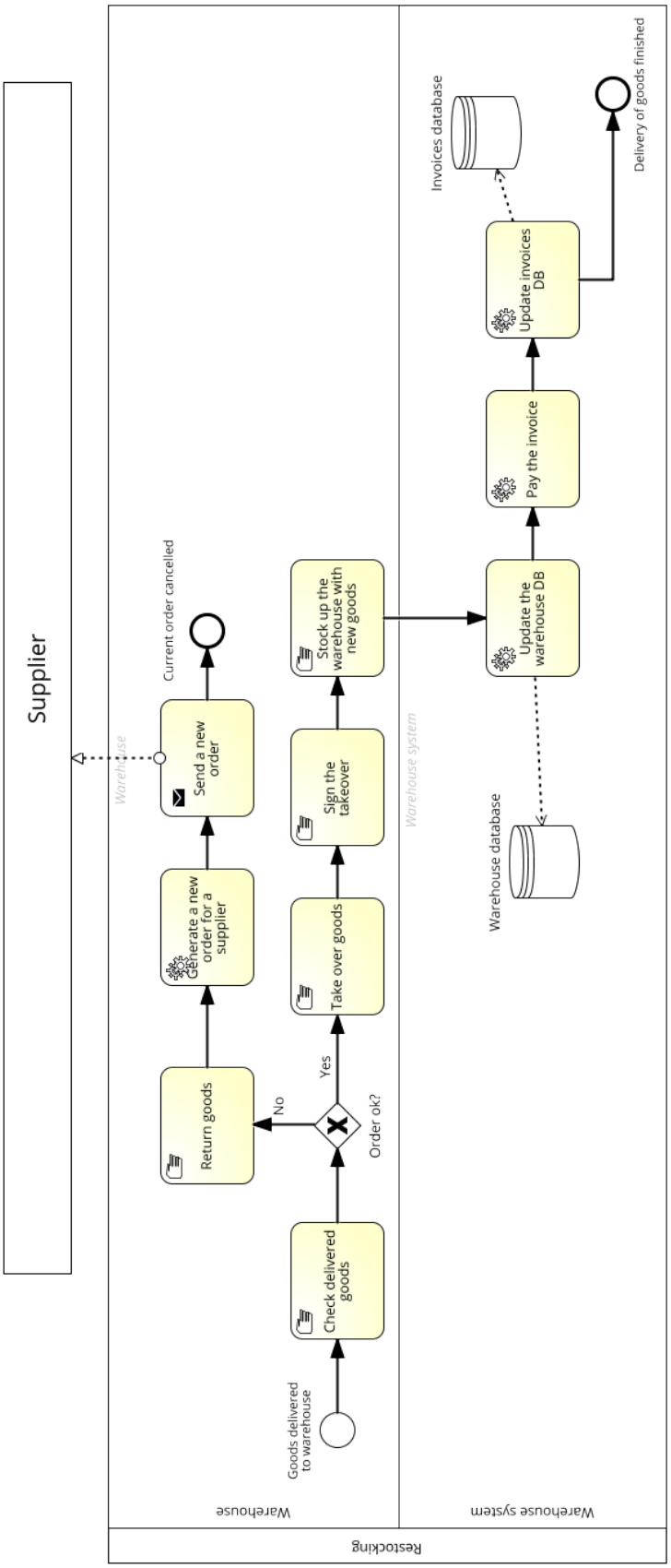
Roles

- Supplier
    - Prepares and delivers ordered goods
- Warehouse employee
    - Takes over the order in the warehouse

Data objects

- Warehouse database
    - Database that holds items in the warehouse and their metadata. It contains statistics about goods.
- Invoices database
    - Database that contains all invoices (issued or received)

Diagram


Supplier
Restocking
Warehouse
Warehouse system
Goods delivered to warehouse
Check delivered goods
Order ok?
No
Yes
Return goods
Generate a new order for a supplier
Send a new order
Current order cancelled
Take over goods
Sign the takeover
Stock up the warehouse with new goods
Update the warehouse DB
Warehouse database
Pay the invoice
Update invoices DB
Invoices database
Delivery of goods finished

