DX-Scheduling

Provides web-based solution that helps mitigate the boredom of manual scheduling.

Provides logistics warehouses with optimized schedules for their outbound process.

Aims at reducing the total costs and durations for companies, thus helps grow the profit margin by using GA algorithms.

Takes companies' resources (employees, vehicles, equipments) into consideration to produce the most optimized scheduling plans that will surely satisfy customers.

DX
Scheduling

PROJECT'S NAME & COMPETITION TRACKS

- Project's name: **DX Scheduling**
- Competition tracks: Innovative Business Model

2. CORE TEAM MEMBERS PROFILE

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Team leader

Lecturer at
Hanoi University of Science
and Technology
Overall solution
Software architecture

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Tran Manh Cong
Team member

Graduate at
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VRP Optimization

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Nguyen Thi Hong Anh
Team member

Undergraduate at
Hanoi University of Science
and Technology
Warehouse Resource
Optimization

Year of birth: 1999
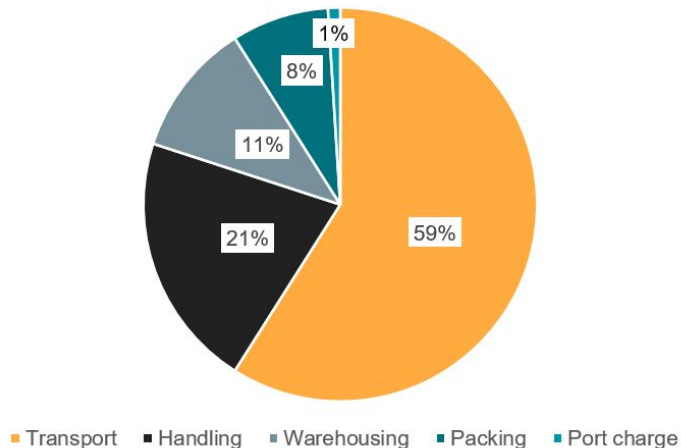Tel No.: 0372883675
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Le Hoang Anh Trung
Team member

Undergraduate at
Hanoi University of Science
and Technology
Order Transportation
Optimization

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trung.lha100899@gmail.com

3. Context

Main components of logistics in Vietnam (2014)

- Transport
- Handling
- Warehousing
- Packing
- Port charge

Overall logistics cost in Vietnam over GDP in 2018: 16.08% (1)

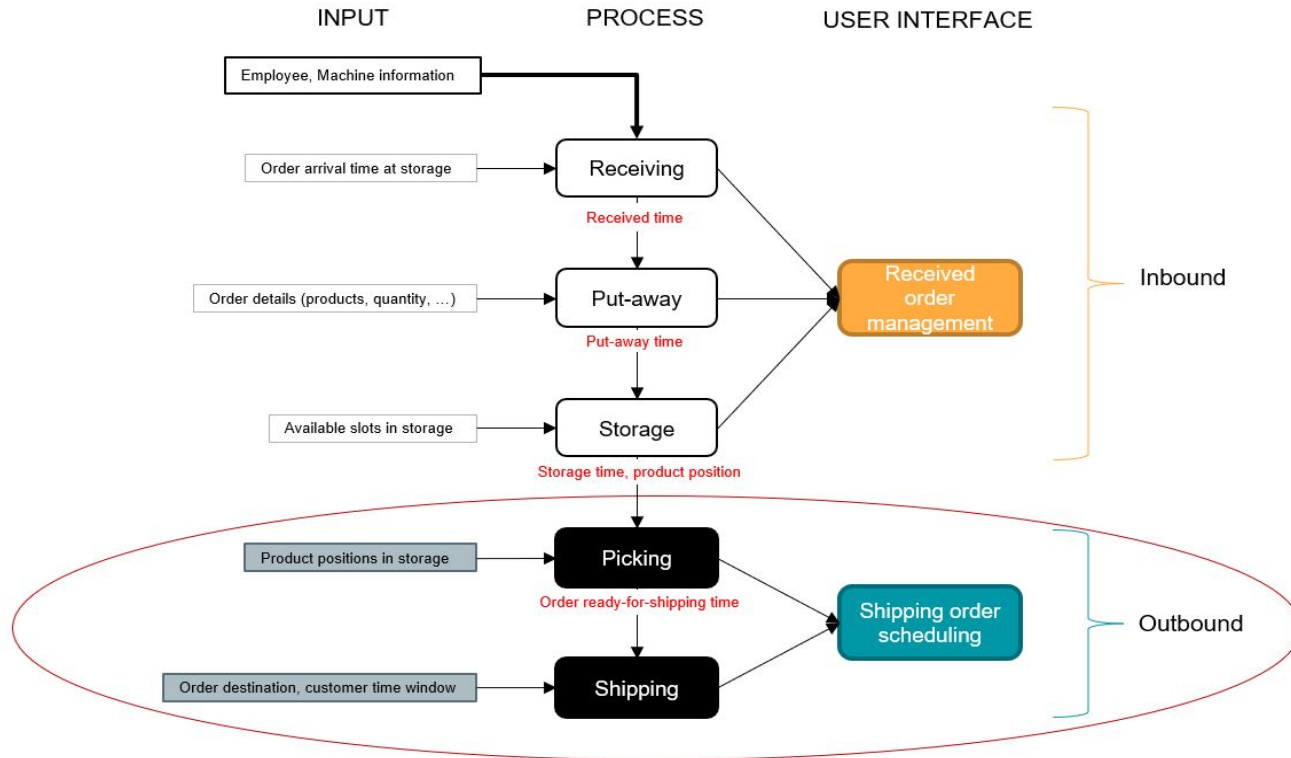World's costs over GDP: 10.70% (2)

