King Abdulaziz University

Faculty of Computing and Information Technology

DEPARTMENT OF COMPUTER SCIENCE

CPCS-351: Software Engineering

SMART PORT

Group No. 4		
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11/9/2022	0.1	Phase 1: project description	All team members
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Contents

Phase l: Project Description

Introduction

Like any city in the world that cross to the sea, it would have a port. The port is the most important thing in many countries, and it is considered the gate of the trade. People deals on the paper, but the staff come into the port so that why it's so important for people lives!

Without a port how will the food, materials, cars, and a lot of necessary resources for the human life arrive to us? especially that not all resources can be delivered by the airplanes, which means we need to use ports.

Here in our project idea, we saw that the Oxagon is a city that located above the water and it's not like any city that we can build a regular port for it; Oxagon is an industrial intelligent city that cares for human, good energy, usage of the latest technology etc.

So, our main idea for this project is to build a smart port that organize and facilitate the delivery of the imports and exports materials and shipments that go into/out the city in the most intelligent way.

Problem Description

As we said that the Oxagon is a city that laying above the water and it's a city that exports and imports the goods that the industrial city produces. So how we can organize these materials and human resources, and how we manage the track of every shipment whether it will go out or into the city.

First, we will divide the whole port into 4 tracks. For example, the first track is for the manufacturer/industrial side, second track is for food/ materials, third one is for the drugs,

and the last track is for shipments for individual people, so the whole system takes all the shipments from the ship and check-up them automatically if there are prohibits in the shipment. If the shipment includes manufacturing/ industrial staff, then the shipment will pass from the first track.

In this step, of course, many companies are waiting their shipments, so maybe the system divide to many sub-systems.

Here, we will look to the code that wrote on the shipment and find out in the system which company the shipment belongs to. After that, the shipment will be arrived automatically to the right place in the port while each company will recognize the location of its shipments.

Also, we could apply a safe system to know what are the materials that enter the port while we could count how many tons that the ship can take to be in safe state.

Problem Objectives

- Our system divides the shipments by type, and that enhance the shipment's receiving process for the companies.

- Distribution of the shipments will reduce congestion that occurs when shipments are received from only one destination; all companies take its products from different places.

- Our port will distribute the shipment so that will increase the accuracy for tracking the shipment by companies if it's lost or arrive safely.

- Receive of the shipment takes less time; each destination focuses on only one filed. Hence, the shipments will be received faster than usual.

- Our port will be a safe and trusted for all the world because our system will detect for any abnormal shipment or any prohibited substances.

- The system will check if the weight of the ship doesn't reach over the maximum allowed weight, as well as make sure that every shipment goes from our smart port be in a safe state as much as possible, until reaching its destination.

- Not like any port in the world, our port specified a track for individuals to take their staff easily and faster without waiting for a company delivering.

Sources of Domain Analysis Information

The sources of domain analysis in our smart system are the individuals and companies targeted by the port to transport and ship their shipments.

To clarify, the targeted companies are the companies who want to deliver their shipments and goods to the city of Oxagon, where their trade and business is located, or they want to deliver their shipments to any city in the Kingdom of Saudi Arabia so that they take Oxygon smart port as an arrival station.

Also, the port is available for use by companies who want to deliver their shipments from one continent to another by passing through the Oxygon smart port which is located in a special and exceptional location in Neom, Saudi Arabia.

The port also will also be available to use by individuals, not just companies and governments.

Goals and Scope of the system

Scope of the system

Scope of the system is a system that allows smooth and flexible passage of shipments and distribute them into subsystems which make the receiving process simpler.

Goals of the system

Our system aims to accomplish many goals as the following:

1. Reducing working hours for workers. Hence, expenses paid will be reduced.

2. Organizing the passage of shipments will reduce the time of delivery of the shipments and thus will reduce the port responsibility in storing or accumulating goods for a long period.

3. Reducing environmental pollution in terms of reducing the use of cars based on fossil fuels in transporting goods within the port.

4. Reducing human dealings with prohibited or chemical substances, and thus maintaining the safety of port workers who are dealing with dangerous materials.

Includes and Excludes Features of the system

The system includes

- High-level of safety, because every shipment arrives will be checked-up in a smart way, and if the shipment contains prohibited substances, then it will be immediately disqualified.

- High-speed in the processes of exports and imports, since the system is a smart port which is a faster port than any port else.

- Reduce shipments build-up and crowding, as there are tracks for each shipment by type and field.

- The system will include consignment tracking feature from its departure to its arrival.

- Higher ability to organize all the shipments and packages in the most efficient way that makes us ensure that every shipment will pass the right track to the right costumer.

