SBS Project

CCSW 223 Lab Project Report

Prepared for: University of Jeddah

Section: Q

3/11/2022

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1 Introduction

The problem with E-Bike's are widely spread in every country. Moreover, the concerns have been increasing and become less convenient for those who are disciplined. Electric bikes are efficient but, require more features to fix the issues within the device itself or the hardware used to create it. On the other hand, there are variations of e-things (scooters,mopeds,bikes) which require a certain software to help endure the problems. In some countries, the government's decided to offer those who trade in their car for an e-bike. However, with the concerns rising we think it's better if we helped out the society by reducing it, and the environment.

2 Problem Definition

Bicycles seem in complete contrast to e-bikes, which the world is seeking to get rid of soon, riding a bike in general is an amazing sport and in many countries people use it to move between neighborhoods, due to the ease and fun of driving and reducing traffic congestion, e-bikes are growing at a high rate in the world before covid-19, sales got higher and will not stop anytime soon.

For many years, e-bikes were bulky, uncomfortable to use, expensive and battery life so limited that they were unsuitable for use. All of that has changed and has become lighter and more advanced.

Among the problems that we noticed in e-bikes: the lack of a GPS tracking device in case it was stolen or the rider was at risk, and the location map was shown to the rider, the lack of audio alerts for people who could not read, the lack of a system that supports sign language, the lack of a system that appears to the rider it's vital indicators such as heart rate, compressor, calories, etc.., lack of safety sensors so that the rider gets altered about dangerous terrain or weather changes, lack of a quick emergency feature, the battery does not support fast charging, and there is no camera available to monitor the road in anticipation of any circumstance facing the passenger.

3 Information Gathering

3.1 Interview Description

This interview aims to help us have a clear view on our topic to develop the required solution. Therefore, we conducted interviews to seek answers which will help build suitable software for E-bike's. In conclusion, we measured the society knowledge about the E-bike's

The below listed questions are the one's used to conduct further information:

1. How much do you know about E-bike's?
2. Do you think riding style affects E-bike's?
3. Do you think there are safety problems within the E-bike?
4. If an E-bike had a GPS tracking system and an application that gives you specific features, would you buy it?
5. What is the difference between conventional bike's and E-bike's?
6. What would you do if you were offered 50k and an E-bike in exchange for your car?Would you trade ?
7. Are electric bikes noisy?
8. Can electric bikes be left outside?
9. What type of E-Bikes do you know ?
10. Are electric bikes safer than regular bikes?
11. Why are electric bikes so expensive?
12. Are e-bike easy to steal?
13. Can You ride an electric bike in the rain?
14. Why are electric bikes so popular?
15. Can you ride an electric bike if you are banned from driving?

16. How do you use an electric bike?
17. Can electric bikes climb mountains?
18. What is the most common cause of accidents?
19. Do you suggest customizing E-bikes for a certain age?
20. Is it possible to travel using an E-bike and how safe is it?
21. Does driving E-bikes help to reduce traffic congestion?
22. Is there a need to develop or build special maps for E-bikes?
23. What do you think about driving an e-bike on the streets with cars without having a special track for it ?
24. What do you think about sitting on the e-bike for a long time, which may take an hour or more, in front of a traffic light due to congestion or for any other reason?
25. What are the physical precautions in case the e-bike was involved in a severe traffic accident that you think it is important to add to the e-bike?
26. Do you prefer to have an e-bike with integrated electronic services?
27. Is it dangerous for an e-bike to reach the maximum speed that cars can reach (ie, are there speed limits for an e-bike that differ from cars)?

3.2 Interview Analysis

Table 3.1

Interviewer	Interviewee	Analyst Comment
Riham	Omar Al-Qahtani, Technical Data Engineer, Uses E-bike, 7/9/2022	E-bike is a fast means of transportation for bikers who don't own a car. Moreover,it varies in sizes,speed and riding style. Unfortunately, there is a safety issue within the battery, the small device and the anti-theft lock. On the other hand, there is a speed tracking problem which means the exact speed isn't accurate.
Riham	Shahad Al-Harbi , Human Resource,Potential User, 9/9/2022	The interviewer might consider switching between a conventional bike and the E-bike. Only if it had a map system and an application which helps the user in so many ways. Because, the normal bike is tiring,needs rest,slow and depends on physique. However, as long as it gives accurate information and has a tracking system people will buy it.
Enas	Lamis Alharbi , Student, 6/9/2022	E-bike cause more commotion than ordinary and keeping in mind that left outside for quite a while electrical parts might be harmed and there are a wide range of types and the distinction lies in batteries and engines however more costly than normal bicycles.
Enas	Fahad Alghamdi, Information Technology, 8/9/2022	The expense of the e-bicycle frequently relies upon the sort of engines and interior batteries, it relies upon the driver and the manner in which he involves it to keep up with his safety.

Fatma	Abdulaziz Al-Shehri Student in America Engineering major 7/9/2022	It is not easy to steal an e-bike, unlike a traditional bicycle, because there is a tracking system inside it and a strong battery protection lock. It must be monitored from time to time. There are some types of e-bikes. If someone tries to steal it, dollar signs are fired at him. It can be used in the event of rain because it is water-resistant, even the cheap ones, but do not leave it for a long time in the rain to prevent moisture from entering and spoiling it
Fatma	Mohammad Al-Gamdi Student in Canada In Business Administration major 9/9/2022	It is popular because it is easy to ride by everyone. There are no conditions for the types of passengers. Passengers do not feel tired because there is a powerful electric motor that can deal with heights, hills and mountains and also allows you to move without pedal It has a gas pedal that you can use for long distances and is also money-saving.You can ride an e-bike if you are banned from driving because it does not require driver's licenses, insurance or registration, but you must pay attention to the laws of your country in this matter because there are some countries that do not allow driving an e-bike if your driving license is suspended, its average speed depends on the engine power and the weight of the passenger
Rawan	Abdullah Alhiji, Owner of an E-bike store, 8/9/2022	The purpose of E-bikes useful but it just require more features to fix the issues within the device itself or the hardware used to create it such as a system that helps and contributes to the regulation of the movement and balance of E-bikes and that will be huge impact to the older and to travel by use it. The people as Abdullah want to add features like develop or build special maps for E-bikes to reduce traffic congestion.
Rawan	Ashjan Asiri, Uses E-bike, 9/9/2022	The interviewer here had a different opinion completely, such as it is preferable to limit bicycle use to a certain age to preserve everyone's lives and how difficult it is to travel by using it especially for long distances. and because other road users underestimate the E-bike so that makes it difficult to regulate the speed of it and the private path will have a huge impact.
Shaden	Youssef Abdel Amir Tarada, a senior civil engineer,8/9/2022	It is not enough to wear a helmet and protective jackets as a precaution for e-cyclists, as there are bumpy roads and not all roads are paved, so it is better if the e-bike is like a small car that is closed from all directions put inside it protective equipment such as seat belt and airbag.An e-bike's speed must be regulated. Also it is good to have services like GPS