P7: Create promotions

Description

Create promotions is an important process that keeps the warehouse inventory from having expired items. It runs on timed schedule and at first, it checks the whole inventory and expiration dates of the individual stocked items.
From there, two parallel tasks are called.
First, if there is anything past its expiration date, the non-sellable goods process is called and execution of this strain ends.
Second, where if there are any goods that is going to expire, a list of such items is generated and sale price is calculated accordingly to each item. After that, an email template is rendered and sent to the potential customer with special offer for these expiring goods. Also warehouse price is updated for these items and website is notified of price change and updated accordingly as well.

Indicators

- KPI: Percentage of goods in stock with an expiration date not less than 4 days
    - integer [percentage of goods]
    - Desired value: [0-10 %] Maximal: [15 %]
- KPI: Number of created promotions per week
    - integer [total number of generated promotions]
    - Desired value: [0-15+] Minimal: [5]
- KRI: Number of sales that used this promotion
    - integer [number of sales]
    - Desired value: [0-15+] Minimal: [5]

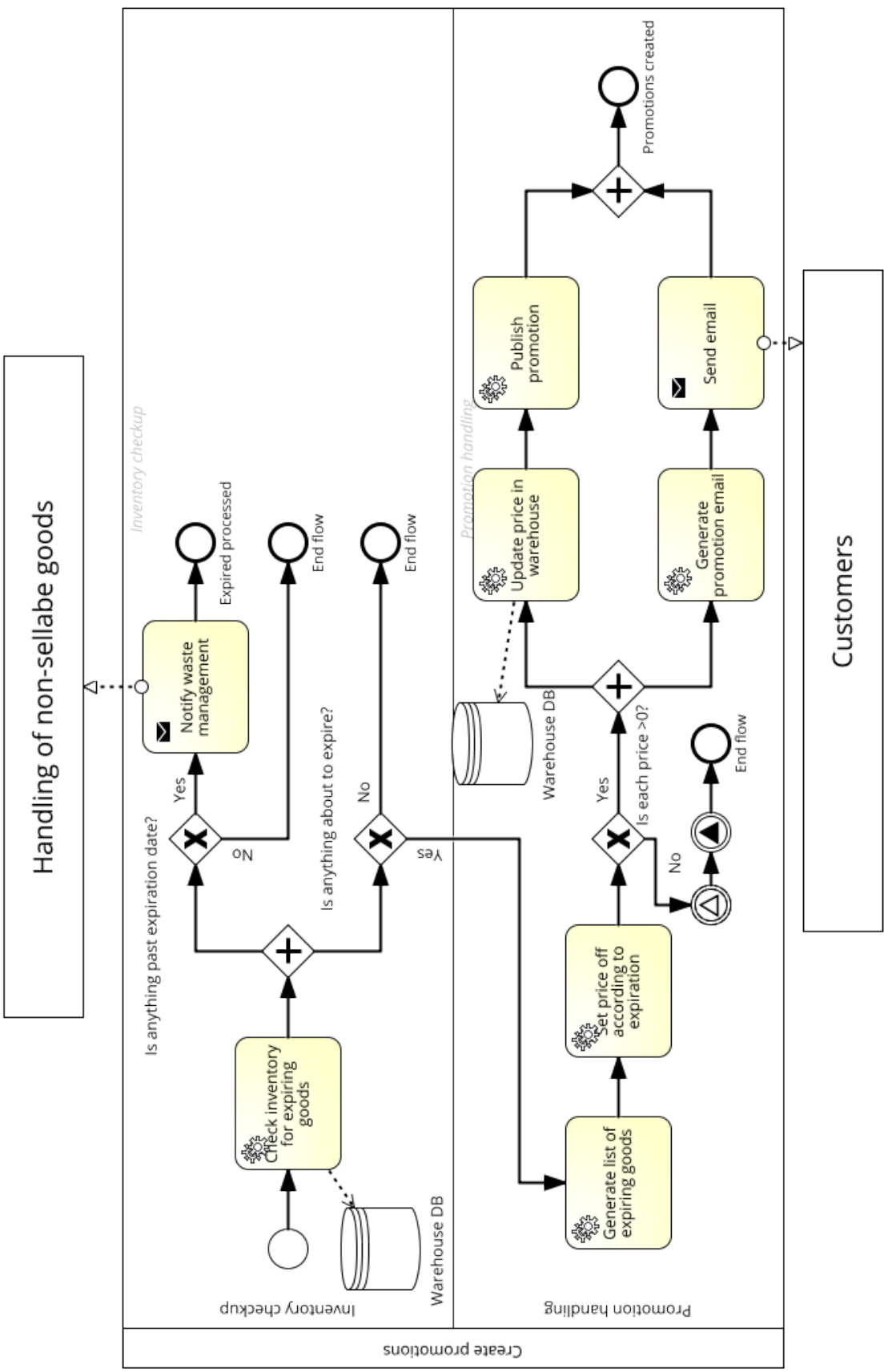
Roles

- Customer
    - Receives an email.

Data objects

- Warehouse database
    - Database that holds items in the warehouse and their metadata.

Diagram


Handling of non-sellabe goods
Create promotions
Inventory checkup
