



# **CS 492: Senior Design Project**

## **Final Report**

### **Toproffer**

Doğacan Kaynak

Burak Kırımlı

Mert Çerçiler

Servan Tanaman

Yiğit Kutay Gülben

**Supervisor:** Halil Altay Güvenir

**Jury Members:** Hamdi Dibekliolu, Varol Akman

**Innovation Expert:** Burcu Coşkun Şengül

# TABLE OF CONTENTS

<b>1. Introduction</b>	<b>3</b>
1.1 Description of the Report	3
1.2 Why Toproffer?	3
1.3 Toproffer Application	4
<b>2. Requirements Details</b>	<b>5</b>
2.1. Functional Requirements	5
2.1.1. Customer	5
2.1.2. Restaurant's Owners	6
2.2. Non-Functional Requirements	7
2.2.1. Maintainability	7
2.2.2. Adaptability	7
2.2.3. Performance	8
2.2.4. Usability	8
2.2.5. Reliability	8
2.2.6. Installability	9
2.2.7. Security	9
2.3. Pseudo Requirements	9
<b>3. Final Architecture &amp; Design Details</b>	<b>10</b>
3.1 Database Architecture	10
3.2 Design Architecture	11
<b>4. Development/Implementation Details</b>	<b>11</b>
4.1 Front-end Details	11
4.2 Back-end Details	12
<b>5. Testing Details</b>	<b>13</b>
5.1. Testing Restaurant Owner Side of Toproffer	13
5.1.1. Create Campaign Feature	13
5.1.2. My Campaigns Feature	14
5.1.3. History Feature	14
5.1.4. Restaurant Profile Feature	14
5.1.5. Confirmation Code Feature (For Restaurant Owners)	15
5.2. Testing Customer Side of Toproffer	15
5.2.1. Notifications List Feature	15
5.2.2. Map Feature	15
5.2.3. Confirmation Code Feature (For Customers)	15
5.2.4. Restaurant List Feature	16

5.2.5. Campaign Details Feature	16
5.2.6. Customer Profile Feature	16
5.2.7. Login and Signup Feature	16
<b>6. Maintenance Plan and Details</b>	<b>17</b>
6.1. Security & Code Maintenance	17
6.2 Design & Feature Enhancements	18
6.2.1 User Scenario	19
<b>7. Other Project Elements</b>	<b>20</b>
<b>7.1. Consideration of Various Factors</b>	<b>20</b>
7.1.1 Consideration of Public Health	20
7.1.2 Consideration of Public Safety	21
7.1.3 Consideration of Public Welfare	21
7.1.4 Consideration of Global Effects	22
7.1.5 Consideration of Cultural Effects	22
7.1.6 Consideration of Social Effects	22
7.1.7 Consideration of Environmental Effects	22
7.1.8 Consideration of Economic Effects	23
7.1.9 Table of Consideration of Various Factors	23
<b>7.2. Ethics &amp; Professional Responsibilities</b>	<b>24</b>
7.2.1 Customer User Data	24
7.2.2 Commercial User Data	25
<b>7.3. Judgments &amp; Impacts to Various Contexts</b>	<b>25</b>
<b>7.4 Teamwork &amp; Peer Contribution</b>	<b>28</b>
<b>7.5 Project Plan Observed &amp; Objectives Met</b>	<b>32</b>
7.5.1 Project Plan Observed	32
7.5.2 Objectives Met	43
<b>7.6 New Knowledge Acquired &amp; Learning Strategies Used</b>	<b>44</b>
<b>8. Conclusion &amp; Future Work</b>	<b>45</b>
8.1. Conclusion	45
8.2. Future Work	45
<b>9. Glossary</b>	<b>46</b>
<b>10. References</b>	<b>49</b>

# 1. Introduction

## 1.1 Description of the Report

The Final Report provides a brief introduction related to Toproffer Application. The report also includes the final architecture and design of Toproffer's system and the final status of the project. Refined analysis and requirements, and the details of Toproffer's design are considered in the report. The project team focused on this report to describe Toproffer's system, detailed implementation, and test information.

Moreover, Consideration of Various Factors part describes how various factors affected Toproffer project design and development. Each factor is considered separately in that section. Ethics and Professional Responsibilities explain ethical issues for both customers and the restaurant owner's side. The team members recognized, observed, and fulfilled these issues during the project. Judgments and Impacts in Various Contexts part includes the information related to global, economic, environmental, and societal contexts which are the impact of the system.

There is also a part which is Teamwork and Peer Contribution related to the participation of the team members in the project and criticism of the team environment. Project Plan Observed and Objectives The Met part describes what we initially set in the project-plan and when and which level these milestones are met with the initial project plan. New Knowledge Acquired and Learning Strategies Used part explains the new knowledge that the team members acquired, applied during the project, and the learning strategies the team used while acquiring that knowledge.

## 1.2 Why Toproffer?

In recent years, the Turkish economy faces several problems and it is impossible to not be affected by this situation. One of the significant results of this problem is inflation and as a result of increasing the ratio of the inflation Turkish Lira

lost its value against the other currencies and became much weaker in the market. By the domino effect, all kinds of products and all kinds of industries have been explicitly increasing. Specifically, the increasing price of the food and beverage industry is crucial in peoples' daily lives.

Socializing is one of the most important parts of peoples' daily lives. The economic crisis that Turkey faces, socializing becomes a burden on one's shoulder. In order to decrease the negative effects of economic problems for both customers and restaurant owners, restaurants have special campaigns in order to attract their potential clients to visit their restaurants. Specially under-sold products and low priced products get placed on the campaign lists for a specific time interval. Making the campaigns are easy for the restaurants but the difficult part is to announce them and from the customers' point of view to know which campaign takes place on which restaurant. There is no way to announce restaurant campaigns to a social platform except social media.