The system excludes

- Indicators of the economy to which the port contributed to its increase.

- Profits of the port from the operations that are executed.

- Blocking many of companies and individuals from using the smart port.

System's stakeholders

The stakeholders of the system are the companies, governments, investors, and individuals.

Phase 2: Business Requirements Specifications

Techniques for gathering data

In this section, we collected information about the current situation of the port to construct the smart port needs which serve our system goals. We used two techniques to collect information: User Survey and communicate with port's employee.

User Survey

The survey gives us acquiring users' opinions about the current port system (traditional system) and their expectations of the new one, See Appendix A. Some information difficult to obtain through user survey only, this is what prompted us to use the other way.

Requirements & its types
Functional Requirements

R1: The system must ask stuff to log in the system. (Log in)

R2: The system must allow the stuff when make an order to determine the city and country of the user (company or individual), where the shipment will arrive. (Make a shipment's order)

> R2.1: The system must provide the feature of modifying the city and country of shipment arrival under progress before the date of shipping.
>
> R2.2: The system must display for the stuff all the available ports to deliver their shipments.
>
>> R2.2.1: The system must allow the stuff to determine the desired destination in the chosen city.

R3: The system must allow the stuff to display his shipments history. (ShipmentHistory)

R4: The system must charge a fee from the user for each shipping request. (Shipping fee)

> R4.1: The system allows the stuff to allow the user to choose the payment

method: pay before delivering or pay on delivering.

R5: The system must gain an additional fee from the user if the user desires to cancel the shipment request after the date of shipping. (Cancel order)

R6: The system must cancel the shipment automatically if the shipments unable to reach the concerned destination due to any emergency circumstance.

R7: The system must allow the stuff to ask the user some <u>questions related</u>[1] to the shipments before completing the request of importing/exporting the shipments.

R8: The system must refuse to export or import a shipment if the shipment information differs from the information recorded in the system. (Cancel process)

R9: The system must allow the stuff to track the shipment.

      R9.1: The system must specify a reference number for each shipment to use this number to track the shipment. (Track shipment)

R10: The system must allow the stuff to allow users to determine whether the user desire to shipdirectly to the concerned destination, or ship to the concerned destination via a temporary destination. (Make a shipment's order)

      R10.1: The system must allow the user to use the smart port as a temporary destination.

R11: The system must display the expected arrival or departure date of the shipment to the smart port.

R12: The system must schedule the dates for shipments to be exported to other destinations. (Scheduling shipment)

R13: The system must refuse to export or import any shipment if the system detects a prohibited substance inside the shipment. (Cancel process)

R14: The system must allow the stuff to communicate with the users. (Provides Services)

R15: The system must allow stuff to offer services in the port (Staff permissions).

R16: The system should measure the weight of all the packages and shipments thatgoes to

the specific ship. (Provides Services)

R17: The system must cancel any order to shipment if the ship has overweight and take the priority packages/shipments. (Cancel process)

R18: The system must allow the stuff to log out. (Log out)

---

[1] Note: Related questions are like (weight of the shipments, type of materials inside the shipment).

Non-Functional Requirements

R1: The system must be available for both individuals and companies.

R2: The system must be available to use 24/7.

R3: The system must provide a user-friendly interface that easy to use and making operations.

R4: The system must be available in Arabic and English languages.

R5: The system must protect the user's privacy.

R6: The system must run on all operating systems.

R7: The system must store all the users' data in a database to be retrieved whenever the data lost.

R8: The system must provide the feature of automatic logging-out of the system when there is no activity by the user in the system for more than 3 minutes.

R9: The system must not complete the process of log-in to the system successfully until the user enters a verification code linked to the registered email.