Promotion handling
Inventory checkup
Promotion handling
Check inventory for expiring goods
Warehouse DB
Is anything past expiration date?
Yes
No
Notify waste management
Expired processed
End flow
Is anything about to expire?
No
Yes
End flow
Generate list of expiring goods
Set price off according to expiration
Is each price >0?
Yes
No
End flow
Warehouse DB
Update price in warehouse
Generate promotion email
Publish promotion
Send email
Promotions created
Customers

P8: Handling of non-sellable goods

Description

This process is working with incoming information about expired goods in stocks. The warehouse will send a reminder when an item will expire, and our system will put a label to the specific item where we distinguish if an expired item is delivered to end-user who agreed to further use expired item, either in fay of fertilizer or for recycling. Item will be appropriately discarded and handled. Every day between 6 PM and 7 PM we will begin the process of gathering all expired goods from warehouse and prepare them for couriers. Couriers will later handle the disposal of expired products properly.

Indicators

- KPI: Percentage of products sent under disposal agreement per day.
    - integer [percentage of all disposed products that were sent under disposal agreement]
    - desired value [98 %] minimal value [95 %]
- KRI: Percentage of disposed products without any future added value per month.
    - integer [percentage of all disposed products without any future added value]
    - desired value [<2 %] maximum value [5 %]