Logistics cost in Vietnam in 2014:

- Transport   - 59%

- Handling   - 21%

- Warehouse - 8%

Higher cost due to outdated machinery and technology

3. Problem: How to optimize [Operation cost] for supply chain components

[Transportation cost]

3. Scope: focus on outbound process

INPUT   PROCESS   USER INTERFACE

Employee, Machine information

Order arrival time at storage → Receiving

Received time

Order details (products, quantity, …) → Put-away

Put-away time

Available slots in storage → Storage

Storage time, product position

Received order management

Inbound

Product positions in storage → Picking

Order ready-for-shipping time

Order destination, customer time window → Shipping

Shipping order scheduling

Outbound

3. Scope

→ *Work on the outbound process in the distribution center/warehouse, which include:*
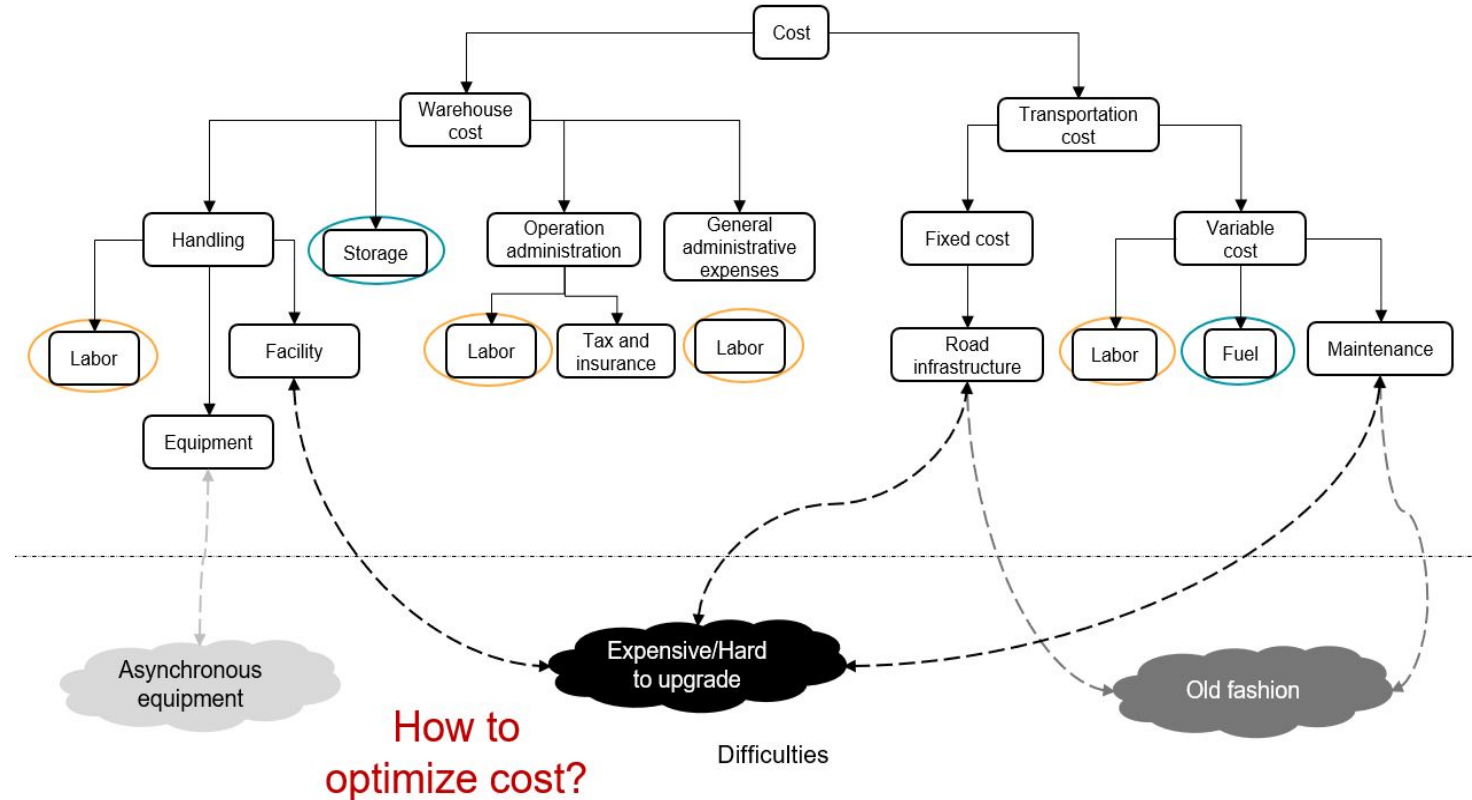
- *Order selection*
- *Transportation*