Therefore Toproffer is an idea to help people to save their time and preserve their economy with less effort compared to searching restaurants blindly on the streets while socializing. In a sense, Toproffer will bring the streets' view in a similar way as Google Maps does to the users, in addition to that it will act as assistance for finding campaigns related to restaurants.

### **1.3 Toproffer Application**

Toproffer application has two types of users which are restaurant owners and customers. Restaurant owners can create two different types of campaigns which are permanent campaigns and momentarily campaigns. A permanent campaign has no time limit and it is always available in a specific time interval on a day for users. On the other hand, momentarily campaigns are created by restaurant owners when their restaurant has fewer customers than usual. From the user point of view to take attention of the customer and let them think that is like a game to catch the specific time interval for the campaign. At the end of the game restaurant owners can save their money by the help of Toproffer. This campaign can be created by the restaurant owner for a limited hour such as one hour, two hours, etc.

Restaurant clients can easily observe the available campaigns that are created by the restaurant owners by using the Map and also by searching and selecting bookmarks. Users who are customers can follow the restaurants they like. By following them, they can get notifications related to campaigns created by the following restaurants.

Moreover, Toproffer is going to be released for Android and IOS. So far, Savor Döner, Federal Coffee Company, Lokal'71, Sözeri Pide & Kebap, Back House, Route, Nil Rock Bar, Zone Bar, Gaga Manjero, etc. agreed to work with us and there are lots of places that we are connected to. The application features, key points, important abilities will be discussed in detail below sections.

## **2. Requirements Details**

### **2.1. Functional Requirements**

#### **2.1.1. Customer**

- Having a valid email address that has not been used before should be enough to sign up for the Toproffer.
- Toproffer sends notifications (through user permission) about the campaigns in the city the user is in. In order to get the location, the information created by the Toproffer itself should be used.
- Toproffer should be able to show the restaurants serving around the close-by areas for the users.
- Customers should be able to see the campaigns that are promoted by the restaurants by tabbing on the restaurants' names that are appearing on the map. Campaign content will be seen on the screen.
- Users are able to follow the restaurants in order to be able to get a notification if there is a change occurring in campaigns such as adding a new campaign or changing the content.

- Toproffer supports the navigation on the map by sliding the screen. Also, users can zoom-in and zoom-out on the map.
- Users should be able to use the navigation feature of Toproffer in order to get a direction as a path to follow towards the restaurant.
- Users can see the restaurant's information deducted with the marker on the map. Their information about the campaign, address, and name specified below the screen.
- The location of the user should be shown on the map in a distinct way, so the user can identify the location of him/herself on the map.
- For some special occasions, users will have to verify code in order to be able to benefit from those campaigns.
- Customers can select a category depending on their interest among the types of restaurants. This selection occurs on "Interest Selection Page".
- By using the information of the city that the user is living in, customers can see all restaurants that are in the same city with customers.

### **2.1.2. Restaurant's Owners**

- Restaurant owners will have all the features that a restaurant client has.
- Restaurant owners should be able to instantly put their desired goods to the campaign within the desired time interval. Customers should verify the code verification to apply those campaigns.
- Restaurant owners should be able to create permanent campaigns for our system.
- Restaurant owners will be able to put the campaign of combined goods together with the same campaign within the desired time interval.
- By the help of line charts, restaurant owners are able to choose optimum campaigns to maximize their profit.
- Restaurant owners will be asked if he/she is sure about the campaign content before he/she created.

- Restaurant owners can confirm the campaign code that customers used, so that the information that customers benefited from this campaign was added to the customer's profile.
- Restaurant owners can see their active campaigns and old campaigns from their user profile page.
- Restaurant owners need to give the restaurant's category. It will define the category of restaurant.
- Restaurant owners are able to edit and delete their created campaigns.
- Restaurant owners should be able to create permanent campaigns for our system and that will not require code verification but they should be in contact with us.

## **2.2. Non-Functional Requirements**

### **2.2.1. Maintainability**

- The architecture of Toproffer's system is easily maintainable, which means errors and bugs can be easily found and fixed.
- The system of Toproffer can be easily updated. It can be added new features and can be removed unwanted features easily with the help of Toproffer's system architecture.
- Since Toproffer has written with a native language, it is compatible with both IOS and Android and this helps us to release new versions easily.

### **2.2.2. Adaptability**

- Toproffer implemented in a way that it can be adapted to the changes in Android and IOS systems.
- Since Toproffer has written with a native language, it is compatible with both IOS and Android.



### **2.2.3. Performance**

- In a project, system response time is one of the most important properties. With the help of Toproffer's architecture, its response time is going to be at most 500 ms.
- In order to increase the performance of Toproffer, new libraries and technologies, which are easily integrated into existing systems, are going to be searched regularly.
- Since Flutter is the best framework among other cross-platform frameworks in performance wise. There would be no problem in the performance of the application.
- Toproffer is going to be a user-friendly application. Since Toproffer is going to be used for ages from 7 to 70, its design needs to be easily understandable. The design of Toproffer is planned to implement in a way that every user can easily understand and use it without any help.
- Colors used in the application's screens selected in a way that will not disturb users. We used soothing colors for the application.

### **2.2.4. Usability**

- Toproffer is a user-friendly application. Since Toproffer can be used for ages from 7 to 70, its design needs to be easily understandable. Design of Toproffer is implemented in a way that every user can easily understand and use it without any help.
- Colors used in the application's screens are selected in a way that it doesn't disturb users.

### **2.2.5. Reliability**

- To prevent possible errors and bugs that can occur after Toproffer is released, it is going to be tested many times before the release date.

- In case of having any problem, users can contact with an email provided on the application.

### **2.2.6. Installability**

- When the new version of Toproffer is released, every user that has any old version of Toproffer can install the new version.
- It can be downloaded easily from Google Play and App Store.