		and music.
Shaden	Hassan Muhammed Shabib. Hobbyist in cycling since childhood,7/9/2022	The reason why it is dangerous to drive an e-bike in popular residential neighborhoods is that it is crowded with cars, especially on internal roads due to the narrowness of the roads. It is also more dangerous to drive e-bikes on the main streets due to the high speed and the risk of injury in the event of a collision. It is necessary to provide a special track for e-bikes. Most e-bike seats are not designed to be comfortable when the e-bike rider is waiting in traffic. It is good to add air conditioning and a place for luggage. In addition, when providing an e-bike with integrated software services, this thing helps low-income people make e-bike an alternative to buying cars.

The Answers conducted from this interview:

Riham:

I don't think there is a safety issue
Except for car owners, I do not think that the streets are well respected by them, as it is dangerous for them Owners of e-bikes or regular bikes, such as the danger to pedestrians when crossing the street or walking in the streets.I think that it is a beautiful and fast means of transportation in terms of the fact that I do not have a car and its price is very attractive for some people
Those who spend most of their time walking to carry out their daily tasks or going to work, if it is close to them, of course I will think
Buying it if it keeps me away from the car and road congestion
Of course, there are small bikes that are not suitable for adults, and there are large bikes that are suitable for large weights. There are bikes suitable for normal weights, the weight may affect the bike sometimes, and the way of riding must have special criteria.
I could trade if the bike would drive me faster than the car to my place of work Or my place of study, and if it has a safety method against theft, it would be great to trade
I might consider buying it if it has a map system and a phone app that tells me where my bike is
E-bikes are great, but they lack some safety and lack anti-theft alarms
It is also a beautiful and wonderful way of transportation, and if its battery is large, it will take you to where you want A traditional bike depends on the movement of the feet and it can be tiring, so a traditional bike rider must Pause a little to take a rest. As for the e-bike, it does not depend on the movement of the feet only, it moves through A button you press with your finger and you can increase or decrease the speed, as there are e-bikes with a speed of up to 60 km As for a regular bike, it often does not exceed 15 kilometers

Enas:

Electric bikes make more noise than regular bikes, but not significantly. The extra noise comes from the motor, which makes a “whooshing” sound that gets louder the more assist you use. This noise usually comes from bearings, coils, and stators and rotors. Most e-bikes are waterproof, and some of the more expensive models are even marked with a waterproof label. However, they should not be left outdoors without a protective covering. You should at least remove the battery, bring it inside, and store it in a dry place. If you leave your e-bike in the rain for a long time, dew and moisture can eventually seep into the electrical components and damage them.
There are many different types of e-things, from the cheap shared scooters that travel at a maximum of 12 miles per hour to more souped up e-scooters that allow you to either stand or sit and can go around 20 mph to e-bikes that look like bikes but have motors to big, honking cargo e-bikes that cost several thousands of dollars to e-mopeds that look a lot like Vespas or other motorized scooters but have batteries and motors instead.And you will find all of them riding in the bike lanes.

Electric bikes are just as safe as regular bikes. Their safety depends on the individual rider and how they ride. They're safer than regular bikes in the city because they're easier to keep clear of traffic around you, which is important to avoid cars rushing past you.
Electric bikes are more expensive than regular bikes because they are much more expensive to manufacture. Equipped with sophisticated electric motors and batteries, they require a lot of time, money and expertise to develop and produce. Frames and other components also add to the price tag.

Fatma:

Electric bikes are no more likely to be stolen than regular bikes. To prevent your electric bike from being stolen, you should not leave it unattended. If you do this, make sure to use a strong proof lock, or even more of them. Protect your battery by locking it as well.
Ever since I became an owner of an electric bike last year, I started becoming gravely concerned about the safety of my bike.In the past, I only ever rode "cheap" bikes.And while I've done my best to protect my bike (mostly), I wasn't too worried about one getting nicked and all that..The time my bike got stolen.But that was when my bike was worth a couple of hundred quid. I didn't want to have to buy another bike, but in the worst case scenario, the cost wouldn't be too abhorrent.
However, my electric bike cost €1,699. That is not an expense that wants repeating in a hurry.
And it's not just my unwillingness to spend a lump on replacing a bike. It's also the fact that e-bikes (especially eye-catching e-bikes like mine) will trigger dollar signs in the eyes of potential thieves
Yes, you can ride an electric bike in the rain. Most e-bikes out there, even the cheapest models, are waterproof or waterproof. This means they can handle moderate to heavy rain with no problem. However, you should not leave your e-bike in the rain for long periods of time as moisture will eventually get inside the electrical components.
Worried about riding your electric bike in the rain? Don't be. Electric bikes, just like push bikes, are water resistant and as long as you can see and ride safely in the rain, your electric bike is fine to ride.
The batteries in our e-bikes are in a high-quality, water-resistant casing. You don't need to glad wrap your battery if the weather suddenly takes a turn.
Our best tip to riding in the rain is to waterproof yourself with a rain jacket and bag to protect your gear. We also recommend mudguards so you don't flick any water or mud on the backs of your legs - especially helpful if you're riding to work or to a friend's house on the weekend.
Electric bikes are popular because they make cycling accessible to almost everyone. You no longer need to be a trained athlete to ride long distances. With the help of a pedal-assist electric motor, you can enjoy long rides without getting too tired, saving money on your commute, fitness and climbing.
They are just easy.
In our small village I know of three commuters who like me use an electric bike to get to the train station in our local town.
It is faster than the bus, runs later in the evening when the last bus has gone (i.e. past 7pm) and is massively cheaper than the £6.70 a day it costs to park at the station.
While we could use a manual bike for the 6 km journey, there is a big hill, who wants to get sweaty, especially as my office does not have showers.
On the way home for the last km there is a slight upward grade and more often than not, a headwind, who wants that after a day at work?
An electric bike just makes it easy.
I've been doing the bike commute for 4 days a week (on average, not when raining or icy, not when I need to be suited and booted).
As I've got fitter I've gradually dialled down the assistance from 80% to 40%.
Yes, you can ride an e-bike if driving is prohibited. To ride an electric bike, you don't need a driver's license, insurance or registration. Therefore, e-bikes are a great means of transportation for individuals who have been disqualified from driving.The answer to this question is not as easy as you might think. Each jurisdiction has different laws, so you might or might not be able to drive an electric bike with a suspended license depending on where you live.For example, California and many other US states allow you to ride your electric bike even when your license is suspended. However, other jurisdictions do not permit drivers with suspended licenses to drive electric bikes.You'll need to familiarize yourself with the laws in your region to determine if you can legally drive your electric bicycle while you have a suspended license.Electric bikes use an electric motor to assist the rider while riding. So, to ride an e-bike, you turn the pedals, which engage the motor to help you pedal more easily. The