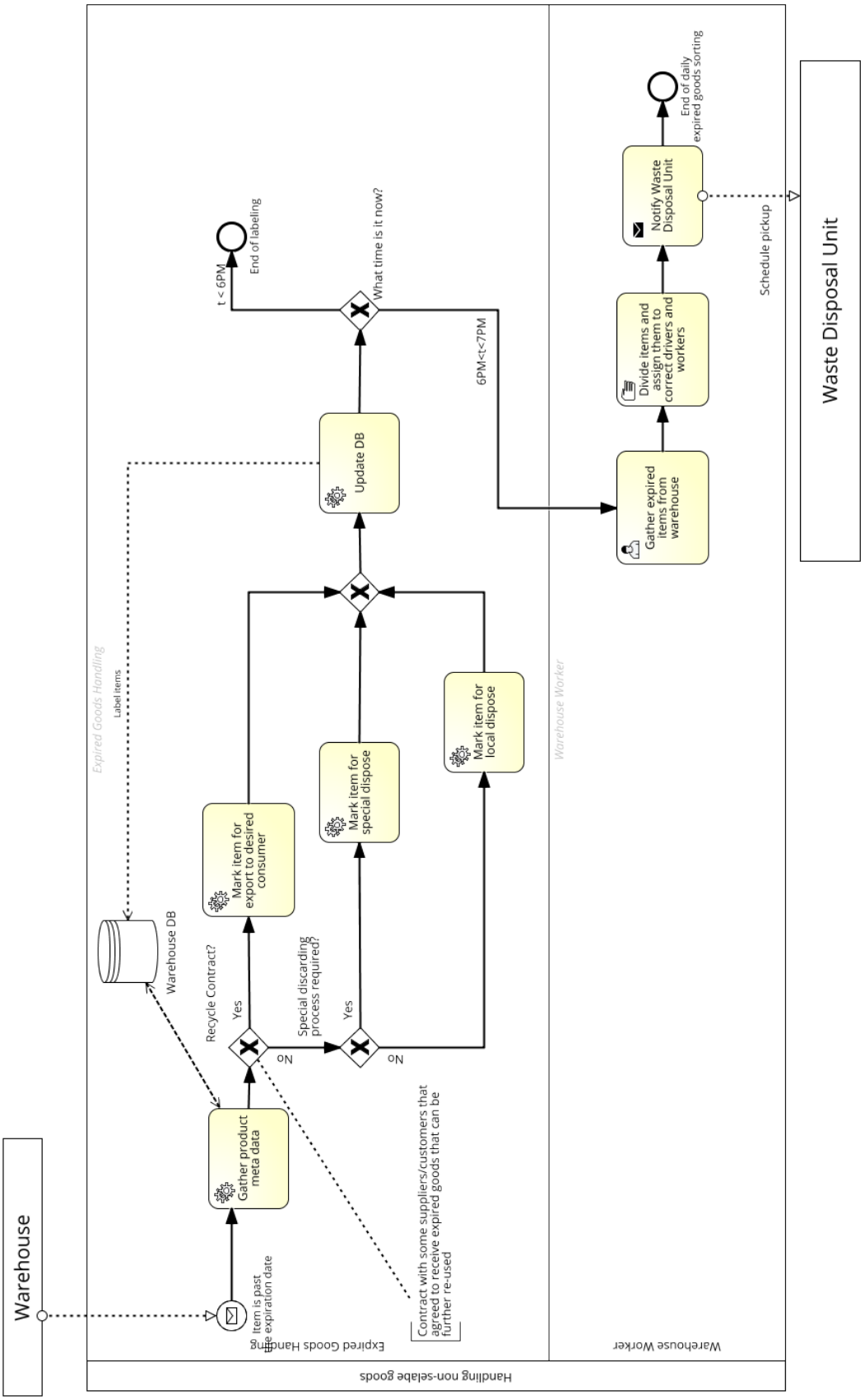
Roles

- Warehouse
    - Send information about expired items.
- Warehouse DB
    - Store all physical items and provide detailed information about them from DB.
- Warehouse worker
    - Receive and handle request to gather all expired goods and divide it by future purpose.
- Waste Disposal Unit
    - Pick up expired goods for delivery to contractors, customers or termination stations.
- Expired Goods Handling System
    - Handle repetitive proces of labeling expired goods and initiate cleaning process at the end of the day.

Data objects

- Order Storage
    - Database storging all order details for statistical and billing purposes

Diagram


Warehouse
Handling non-selabe goods
Expired Goods Handling
Warehouse Worker
Item is past the expiration date
Gather product meta data
Contract with some suppliers/customers that agreed to receive expired goods that can be further re-used
Recycle Contract?
Yes
No
Special discarding process required?
Yes
No
Mark item for export to desired consumer
Mark item for special dispose
Mark item for local dispose
Warehouse DB
Label items
Expired Goods Handling
Update DB
What time is it now?
t < 6PM
End of labeling
6PM<t<7PM
Gather expired items from warehouse
Warehouse Worker
Divide items and assign them to correct drivers and workers
Notify Waste Disposal Unit
End of daily expired goods sorting
Schedule pickup
Waste Disposal Unit

Implementation

Used platform and software

- JBPM 7.20
- Python
- Java
- Flask
- Linux server for REST API

Implemented services

1. *Service*

- **Check Goods Availability**
- **Specify Delivery and Payment Details**
- **Transaction Verification**
- **Notify customer**

REST API [GET]