### **2.2.7. Security**

- The system of Toproffer protects sensitive data depending on KVKK laws.
- Toproffer uses a server that has successfully completed the ISO 27001 and SOC 1, SOC 2, SOC 3 evaluation process, and some services have also completed the ISO 27017 and ISO 27018 certification process.
- Firebase services encrypt data in transit using HTTPS and logically isolate customer data.
- Before sharing personal information of a user, Toproffer ask for the appropriate permissions first.
- Depending on the user's request their personal data is deleted. So that it's not going to be used after all.
- The user's location will not be shared with any restaurant or other users.
- The user's information on votes on health criteria won't be seen by the restaurant owner. The restaurant owner can only see an average of votings on health criteria.

## **2.3. Pseudo Requirements**

- Toproffer released for both Android and IOS operating systems.
- Genymotion will be used as an emulator for Android devices and Appetize.io will be used as an emulator for Mac devices.
- The project was completed before May 25, 2020.
- The number of developers for implementation is limited to 5 people.

- The application has more than 15 restaurant owners in normal circumstances but since pandemic started we couldn't keep in touch with owners.
- Campaigns can be added to the map within at most 5 seconds.
- Recommendation chart provided if the campaign code used in the application for the restaurant owner. It will be an informative chart.

## 3. Final Architecture & Design Details

### 3.1 Database Architecture

We used Google Firebase for the database in this project, which uses NoSQL queries. Since NoSQL queries are composed of JSON objects and they are not relational and it is schema-less, we can not represent our database with a diagram, but we simply created a database architecture for our project.

NoSQL databases can be briefly designed as documents and collections. Documents are documents of the collections, and collections are storing the data as JSON objects. Although NoSQL databases can not be represented with diagrams, we can represent our data models separately, as it is shown in the following figure.

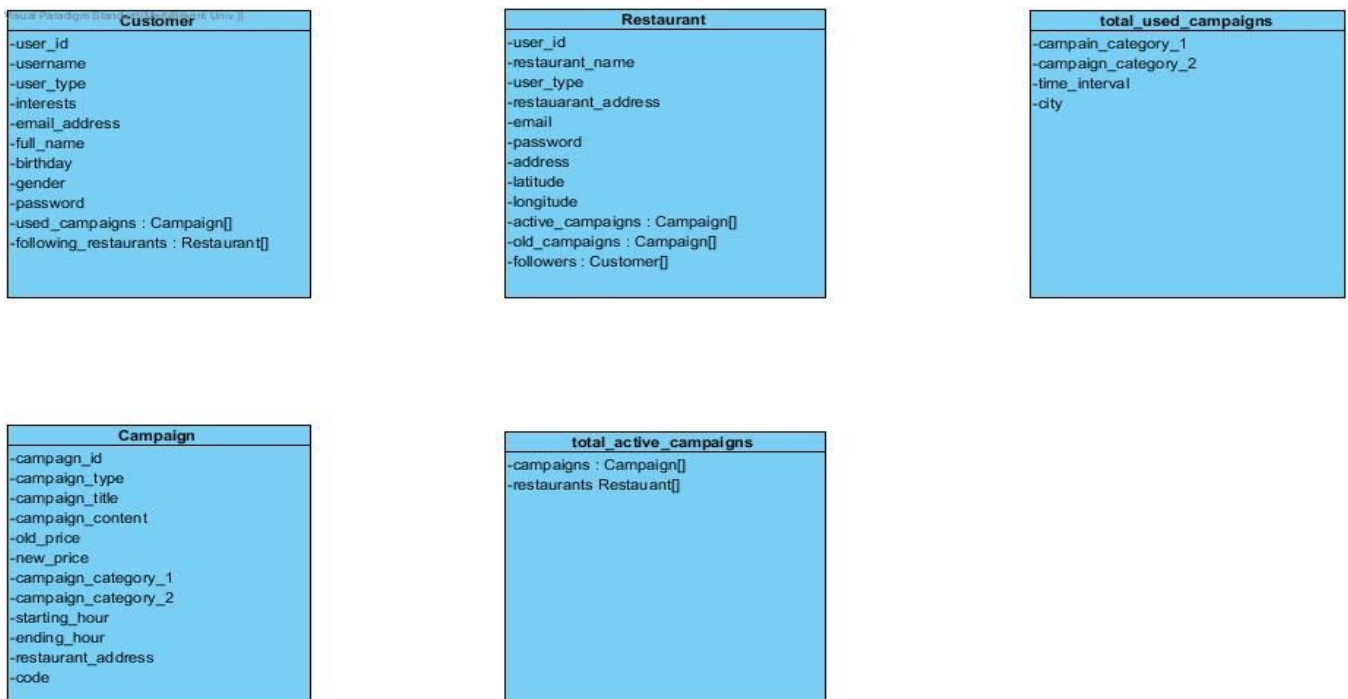


Figure 1: Data models of our NoSQL database (JSON Objects).

## 3.2 Design Architecture

We used a model-view-controller as a design pattern and built this project with this approach. Since we were building a mobile application, we have a lot of pages as a view part of this architecture, lots of controller pages for managing these pages with their interactions with the database, namely Blocs, and a couple of model pages to make the database operations easy and ordered. We had three service classes as web services, one of them was for the getting authorized user, other one was for creating paths for the database, and one of them was for arranging all the pushing information to database and retrieving information from the database. Our controller pages were connected with the database services, and model and view pages. Also, model pages were connected with controller pages and view pages were connected with controller pages, like a regular model-view-controller architecture.

## 4. Development/Implementation Details

### 4.1 Front-end Details

Flutter framework and Dart language were used in Toproffer's front-end implementation. Reasons why we choose Flutter framework and Dart language are listed below:

- To develop an application for Android and IOS devices, you need to develop 2 different applications. The most beneficial advantage of Flutter is, with one codebase we can develop and publish applications for both Android and IOS.
- Flutter has a hot reload feature which helped us to see the changes instantly that we made.
- There is a huge Flutter and Dart community on the internet which can help us to find a solution to our problems that we faced while developing our application.