only exception is using the gas pedal, which allows you to move without pedaling, like a scooter.Use an electric bike as you would use a conventional bike. Take it on casual city rides, or commutes to work, or on long cross-country trips. Use the power of an electric motor to help you tackle accends and hills. Smartly combine electric and mechanical gears to ride as if it was always flat.Yes, e-bikes can climb mountains. After all, that's what they are for. With an e-bike, climbing hills is a breeze, especially if you use the throttle or high pedal assist levels. The average speed depends on the power of the motor and the weight of the rider.Electric bikes are gaining momentum among riders of all ages and skill levels.One of the main appeals is that you can get in exercise while having the same amount of power as a motorbike does.For outdoor adventurers and mountain bike riders, most people want to know if electric bikes can handle going up steep hills? The short answer is yes.
electric bikes are more than equipped to power over all types of terrains and inclines.
It's even better if your bike has a mid-drive motor, as these are optimal for managing steep hills quickly.
This type of motor offers a range of settings, and you can simply up the gear when you need more pedal assist.

Rawan:

I just absorbed from the answers to my questions that we will have two sides firstly, E-bikes serve a useful purpose, but they simply need more features to address problems with the hardware that was used to make them, such as a system that aids in and contributes to the regulation of the movement and balance of E-bikes, which will have a significant impact on older people who travel by using them. A lot aim to expand capabilities like creating unique maps just for e-bikes to ease traffic congestion. On the other hand, we've opposite viewpoints, such as how bicycle use should be restricted to a specific age to protect everyone's life and how challenging it is to travel by bicycle, particularly over long distances. Additionally, the private path will have a significant impact because other motorists' ignorance of the E-bike makes it challenging to control its speed.

Shaden:

I realized from the answers that people think riding an e-bike on the streets with cars without a special track is dangerous. Therefore e-bike must have their own track. Yousef said that it is dangerous for both the people in cars and the e-bike riders, there must be a special track for each of them because of their differences in size and speed and so on.Hassan said that E-bike must have their own track. It is dangerous to merge both cars and E-bikes in the same track. If they are in the same track that will lead to big traffic incidents. To reduce the struggle of sitting on the e-bike for a long time we must add tools. The e-bike must have air conditioning. As Yousef said he thinks that it is very hard sitting on the E-bike for a long time especially when the weather is bad. He would prefer if there is an air conditioner that will make it more comfortable to ride an e-bike for a long time.Hassan said it is so tiring if he has a heavy back bag. So he would like there to be a place in the e-bike to put bags in it. So the e-bike should include a place to put bags and other luggage. To reduce the damage of the incidents people suggest different physical precautions. They said it is good to have a safety belt that protects the rider from flying away in case of an accident and it is comforting if it is possible to add an airbag that minimizes the damage of the incident. So we took into account adding seat belts and airbags for rider safety. People like to have electronic services in the e-bike so they can listen to music and using the GPS sp it can be used to replace cars for people with low income.. The speed of the e-bike must be regulated and can be fixed as people said that it is dangerous for the riders and other people if the speed of the E-bike was the same as cars because the size and materials of e- bike is different from cars. It is good to specify the proper speed.

4 Planning Phase

4.1 Project Goals

It is a severe issue, a little routine maintenance can keep you safe and save you money on later, expensive repairs. but it's something that we always forget around. As a result, we must use our systems to resolve this problem, which will have a significant impact.

4.2 Cost and schedule estimation

Cost & schedule estimates:

We expect to complete the project within 3-6 months from the start date.

Project Estimated Costs

Table 4.1

Resources	Estimated cost
Device Battery	3200$
Solar panel	2000$
Software cost	300,000$
Smart safety key	4000$
Salary of employees	45,000$
Testing	50,000$
Designed	50,000$
Development	45,800$

Project Estimated Schedule:

Table 4.2

Tasks	Estimated duration	Start date	End date
Proposal	3 days	28/Aug	3/Sep
Information Gathering	4 days	6/Sep	9/Sep
Interview	2 days	10/Sep	12/Sep
Report	5 days	13/Sep	18/Sep

4.3 The Feasibility Study

1. **Scope Objectives of "new system":**

The name of The System is: SBS which means SMART BIKES SYSTEM

The purpose of this system is to provide more accurate information than the models nowadays.Also, help the users with new customized features for those in need , which we want more companies to pay attention to.

This system provides many good features, the device contains accurate information about the battery, speed limit, exact speed, location and tracking, and an application connected to the user's mobile phone via Bluetooth, the device gives a warning when it detects a problem with tires and battery and if the e-bike is about to be stolen and accessed, the device has access to the bicycle helmet And transfer the audio to it, it records a video before and after the accident, the device is charged with solar panels connected to the device.

The device has 3 modes (marathon, normal, eco) and the user can add more modes that meet his needs, the device contains a system that can regulate the speed of E-bike with road users who reduce the speed of the e-bike, the device gives notifications and warnings when the user cannot balance the e-bike, the device has a certain travel function to overcharge the e-bike battery, the device stops providing voltage to the battery when it is full, the device switches the ride In a more aerodynamic mode to increase the range of the e-bike, the device automatically locks the battery, the device has an automatic charging function.