Output: Return information about order and check if goods are available for order, if order is payed, if payment is verified and if order is not canceled by user. We are using same JSON structure.


```
{
  "phone_number":5525601,
  "canceled":false,
  "first_name":"Radim",
  "last_name":"Lipovcan",
  "order_price":645,
  "address":"Brno, Hybesova",
  "is_payed":false,
  "goods_available":true,
  "id":1
}
```

2. *Service*

- **Check inventory of expiring goods**
- **Update price in warehouse**

REST API [GET]

Output: TODO


```
{
  "amount":1,
  "id":4,
  "name":"rohlik",
  "daysToExpire":4
}
```


3. *Service*

- **Check the latest statistics**

REST API [GET]

Output: Return latest statistics about supplier. All of the information is part of the contract with supplier. Supplier_stats is used to decide whether order more, less or the same amount of goods for next contract.


```
{
  "supplier_actual_amount":3707721,
  "supplier_stats":2,
  "id":1,
  "supplier_name":"IBM"
}
```

Implemented processes

Driver hiring process

Process handles the hiring process in BuyBread. A job applicant sends a CV to the system, which is then evaluated by a recruiter. If the applicant is qualified for the job, the recruiter contacts him about the interview. According to the interview, the applicant is either hired or rejected.

Order creation

This process manages all steps of creating an order by a customer. He starts the process by choosing the goods he wants to buy. Then he is asked about specifying the payment option and desired time and place of delivery. If the order is finalized successfuly, the customer receives confirmation email and order is sent to order management.

Create promotion

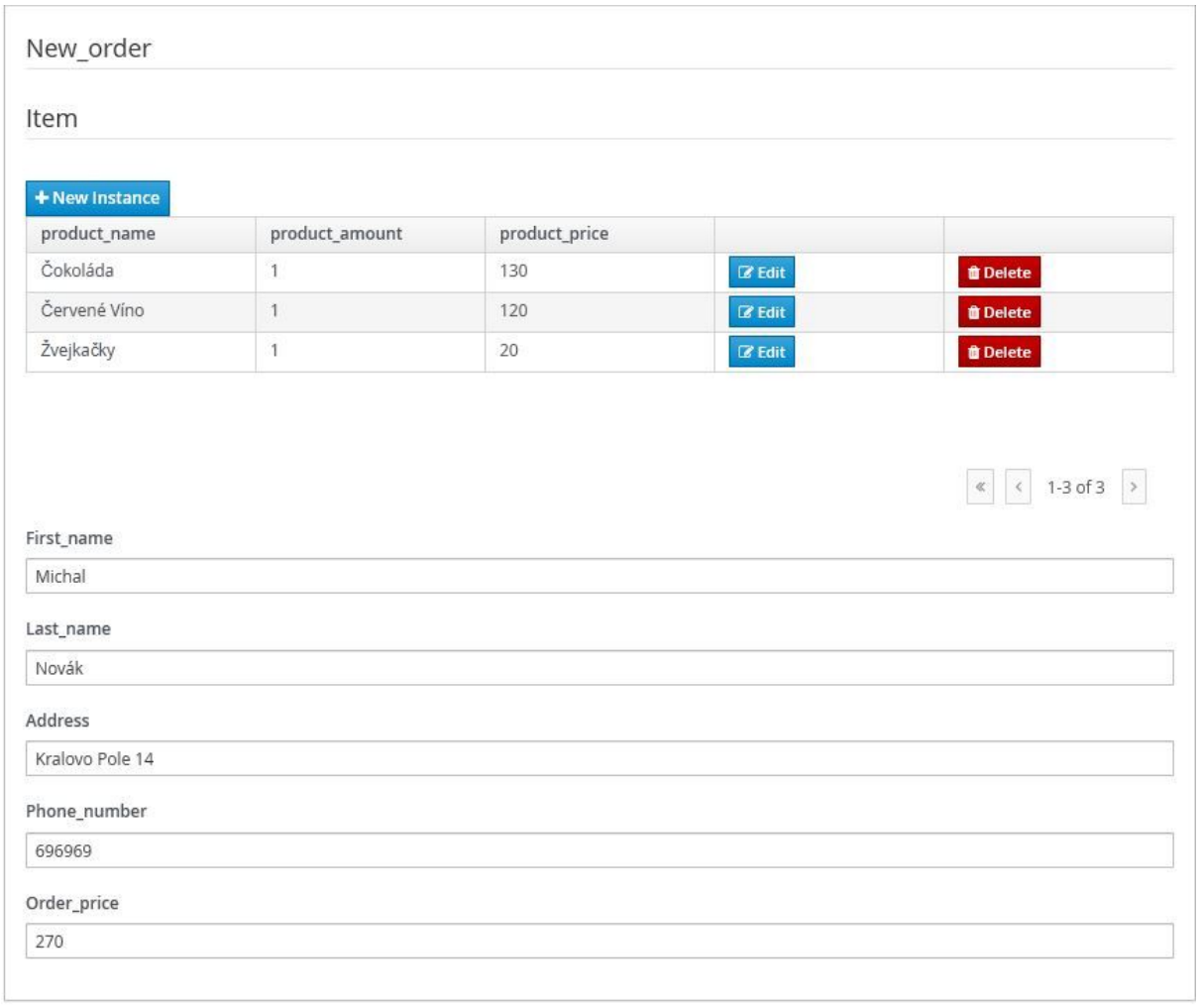
Create promotions is a necessary process that keeps the warehouse inventory from having expired items. Running on the schedule, it checks expiration dates of goods. If any of them is past its expiration date, the handling of the non-sellable goods process is called. If there are goods that are about to expire, a promotion is created to support the sales of this product.