- We wanted to use the most modern language and framework to build our application because after our senior project we can use our knowledge while developing other applications and while we are applying for a job.
- While developing our application we used a wide range of widgets that Flutter provided us. With using these widgets everyone can build his/her application how he/she wants because there are huge amounts of widgets.
- Dart language has similar features with the Java language we learned in the first year at university. With the help of these similarities we learned Dart easily.

## 4.2 Back-end Details

In this section, the essential and important details of the back-end part of our project are mentioned. The structure of our back-end code and important features are stated, to give an idea of how our back-end code was written in this project.

We used Firebase to store our data on the server. Firebase uses a realtime database and cloud server for storing the data. Firebase was a good pick for us because it has a good match with Flutter framework, since they are both Google technologies. Since Flutter framework uses Dart programming language, which is also a Google technology, all the web services, all the types of the communication with the database was written in Dart. Firebase provides good features with the Dart language, especially in the authentication part of our system. It has several libraries that made our job very easy in authentication of users although authentication is one of the most annoying parts of common projects, for most of the people. Also, there was no pressure on working with a realtime database in our application since we were able to use streams easily in Dart language and it had a good compatibility with Firebase.

While the back-end codes were written in our project, we wrote a class named 'database.dart' that performs all the interactions from our controller classes to the database, such as creating a campaign, creating a user, getting data from the database, etc. The functions of this class, namely our service class, were able to be called from our pages to perform desired interaction to the database. All these

operations, that are calling the functions from our service class and the functions in the service class, were both asynchronous, to avoid collision data. Also, there are both stream and non-stream operations in accordance with the need of working with a realtime database, in our service class. We also generated a class that specifies the database locations of data operations that perform in the service class. For example, when we need to push or retrieve data from the database using our service class, we have to give the locations of the data in the database using the specified path in our path class.

In order to write a clean and arranged code and obey the architecture, we divided our project into model, view and controller. For the backend code, we worked with both the model and controller part of this project. We created some model classes according to our needings in that project, and controller classes, namely Blocs, to store the logic code of our pages. We call the model classes in our Blocs and make logic and controller operations in that class then either providing output to view classes or getting the inputs from them.

Furthermore, we used inherited widgets, namely providers, to not pass around the stuff that we need all over the project, to call them just where we need, instead. We created our providers in the beginning of database creation, or user authentication, then we just called them where we needed to access the database or current authenticated user.

## **5. Testing Details**

To test Toproffer, first, we listed all features of Toproffer then divided them to our team members. Work distribution lists are written below.

### **5.1. Testing Restaurant Owner Side of Toproffer**

#### **5.1.1. Create Campaign Feature**

Doğacan Kaynak tested creating the campaign feature of Toproffer. In the “Campaign Creator” page restaurant owners can create their campaign with

providing related information about the campaign such as campaign type, campaign content etc. Doğacan tested this feature and he reported that creating campaign features is working correctly, restaurant owners can create campaigns and the system will save it to our database correctly.

### **5.1.2. My Campaigns Feature**

Doğacan Kaynak tested my campaigns feature of Toproffer. In the “My Campaigns” page, restaurant owners can display their campaigns. Doğacan tested this feature and he reported that my campaigns feature is working correctly, our system gets restaurant’s campaigns from database and restaurant owners can see campaigns on the “My Campaigns” page.

### **5.1.3. History Feature**

Doğacan Kaynak tested the history of Toproffer. In the “History” page, restaurant owners can display their old campaigns. Doğacan tested this feature and he reported that history feature is working correctly, our system gets restaurant’s old campaigns from database and restaurant owners can see their old campaigns on the “History” page.

### **5.1.4. Restaurant Profile Feature**

Servan Tanaman tested the profile feature of Toproffer. In the “Profile” page, restaurant owners can display their active campaigns, old campaigns and a restaurant owner can use the settings tab to change the restaurant’s profile (editing description, editing profile photo etc.). Servan tested this feature and he reported that the profile feature is working correctly, our system gets restaurant’s old campaigns and active campaigns, and a restaurant owner can change restaurant information with using settings and our system updates it.

### **5.1.5. Confirmation Code Feature (For Restaurant Owners)**

Yiğit Kutay Gülben tested the confirmation code feature of Toproffer. Restaurant owners can confirm the code that customers shared to verify customers used that campaign. Yiğit tested this feature and he reported that the confirmation code feature is working correctly, when the user told the campaign code and the restaurant owner entered that code to our confirmation page, the system can verify whether the code is correct or not.

## **5.2. Testing Customer Side of Toproffer**

### **5.2.1. Notifications List Feature**

Burak Kırımlı tested the notification list feature of Toproffer. Customers can display the campaigns that restaurants created on the “Notification” page. Burak tested this feature and he reported that notification list feature is working correctly, when a user opens “Notification” page, our system gets the active campaigns and shows them to the customer.

### **5.2.2. Map Feature**

Yiğit Kutay Gülben tested the map feature of Toproffer. Customers can display their current location and restaurants that have active campaigns on our map. Yiğit tested this feature and he reported that map feature is working correctly, when the user opens the “Map” page, our system gets the restaurants that have active campaigns and displays them on our map successfully.

### **5.2.3. Confirmation Code Feature (For Customers)**

Yiğit Kutay Gülben tested the confirmation code feature of Toproffer. Customers can display confirmation code on the campaign details page and share this code with the



restaurant owner to let him/her verify the campaign. Yiğit tested this feature and he reported that the confirmation code feature is working correctly, customers can display the confirmation code.

#### **5.2.4. Restaurant List Feature**

Burak Kırımlı tested the restaurant list feature of Toproffer. Customers can display the list of restaurants on the “Restaurant List” page. Burak tested this feature and he reported that the restaurant list feature is working correctly, when a customer opens the “Restaurant List” page, our system gets the restaurants from the database and displays that on the “Restaurant List” page successfully.