Distribution center/warehouse costs include:
- **Handling**: labor, equipments
- **Storage**
- **Operations administration**: administrators, clerks, labors salaries
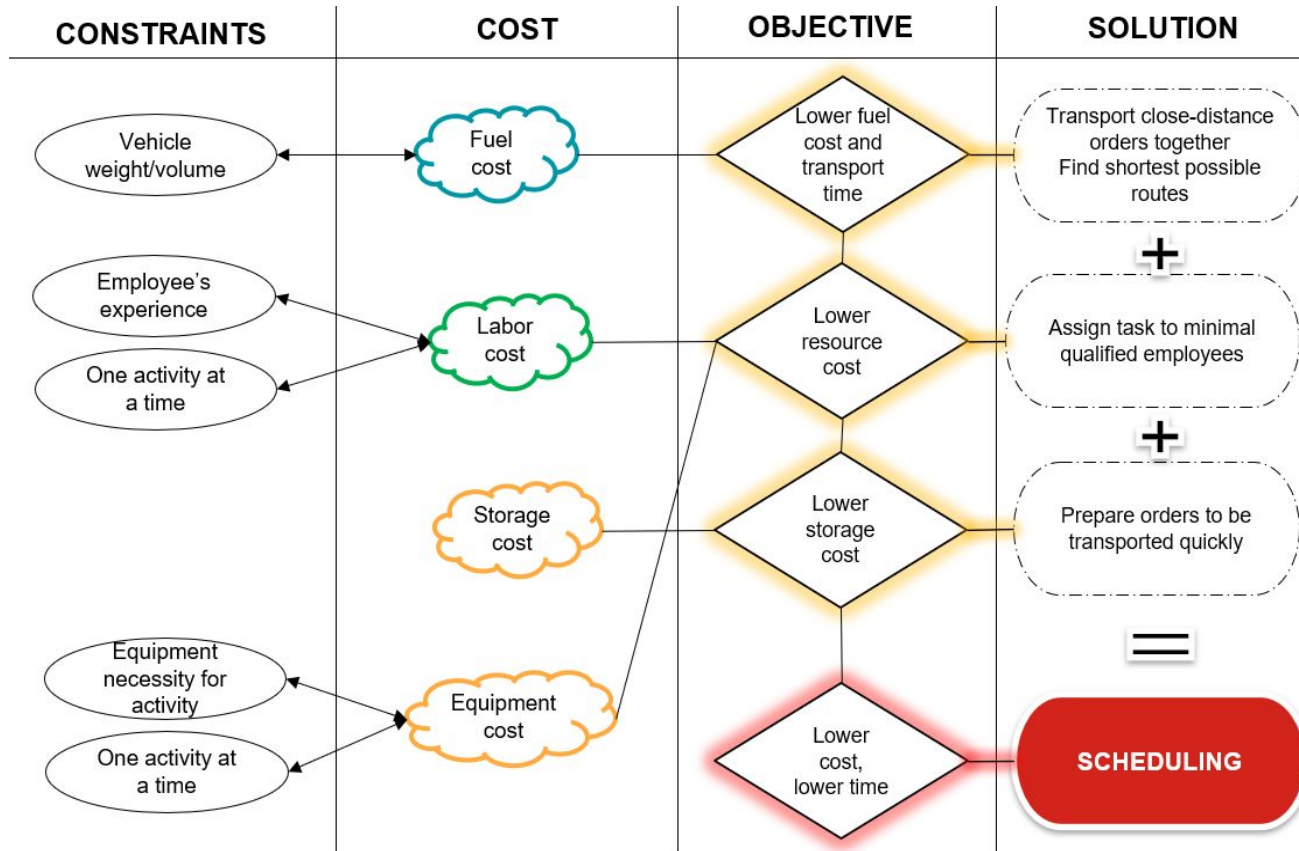- **General administrative expenses**: Executive salaries