Optimize supply chain

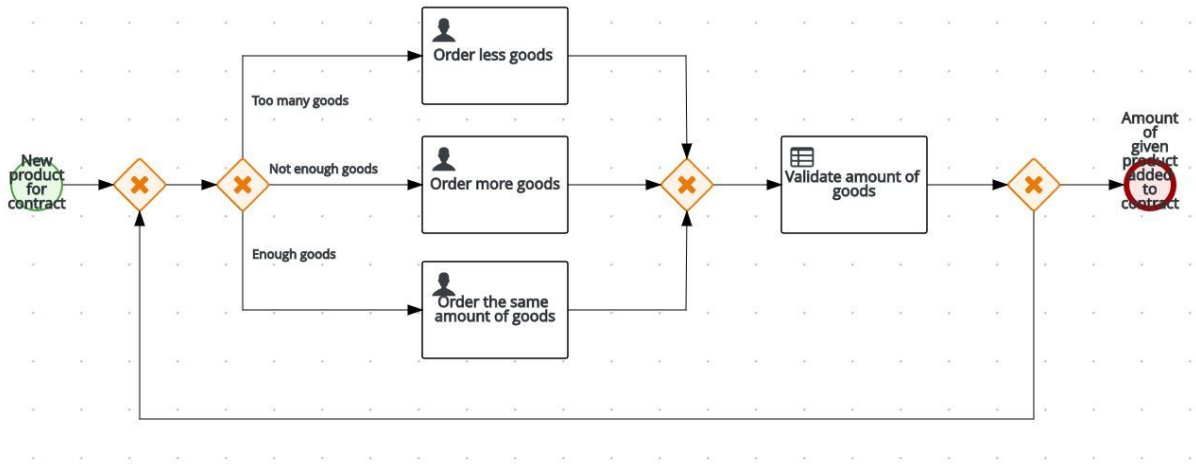
This process handles optimization of goods in Warehouse. Statistics of all goods are stored in Warehouse Database. This prevents Warehouse from being overstacked and from goods to expire. Stock manager sets the contract with supplier while trying to order what is needed and reduce orders of goods that are not needed.