#### **5.2.5. Campaign Details Feature**

Burak Kırımlı tested the campaign details feature of Toproffer. Customers can display the details of the campaign that they selected. Burak tested this feature and he reported that the campaign details feature is working correctly, when a customer selects a campaign our system gets its information from our database and displays it to the customer.

#### **5.2.6. Customer Profile Feature**

Mert Çerçiler tested customer profile features of Toproffer. Customers can display their profile which contains their name, surname and e-mail information. Mert tested this feature and he reported that the customer profile feature is working correctly. When a customer enters his/her profile, he/she can display user information successfully.

#### **5.2.7. Login and Signup Feature**

Mert Çerçiler tested login and signup feature of Toproffer. Customers can register to our system with filling the registration form on “Signup Page” and login Toproffer with filling the form on “Login” page. Mert tested this feature and he reported that login and signup feature are working correctly. A customer can signup and with

using user information he/she can login to our system. Our system successfully handles registration and login operations.

## **6. Maintenance Plan and Details**

It would be a major mistake if we weren't allocating adequate resources for ongoing maintenance and updates. Maintenance is necessary, crucial and equally important like development. The team member is planning to overcome the problems coming from business environmental changes via maintenance plan. Maintenance plan will improve our solution efficiently.

### **6.1. Security & Code Maintenance**

If the team members add a new feature, code will be updated to ensure compatibility with the versions which are new for iOS or Android platforms. Code maintenance and security patches are not related to new features but for compatibility. Compatibility is the key factor for this section as we all know there are always new updates for different platforms and Toproffer has to fit those updates without any doubt.

Roughly once a year, Google and Apple release updates for operating systems to their systems in order to increase efficiency of their devices. These releases are not the updates mentioned above but changes in operating systems. Maintenance plan includes and avoids these changes by checks and tests according to the maintenance plan.

For the security perspective, Toproffer asks users' permission to activate location data via gps. In addition Toproffer requires user permission to access the user's photo gallery.

User data is stored in Firebase Platform which is a service of Google thus the security of the database controlled by Google itself. User data includes personal information related to users such as names, e-mails.

## 6.2 Design & Feature Enhancements

Listening to user feedback is the key point for design and feature enhancements. Toproffer's feature updates will be related to discussion with our customers and users. Restaurant owners and customers can get in touch with the development team by emailing us which can be found on application. Main reason behind this idea is to not let customers and users feel alone while using the application and quick response and quick solutions related to their demand will increase the reliability of the application.

These communication stories have 5 basic steps from beginning to end. First of all, two different teams from team members will take care of these demands and e-mail from customers and users. One team will be responsible for customers' demands and the other will be there for users. They will respond in teams of three people from the development team.

One of them will be responsible to read email and analyze correctly what is requested and what is the problem if the problem is not understood correctly he/she will contact the customer or user again to get correct information related to demand and that person's role will call as receiver in the team. After communication with the customer or user the same person is going to prepare a quick report related to the problem which includes the screenshots from the application, email from customer or user and personal opinion related to the problem and send the report to the second person from the responsible team.

Second person role is to find a solution to the reported problem from the receiver and the role of second person will be called as a solver in the team. Solver will analyze the report and find the most proper solution for the customer satisfaction. Sometimes there might not be a problem even the customer reported, the reported problem may be because of users or customers' side because of internet connection, lack of device updates or whatever. Solver will consider these all scenarios with the help of receivers report. Solver will prepare a solution list and send the report and solution to the team leader who is the tester as well as the third person of the group.

Group leader will analyze the solution and test the solution according to two reports which come from the receiver and solver. After the approval from the team leader solution takes place and there will be a new communication between customer or user and maintenance team. Receiver is going to send a response email to the customer to explain the solution of the demand. Here you can find the scenario related to contact us button and communication between customers, users and development team.

### **6.2.1 User Scenario**

Mr. Altay is the owner of the restaurant chain Güvenir Restaurants. The restaurants of Mr. Altay are based in Ankara and there are 6 of them in the different areas of the town. Mr. Altay underwent a healthy stay home period with his family at home and because of the COVID-19 his restaurants were closed. After the announcement of the government related to restaurant open hours he opened all the 6 restaurants after a few months. But after a while he noticed that the same amount of customers are not visiting his restaurant as before. When he was speaking with his friend Mr. Hamdi who is the owner of another restaurant based in Ankara, Mr. Hamdi suggested an application Toproffer to Mr. Altay. Mr. Altay downloaded and became a customer of Toproffer application because of several reasons which are huge user quantity, to announce campaigns to take attention of people and because of COVID19 pandemic the users of the Toproffer application pay attention to the Clean symbol on the restaurant page screen of Toproffer which means the restaurant pay attention to social distance and disinfection of the restaurant environment. Mr. Altay gets the Clean symbol by providing daily disinfections and avoiding social distance for the distance between tables and chairs. After he got the clean symbol Mr. Altay noticed that he can use the application for only one of his 6 restaurants. He thought he had to be a customer for all of the restaurants but he didn't know if he had the right to use all of the restaurants or he had to be a new customer for each restaurant and he saw the Contact Us button on the screen. He mailed the situation to the Toproffer team by using the Contact Us button. Team members consist of 3 people named Servan, Burak, Doğan. Servan is the receiver, Burak is a solver and

Doğacan is the team leader for customer demands. Servan received the e-mail from Mr. Altay and directly sent back the email related to the response will be given soon. After reading the e-mail, Servan understood the situation with no need for an extra email to Mr. Altay and Servan prepared a report related to demand. Solver Burak received a report from Servan and Burak prepared a solution report for team leader Doğacan. Doğacan saw that the report which says there is no low design for more than one restaurant for one account, Doğacan accepted the solution and send an email to receiver Servan to send email to Mr. Altay to apologize for the issue and Mr. Altay has to open another account for the other restaurants. But team leader Doğacan saw the lack of design for the specific problem of Mr. Altay and noted the problem. Team leader Doğacan starts to negotiate this problem with other team members to make updates related to different restaurants for only one customer if he/she owns all of them. After the 3 months period the development team released a new update and after the update one owner can manage his/her all restaurants from the same account. Team leader Doğacan reminded this issue to receiver Servan again and Servan send an email to Mr. Altay to update his application then he can use only one account for his 6 restaurants.