Transportation costs include:

- **Fixed costs**: Road infrastructure
- **Variable costs**: Maintenance, Labor, Fuel

3. Challenges

3. Objective

CONSTRAINTS	COST	OBJECTIVE	SOLUTION
Vehicle weight/volume	Fuel cost	Lower fuel cost and transport time	Transport close-distance orders together Find shortest possible routes
Employee's experience / One activity at a time	Labor cost	Lower resource cost	Assign task to minimal qualified employees
	Storage cost	Lower storage cost	Prepare orders to be transported quickly
Equipment necessity for activity / One activity at a time	Equipment cost	Lower cost, lower time	SCHEDULING

3. Approach

➔ Warehouse costs:
  ○ Storage
  ○ Labor expenses

Approach: Reduce warehouse costs by reducing labor costs.

➔ Focus on the optimization of resources (in terms of employees' salaries in the warehouse)

➔ Use flexible workforce rather than full-time employees

➔ Transportation costs:
  ○ Fuel
  ○ Labor expenses

Approach: Reduce transportation costs by reducing variable costs, especially labor and fuel.

➔ Labor wage is time-related whereas fuel is distance-related.

➔ The goal is to transport as many orders as possible within the shortest time and distance and cost the least.

3. Approach

Reduce total costs by focusing on the following costs:

- Warehouse costs:
    - Storage
    - Labor expenses
- Transportation costs:
    - Fuel
    - Labor expenses

How to optimize ?

- *Labor expense*: Reduced by assigning tasks to minimal qualified employees

- *Fuel cost*: Allocate equipments efficiently, find the shortest routes for transportation

- *Storage cost*: Store incoming orders and prepare orders for transportation efficiently

→ Cost optimization problem can be solved by scheduling

3. VRP scheduling algorithm

Objectives: Find all possible solutions that satisfy the defined constraints (resource ability, customer's time windows) and reach the expected objectives (lower cost and lower time)

Solution: NSGA-II as the core logic to find optimal solutions that can solve the problem.

Application:

- Fetches user's input (orders, employees, customers, vehicles, storages)

- Uses this algorithm to calculate the outputs (schedules: total cost, total time, employee assignments, transportation journeys).

Calculated solutions

Duration

● Optimal solutions

○ Non-optimal solutions
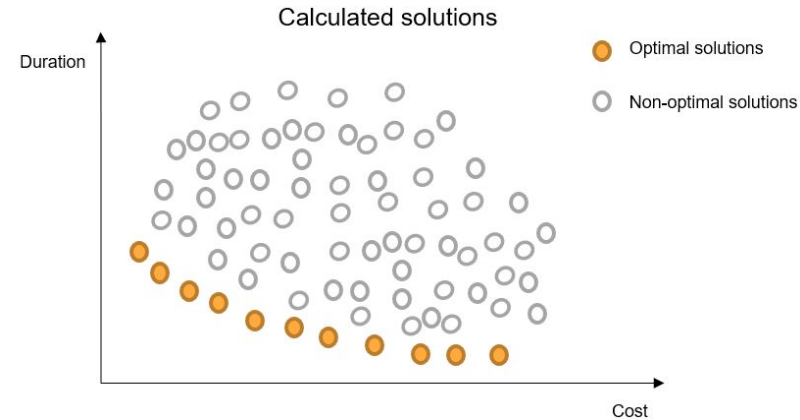
Cost

4. Software Architecture

- Build a software to help customer find the optimal scheduling scheme for inventory / transportation processes

→ Minimize operation costs and total duration.