For a quick, the device contains a map that shows passengers the crowded places, the device is equipped with a weather notification system, the device has the feature of voice emergency calls when there is a problem related to security and safety, the device shows the vital signs of the passenger,heart rate, pressure and calories, that the device is waterproof, The device contains an audio system to read information for the passenger who is unable to read, and shows sign language. The device is foldable so that it is easy to store and is less likely to be stolen.

2. Alternative Solutions:

- Establishing lanes dedicated to e-bikes

- Directing the e-bike rider to take precautionary measures and educate them

-The e-bike must be closed from all directions and an airbag and belt must be placed inside the e-bike to reduce the risks that may occur in the event of a severe traffic accident, as well as a cooling and heating air conditioner can be placed to avoid strong sunlight or extreme cold.

- Providing a comfortable seat with a seat belt.

- Putting a small place in the back that can fit a child, travel luggage, a spare tire and a charging battery for the bike.

- Putting back sensors in the event of traffic jams

3. Cost and benefits of Alternatives:

Table 3.1

Resources	Estimated cost
Device Battery	3200$
Solar panel	2000$
Software cost	300,000$
Smart safety key	4000$

Salary of employees	45,000$
Testing	50,000$
Designed	50,000$
Development	45,800$

- We prefer to change the design price or employee salaries to match the project budget

4. Software impacts:

-The device shall have accurate information about the battery,speed limit ,accurate speed,location and tracking.
-The device shall have an app connected to the user's own mobile by bluetooth.

-The device shall give a warning when it detects a problem in tires,battery and if the e-bike is about to be stolen and accessed.

-The device shall have access to the bikes' helmet and transfer the audio to it.

-The device shall give an emergency function which takes a video before censoring an accident.

-The device shall have 3 modes(Marathon,Normal,Eco) and the user can add more modes that meet their needs.

-The device shall have a system that can regulating the speed of the E-bike with road users who underestimate the speed of the E-bike.

-The device shall give notifications and warning when the user can't balance the E-bike

-The device shall stop providing voltage to the battery when it's full.

-The device shall switch ride in a more aerodynamic position to increase the range of the E-bike.

-The device shall lock the battery automatically.

-The device shall have a quick charge function.

-The device shall have a Map that shows the passenger the crowded places.

-The device shall have a weather notification system.

-The device shall have an emergency call feature by voice when there is a problem related to security and safety.

-The device shall show the passenger's vital signs,heart rate, pressure and calories.

-The device shall have an audio system to read information for the passenger who is unable to read,shows the sign language.

5. Potential Changes in the Organization:

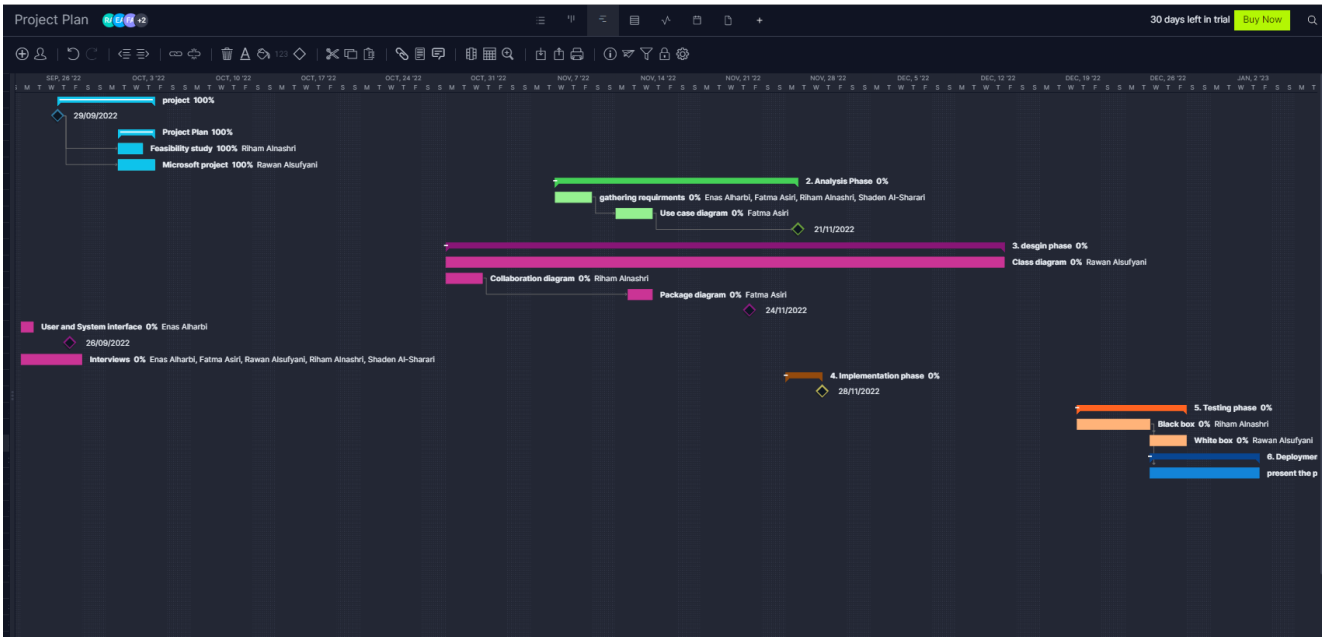
We will change the most important 4 areas;strategy,structure,process and people. In strategy we will change the methods used to fix and update the software. Secondly, in structure we are going to roll out new projects,use small steps to change the organization. Thirdly,processes used need to be changed meaning we