## **7. Other Project Elements**

### **7.1. Consideration of Various Factors**

In this part how various factors affected the project design and development will be discussed.

#### **7.1.1 Consideration of Public Health**

There has been a pandemic occurred in the development time of the project and as a team we realized that we must give a great importance to public health since the Toproffer is a platform which aims to connect restaurants and customers. From the restaurant side, we want certain information from the restaurant as

applying the platform. After a restaurant applies to Topoffer, the restaurant is being surveyed and expected to have certain features. One of the features Topoffer is looking for is hygiene. If a restaurant doesn't meet the requirements such as not placing social distance between people, allowing too many people at a point restaurant can be crowded or not separating tables from each other. These are one of the most important reasons restaurant applications will be declined. On the scale of 0 to 10 the level of effect of Topoffer for public health factors is 10.

### **7.1.2 Consideration of Public Safety**

Topoffer is accepting applications of restaurants but before commencing business, restaurant evaluation is taking place. As the developer team we realized that some false or half applications may enter as applications and commencing business with those bad restaurants may lead customers in unsafe situations. For example a person may enter a wrong address as a restaurant knowingly or unknowingly and if the system accepts that restaurant as a valid application and commence business, some customers may go to that location hence that may create serious inconvenience. Trust and safety are both very important for the public and our business model. On the scale of 0 to 10 the level of effect of Topoffer for public safety factors is 7.

### **7.1.3 Consideration of Public Welfare**

As WHO declared global pandemic, the economy became unstable around the globe due to Covid-19 since the beginning of 2020. People tend to stay at home and that decreases the cash flow which is very important for the economy. Since Topoffer is announcing campaigns, customers became aware of those campaigns and saved their money. They may lower the expenses especially if they have to eat in restaurants everyday. On the scale of 0 to 10 the level of effect of Topoffer for welfare factors is 2.

### **7.1.4 Consideration of Global Effects**

Toproffer is aiming healthy food at a lower price than usual. The restaurants as they can see each others' prices and campaigns, competition for better service would increase. In that way this system may benefit the restaurants which are caring their customers more and may create social awareness which is desired globally for everyone and become an example. On the scale of 0 to 10 the level of effect of Toproffer for global factors is 2.

### **7.1.5 Consideration of Cultural Effects**

Toproffer is offering restaurants to announce their campaigns to everyone. Thus restaurants may offer their exclusive menus to customers who are looking for a campaign. Unusual restaurants or cultural restaurants may have difficulties attracting customers in regular ways such as placing signs on the roads. But in Toproffer new or unusual restaurants may create campaigns and attract the attention of potential customers much more easily. On the scale of 0 to 10 the level of effect of Toproffer for cultural factors is 10.

### **7.1.6 Consideration of Social Effects**

There are restaurants in places that are only visible by a short amount of people and most of the potential customers are not even aware of. Most of the people who walk by a building may not realize if there is a restaurant on the 5th floor. Toproffer is marketing all kinds of restaurants no matter which floor, and making people aware of those restaurants that are undetected. So the social habits may change over time. On the scale of 0 to 10 the level of effect of Toproffer for social factors is 3.

### **7.1.7 Consideration of Environmental Effects**

Toproffer is a platform where restaurants can show their advertisements other than using printed advertisements on the billboards or papers. That will solve

the problem of using paper that has a lot of environmental side effects. On the scale of 0 to 10 the level of effect of Toproffer for environmental factors is 10.

### **7.1.8 Consideration of Economic Effects**

Economy is tighter than ever because of Covid-19 precautions and restrictions. On the other hand Toproffer emerges to bring people together with healthy and cheaper food. Therefore Toproffer has a great impact on the economic situation of the current era. On the scale of 0 to 10 the level of effect of Toproffer for economic factors is 10.

### **7.1.9 Table of Consideration of Various Factors**

Various Factors	Effect Level from 0 to 10
Consideration of Public Health	10
Consideration of Public Safety	7
Consideration of Public Welfare	2
Consideration of Global Effects	2
Consideration of Cultural Effects	10
Consideration of Social Effects	3
Consideration of Environmental Effects	10
Consideration of Economic Effects	10



## 7.2. Ethics & Professional Responsibilities

### 7.2.1 Customer User Data

- Toproffer deals with personal data like passwords, location, restaurant, and pub information. All the data should be stored and transferred securely depending on GDPR laws.
- Toproffer uses a server that has successfully completed the ISO 27001 and SOC 1, SOC 2, SOC 3 evaluation process, and some services have also completed the ISO 27017 and ISO 27018 certification process.
- Firebase services encrypt data in transit using HTTPS and logically isolate customer data.
- To keep personal data safe, Toproffer using a server which employs extensive security measures to minimize access:
  - It restricts access to select employees who have a business purpose to access personal data.
  - It logs employee access to systems that contain personal data.
  - It only permits access to personal data by employees who sign in with Google Sign-In and 2-factor authentication.
- Before sharing personal information of a user, Toproffer ask for the appropriate permissions first.
- Depending on the user's request their personal data is deleted. So that it's not going to be used after all.
- The user's location will not be shared with any restaurant or other users.
- The user's information on votes on health criteria won't be seen by the restaurant owner. The restaurant owner can only see an average of votings on health criteria.