- Main services:
    - Scheduling for warehouse handling
    - Scheduling for transportation
- Constraints:
    - Resource ability (employees, machine, vehicles)
   - Customers' time window

Detailed description
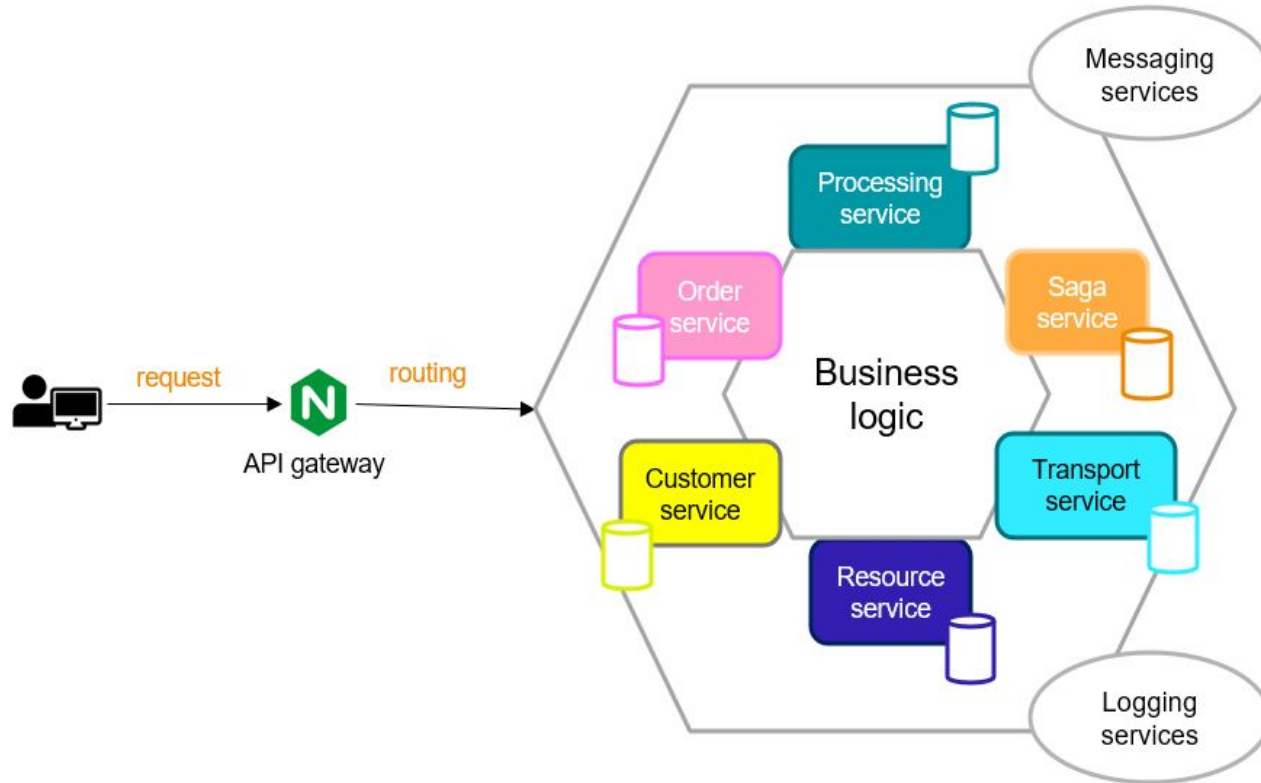
5. MARKET OVERVIEW AND COMPETITORS

		Strength	**Weakness**	**How it reduces costs**
Processing phase	Opendock	Let employee schedule online independently	No automatic recommendation for scheduling	Online schedule booking instead of working at the company
Transportation phase	Vehicle Routing OR-Tools	Opensource, suitable for application development	Require professional background to implement	Calculate the shortest paths to reach the destination