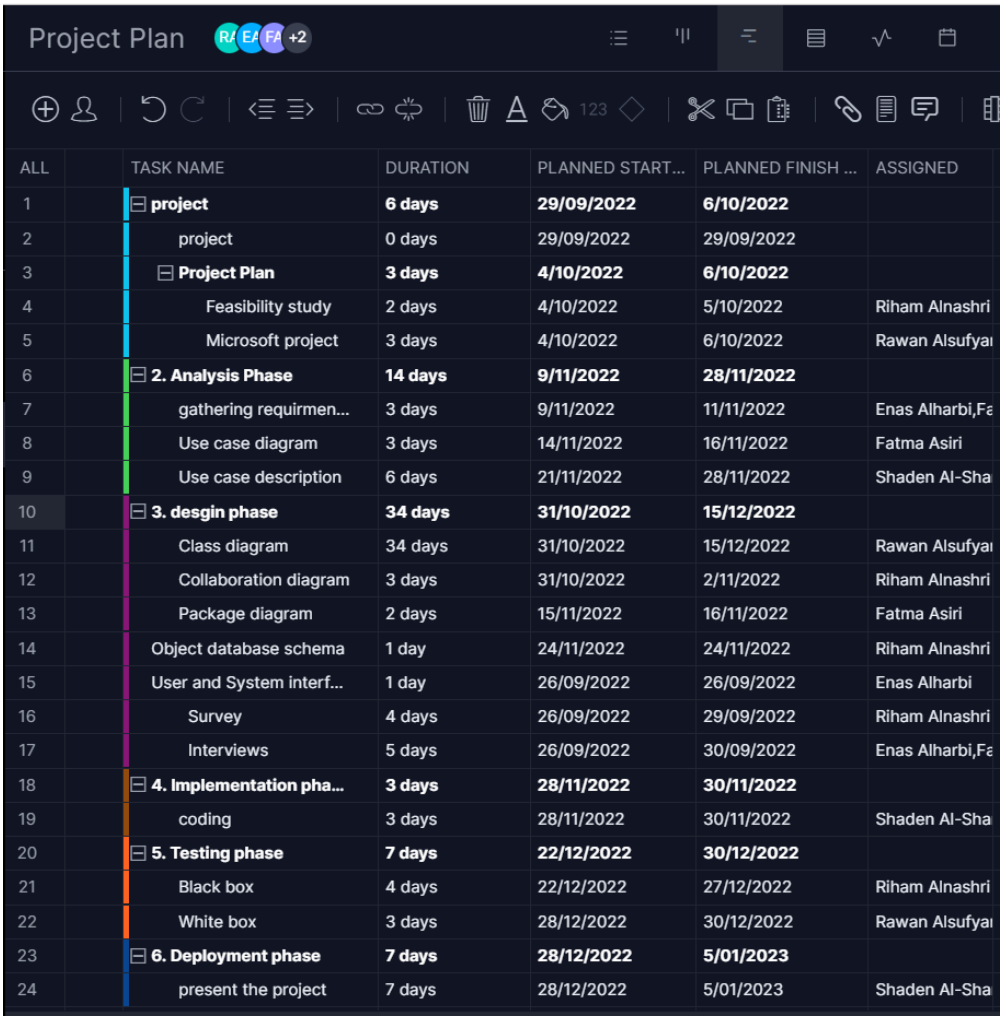
need more technologies and parts that will be discussed with a professional team. Lastly, we will hire more people due to more roles that need to be covered and increase the payment with bonuses to motivate the employees to work.

6. Recommended Alternative of the course of Action:

Establishing lanes dedicated to e-bikes because driving e-bikes in popular residential neighborhoods is considered dangerous in terms of traffic safety, in terms of crowding of vehicles, especially in internal roads due to narrow roads and the lack of separate lanes for bicycles, and also in the main streets the danger increases due to high speed and severity of injury in the event collision and thus to make the bike safer, it needs its own roads.

4.5 Project Plan





ALL		TASK NAME	DURATION	PLANNED START...	PLANNED FINISH ...	ASSIGNED
1		**project**	**6 days**	**29/09/2022**	**6/10/2022**	
2		project	0 days	29/09/2022	29/09/2022	
3		**Project Plan**	**3 days**	**4/10/2022**	**6/10/2022**	
4		Feasibility study	2 days	4/10/2022	5/10/2022	Riham Alnashri
5		Microsoft project	3 days	4/10/2022	6/10/2022	Rawan Alsufyai
6		**2. Analysis Phase**	**14 days**	**9/11/2022**	**28/11/2022**	
7		gathering requirmen...	3 days	9/11/2022	11/11/2022	Enas Alharbi,Fa
8		Use case diagram	3 days	14/11/2022	16/11/2022	Fatma Asiri
9		Use case description	6 days	21/11/2022	28/11/2022	Shaden Al-Sha
10		**3. desgin phase**	**34 days**	**31/10/2022**	**15/12/2022**	
11		Class diagram	34 days	31/10/2022	15/12/2022	Rawan Alsufyai
12		Collaboration diagram	3 days	31/10/2022	2/11/2022	Riham Alnashri
13		Package diagram	2 days	15/11/2022	16/11/2022	Fatma Asiri
14		Object database schema	1 day	24/11/2022	24/11/2022	Riham Alnashri
15		User and System interf...	1 day	26/09/2022	26/09/2022	Enas Alharbi
16		Survey	4 days	26/09/2022	29/09/2022	Riham Alnashri
17		Interviews	5 days	26/09/2022	30/09/2022	Enas Alharbi,Fa
18		**4. Implementation pha...**	**3 days**	**28/11/2022**	**30/11/2022**	
19		coding	3 days	28/11/2022	30/11/2022	Shaden Al-Sha
20		**5. Testing phase**	**7 days**	**22/12/2022**	**30/12/2022**	
21		Black box	4 days	22/12/2022	27/12/2022	Riham Alnashri
22		White box	3 days	28/12/2022	30/12/2022	Rawan Alsufyai
23		**6. Deployment phase**	**7 days**	**28/12/2022**	**5/01/2023**	
24		present the project	7 days	28/12/2022	5/01/2023	Shaden Al-Sha