Use case diagram for given problems
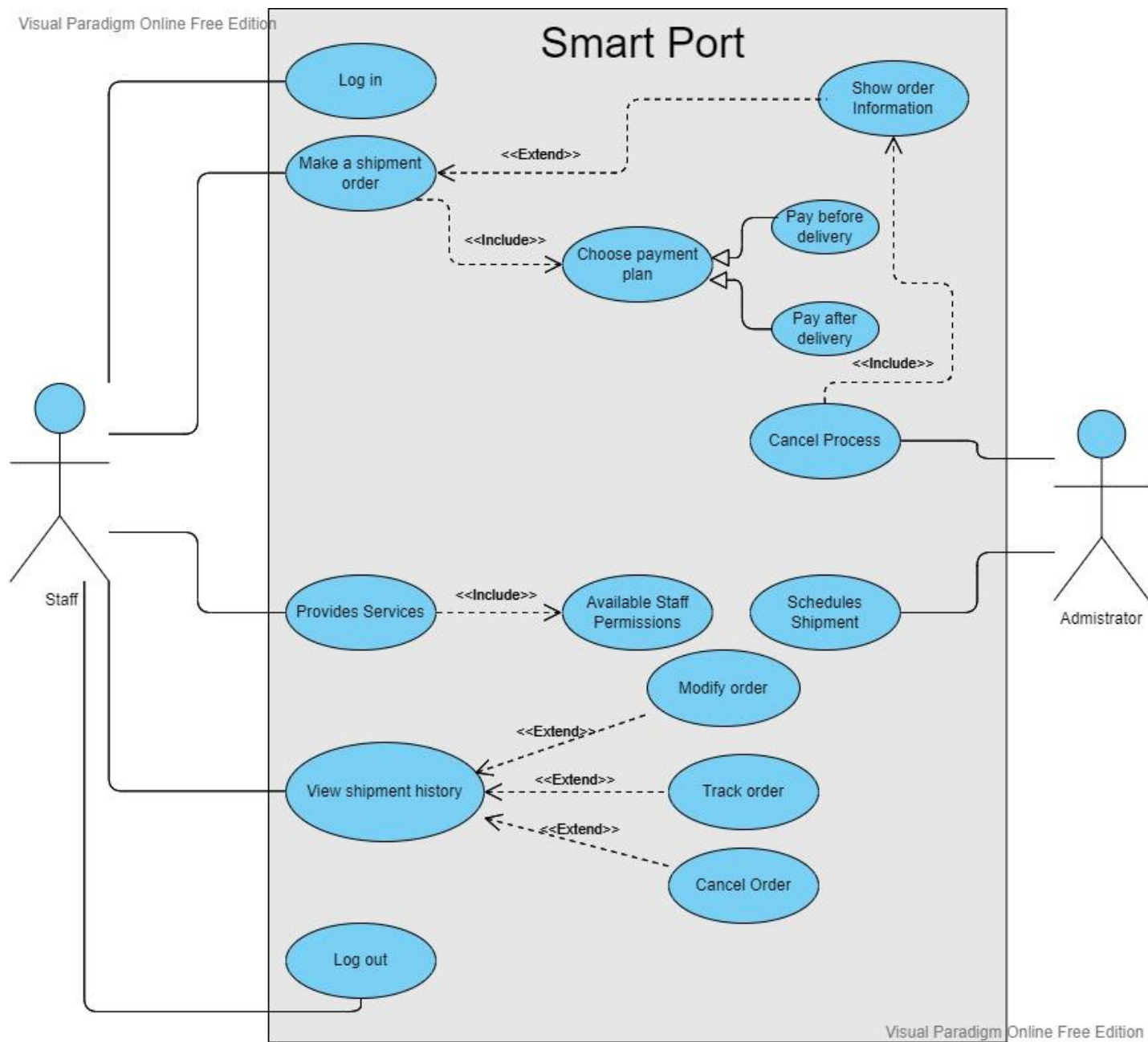
Use case description

Use Case 1

Making a shipment order
Brief Description: The making of shipping an order by the staff at the request of the user (companies or individuals) .
Actors: Staff
Pre-condition: 1. The staff must be logged into the system. 2. The staff must create an account in the system.
Basic flow of events: 1. The staff presses "Create new order" button. 2. The system asks the staff to choose the type of the shipment. 3. The system asks the staff to enter the related information of the shipments. 4. The system asks the staff to determine user location by the city and country. 5. The system asks the staff to determine the country of shipment's arrival. 6. The system asks the staff to determine the city of shipment's arrival. 7. The system asks the staff to choose the desired port of shipment's arrival.
Extension: None.
Post-condition: 1. The staff asks the user to pay to finish his order. 2. The user receives a bill of his order including the reference number.
Special requirements: Actors must be connected to the Internet to making operations in the system.

Use Case 2

Track shipments

Brief description: The system allows the staff to track shipments from theport of export to the port of import as well as know the time required for the arrival of the shipment.

Actors: Staff.

Pre-condition:
- The staff must create an account or log in to the system.
- The staff must have the shipment tracking number

Basic flow of events :
- The staff logs into the port system.
- The staff clicks on the "Track Shipments" button.
- The staff enters the shipment tracking number in the icon shown.
- After entering the shipment tracking number, click on the "Search" icon.
- In the end, all the information about the shipment will be visible to the employees, such as the location of the shipment and its arrival time, as well as how long the shipment process will take, and the staff will communicate this information to the user.

Extension:

The system fails in the following cases:
• 3a - The shipment has not been shipped.
• 3b - The staff does not have the shipment tracking number.