## 7.2.2 Commercial User Data

- Toproffer deals with personal data like passwords, location, and restaurant/pub information for businesses. All the data should be stored and transferred securely along with laws on E-Commerce.
- Illegal goods can't be sold on Toproffer. In this context the legality of a good varies depending on the country where that good is sold.
- The restaurant's information about how many times the campaign used will be seen by only the restaurant owner. There are going to be recommendations based on other restaurant's information but the recommendation won't include any numbers.
- Toproffer stores the old campaign information and charts about it for just informing the restaurant owner.
- To minimize the risk of a data loss that can be valuable for the restaurant owners, there should be frequent database backups stored in a different location.
- Toproffer services encrypt data in transit using HTTPS and logically isolate restaurant's data.

## 7.3. Judgments & Impacts to Various Contexts

For the project we choose framework Flutter which is an open-source UI software development kit created by Google since it is easy to create a project for both IOS and Android at the same time by Flutter.

### Choosing Flutter Framework for Dart

Judgement Description:	Choosing Flutter as Framework
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	Impact Level	Impact Description
Impact in Global Context	0	No Impact in this field

Impact in Economic Context	0	No Impact in this field
Impact in Environmental Context	0	No Impact in this field
Impact in Societal Context	0	No Impact in this field

**Choosing Firebase application development platform which is developed by Google as database**

Judgement Description:	Choosing Firebase platform as Database
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	Impact Level	Impact Description
Impact in Global Context	5	Security of customer information
Impact in Economic Context	1	We didn't pay for any database service.
Impact in Environmental Context	0	No Impact in this field
Impact in Societal Context	0	No Impact in this field

**Choosing Dart as language which is developed by Google**

Judgement Description:	Choosing Dart as Language
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	Impact Level	Impact Description
Impact in Global Context	0	No Impact in this field
Impact in Economic Context	0	No Impact in this field

Impact in Environmental Context	0	No Impact in this field
Impact in Societal Context	0	No Impact in this field

### **Adding map view to the project**

Judgement Description:	Adding Map View to the Project
------------------------	--------------------------------

	Impact Level	Impact Description
Impact in Global Context	1	Customers can see the world through the map
Impact in Economic Context	5	Increasing awareness of restaurants that also increases the potential customers
Impact in Environmental Context	0	No Impact in this field
Impact in Societal Context	1	People may see the buildings such as cinemas or theaters

### **Adding notification system to the project**

Judgement Description:	Adding Notification System to the Project
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	Impact Level	Impact Description
Impact in Global Context	0	No Impact in this field
Impact in Economic Context	5	Increasing awareness of restaurants that also increases

		the potential customers
Impact in Environmental Context	3	Lowers the paper use due to advertisement purposes posters
Impact in Societal Context	3	Social campaigns might announced

## 7.4 Teamwork & Peer Contribution

- Yiğit Kutay Gülben:
  - I started to search noSQL database systems and came out with Firebase Platform as our database service and established Firebase for the project.
  - For the map with Doğacan Kaynak, I used openstreetmap which is a free editable map[1]. At the end Google Map Api used for map and deployed.
  - I worked on permissions and access to location data and wifi connection of the phone and user permission for those.
  - Chart was created to show statistical values in an animated way to visualize data. I used a line chart and it takes the number of products sold for every category per hour.
  - For notifications, I learned how to use the notification system called “Cloud Messaging” in Firebase. After creating a project in Firebase I started programming Firebase Cloud Function and tried to test the real time feature of Firebase. I wrote a JavaScript language for cloud function and deployed it into Firebase by using NodeJS.
  - I contacted restaurants in Kızılay/Ankara to listen to their needs and negotiate with the restaurant owners. Collected feedback from owners about the system we were developing.
  - I fulfilled my part in writing the reports.

- I fulfilled my part in the user manual.
- Burak Kırımlı:
  - We went to negotiate with the restaurant owner to use our application with and without my teammates. We introduced the application and get advice from the restaurant owner. Since they have more experience than us in this sector, their ideas are important.
  - At the beginning of the project, me and Doğacan get the user interface pages of Toproffer. I bought an online course from Udemy which is about Flutter and Dart. I watched it to learn Flutter and Dart, after that I started to implement front-end pages which are listed below.
  - Customer side front-end pages: Interest Selection page, Campaign Notification page, Restaurant List page, Detailed Campaign page, Restaurant Description page (which includes Info page, Campaign History page, Active Campaign page and Photos page)
  - Restaurant Owner front-end pages: My Campaigns page, Campaign Confirmation page, Campaign Creating page, Restaurant Profile page (which includes Campaigns page, Restaurant Photos page and Settings page)
  - I made some changes on some of the front-end pages after Professor Halil Altay Güvenir wanted.
  - I made a research about the image upload feature on Flutter. I sent an example image picker code segment to our teammates.
  - I fulfilled my part in writing the reports.
  - I fulfilled my part in the user manual.
- Mert Çerçiler:
  - I did the database creation using the Google Firebase, created the database structure and architecture.
  - I developed all the database interaction of this application, including permanent campaign creation, momentarily campaign creation, adding and retrieving campaigns to restaurants active campaigns, deleting

campaigns and adding them to old campaigns, retrieving all the campaigns as a list for the customers, retrieving all the campaigns to the map, showing the remaining campaign duration to the user, retrieving campaign code to restaurants owners, code verification, storing the applied campaign data after code verification, following restaurants and storing customers as followers of the restaurants, retrieving all the restaurants a list for the customers, registering the customers, registering the restaurants, both customer and restaurant authentication, storing user interests of customers.

- I displayed the graph of all the applied campaigns with their time intervals, day of weeks and campaign categories to the restaurant owners with Yiğit's help.
- I registered the restaurant's addresses using geocoder, with their latitudes and longitudes, to mark them on the map if they have an active campaign.
- I made some changes in front-end pages while retrieving the data from the database.
- For the machine learning algorithm, me and Doğacan found the model for our application, however, after the pandemic, we could not make interviews for restaurant owners and we could not create a dataset for this model.
- I fulfilled my part in writing the reports.
- I fulfilled my part in the user manual.
- Doğacan Kaynak:
  - We went to negotiate with the restaurant owner to use our application with and without my teammates. We introduced the application and got advice from the restaurant owner. Since they have more experience than us in this sector, their ideas are important.
  - At the beginning of the project, me and Burak get the user interface pages of the application. I learned a new framework which is called Flutter. It was a strange experience for me because its structure is

different from others. To give more detail, I took login, signup and forgot password pages for both customer and restaurant owners.