5. MARKET OVERVIEW AND COMPETITORS
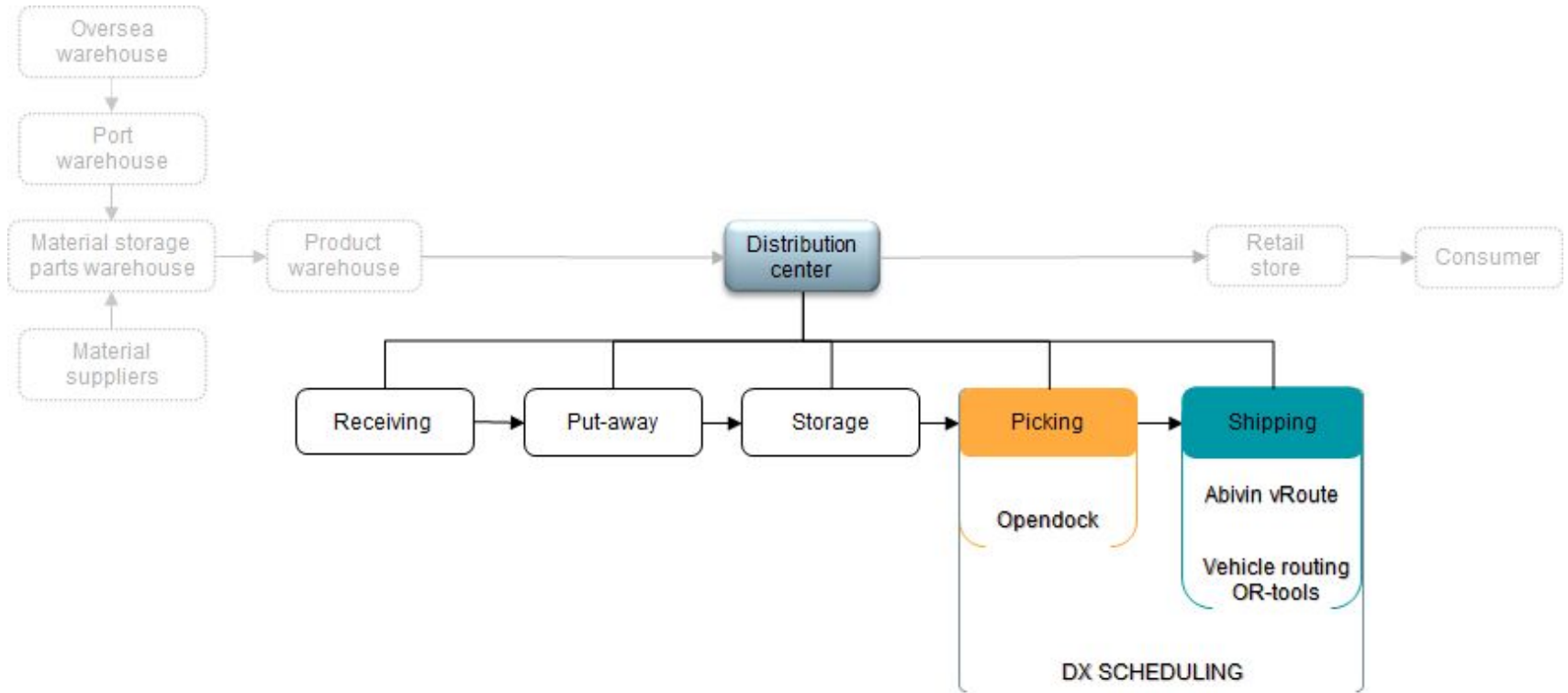
Opendock lets employee schedule online independently
Vehicle routing OR-tools requires professional knowledges
DXScheduling automates the scheduling and does not require professional knowledges.
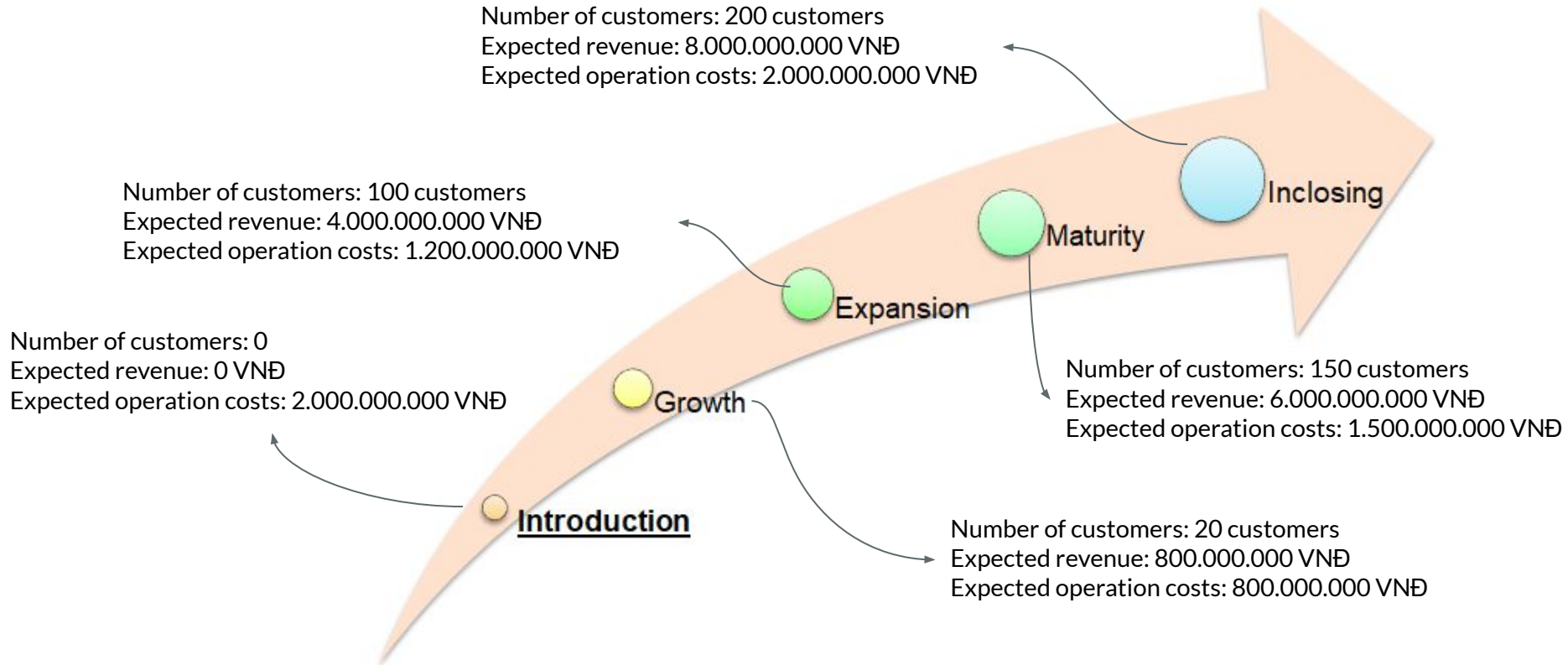
6. TARGET CUSTOMERS