Post-condition:

- The staff tracks the shipment based on the user's request.

Special requirement:
- The staff must have an account in the system.
- The staff must be connected to the internet.

Use Case 3

Cancel Order
Brief description: The staff can be cancelling the order through the system.
Actors: Staff.
Pre-condition: • The order must be in progress..   • The staff must register in the smart port system.   • The staff must be logged into his account.
Basic flow of events: 1- Staff logs into his account.   2- The staff go to the orders and select the order he wants to cancel.   3- Select the check box next to each item he wants to remove from the order. To cancel the entire order, select all the items.   4- Select the cancel checked items when finished from step 3.   5- The staff exists from cancellation page.   6- The user receives confirmation massage into his email address after submitting the cancellation successfully done.

Extension:
 	
1.There is not an order in the system.
 	
The system.
 	
      1.1 the system will appear reject message to staff that telling it no items under progress.
 	
2.The staff can remove the item or cancel order that did not enter the charging process yet.
 	
      2.1 the system will appear reject message to staff that telling it can't cancel the order.

Post-condition: The order cancellation successfully done by staff.
Special requirement: • Actors must be connected to the Internet to making operations in the system.

Use Case 4

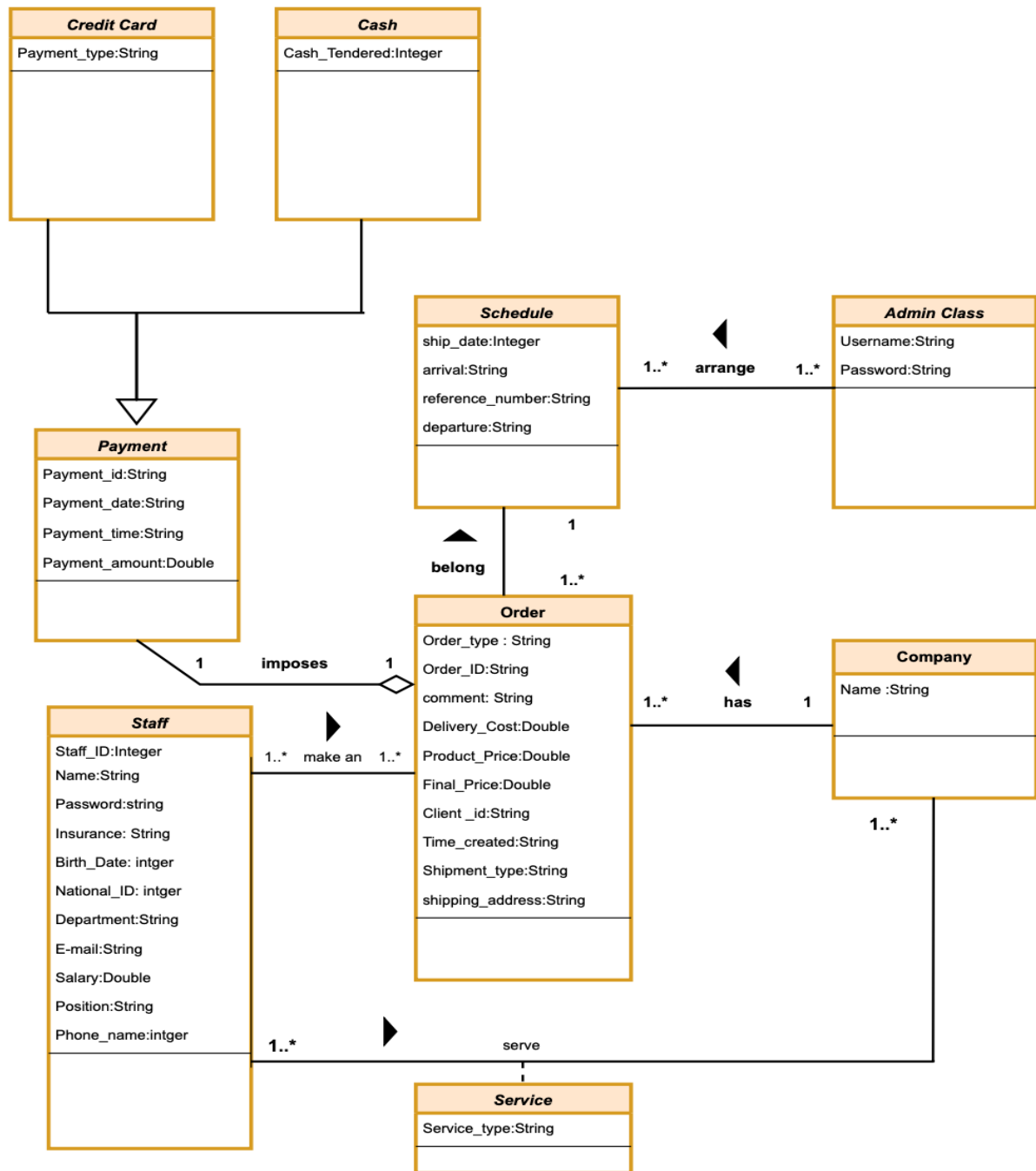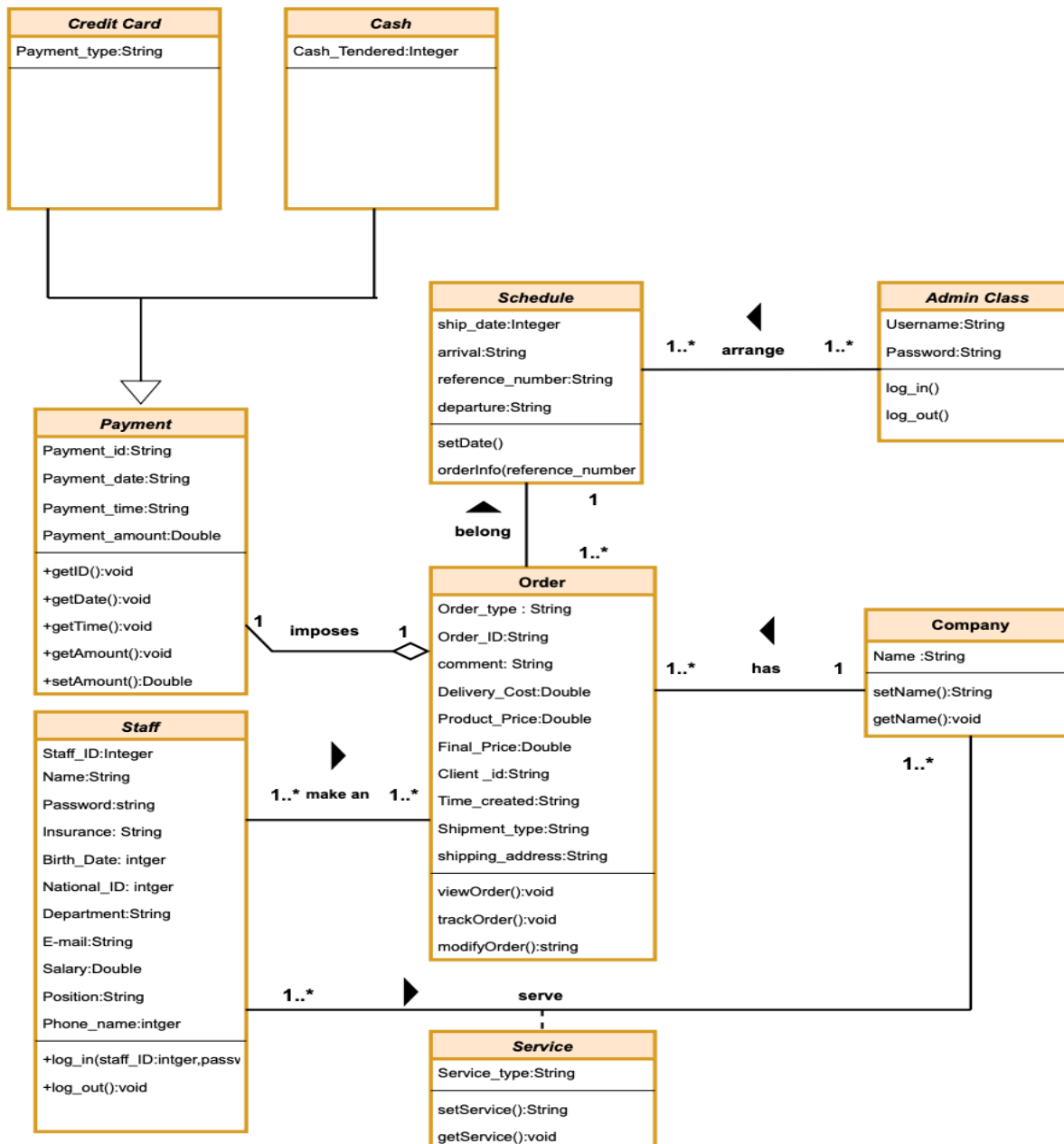| Provides services |
|---|
| Brief description The System measures the weight of all the shipment/packages that goes to specific ship |
| Actors: Admin. |
| Pre-condition:

1- The staff login to the system to write the user shipment details.

