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Abstract

We are going to introduce an application for people who wasting time to get a (luxury a/c) bus and people who waste their time in front of the highway entrance to pay for the highway and get a ticket on highway exit point. We did some research about how to resolve these problems. We found some foreign applications helps to find buses on normal way but those app have some problems like where the applications tracking system is not accurate and also can't the track bus arriving time, interfaces were designed poorly, offline services were not there to track their buses, pages didn't get refreshed resulting to wrong bus locations. So, in our app we are going to remove those bugs and add more new innovative features (like our offline SMS service and our new live bus tracking system). According to our research there aren't any payment methods and ticket giving methods in highway travels like what we're going provide. Our app will give new experience for users with those features (highway and normal way).

Acknowledgement

This project was a great chance that was given to us to show our creativeness and innovativeness. First, I would like to thank our Module leader Ms. Aniqah Zeezan who is mainly responsible for creating us this opportunity and Ms. Tharushi Sandamali who gave us great support by sorting out all our problems and encouraging us from our backs.

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Introduction and description of the project

Getting a seat on a bus can be somewhat of a trouble and being late can just set your life mundane. The average person uses public transport on a daily basis to get to work. and waiting for the right vehicle (buses in our case) can be tiresome. And when a bus arrives you can never know whether it's the right bus or not. Time consumption is one of the biggest drawbacks in getting the right bus and guaranteeing a seat is also a problem. And when it comes to paying some don't tend to have change. And comfort while travelling is very important in the day because anything that happens during the day could affect your mindset for the day. Getting frustrated that you missed a bus or that you got late to work again could stress you out. So, we decided to try and add some extra color in your life. And here we introduce to you our app. Bus N,route. This app should really make your daily travels more conducive and less time consuming. Paying would be way easier, tracking our buses in real time, and many other benefits you will see here. We have been focusing on highway buses and galle road buses and according to our success we will be working on other vehicles for commodity in travelling on the highway. This app is quite basic but is definitely going to save you more time and will give you that chance to plan your day and make it more sufficient. In our application we will be talking about our new feature to track buses offline where it gives you an accurately estimated time of when your bus will arrive. You can plan your day ahead, save time by using our online payment methods even when you don't have change. Our E-ticketing system is quite thorough. We work to please everyone so we made our application multi lingual so that everyone should be able to use this without any hassle. We saved in your ride history just in case you maybe left an item or you would like to give our bus drivers a rating.

Methodology

In the above section that carried out the current situation during the cause. In that case there might be more than one solution had but deeply studying them the team decides to choose a most suitable method to come up with the project. This part shows how studies held related to method that used. At beginning we clearly understanding the problem and how is the way that affected to the target market. In that team got a proper idea the sectors that need to focused on. Then move on to collect statical Qualitative data from target market by conducting Questionnaire, Empathizing with them like the way. From those way we gather data for make decision what were the most suitable SDLC (Software Development Life Cycle) model structure that helps to succeed our project. Before moving to modeling team, members make a comparison among all models it was helpful to team to select best one among them. In that previously mention the team gather some information from user's needs referring that part team members made qualitative measurement relating user needs to how much the model must capable to cover user's favor. Then SDLC modeling was started. According to the comparison the best model that chosen was "STRUCTURE EVALUATONARY PROTOTYPING MODEL" the major reason that based on to select this model structure because of the user can see the system requirements as they wanted with their own eyes. That is a good way to complete our end product better that supposed to full fill user's favor. The aim of this project to build a product that impressed the users. So usually interact with them and find were to improve is useful. From the beginning developer team create a hand written notes to explain what the steps that they take part by part. In prototype development designers builds databases, user interfaces, algorithmic functions like that. In creating database that team used Database management system like MySQL. Those works did by their pioneers of handling with database management works and then design user interface that was an attractive part of the work steps. The designers might be creative to build user friendly , attractive unique interface to the project this thing hold great part of the work if the user unlike the interface designers need to roll back to the previous steps to empathize with them what user really needs to their interface look like if it happen it means the whole steps that we followed were got wrong with a point. If there is nothing wrong with the interface building designers can move on to evaluate from user for their suggests improvements and make it better and better.

Solution outline

The solution proposed by the group

For Galle Road Super luxury (a/c) buses,

We can create an app. which as has two parts. The first part for service suppliers, and the second part for clients. The first part of the app should be provided to the bus conductor and the second part should be provided to the daily luxury (a/c) bus users. First of all, buses need to include the bus stop users normally use to get to their work and their normal bus stop. User needs to verify whether user a robot or a human using google verification. Then a QR code reader should be installed near the bus stop in front of each bus stop. It can be used any roof or safety box for protection. Also, the second part of the app should be set up by the bus conductor. After providing their name and bus registration details, the app will provide the relevant QR code. Then the bus conductor should show his / her relevant QR code to the QR code reader at each bus express stop (within two kilometers there can often be one super express bus halt so in that situation this method is possible) and then the QR code reader machine will identify it and give the correct SMS message to the required bus passengers. Users of this app will be notified of how many bus halts they need to be notified of as the same bus does not return every time, so all buses arriving at the designated bus stop within an hour will be notified via a SMS. Users of this app can track the live location of the bus without any problem and can easily know the departure times and arrival times of the buses. After you entered your starting point and destination point you can see what the available buses are and also buses departure times and arrival times and also you can see live locations of buses.

For highway all vehicles,

You can pay in online using our app for getting a ticket on highway. You can enter your entrance point and exit point after app will give the payment details including how to pay, what are the payments methods that you can use in our app and how much rupees that you need to pay. After you paid immediately you will receive your QR code. Then you can go to the relevant your highway entrance point and show your QR code to the QR code scanning machine then after

scanned your QR code (that QR code scanning machine will save your details like your entrance point, entrance time and other relevant details that needed) the gate will open. After you arrived into exit point of highway you can show your generated QR code for the QR code scanning machine (This machine will evaluate your details and your entrance point and entrance time and exit point and exit time check and after did some mathematical parts it will also give your average speed.). After you showed it immediately give your ticket to your app.

The techniques used to validate the solution idea

1. Brainstorming

We used brainstorming to validate the solution idea. This is a good and very popular method in the validation part. Brainstorming is a group discussion that based on how to solve a problem. In this brainstorming method normally, we discuss as a group about how can solve the problem. This method helped us to solve various issues. When we were trying to get innovative ideas regarding the project, we had to face various issues such as not having enough innovative features, faced various errors and unmatching criteria's when we were trying to implement those features, some features were less innovative, so we had to update those ideas by combining with new things. By using this brainstorming technique, we collected each and every idea of the group members, summarizing them to small parts and making links between those ideas we had found new innovative ideas to our project.

2. Survey Questionnaire

We used Survey Questionnaire to validate the solution idea. The main purpose is to get ideas from the user. And, we then check if the solution will be worthful to the user and whether they want it. To introduce an application based on transportation we must consider the ideas and opinions of the application consumers, so we had to use a technique called Survey Questionnaires by this method we introduced the common questions that arises among the people who are willing to use our application and sent them the questionnaire via email. We got the personal opinions of those people and some negative feedback as well. By referring those questionnaires with answers, we could make some changes in our project, and it helped us to add more creative ideas. This method helped us a lot when doing the project.

Key Benefits

1. Timeliness

- Users expect a high level of service, So the users like to get a faster service, from our app we provide the best and faster service so the users can get their work done quickly. From just few steps user can book a bus for the destination required.

2. Multi Language

- There are still major obstacles on developing an application, one of them is form of language barriers, but in our app, Users will not get such problems, we are developing our app with three separate languages (English, Sinhala and Tamil), for make our app more user friendly.

3. Online Payment Methods

- To save our customers time and to provide more efficient service we have included online payment methods to our app so the customers don't have to wait to make their payments. They can pay the relevant amount through the app.
- User can pay online using our app for getting a ticket on highway. User can enter the entrance point and exit point then the app will show all the calculate the amount for the trip and will give the payment details including how to pay, what are the payments methods that you can use in our app and how much rupees that you need to pay. After you paid immediately you will receive your QR code. Then you can go to relevant your highway entrance point and show your QR code to the QR code scanning machine then after scanned your QR code the gate will open, and you can go.

4. Message Service

- This feature can be very useful to the users, when they register in our app, they can enable our extra service the message feature that can be very helpful for them. When the user book a bus they can enable the message feature that can remind them how many bus halts away is the bus. And it does not apply any data charges even if the user has disconnected their data service still, they will get their message.

5. Track the bus

- There are not many apps on public transport that have the feature to track the vehicle, but from Bus N'route You can easily track your bus location and bus departure time and time for the bus to reach its destination. With this feature customers can manage their time much easily.

6. User ride history

- Another useful feature is that the user has the permission to access his/her ride history, User can see the bus details, driver and the conductor details, bus arrival time, the destination of the travels, duration for each ride, payments made to each ride and how the payments were paid.

7. After user entered their direction user can experience these new features in our app.

- User can enter the directions, starting point and choose your destination point then our app will show what are the available buses (luxury) in Galle Road (we are using live location system for all luxury buses in Galle Road) that can arrive to your destination and then you can select a bus.

We are also introducing some new features like you can see all bus details. (After clicking on **details button**)

- User can see bus conductor or bus driver contact number.
- User can see bus departure time and time for the bus to reach its destination and bus arrival time is there.
- And we also show the bus number plate and bus road number like 400,401/2 then user can find bus easily

Innovative features incorporated in the project

Messaging Feature

The application is based on so many innovative features which can attract customers attention firstly we have implemented a messaging system in our Bus N' Route application. As you know in the modern society transportation plays a huge role, for this to be efficient our application provides a feature that will ask for your starting halt, your destination halt and when should you need to be notified when the bus comes closer to your location.

Accurate Bus Tracking

The second feature that we have introduced in our bus application is accurate bus tracking system. This feature will help the application users in a lot of scenarios such as when the user wants to know the location of the bus, they are waiting our application will provide the exact location of the bus. For this to be done in perfection we have joined our hands with google maps which is the best GPS system currently available in the world.

Highway Online Ticket Booking

The next innovative features which we have implemented in the application is specially targets highway users and mainly highway bus users. Highways routes are the fastest and efficient ways of transportation currently available in Sri Lanka but people using these highway buses face a lot of issues. Ticketing for buses is one of the main problems that they are facing because Sri Lankan bus conductors still uses traditional bus ticketing method even for the highway buses. This is not ethical with luxury highway buses. To fix this issue we have introduced a Highway online ticketing system with our application which provides you the ability to get a ticket for bus or other vehicles online. Once you order your ticket our application will provide a QR code with the necessary ticketing details that you need to If you are a highway bus passenger you need to show the QR code to the bus conductor and if you are a private vehicle owner you need to provide the QR code to the highway ticketing counter.

Multi Language

There are various kind of nationalities which lives in Sri Lanka. Our application must be user friendly to them but because of these nationalities understand different kind of languages we have implemented a feature which enables the user to change the language as they prefer. They have the option to choose from Sinhalese, English, and Tamil.

Bus Arrival Time and Bus Departure Time

As mentioned above the main target of our application is to sort out the problems that people are facing when it comes down to transportation. Mainly office workers and students must know the buses that are available for the day. In the application when a bus conductor signup with our application we will ask them to provide their details and their working shifts. By using this the application will provide you a list of buses that are available for you, according to that you can find your desired bus.

Bus Location Tracking

Knowing the exact location of a bus is very helpful to the application consumers. This feature will provide you the ability to know the location each bus that relates to our application service. When the user inserts a certain bus route the application will provide a map pinpointing each bus that are currently running in that route. By using this feature, you can decide

Requirements and Analysis

Briefly explain the selected requirements elicitation process

Interviewing

Interviewing can be described as a more traditional as well as a methodology that can help many people express their views. This is very beneficial to our project and has a number of absolutely beneficial benefits compared to strategies such as prototyping. It helps to go among the passengers who use buses as the main means of daily transportation in the lifestyle, to get close to them, to see how much they have an insightful vision of our innovative idea and to identify if there are any areas that need to be revised as they see fit. Furthermore, we can identify their independent opinions about our product, both positive and negative reactions. This allows us to successfully contact the client.

Questionnaires

This quiz methodology can be done in a number of ways, such as conducting online quizzes and traditionally face-to-face quizzes. This adds a lot of fruit to our project. Because the problem we choose is a social problem. In order to come up with solutions to a social problem, we must not limit ourselves to a select group of people, but by collecting answers to our questions from all the groups covered by our solution. The solution will be more accurate and time. As mentioned earlier, this can be done using any existing messaging services such as email and text messaging as the basis, so the cost is minimal. But not all the answers here can contribute to our project because they may have issues of relevance and it is important to re-select them in several stages

Background Reading

It is imperative to know the background on which our project is based. This is because carrying out the project without an understanding of the background hinders the realization of the right goal. Hence the exact requirements. We did a background study to find out. We used social media and the internet as sources for this. We are aware of the comments made by the bus users as well as the rules and regulations regarding public transport services. It was very helpful for the development of the project in the right direction.

The requirements elicitation survey/interview questions are mentioned in the appendices.

Detailed and specific requirements of the project.

- **Ability to track your bus**

When it comes to live tracking there are not many apps on public transport that have the feature to track the vehicle, but from Bus N'route You can easily track your bus location and see where it is.

- **Ability to book your Highway ticket**

Making it possible to book your highway tickets through our app is one of our best services you can get from our app.

- **Access for the Offline Message Service**

If the user has enabled the offline message service even though the user mistakenly disconnects their Data/WIFI connection they will not miss their bus because of this message service.

- **Ability to see your ride history**

This is another useful feature we provide to the users. The user has the permission to access ride history, User can see the bus details, driver and the conductor details, bus arrival time, the destination of the travels, duration for each ride, payments made to each ride and how the payments were paid

- **Every detail of the passenger and the conductor**

In our system we have provide every useful detail for the passenger and the conductor, so if there's any issue, they alone can get the details of the bus to the passenger and every passenger detail for the conductor.

- **Ease of use**

from our app we provide the faster and the accurate service, so the users can get to their destination without any issues. And we are developing our app with three separate languages (English, Sinhala and Tamil), for make our app more user friendly.

Context diagram

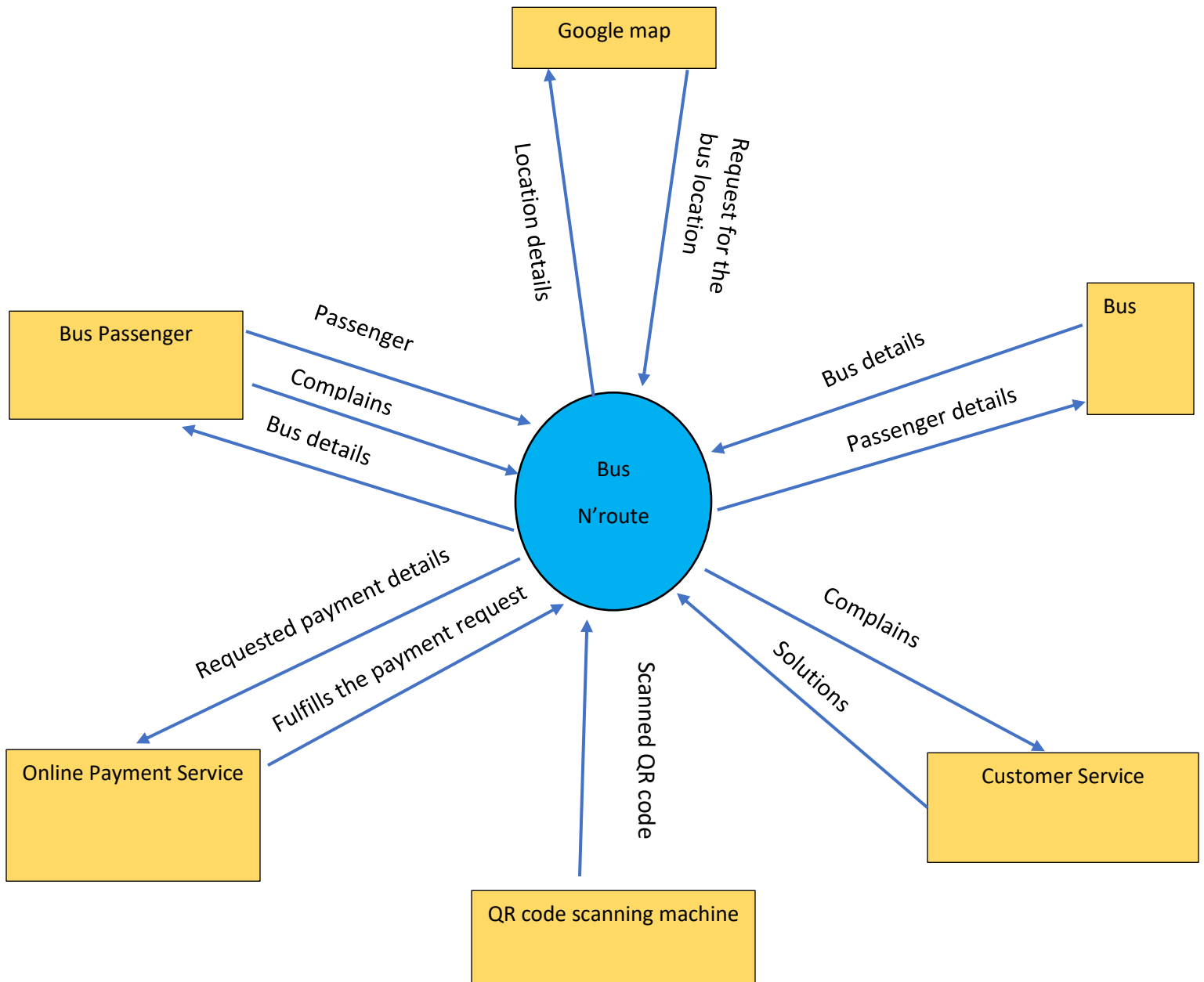


Figure 1 : context diagram

Screenshots of the prototype



Figure 2 : front page

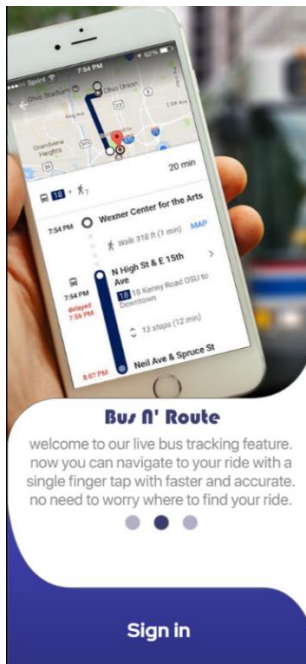


Figure 3 : front page 2

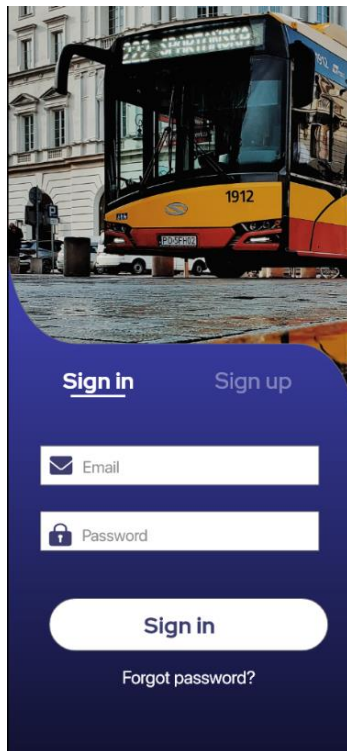
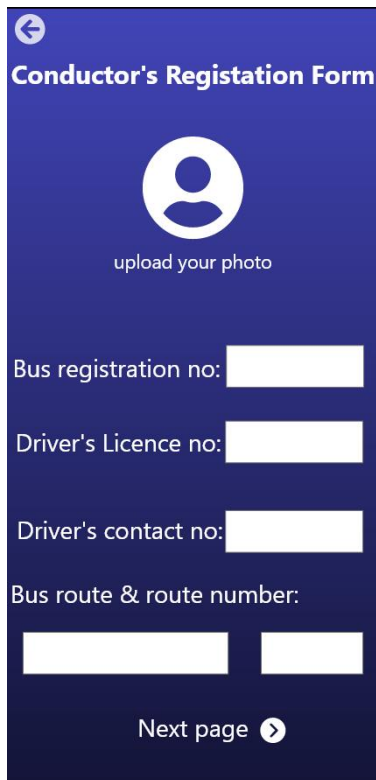


Figure 4 : sign in page



Figure 5 : user selection



Conductor's Registration Form

upload your photo

Bus registration no:

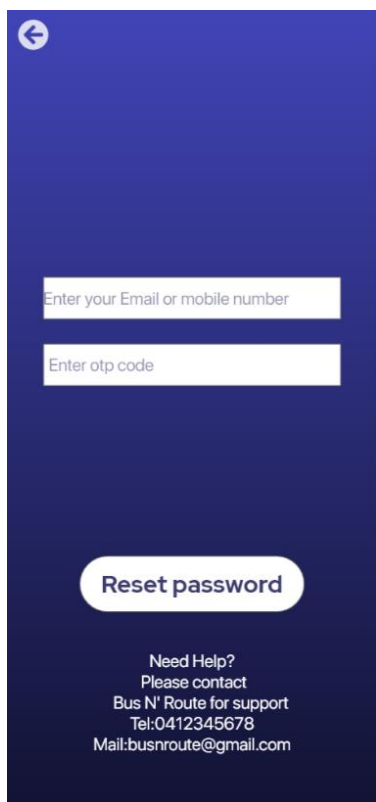
Driver's Licence no:

Driver's contact no:

Bus route & route number:

Next page >

Figure 6 : bus drivers' registration



Enter your Email or mobile number

Enter otp code

Reset password

Need Help?
Please contact
Bus N' Route for support
Tel:0412345678
Mail:busnroute@gmail.com

Figure 7 : forgot password

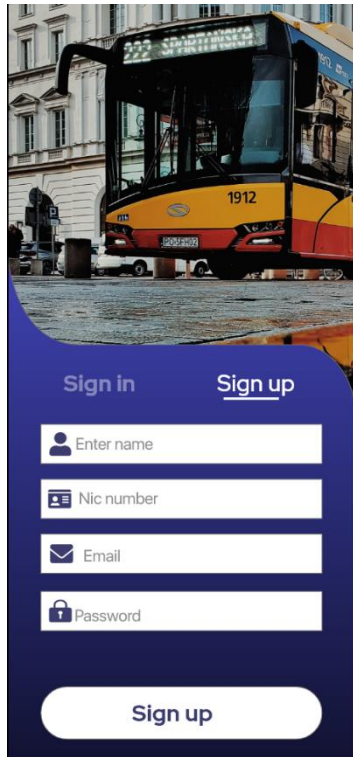


Figure 8 : sign up page



Figure 9 : users QR code

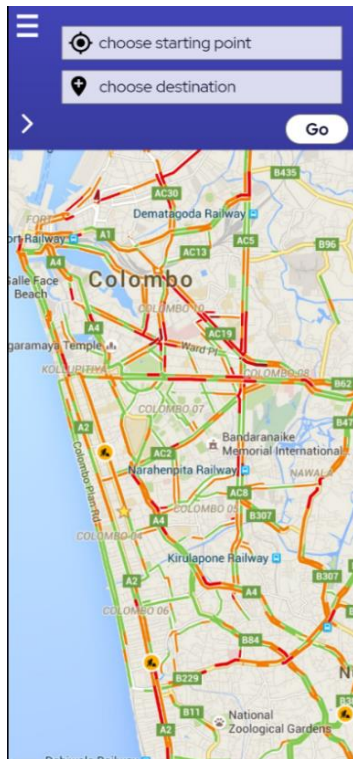


Figure 10 : location map

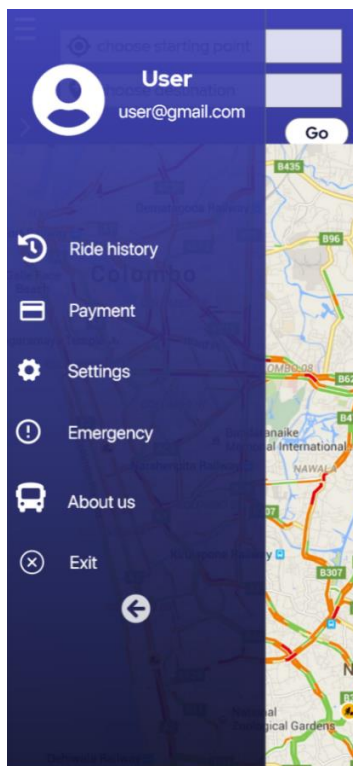
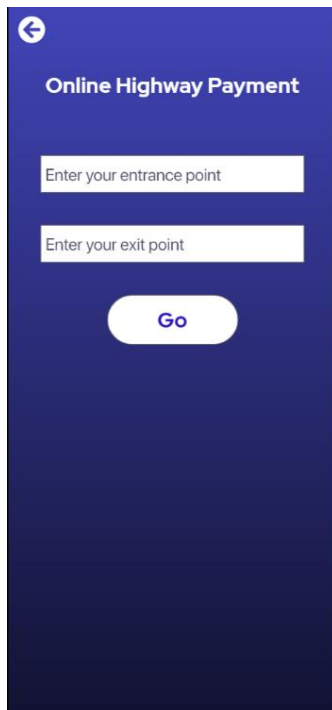
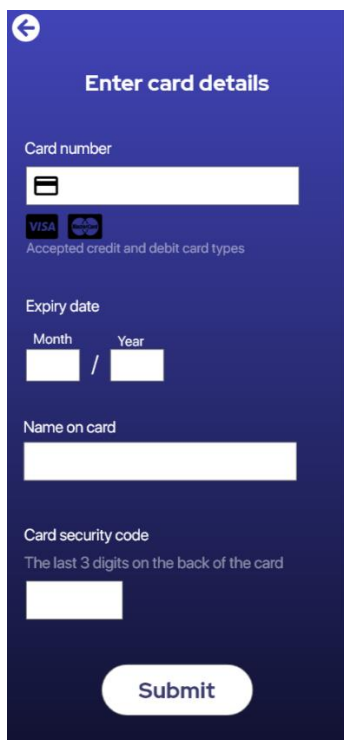


Figure 11 : menu bar



A mobile application screen with a dark blue gradient background. At the top left is a white back arrow icon. Below it, the title "Online Highway Payment" is displayed in white. There are two white input fields: the first is labeled "Enter your entrance point" and the second is labeled "Enter your exit point". Below these fields is a white rounded button with the text "Go" in blue.

Figure 12 : online highway payment



A mobile application screen with a dark blue gradient background. At the top left is a white back arrow icon. Below it, the title "Enter card details" is displayed in white. The form contains several sections: "Card number" with a white input field and a card icon; "Accepted credit and debit card types" with logos for VISA, Mastercard, and American Express; "Expiry date" with "Month" and "Year" labels and two white input fields separated by a slash; "Name on card" with a white input field; and "Card security code" with the text "The last 3 digits on the back of the card" and a white input field. At the bottom is a white rounded button with the text "Submit" in blue.

Figure 13 : card payment details

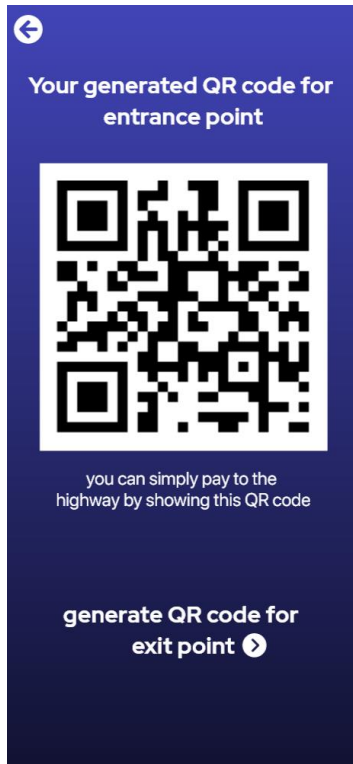


Figure 14 : entrance QR code

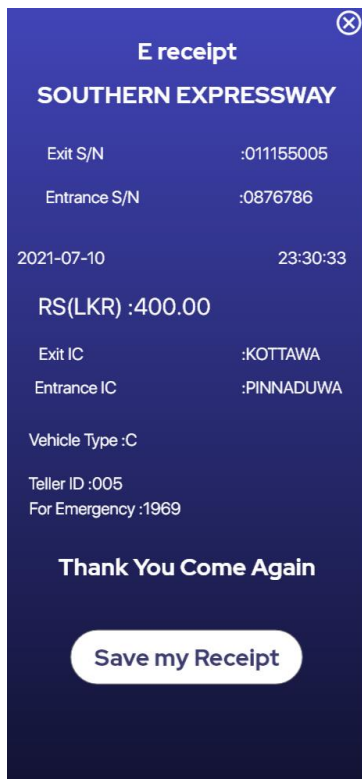


Figure 15 : E-receipt

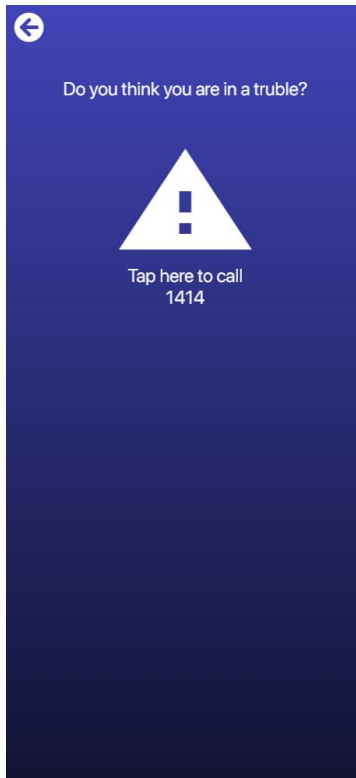


Figure 16 : help dial

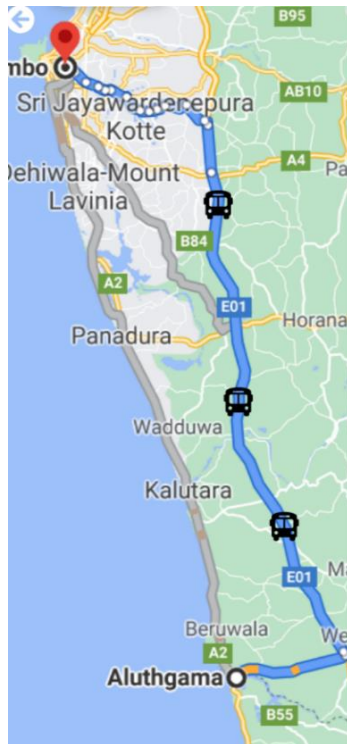


Figure 17 : location route

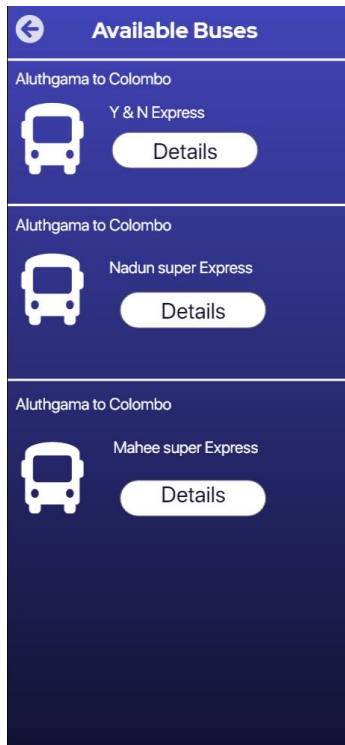


Figure 18 : buses near you

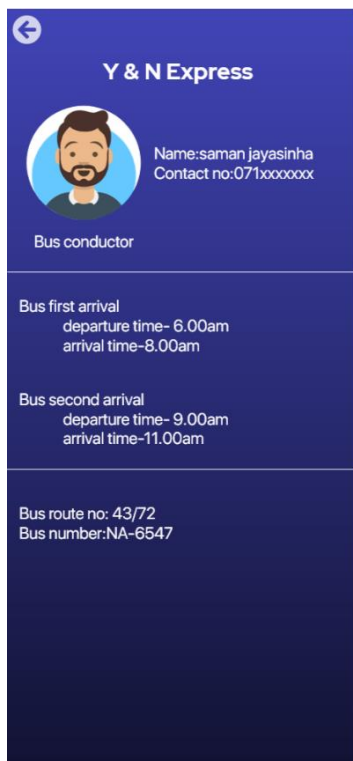


Figure 19 : selected drivers' info

EVALUATION

Detail analysis of the solution

Test case ID	Test scenario	Test steps	Test data	Expected results	Actual results	Pass/fail
1	Sign in to Bus N' Route	1.Open the app 2.Enter sign in details 3.Tap sign in	1.Email 2.password	Passenger's /conductor's interface	As expected,	pass
2	Sign up to the Bus N' Route	1.Open the app 2.Enter sign up details 3.Tap sign up	1.full name 2.NIC number 3.Email 4.Password	Select who you are	As expected,	pass
3	If you select Conductor	1. Open the app 2.Enter sign up details 3. Tap sign up 4. Select Conductor 5. Fill the conductor's registration form	1.Upload your photo 2. Driver's license number 3. Driver's contact no 4. Bus route & route number 5.Enter your daily shifts	Display conductor's interface	As expected,	pass
4	If you select passenger	1.Open the app	Direct to the passenger interface	Passenger's interface	As expected,	pass

5	Forget password	1.open the app 2.Enter reset details 3.Tap the forget password	1.Email or phone number 2.otp code	Password reset successfully	As expected,	pass
6	Bus tracking	1.open the app 2.Enter starting point and destination point 3.click “go” icon	1.choose starting point 2.choose destination	Bus tracking interface	As expected,	pass
7	Message service	1.open the app 2.click menu icon 3.click settings icon 4.tap enable message service 5.enter the relevant details 5.tap enable icon	1.enter your starting bus halt 2.enter your destination bus halt 3.how much halt before that you have to inform	Message service enabled successfully	As expected,	pass

Table 1

- User validation survey questions are mentioned under appendices

Lessons learned

- This module was and project was a new and exciting experience for me, I learned how to develop an idea from stage from stage to develop an app with the help of the group members.
- Regarding this project documentation that help to learn & improve innovative thinking strategies. In methodology part was the main section that represent step by step works how the team follow the path to the last outcome. In that case having proper ideas about every other steps as well. In every method that team followed there was a more than one way to achieved that stage so then had to refer extra resources to make clear which one was the suitable for us. In that reading carry to the points that never learn from the presentation slides sometimes that is big opportunity to gather and helping to make prototype is a great point in this work before that had no ideas about specific software or anything about how to do it but then learn it as well.
- I learned how to deal with group members correctly, how to do a group work with group members as a team, how to manage my time correctly for a presentation and I learned how to solve problems and how to find innovative ideas for problems.
- This project was a whole new experience in my career, and I learnt few whole new things such as innovativeness, creativeness and I learnt how to work as a group by managing my time. And working as a group I found out that we need to respect other members ideas as well and accepting them.

Suggestions for future work (Recommendations)

- Add more bus routes to the map and provide and expand our service.
- We are thinking of using NFC instead of QR code scanning.
- Add Google verification for a more secure payment transfer.
- Real-time updates of the tracking system.
- Offline display of schedules and routes, so they can easily plan their journey from in offline mode.

Conclusion

Working on this project gave us this idea to create this app as we found out in our surveys listed below that people had a lot of feelings for this application but most of them were pleasant and subtle. Which we could encourage us to make more enhancements in the future to make it better. In conclusion and using all our points given above we are hoping that you will see the importance of Bus N' route and how it will help any user that travels in public transport.

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Appendices

Workload Matrix

Task No.	Task	Student Name & Number	Task handover date	Student signature.
1	<ul style="list-style-type: none"> • Introduction & description of the project • Table of content • List of tables • Conclusion • Ideas given for prototype 	ADHEEB MARIKKAR - 20200884	23/07/2021	<u>ADHEEB</u>
2	<ul style="list-style-type: none"> • Solution outline • Abstract • Ideas given for prototype 	NADUN WICKRAMANAYAKE – 20200928	23/07/2021	<u>NADUN</u>
3	<ul style="list-style-type: none"> • Methodology • Appendices • Ideas given for prototype 	HASITHA LAKMAL - 20200934	23/07/2021	<u>HASITHA</u>
4	<ul style="list-style-type: none"> • Creating Whole interface prototype by using Adobe XD. • Crafting Title page • Getting screenshot of the prototype • List of Acronyms or Abbreviations • References • Ideas given for prototype 	PRAVEEN NAVANJANA - 20200877	23/07/2021	<u>PRAVEEN</u>
5	<ul style="list-style-type: none"> • Requirements & Analysis • Evaluation • Ideas given for prototype 	SIDATH PERERA - 20200847	23/07/2021	<u>SIDATH</u>
6	<ul style="list-style-type: none"> • Innovative feature incorporated in the project • Acknowledgement • Ideas given for prototype 	NAVINDU CHRISHEN - 20200935	23/07/2021	<u>NAVINDU</u>

Meeting Agenda

Meeting date	Meeting agenda	Meeting time	Group members attendance
13/07/2021	Distributing topics & reminding Specification of IFD	45min	Everyone
17/07/2021	Understanding The procedure to follow each topic and discussion	1h 45min	Everyone
21/07/2021	Collecting information for some relevant topics by share screen.	1h 30min	Everyone
22/07/2021	Screen sharing the prototype and make correction some points and complete it	2h	Everyone
24/07/2021	Do corrections some points that in the documents file and organized them.	45min	Everyone
25/07/2021	Finalizing the document	12 hours	Everyone

Survey 1

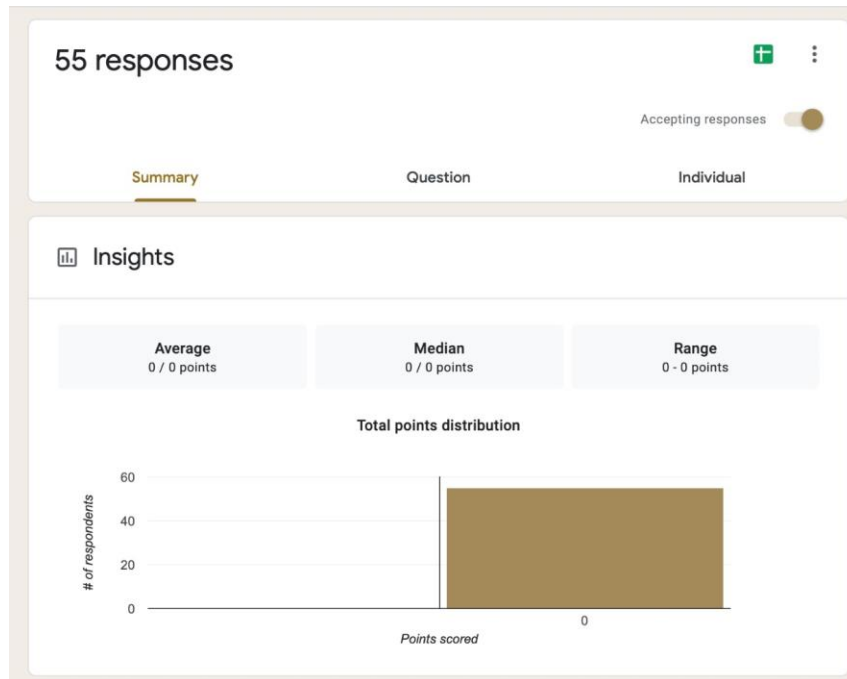


Figure 20 : survey(1) responses

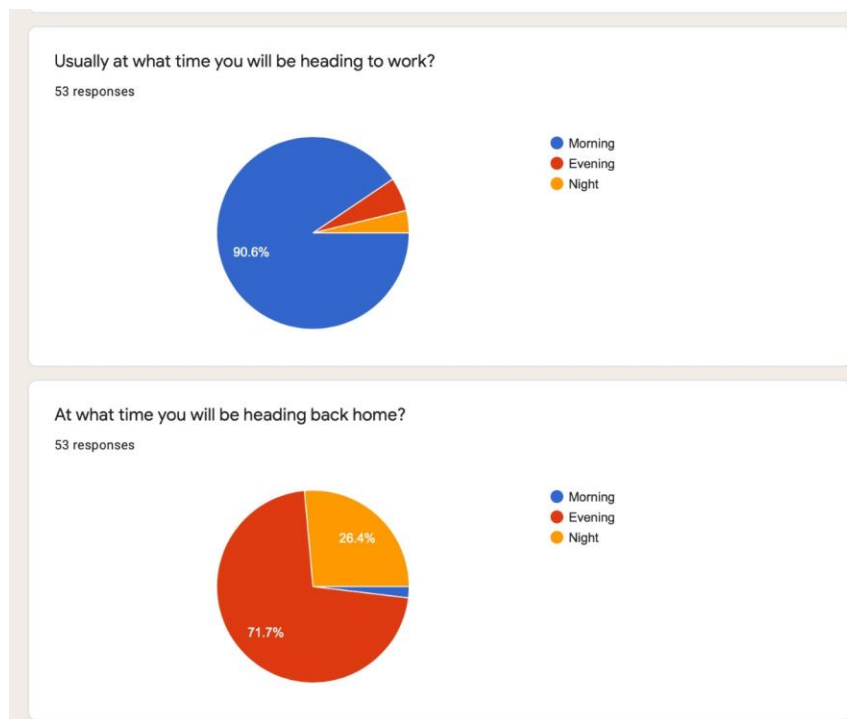


Figure 21 : survey(1) Q1 & Q2

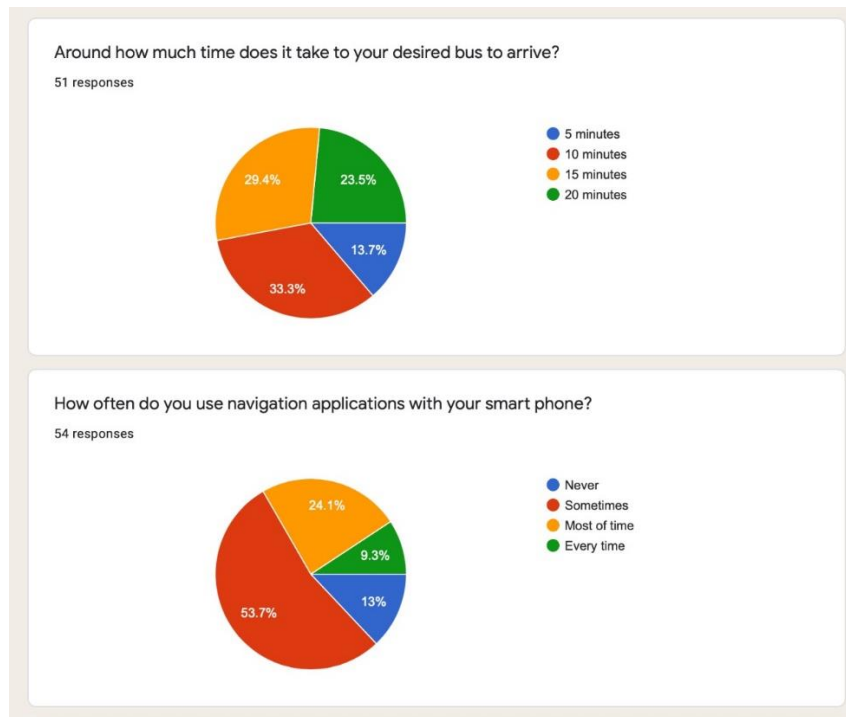


Figure 22 : survey(1) Q3 & Q4

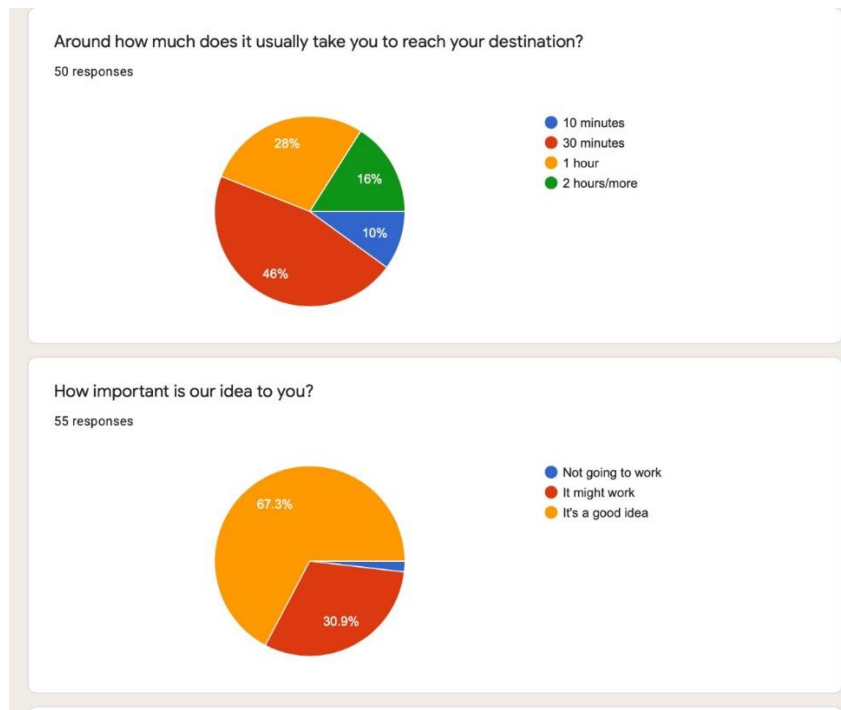


Figure 23 : survey(1) Q5 & Q6

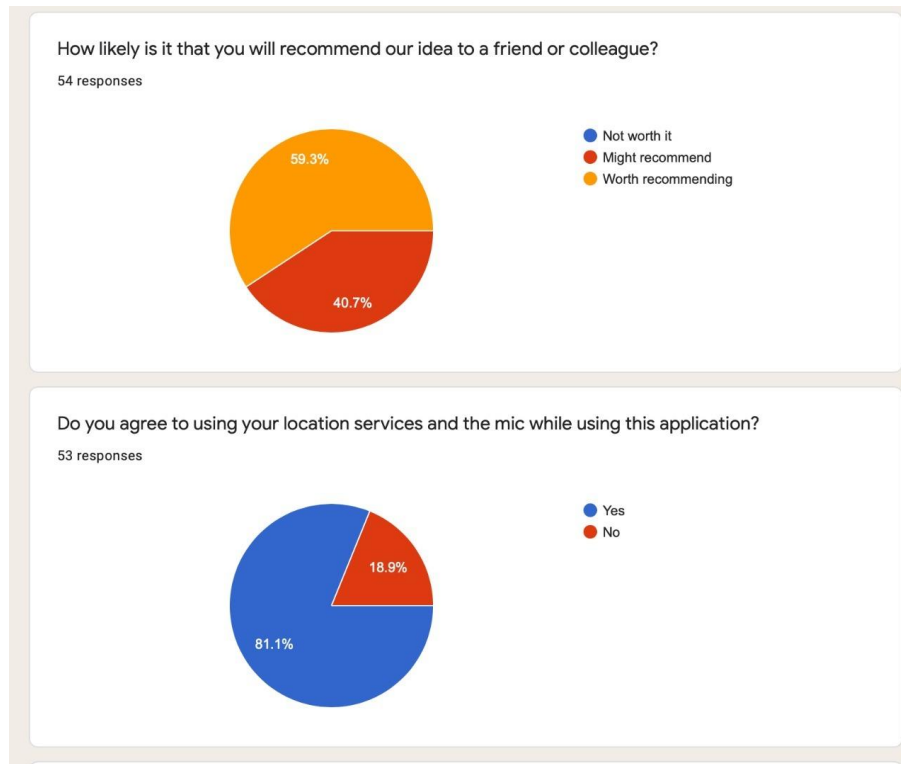
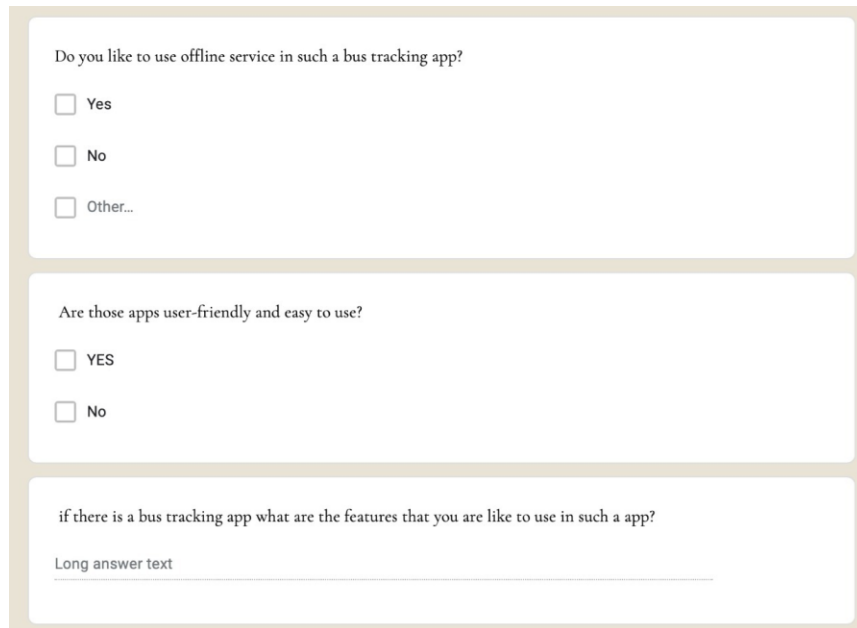


Figure 24 : survey(1) Q7 & Q8

- Here are a few comments we received from our survey
 1. This is a good idea. If you will make an app like this it will be very useful for us.
 2. the application is a really good idea
 3. Good work
 4. Please do this soon
 5. Try to do your best. Because this is a Useful idea.
 6. It's a good idea

Survey 2



Do you like to use offline service in such a bus tracking app?

☐ Yes

☐ No

☐ Other...

Are those apps user-friendly and easy to use?

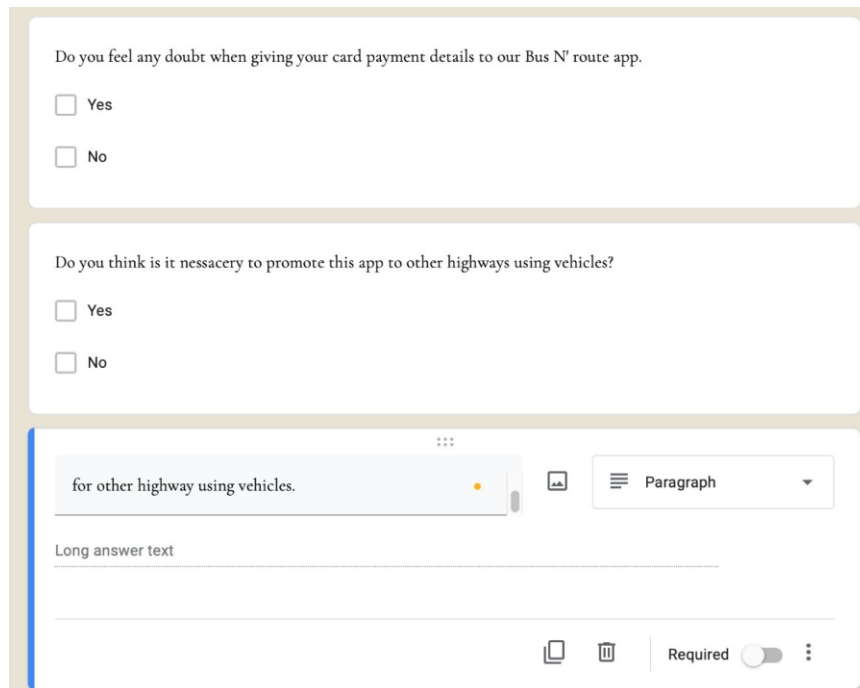
☐ YES

☐ No

if there is a bus tracking app what are the features that you are like to use in such a app?

Long answer text

Figure 25: Survey(2) Q1, Q2 & Q3



Do you feel any doubt when giving your card payment details to our Bus N' route app.

☐ Yes

☐ No

Do you think is it nessacery to promote this app to other highways using vehicles?

☐ Yes

☐ No

for other highway using vehicles.

Long answer text

Paragraph

Required

Figure 26 : Survey(2) Q4, Q5 & Q6

Have you experienced notification faculties while using other apps?

☐ Yes

☐ No

When you are using such a bus tracking app what are the problems that you are facing?

Long answer text

Do you think the live bus tracking feature is useful than the normal one?

☐ Yes

☐ No

Figure 27 : Survey(2) Q7, Q8 & Q9

Do these applications take a lot of CPU memory from your device? Yes No

☐ Yes

☐ No

is it helpful calling in tech support to help you fix your issue?

☐ Yes

☐ No

Have you had to pay more than once for your ticket where the application didn't register your payment?

☐ Yes

☐ No

Figure 28 : Survey(2) Q10,Q11 & Q12

Do you think it nessacery to promote this app to other highways using vehicles?

0 responses

No responses yet for this question.

If it is "no" can you send a reason why it wouldn't be useful for other highway using vehicles.

0 responses

No responses yet for this question.

Figure 29 : : Survey(2) Q13 & Q14

When you are using such a bus tracking app what are the problems that you are facing?

4 responses

- It most of the time gives wrong locations. Every time it is lagging.
- latency
- Payment Error
- Information accuracy is low

Do you think the live bus tracking feature is useful than the normal one?

0 responses

No responses yet for this question.

DO you feel any doubt when giving your card payment details to our Bus N' route app.

0 responses

No responses yet for this question.