5 Analysis Phase

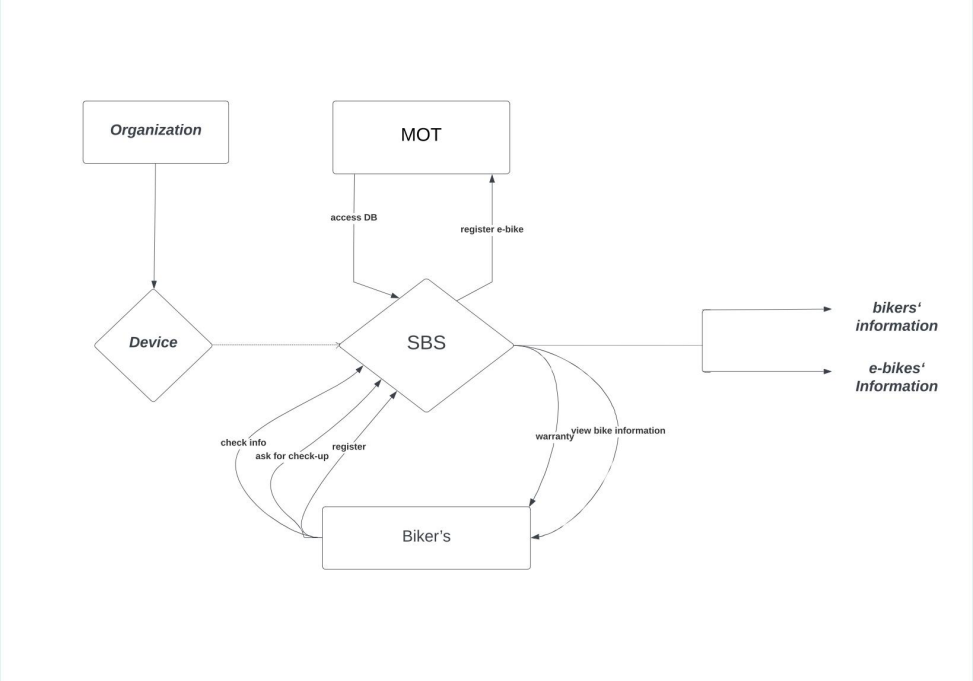
5.1 Stakeholders

The Stockholders for our project are:

a. **The Client:** *The person who makes the investment*
b. **The Customer:** *The person intended to buy the product*
c. **Other Stakeholders :**
    1. **Bikers:** *Are those who use the device*
    2. **Project Manager:** *The one in charge of the IT staff to plan and keep track*
    3. **Ministry of Transportation:** *One of the affected organizations*
    4. **IT staff:** *The team building the device*
    5. **Designers:** *Those in charge of UI/UX and the hardware design for the mini device*
    6. **E-bike Companies:** *Companies that will buy the device and install it on their product*

5.2 Context Diagram

Figure 5.1



5.3 Event Table

SBS Event List

Fig 5.2 Event Name	Input and Output	Summary
Receiving device	In	Receiving the designed (Customized) device
Register	In	The bikers register with their National ID's a new account
Check-up	In	The bikers can ask for an annual check-up for the software
Check information	In	The bikers can check all the bikes data concerning tires, battery…etc.
Warranty	Out	The biker's can use the warranty to fix certain issues
View bike information	Out	The biker's data can be used to evaluate and upgrade the system
Access DB	In	The biker's data will be used to give precise number of citizens using it
Register E-bike	Out	The registration data will be connected with the government

5.4 Functional Requirements

Functional requirement:

Fig 5.3 ID	Requirement Definition
FR1	**Delivering device**
FR1.1	The organization shall provide the device
FR2	**Implementing software**
FR2.1	The staff must implement the software into the device
FR3	**Create Account**
FR3.1	The system shall enable a user to create an account
FR4	**Login**
FR4.1	The system shall allow all actors to have a username and password
FR5	**Access**
FR5.1	The device shall have access to the bikes' helmet and transfer the audio to it.
FR6	**Emergency**
FR6.1	The device shall give an emergency function which takes a video before censoring an accident.
FR7	**Regulation**
FR7.1	The device shall have a system that can regulating the speed of the E-bike with road users who underestimate the speed of the E-bike.
FR8	**Weather**
FR8.1	The device shall have a weather system.
FR9	**Health**
FR9.1	The device shall show the passenger's vital signs,heart rate, pressure and calories.
FR10	**Read Information**
FR10.1	The device shall have an audio system to read information for the passenger who is unable to read.
FR11	**Check up**
FR11.1	The user shall be able to ask for check up
FR12	**View Bikes Information**
FR12.1	The user shall be abele to ask for view bike information

5.5 Non-Functional Requirements

Non-Functional requirement:

User Interface

UI1: The system shall provide certain functionalities in the user interface according to the user authorization
UI2: The system shall provide user friendly interface
UI2: The user interface shall be as GUI

Hardware Interface

HI1: The system shall be implemented to the required device received from the required organization.
HI2: The device shall be water resistant.
HI3: The device shall be foldable so that it is easy to store and less likely to be stolen.
HI4: The device shall have a certain function for traveling to overcharge an E-bike battery.
HI4.1: The device shall be charged by solar panels connected to the device.
HI4.2: The device shall provide a quick charge function
HI5: The device shall have an app connected to the user's own mobile by bluetooth
HI6: The device shall have access to the bikes' helmet and transfer the audio to it.

Software Interface

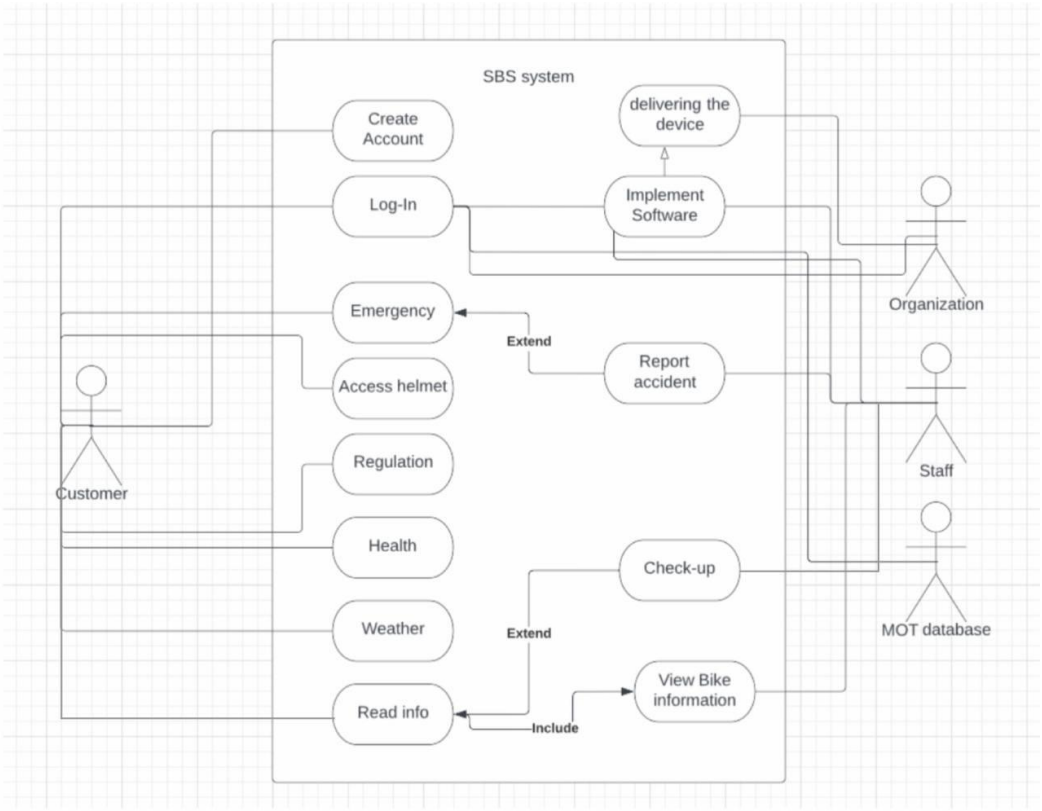
SI1 The device shall register the new E-bike owners into the ministry of transportation database.
SI2 The device shall have an emergency call feature by voice when there is a problem related to security and safety.
SI2.1 The device shall give notifications and warning when the user can't balance the E-bike
SI3 The device shall switch ride in a more aerodynamic position to increase the range of the E-bike.
SI4 The device shall have a system that can regulating the speed of the E-bike with road users who underestimate the speed of the E-bike.
SI5 The device shall have a Map that shows the passenger the crowded places.
SI6 The user shall be able to use a mode's application
SI6. 1 The System shall have 3 modes(Marathon,Normal,Eco)
SI6.2 The user can add more modes that meet their needs
SI7 The user shall be able to view bike's information
SI7.1 The user shall be able to request a checkup for the bike
SI8 The user shall be able to use a store to download applications
SI9 The user shall be able to use a music application
SI10 The user shall be able to use a track application
SI11 The user shall be able to use a weather application
SI12 The user shall be able to use a bluetooth application