2- The user paid their shipments fees.

3- The shipment accepted in the system and have a register number. |
| Basic flow of events:

1- The system by default creates a sum object for all the shipments that for example end with 13 register number, so that means that all the shipments that ends with 13 goes to the ship SAS13.
2- The object sum, adding the weights of all shipments, till it exceeds the total weight approved to handle by a ship and that's means the shipments with less priority will postponed to the next ship otherwise all the shipments will go to the ship. |
| Extension:

If the weight is exceeding the register number that have less priority shows an optional message to the staff if he wants to schedule the next ship or will by default schedule by the port. |
| Post-condition:

1- All the packages/shipments in specific ship measure so there are no ships have over weights packages/shipments for the safety of the ship. |
| Special requirement:
A admin that works correctly to counts the sum for the weights allowed in specific ship. |

Difficulties & risk analysis in the domain

1. Difficulties to reach the people who has experience in the field.

2. Requirements able to change or enhance while processing the project.

3. Obstacles when collecting the needed information.

4. Inexperienced team might face difficulties when develop the non-functional requitements.

5. Some processes need a full knowledge in emergency situation.

Phase 3: Design and Structuring

3.1 Converting use cases to class diagram

3.2 UML class diagram

Credit Card
Payment_type:String

Cash
Cash_Tendered:Integer

Schedule
ship_date:Integer
arrival:String
reference_number:String
departure:String
setDate()
orderInfo(reference_number

Admin Class
Username:String
Password:String
log_in()
log_out()

1..* arrange 1..*

Payment
Payment_id:String
Payment_date:String
Payment_time:String
Payment_amount:Double
+getID():void
+getDate():void
+getTime():void
+getAmount():void
+setAmount():Double

1 imposes 1

belong

1

1..*

Order
Order_type : String
Order_ID:String
comment: String
Delivery_Cost:Double
Product_Price:Double
Final_Price:Double
Client _id:String
Time_created:String
Shipment_type:String
shipping_address:String
viewOrder():void
trackOrder():void
modifyOrder():string

1..* has 1

Company
Name :String
setName():String
getName():void

1..*

Staff
Staff_ID:Integer
Name:String
Password:string
Insurance: String
Birth_Date: intger
National_ID: intger
Department:String
E-mail:String
Salary:Double
Position:String
Phone_name:intger
+log_in(staff_ID:intger,passv
+log_out():void

1..* make an 1..*

1..* serve

Service
Service_type:String
setService():String
getService():void

3.2.1 Association

1. A relationship between Admin class and Schedule class
    * One admin can arrange one schedule process.
    * One schedule process is arranged by one admin.

2. A relationship between Order class and Company class
    * One company has one or more orders.
    * One or more orders belong to one company.

3. A relationship between Company class and Stuff class
    * One or more stuff serves one or more companies.
    * One or more companies are served by one or more stuff.

4. A relationship between Order class and Schedule class
    * One or more order belongs to one Schedule.
    * One Schedule belong to one or more Order.

5. A relationship between Stuff class and Order class
    * One or more stuff makes a one or more order.
    * One or more order is made by one or more stuff.

3.2.2 Composition

In our system we don't have any relation ship that classified as composition

3.2.3 Generalization

1. Payment class is inherited to Cash class and Credit card class.

3.2.4 Aggregation

1. Between Order class and Payment class.
    * Payment class is a part of the Order class.
    * If there is no order, there is no payment done for it.
    * One order is imposed by one payment process.
    * One payment process imposes one order.

3.3 System Architecture

3.3.1 Type of The System

We decided to choose N-Tier architecture for our system because this architecture rely on the user-interaction. This corresponds to the nature of our system which provides an interaction between the system and the stuff.

For example, the system responses stuff and admins' requests when they ask to view the shipment's history, make orders, and cancel orders or process as well.