Screenshots

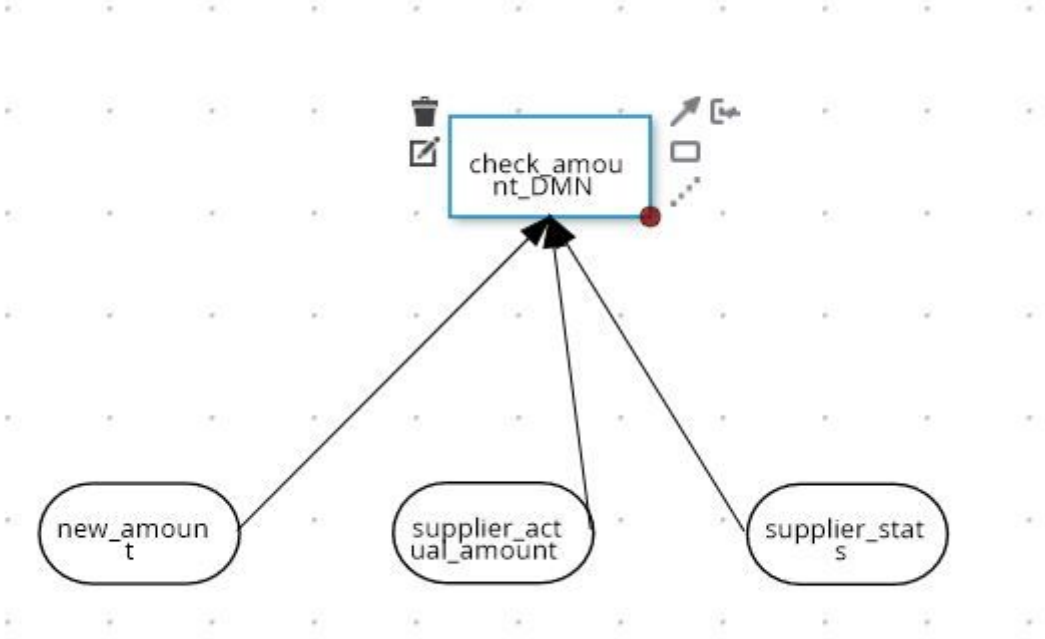
Create Order Form



Add Product to Contract Subprocess



Check amount DMN which is part of subprocess

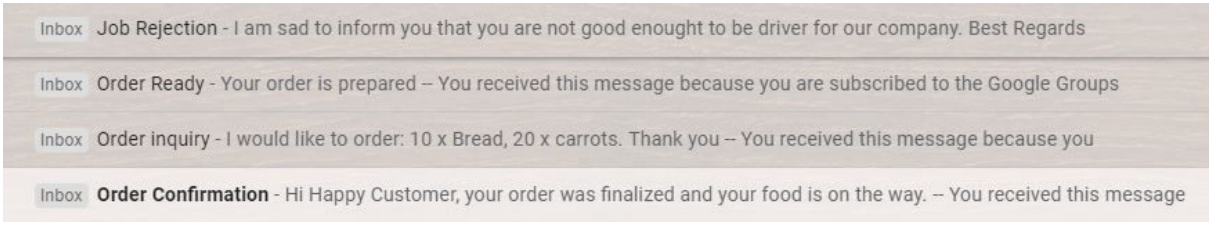


Decision table for check amount DMN

check_amount_DMN *(Decision Table)*

U	new_amount *(number)*	supplier_actual_amount *(number)*	supplier_stats *(number)*	check_amount_DMN *(boolean)*	Description
1	<supplier_actual_amount	-	2	true	new_amount is less
2	=supplier_actual_amount	-	1	true	new_amount is the same
3	>supplier_actual_amount	-	0	true	new_amount is more

Emails



Teamwork and tasks

Radim Lipovčan [Team leader + Process analyst]

- Coordination of the team
- Creating Vision, Mission and strategy
- Process analysis of Create promotions and Manage warehouse

Alžběta Šmerdová [Business analyst + Process analyst]

- Process analysis of Driver hiring process and Restocking inventory
- Creating measurement indicators
- Describing of organization structure and roles

Tomáš Chomo [Process analyst + Developer]

- Process analysis of Create Order and Handling non sellable goods
- Implementation of Create Order, Manage Warehouse
- Handling creation of corresponding forms and User Tasks

Zoltán Strcuľa [Process analyst + Developer]

- Process analysis of Delivery and Optimize supply chain processes
- Implementation of Optimize supply chain
- Handling analysis of business processes