The target customers are small/medium companies that:

- Offer warehouse rental service and/or transportation service

- Manually schedule outbound process of orders

    - Order arrangement: manually assign employees to orders and tasks

    - Order transportation: merge orders on same truck without specific journeys

- Own different scheduling application for order preparation and transportation, thus lack of cohesion between the two process. Data migration between the applications is also burdensome.

- Yearn for efficiency boost through development and process planning.

7. COMPETITIVE ADVANTAGE

- Consideration for more practical constraints:
    - Employees: salary, working time
    - Vehicles: routes taken, drivers assigned, maximal weight and volumn
    - Customer's time window and destination
    - Types of goods: which types of goods can be delivered together
- Increase cohesion between order preparation and transportation in the outbound process, increase work efficiency by 10%, decrease delay time between the two steps when scheduling by 10%

8. BUSINESS STAGE (2021 – 2025)

Number of customers: 200 customers
Expected revenue: 8.000.000.000 VNĐ
Expected operation costs: 2.000.000.000 VNĐ

Number of customers: 100 customers
Expected revenue: 4.000.000.000 VNĐ
Expected operation costs: 1.200.000.000 VNĐ

Number of customers: 0
Expected revenue: 0 VNĐ
Expected operation costs: 2.000.000.000 VNĐ

Inclosing

Maturity

Expansion

Growth

Number of customers: 150 customers
Expected revenue: 6.000.000.000 VNĐ
Expected operation costs: 1.500.000.000 VNĐ

Introduction

Number of customers: 20 customers
Expected revenue: 800.000.000 VNĐ
Expected operation costs: 800.000.000 VNĐ

9. BUDGET AND/OR FINANCIAL STATUS

Investment plan

- Missions:
  - Market analysis
  - Product development:
    - Service-based development
    - Testing and Integration
    - Deployment and Refinement
  - Business planning:
    - Customer analysis
    - Product customization upon requests
  - Product tuning
  - Marketing plan
- Tactics:
  - Equity: 30%
  - Mobilized: 70%