Safety/Security Requirements

SE1: The system shall provide login page
SE2 The device shall authorize the user before accessing the system
SE3 The device shall lock the battery automatically after 10 seconds.
SE3.1 The user shall be able to change the lockdown for the battery
SE4 The device shall stop providing voltage to the battery when it's full.
SE5 The device shall give a warning when it detects a problem in tires,battery and if the e-bike is about to be stolen and accessed.

5.6 Use case Diagram

Figure 5.4



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5.7 Scenarios

UC1: Delivering The Device

Scope: Organization

Level: providing the device to implement the system

Primary Actor: Organization

Stakeholders and Interests:

Staff

Scenario of UC1:

1-The organization shall provide the device

2-The staff shall receive the device

UC2: Implement Software

Scope: Organization -Staff

Level: implementing the developed software into the device

Primary Actor: Organization

Stakeholders and Interests:

Staff

MOT (ministry of transportation)

Scenario of UC2:

1-The Staff must implement the software into the device

UC3: Create Account

Scope: customer

Level: primitive

Primary Actor: customer

Precondition: after show the enable of create an account on the system

Stakeholders and Interests:

customer

MOT database (ministry of transportation)

Scenario of UC 3:

1- after showing the ability to create an account on the system.

2-they can create an account to log in to the system.

UC4:Login

Scope: organization,MOT database

Level: primitive

Primary Actor: customer

Precondition: after the customer have an account

Stakeholders and Interests:

customer

MOT database

staff

Scenario of UC4:

1-after the customers have an account.

2-They have the ability to gain access to the application interface

UC5:Access

Scope: Staff , MOT database

Level: take the approval to control and access and transfer.

Primary Actor: customer

Precondition: verify and availability to control the account by login

Stakeholders and Interests:

Organization

Staff

MOT staff(ministry of transportation)

Scenario of UC5:

1-The user shall request to play audio on a device

2-the system shall allow the customer to control the audio and transfer it by bluetooth

3-the user shall receive the functionality

UC6: Emergency

Scope: Staff

Level: Take the report accident from staff

Primary Actor: Customer

Precondition: The device shall give an emergency function

Stakeholders and Interests:

Customer

MOT (ministry of transportation)

Staff

Scenario of UC6 :

1-The system take the emergency function from the customer

2-The system received report accident from the staff

UC7: Regulation

Scope: Customer

Level: primitive

Primary Actor: Customer

Precondition: The device shall have a system that can regulating the speed of the e-bike

Stakeholders and Interests:

Customer

Staff

MOT (ministry of transportation)

Scenario of UC7 :

1-The user will request to read information

2-The device will display the regulation system

3-The user can read all the regulating the speed of e-bike

UC8: Weather

Scope: Organization

Level: to provide all weather information

Primary Actor: Customer

Precondition: display the information

Stakeholders and Interests:

Staff

MOT (ministry of transportation)

Scenario of UC8:

1-The user will request to show the weather's information

2-The system will display to the user weather's information

UC9: Health

Scope: Organization - MOT Database (Ministry Of Transportation)

Level: Providing the user the health related information

Primary Actor: Customer

Stakeholders and Interests:

Staff

MOT(ministry of transportation)

Scenario of UC9:

1. The user will request to show health's information

2. The system will display the users vital signs,heart rate , pressure and calories

UC10:Read Information

Scope: Staff,MOT database

Level: To display and read the required information

Primary Actor: Customer

Stakeholders and Interests:

Organization

MOT staff(ministry of transportation)

Staff

Scenario of UC10:

1.The user will request to read the information

2. The device will automatically read the information and display it

UC11:Check-up

Scope: Staff,MOT database

Level: Providing an annual check-up for the customer

Primary Actor: Customer

Precondition: Read information

Stakeholders and Interests:

Organization

MOT staff(ministry of transportation)

Staff

Scenario of UC11:

1. The user will request to read information
2. The user can ask for check-up
3. The staff will receive notification and will provide the biker the information about speed,usage, battery and the safety lock

UC12:View bike information

Scope: Staff, Organization, MOT

Level: Displaying the required information concerning the bike

Primary Actor: Customer

Precondition: Read information

Stakeholders and Interests:

MOT staff(ministry of transportation)