- Also I did the map page and restaurant owner chart with Yiğit. I tried to guide Yiğit with the notification page part but he did all the work.
  - For machine learning algorithms, me and Mert mostly worked on it. We found the model for our application. However, we couldn't find a dataset for the model. So we tried to create one from our interviews with restaurant owners. Since the pandemic started, we couldn't get in touch with restaurant owners.
  - I fulfilled my part in writing the reports.
  - I fulfilled my part in the user manual.
- Servan Tanaman:
    - We went to negotiate with the several restaurant owners in order to get an opinion and make advertisement of the product that we are planning to release with my teammates.
    - Firstly i increased my coding on Dart language which is totally a new language for me and i used lots of videos for training on Dart language.
    - After a bit of knowledge related to Dart I used Flutter and increased my ability related to user interface widgets on Flutter.
    - I helped Mert in back-end architecture and I helped the development of customer photos installation, downloading and getting the related information of the selected restaurant from Firebase system.
    - I helped teammates with the push notification feature.
    - I tried to do my best in writing reports.



## 7.5 Project Plan Observed & Objectives Met

### 7.5.1 Project Plan Observed

Below, there are work packages, which shows the project's development process, taken from the Analysis Report. Each package had a name, duration, participants with their leader, and description. For the project plan observation, one more section included in these work packages. It's named as evaluation. The observation timeline starts from the last semester to the presentation of this project.

#### Analysis Report Work Package

<b>Work Package Name:</b> Analysis Report
<b>Duration:</b> 7 Days ( <b>Start:</b> October 7, 2019 - <b>End:</b> October 14, 2019)
<b>Group Leader:</b> Doğacan Kaynak
<b>Group Members:</b> Mert Çerçiler, Burak Kırımlı, Servan Tanaman, Yiğit Kutay Gülben
<b>Description:</b> Functional and nonfunctional requirements, work plans, pseudo requirements, system models, scenarios, mockups, consideration of various factors, risks, and alternatives, project plan, ensuring proper team-work.
<b>Evaluation:</b> The work package completed within the specified time.

#### High-Level Design Report Work Package

<b>Work Package Name:</b> High-Level Design Report
<b>Duration:</b> 7 Days ( <b>Start:</b> December 24, 2019 - <b>End:</b> December 31, 2019)
<b>Group Leader:</b> Yiğit Kutay Gülben
<b>Group Members:</b> Mert Çerçiler, Burak Kırımlı, Servan Tanaman, Doğacan Kaynak

**Description:** A report having detailed information about our project's high-level design and the related formal expressions, models, diagrams, architectures, charts will be an important part of our high-level design report. New knowledge acquired and learning strategies used will be inside the report as well.

**Evaluation:** The work package completed within the specified time.

### Low-Level Design Report Work Package

**Work Package Name:** Low-Level Design Report

**Duration:** 7 Days (**Start:** February 10, 2020 - **End:** February 17, 2020)

**Group Leader:** Burak Kırımlı

**Group Members:** Mert Çerçiler, Doğacan Kaynak, Servan Tanaman, Yiğit Kutay  
Gülben

**Description:** Refining a high-level design report to the more detailed low-level design report. The low-level design architecture of the project is going to be explained in this report.

**Evaluation:** The work package completed within the specified time.

### Front-End Work Package

**Work Package Name:** Front-End

**Duration:** 4 Months (**Start:** November 11, 2019 - **End:** March 1, 2020)

**Group Leader:** Burak Kırımlı

**Group Members:** Servan Tanaman, Mert Çerçiler, Doğacan Kaynak, Yiğit Kutay  
Gülben

**Description:** Front-end pages for the customer user type are going to be

implemented. Map page, notifications page, list of restaurants page, profile page, interest selection, registration page for the customer, and profile edit page for customers are going to be implemented in that phase. List of 3 sub-work packages:

Customer Front-End - Burak Kırımlı

Restaurant Owner Front-End - Burak Kırımlı

Photoshop - Servan Tanaman

**Evaluation:** The work package completed 1 week later than the specified time. The reason is, there was too much workload while we were handling the restaurant owner work package.

### Customer Front-End Work Package

**Work Package Name:** Customer Front-End

**Duration:** 3 Months (**Start:** November 11, 2019 - **End:** February 11, 2020)

**Group Leader:** Burak Kırımlı

**Group Members:** Servan Tanaman, Mert Çerçiler

**Description:** Front-end pages for the customer user type are going to be implemented. Map page, notifications page, list of restaurants page, profile page, interest selection, registration page for the customer, and profile edit page for customers are going to be implemented in that phase.

**Evaluation:** The work package completed within the specified time.

### Restaurant Owner Work Package

**Work Package Name:** Restaurant Owner Front-End

**Duration:** 4 Months (**Start:** November 11, 2019 - **End:** March 1, 2020)

**Group Leader:** Burak Kırımlı

**Group Members:** Doğan Kaynak, Yiğit Kutay Gülben

**Description:** Front-end pages for the restaurant owner user type are going to be implemented. List of active campaigns page, campaign generator page, campaign confirmation page, campaign creation page, food and beverage list of the restaurant page, end of day Z reading page(to provide statistical information to campaign generator), campaign content page, restaurant profile page, registration page for the restaurant owner and profile edit page for restaurant owner are going to be implemented in that phase.

**Evaluation:** The work package couldn't be completed within the specified time because of the workload members had. It finished 1 week late.

## