Bilkent University

Department of Computer Engineering

Senior Design Project

BilRide

Project Specifications Report

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Contents

1. Introduction

In this part of the report, we will be introducing the project by giving a description of it and as well delving deep into its constraints of the project.

1.1 Description

The primary purpose of BilRide is to create a mobile app to solve the issues caused by the lack of ring shuttles at Bilkent University and the lack of hitchhiking culture. It also aims for a transformation in the transportation environment of Bilkent and its individuals and it is willing to create an opportunity for people who are cautious about hitchhiking, enabling people to socialize with others. In the meantime, the driver will not suffer from high gas prices, and the passengers will be able to arrive at the campus on time and in a much more comfortable way. Also, the carbon emissions due to private car usage will decrease.

Also, the BilRide app has additional features, such as the passengers can rate the driver, give feedback, and view the drivers' upcoming routes schedule if they set it. Also, they can filter for their preferences; for example, they can choose to filter only rides with fewer people in one car. Drivers can view which route they will take, how many passengers they want, whether there will be a tip (a certain percentage of the gasoline price), and the passengers' information, such as their profile photos, names, and pickup points. Besides, there will be a reward system for drivers and passengers who can earn cool badges or points for each completed quest. They can show off their badges on their profile or use the points to get a higher rank among the other participants. Even the passengers and drivers can form small teams among themselves and use them for exchanging information related to their travel, or they can choose or create a Spotify playlist that will be played during the journey.

In addition to carpooling, we wanted to touch on the ring problem. The excessive occupancy of the rings due to the increase in the student population in the number of rings in Bilkent and the delay caused by the harsh weather conditions and traffic make it difficult for the students to use the rings. With the ring tracking system, we can determine which station the rings are at, the data we will collect and the ETA times between the stops (using ML), the number of people in the rings, and the occupancy rate. Thus, when the passenger who wants to do carpooling cannot find a car and/or misses it, s/he will be able to choose to get on the ring thanks to the BilRide app.

Customer engagement innovation will be used to enhance the BilRide application. The passengers can improve the application via feedbacks about the timing of the shuttles, which creates more precise data for the ETA of shuttles, about the behavior of the driver, which creates a more secure application for Bilkent students, and about the application itself, which leads to the changes that make the application better. In other words, we will use the customer data to improvise our application.

1.2 Constraints

In this section of the report, we will be delving into the constraints of the project in more detail.

1.2.1 Economic Constraints

BilRide involves proposing an optional gas price split between the drivers and the hitchhikers. If gas prices increase in the country, more people may tend to share cars instead of using separate cars, which would increase our number of users. Oppositely, if gas prices drop, users and potential users may resent sharing their cars and lean toward using their own cars because they do not need to divide the gas prices with some hitchhikers, as is the case with high gas prices.

1.2.2 Health and Safety Constraints

There may be COVID-19-positive users who want to use the carpooling feature of our project during the COVID-19 period. This creates a risk of exposure for other users sharing a car with a COVID-19-positive user. Thus, the application will warn users in case of such a situation.

Carpooling involves people who may not know each other sharing the same car, picking hitchhikers up from a place, or dropping the hitchhikers somewhere. There may be some places that hitchhikers are at or need to go that are not safe. Some individuals may have previously taken serious disciplinary action in the role of driver or hitchhiker that could result in dangerous safety-related situations for other users. The application will try to reduce these kinds of situations.

1.2.3 Social Constraints

Users may resist sharing a ride with people who they do not know or with users who did not provide any information about themselves. Similarly, users may choose to share the ride with a user of a certain gender due to personal preference. The application will have user-specific options that take these preferences into account.

1.2.4 Environmental Constraints

Because using public transport reduces the carbon footprint for an individual, BilRide needs to offer to use ring buses instead of car-sharing when both are available for the user at the same time for a road [1]. In addition, traffic and noise pollution can be reduced if more people use public transportation instead of shared cars.

1.2.5 Political Constraints

Various safety measures should be taken to ensure the safety of passengers and drivers who want to travel via BilRide and to minimize possible dangerous conditions. For this reason, each user using the BilRide app is required to accept the Personal Data Protection Agreement in terms of privacy.

KVKK aims to prevent the non-purpose processing or misuse of personal data, prevent the violation of individual rights, and ensure data security. As an example of situations where KVKK is required, drivers may unintentionally learn the place of residence of the passengers they take to their cars while going through the route they have determined. That may cause the passengers to feel uneasy and unsafe and to think that there is a situation that violates the privacy of their private life. Likewise, the passenger can learn the driver's residence address, which may bring similar problems to the driver's mind. Users will feel more secure as there will be a mutual agreement with using KVKK.

In addition to the security issues users may experience with their place of residence, the application reveals some user data, such as location, name, ID, and email; For this reason, KVKK (Personal Data Protection Law) becomes a necessity for the use of this data. Also, since we will use Bilkent University's student data, we need to follow the rules which the university determines. Furthermore, as a plan, we need to follow the other universities' rules if we can extend the application to other universities in the future.

1.3 Professional and Ethical Issues

The potential ethical issues of the BilRide application can be examined under two subheadings, gender norms and privacy of life. Gender inequality has an impact on every aspect of our lives. For example, when buying tickets on road trips, the website only allows the customer to sit next to the same gender. Similarly to the example, a situation may arise in the BilRide application where some users only want to get into their fellow's cars or put them in their car. In this case, the gender data of the users must be kept in the BilRide application. Thanks to the gender information that can be displayed, users will be freer to make the choices they want. Another ethical issue is the privacy of life. In the case that the passenger's home is at the end of the ride, the passenger will inevitably share the home address with the driver. This can cause privacy issues. However, our project will include a feedback and complaint system in order to detect the drivers violating the privacy policy that users have to approve when logging into the BilRide application. Since users will create their membership with their Bilkent id numbers, the student with a complaint can be easily found from the university database and can be permanently banned from the application according to the conditions.

1.4 Similar Technologies

Though there is not precisely the same application as ours in Turkey, some applications use nearly the same logic as our application worldwide. However, residents of Turkey do not use these applications for now, so our competitors are limited in Turkey. Though, if we can expand the app outside of Turkey, they can be a competitor for us. Besides, unlike other transportation apps, BilRide focuses on bringing transformation to Bilkent transportation by completely solving transportation problems with carpooling and ring tracking features.

1.4.1 BlaBlaCar

BlaBlaCar allows users to book a ride. So, the driver does not travel alone, and the passengers have no difficulties finding a way to go [2]. The passenger selects the point of departure, destination, date, and number of people. Then, they choose from the list of drivers they depart from and go to the nearby places. After the ride, the passenger can rate the driver and give feedback [3].

Our application is nearly similar to BlaBlaCar. However, in our application, we extend the pickup choice of the passenger. BlaBlaCar offers only pickup points to the users. However, in our application, the passenger can also be picked up from the current location and the pickup points. Besides, we want to bring to the market a sustaining innovation by adding unique features. These are checking if the user is a Bilkent University member, providing both carpooling options and ring bus ETA's, environment for socializing with exchanging information about their ride, Spotify playlists, and badge system.

2. Requirements for Project

In this section of the report, we will be discussing the requirements of the project in detail. We will first start with the functionalities of the application and deliver them to the functionalities of the end user who uses the application.

2.1 Functional Requirements

In this section of the report, we will discuss the project's functional requirements in detail. This part can be divided into two sides: functionalities of the application and the server. Since there are two user types, application functionalities can also be divided into the driver and passenger sides.

2.1.1 Functionalities of the Application

2.1.1.1 All Users Functionalities

- The application should provide users with the logging-in and/or signing-up options.
- The application should provide users with a map view, including some information, such as routes, and the current location of the cars, passengers, and shuttles.
- The application should provide a customizable user profile page for all users.
- The application should show the progress for each badge to each user.
- The application should show the earned badges in the user profiles.
- The application should show users how much gasoline they save after each ride and how much gasoline they save in total on the profile page.
- The application should allow all users to create a team with other users to create a common Spotify playlist and chat with each other before the ride.

- The application should allow all users to join the open teams or private teams with an invitation.

2.1.1.2 Passenger Functionalities

- The application should show nearby routes of the drivers to the user from the map.
- The application should show the route, available quota, gender of the car's other passengers (if it is a problem for the user), whether the gasoline price is needed, the driver's rating, picture, and name for each nearby car to the user.
- The application should allow passengers to filter the routes according to their gender preferences, the gas price and the total number of passengers in the car, and the driver's rating.
- The application should allow passengers to choose the gender of the other passengers (if they need to) they wish to travel with.
- The application should allow passengers to send requests to nearby drivers with a selection of pickup points or their current locations.
- The application should allow passengers to rate the driver and give feedback about the journey after the ride.
- The application should show the current approximate location of the shuttle to the user.
- The application should show the occupancy rate of the upcoming shuttle.

2.1.1.3 Driver Functionalities

- The application should show the current requests from the passengers to the driver with selected options, such as their pickup points, the gender they prefer to travel with, and whether they pay some portion of the gasoline price.
- The application should suggest the driver's route with the least gas consumption.

- The application should allow drivers to choose the number of people they want to travel with and the route, then inform the system about the choices.
- The application should allow drivers to see the passengers' Covid-19 status.

2.1.2 Functionalities of the Server

- The system should keep the information about all drivers, such as name, Bilkent ID number, rating, and routes informed to the app.
- The system should keep information about all passengers, such as name, Bilkent ID number, and stops where they want to join the ride.
- The system should keep information about the shuttle, such as the estimated location and occupancy rate.
- The system should keep the information about the teams, such as the member information.
- The system should keep the requests for joining the team.
- The system should keep the location information about each user in case of emergency, such as accidents.

2.2 Non-Functional Requirements

In this section of the report, we will discuss the non-functional requirements of the project in detail. We choose the non-functional requirements in the scope of our application's domain.

2.2.1 Usability

Usability is an important non-functional requirement for our application because our application aims to reach everyone in the university. The application should be easy to use by design. All of the main functionalities of our application should be accessible by at most 3 touch gestures. The user interface will be designed to be friendly to people from all backgrounds, regardless of their understanding of technology. The application should not require any previous experience, and it should be easy to learn for novice users. The user should feel satisfied while using the application with intuitiveness.

2.2.2 Supportability

Supportability is another important non-functional requirement for our application because our application should be able to work as designed on different platforms. The application should be able to run on both Android (10.0 and above) and iOS (11.0 and above) operating systems. The application should be able to run smoothly with average hardware requirements. The application may require external installation of Google App Services for Chinese versions of some Android Mobile Phones.

2.2.3 Maintainability

The application should be developed with future improvements and extensions in mind. Object Oriented Software Development techniques will be used during implementation. The application's codebase will be utilized with the version control tools like Git, which enables our team to work on multiple branches. That's how our team can continue development while the application is still usable. The deployment of our application will be automated with the help of GitHub Actions; when a new release happens, the action will automatically distribute the app package to the remote servers where our users can update their apps on the air. That is how the application will be easier to maintain.

2.2.4 Performance

The application should be loaded from a cold boot in less than thirty seconds. In-app pages should load in under three seconds. The application should send the user's information to the application's backend servers in less than 3 seconds.

2.2.5 Security

In our application, there will be a database in which we store all the user's personal data such as; student id, full name, password, mail address, route information, etc. Sensitive ones, such as passwords, should be stored encrypted with a non-reversible hash function in the application database. Other sensitive information related to the user itself will be stored and processed according to the law requirements such as KVKK and GDPR. The backend functionality of the application should be only accessible by the application itself. The application should sanitize dangerous codes from the user-inputted fields and have a rate-limit functionality to prevent DoS attacks. The password should be at least eight characters in length. The application should automatically disable the user's account if the

user tries to log in with the wrong password three times. The application should require re-login if the user has not opened the application for more than five days or the user changes password. Since the application will not process transactions over it, there will be no further security checks other than the implementation guide of 3rd party payment provider. The application package will be compiled with some obfuscation techniques as best practices to prevent the decompilation of our application package.

2.2.6 Scalability

Since the application's implementation process was designed considering the scale-out approach, scalability would not be difficult. The only thing we may have to scale is the backend API, and the database in the future depends on the user count we will have. The application backend will not use microservice for simplicity, but we will try to Dockerize the API to enhance security and scalability.

3. References

[1] “Shuttles vs. Uber and Lyft: What’s Better for the Environment?”. https://www.pcma.org/shuttles-versus-uber-lyft-better-environment/. [Accessed: Oct 16, 2022]

[2] “Hakkımızda”. https://blog.blablacar.com.tr/about-us. [Accessed: Oct 16, 2022]

[3] “BlaBlaCar Hakkında”. https://support.blablacar.com/hc/tr/categories/360002754379-BlaBlaCar-hakk%C4%B1nda. [Accessed: Oct 16, 2022]