Investment plan – Fundings

- Fundings:
  - Market analysis ~ 20%:
  - Product development ~30% :
    - Service-based development ~20%
    - Testing and Integration ~ 50%
    - Deployment and Refinement ~ 30%
  - Business planning ~ 30%:
    - Customer analysis ~30%
    - Product customization upon requests ~ 40%
  - Product tuning ~ 30%
  - Marketing plan ~ 20%

Introduction stage: DELIVERABLES AND TIMELINE

Deliverables	Timeline
Market research and analysis	01/03/2021 - 31/05/2021
Product development	01/06/2021 - 31/10/2021
Set up business plan	01/11/2021 - 31/01/2022
Product tuning and customization	01/11/2021 - 31/05/2022
Set up marketing plan	01/01/2021 - 31/05/2022

10. PRODUCT IMAGE

Precondition: Coordinator has logged in and has the necessary role

Scenario	Create schedule	Bind drivers to schedule
User	Logistics/Warehouse/Transportation coordinator A	Transportation coordinator B
Objective	A needs to create work schedule for a set of orders: assign tasks to employees in the warehouse, and find routes to transport the orders, so that the total cost and time for order preparation and transportation are optimal	B needs to assign drivers to work for a calculated schedule
Narrative	A checks for orders to be prepared and delivered, and chooses a set that he/she needs to plan for. A follows the steps provided by the system, and finally saves the schedule calculated for the chosen orders.	B goes to Order Management > Transportation Schedule > List of schedules to see which schedules have no drivers binded to them. He/she chooses the drivers from a list of available drivers for the given time frame of the each order. The system will assign each chosen driver to each vehicle needed for that schedule

11. BUSINESS LICENSE SCAN / PHOTO

SỞ KẾ HOẠCH VÀ ĐẦU TƯ
THÀNH PHỐ HÀ NỘI
PHÒNG ĐĂNG KÝ KINH DOANH

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

GIẤY CHỨNG NHẬN ĐĂNG KÝ DOANH NGHIỆP
CÔNG TY CỔ PHẦN

Mã số doanh nghiệp: 0106340461

Đăng ký lần đầu: ngày 21 tháng 10 năm 2013

Đăng ký thay đổi lần thứ: 7, ngày 26 tháng 03 năm 2018

1. Tên công ty

Tên công ty viết bằng tiếng Việt: CÔNG TY CỔ PHẦN CÔNG NGHỆ AN TOÀN THÔNG TIN VÀ TRUYỀN THÔNG VIỆT NAM

Tên công ty viết bằng tiếng nước ngoài: VIET NAM INFORMATION AND COMMUNICATION SECURITY TECHNOLOGY JOINT STOCK COMPANY

Tên công ty viết tắt: VNIST., JSC

2. Địa chỉ trụ sở chính

Số 7D, ngách 378/39 Thụy Khuê, Phường Bưởi, Quận Tây Hồ, Thành phố Hà Nội, Việt Nam

Điện thoại: 02436230658   Fax:

Email: Website:

3. Vốn điều lệ

Vốn điều lệ: 1.800.000.000 đồng

Bằng chữ: Một tỷ tám trăm triệu đồng

Mệnh giá cổ phần: 10.000 đồng

Tổng số cổ phần: 180.000

4. Người đại diện theo pháp luật của công ty

*   Họ và tên: NGÔ HUY HOÀNG   Giới tính: *Nam*

Chức danh: Giám đốc

Sinh ngày: *31/10/1982*   Dân tộc: *Kinh*   Quốc tịch: *Việt Nam*

Loại giấy tờ chứng thực cá nhân: *Chứng minh nhân dân*

Số giấy chứng thực cá nhân: *012030873*

Ngày cấp: *23/07/2012*   Nơi cấp: *Công an thành phố Hà Nội*

Nơi đăng ký hộ khẩu thường trú: *Số 57 Hàm Long, Phường Hàng Bài, Quận Hoàn Kiếm, Thành phố Hà Nội, Việt Nam*

Chỗ ở hiện tại: *Số 28 Quán Thánh, Phường Quán Thánh, Quận Ba Đình, Thành phố Hà Nội, Việt Nam*

TRƯỞNG PHÒNG

PHÓ TRƯỞNG PHÒNG

Lê Hồng Hạnh

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