3.3.2 Architecture design

N-tier architecture is used with this interactive system
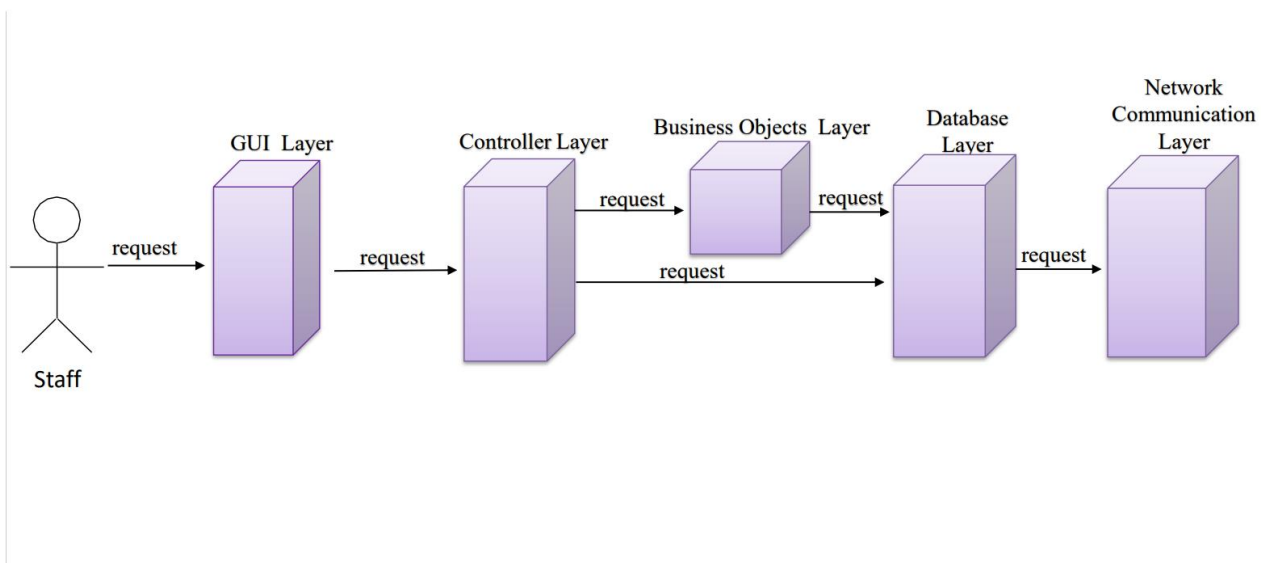
Appendix A

Information Collect

Appendix A

Information was collected from the public in two ways: the first was a personal interview with an employee at a port, the second was a questionnaire that was made and disseminated to the public.

Employee Interview

we do a user interview survey; we ask three questions about:

Q1| What is the lifestyle of your port?

Then we are telling her about our idea to the next question, and it is

Q2| Do you believe that our idea will help the lifestyle of port?

Last, we ask the evolution question that is

Q3| Do you have any other recommendations to our system to be in more efficient way?

The answers for these questions:

Q1|

The following are some of the port services: Ship timings, photo inquiries, stakeholder billing, real estate request, transaction tracking, and service agreements.

Q2|

The concept is brilliant and practical, and the ports require it because it will speed up the delivery of commodities to businesses as well as the process of shipping and sorting items or shipments.

Q3|

I propose developing a platform that connects ports and shipping firms to enable communication between them, coordinate, and hasten the sorting and delivery of shipments.
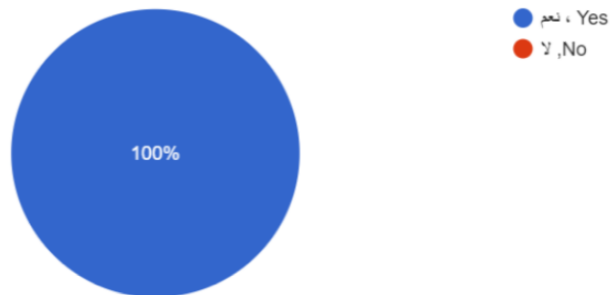
Our Survey

Survey Link (https://forms.gle/xtsFbeDz6oL2TXRQA).

Survey Results

Q1|

Q2 |
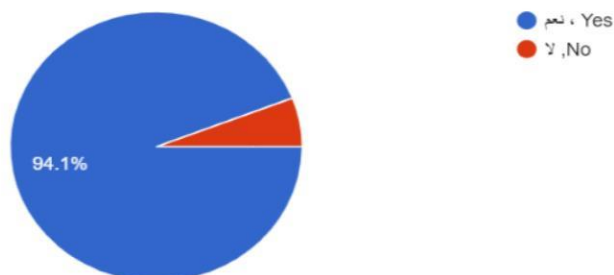
Q3 |

?If the answer is no, give me another reason that you might think is the problem

(إذا كانت الإجابة لا ، أعطني سببًا آخر قد تعتقد أنه المشكلة؟)

رد واحد

تأخرت بسبب خطأ في نقل رقم الجوال الخاص بي

Q4|

?Do you think truck overload is also a reason for delayed shipment to the customer