Organization

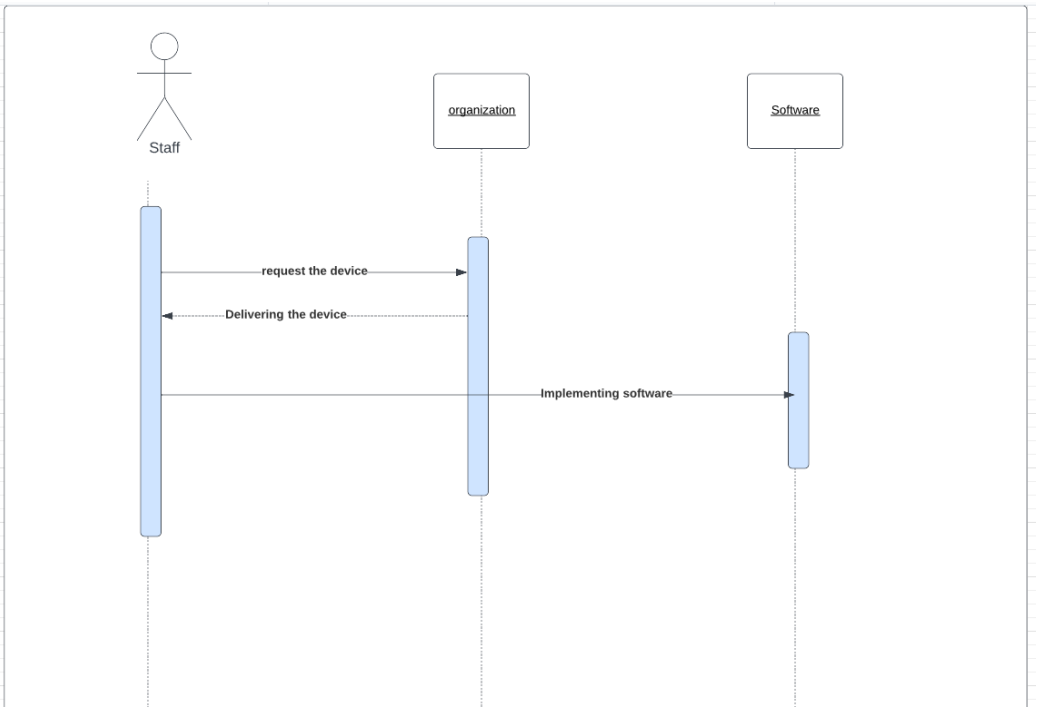
Staff

Scenario of UC12:

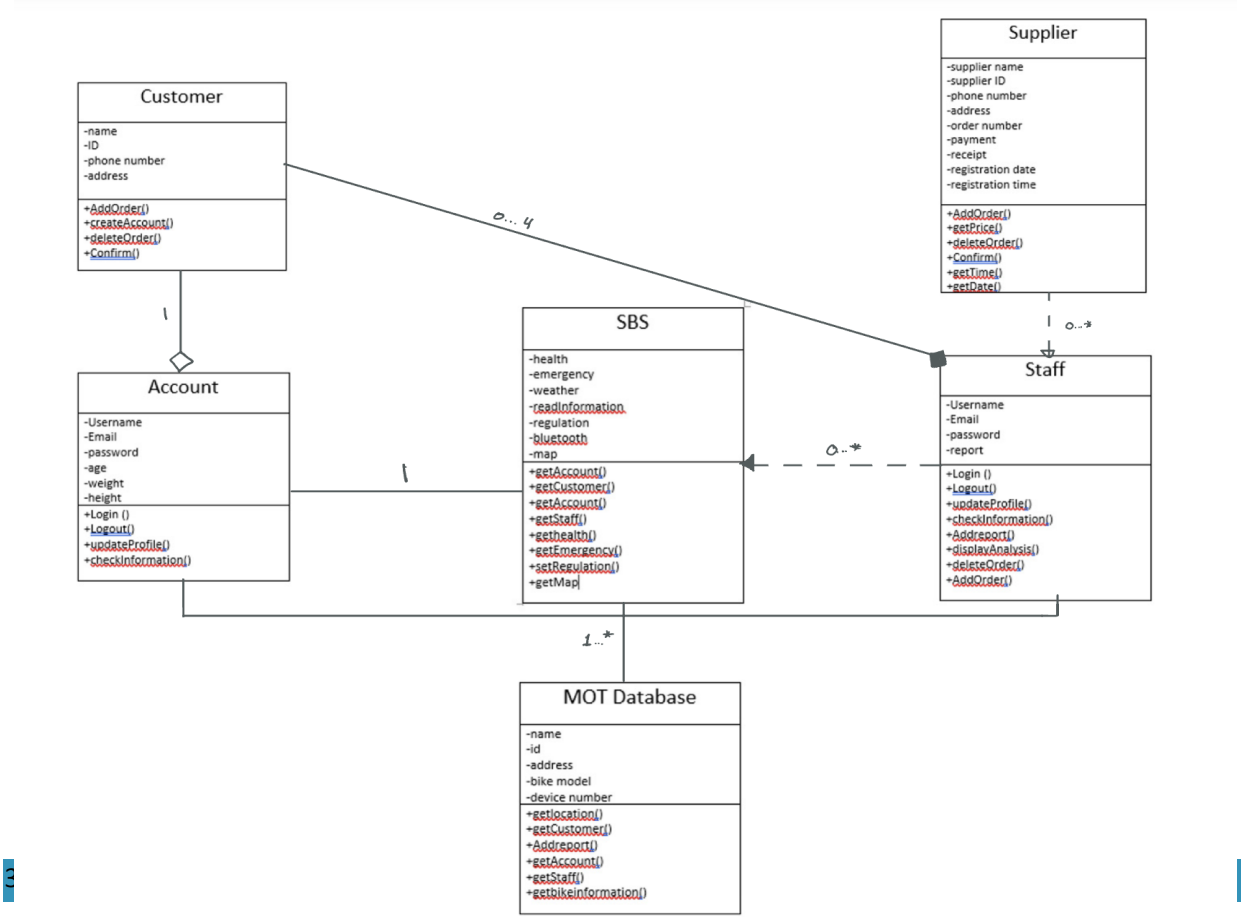
1. The user will request to read information
2. The user can ask for check-up
3. The staff will receive notification and will provide the biker the information about tires,battery health and the warranty.

6 Design Phase

6.1 System Sequence Diagram



6.2 Class Diagram



7 Conclusion

We took a long journey in discovering how to build a project from scratch that didn't have an alternative solution and was one of a kind. There were a lot of new objectives that we learned how to write and do. Moreover, now we know how to write system specification,design,requirements validation. However, the time was short and we had to do a lot of outside meetings and online classes to discuss our project and how we divided the tasks for each member. Therefore, the whole experience taught us how to write professional software documentation that will help us in our jobs. Finally, group work was a bit difficult but we handled it and maintained the work.