Figure 30 : : Survey(2) Q15, Q16 & Q17

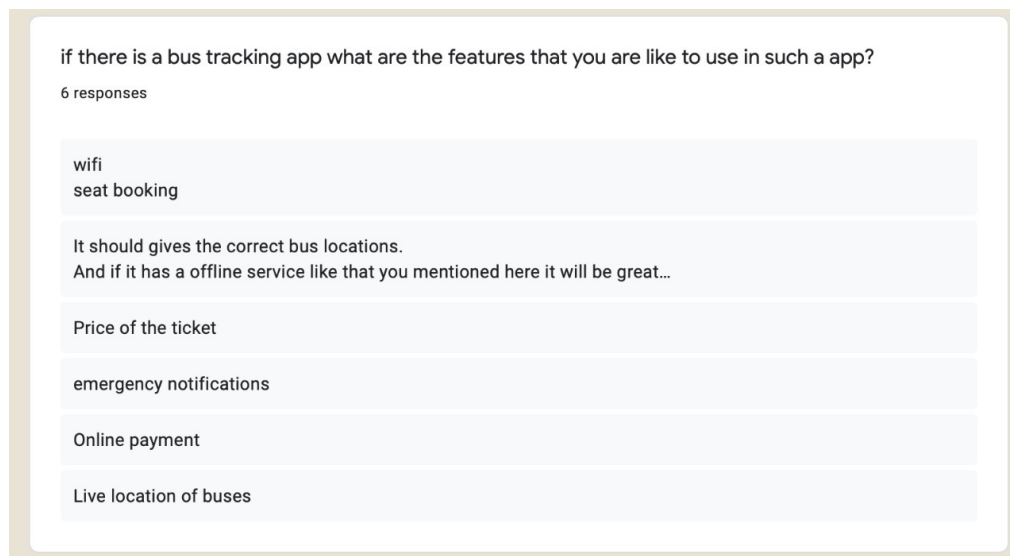


Figure 31 : Survey(2) Q18

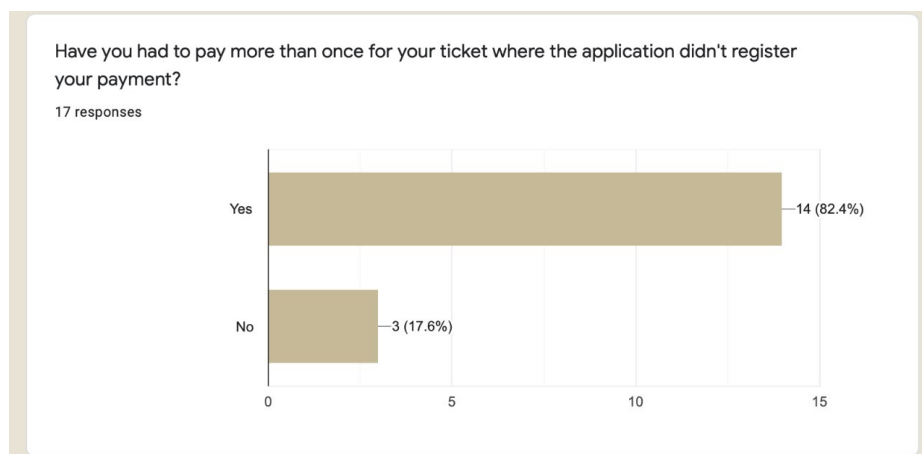


Figure 32 : Survey(2) Results 1

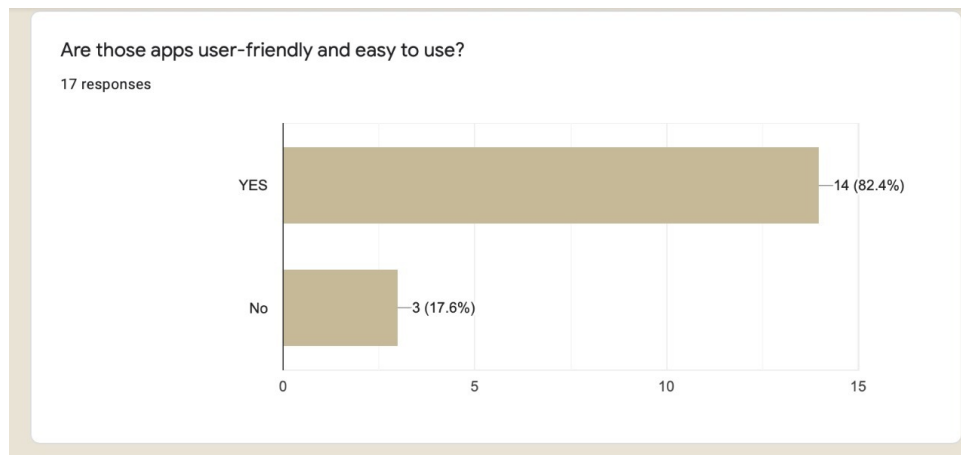


Figure 33 : Survey(2) Results 2

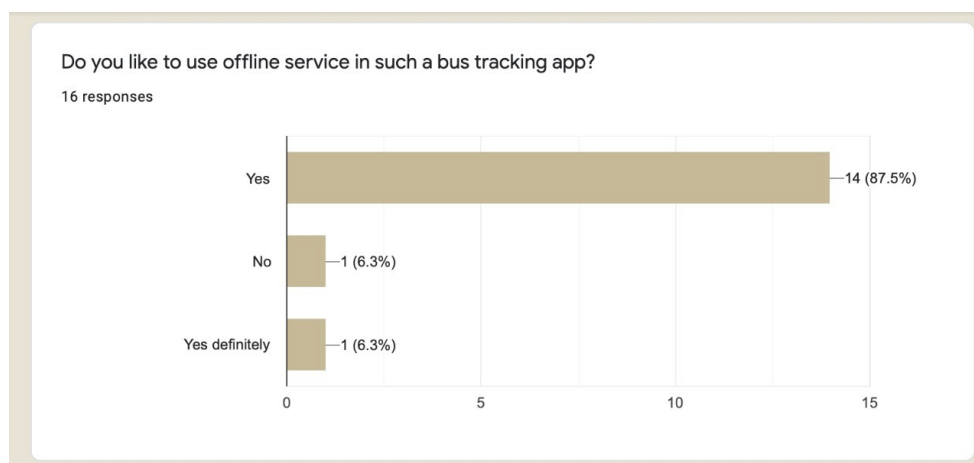


Figure 34 : Survey(2) Results 3

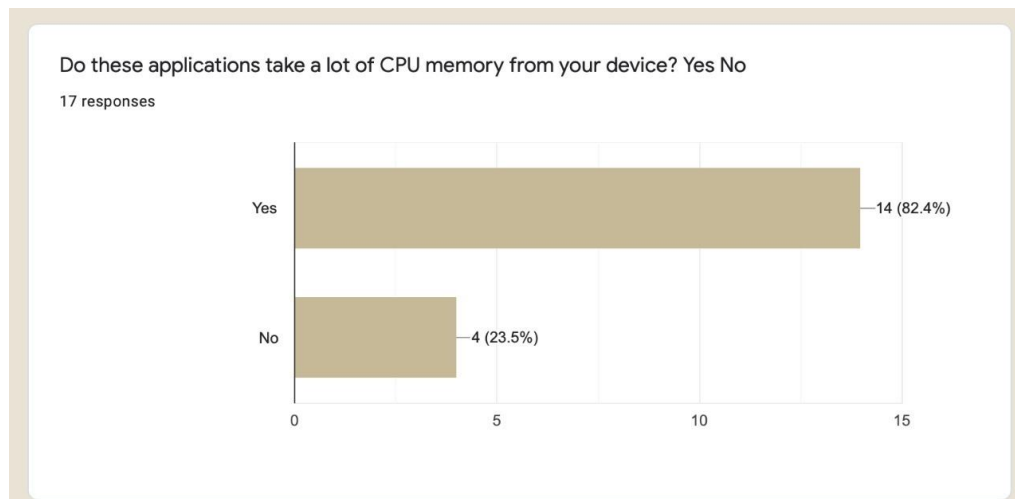


Figure 35 : Survey(2) Results 4

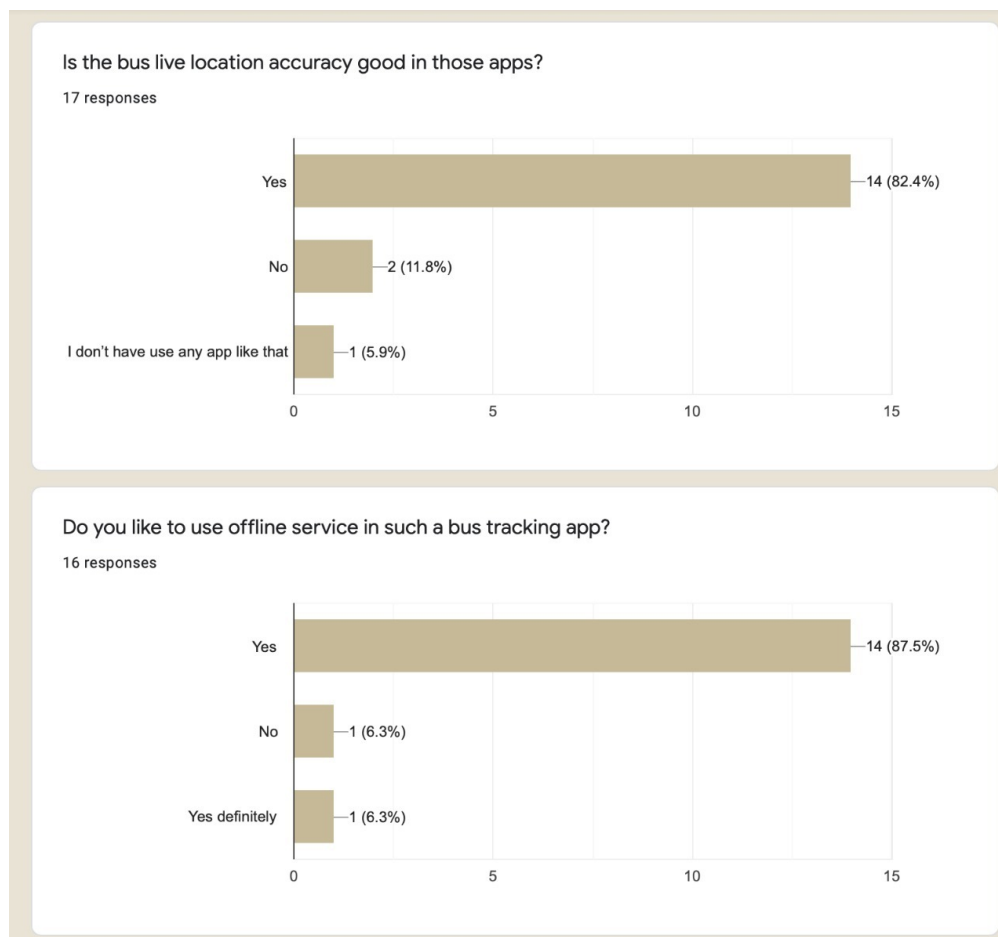


Figure 36 : Survey(2) Results 5 &6