(هل تعتقد أن الحمولة الزائدة للشاحنة هي أيضًا سبب لتأخير وصول الشحنة إلى العميل؟)
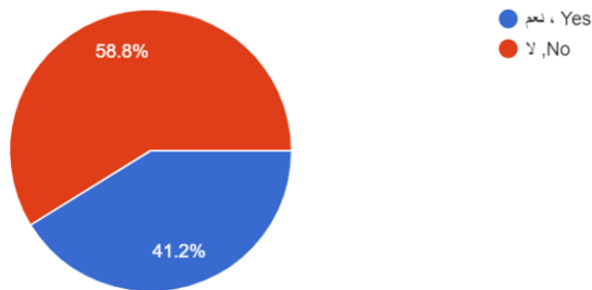(معنى ذلك أنه قد يبطئ من عملية فحص الشحنات مما يجعلها تستغرق وقت أطول حتى تصل إلى العميل)

34 ردًا

- Yes ، نعم
- No, لا

29.4%

70.6%
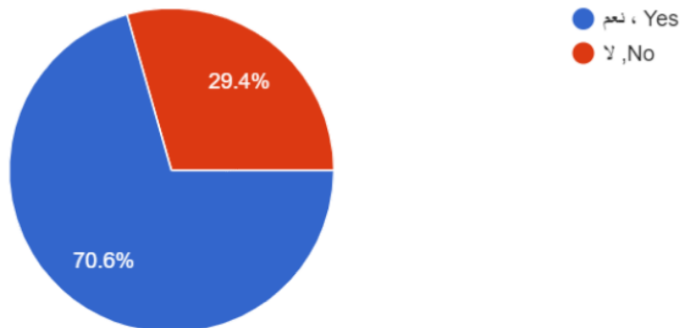
Q5|

?Do you ever your shipment crashed? or it didn't reach you properly

(هل تحطمت شحنتك من قبل؟ أو لم تصل اليك بالشكل السليم؟)

34 ردًا

- Yes ، نعم
- No, لا

58.8%

41.2%

?Do you have solutions to ensure that the shipment reaches the customer properly

(هل لديكم حلول تضمن وصول الشحنة للعميل بالشكل الصحيح؟)

10 ردود

Providing more shipment facilities to avoid over crowding which leads to damaged packages

توفير وسائل السلامة - تغليف الشحنة وتجهيزها بشكل جيد

اسوأ شي توصيل البحري دايم يوصل خربان، اتمنى انهم يخزنو الشحنات بشكل صحيح وآمن، في مرحلة فحص البضائع دائماً الاقي قطع مفقودة او انها اتكسرت وتكون العلبة غير سليمة بعد الفحص

تغطية الشحنه من الداخل و من الخارج بأكياس فقاعية

لا للاسف

اتمتة نظام نقل الشحنات بشكل كلي

شحن كميه قليله من البضائع وضعها في كراتين محكمه

شحن كميه قليله من البضائع وضعها في كراتين محكمه

تغليف ماقد يحتمل كسره أو ضرره جيدا - الفصل بين شاحنات نقل البضائع الحساسة عن البضائع التي تحتمل الطرق الوعرة

لف المنتجات الهشه بالاكياس المعباة بالهواء لتحافظ عليه من الارتطامات
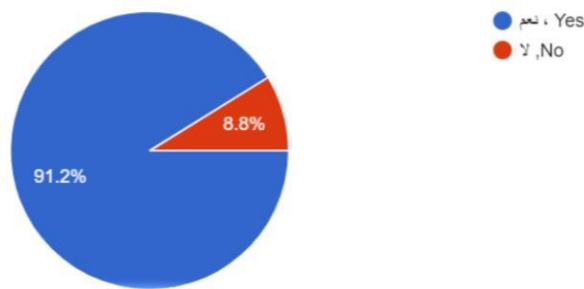
التغليف الجيد

Q6|

Do you think that dividing the port into tracks will contribute to the efficient delivery of shipments?

(هل تعتقد أن تقسيم الميناء إلى مسارات سيسهم في تسليم الشحنات بكفاءة؟)(المقصود بالمسارات أن كل نوع شحنة معين سيكون في مسار معين مما يقل من تراكم الشحنات ويزيد من انسيابية فحصها)

34 ردًا

- نعم ، Yes
- لا, No

8.8%

91.2%

Q7|

Based in your experience: How long does it take for the shipment to arrive at the port and take the procedures (checking, weighing, and packing) until it is shipped:

(بناءً على تجربتك: كم من الوقت يستغرق وصول الشحنة إلى الميناء واتخاذ الإجراءات (الفحص والوزن والتعبئة) حتى يتم شحنها:)

34 ردًا

- ٢٤ ساعه , 24 hours
- ٣٦ ساعه ، 36 hours
- ٤٨ ساعه ، 48 hours
- اكثر من ذلك, more than that

41.2%

8.8%

32.4%

17.6%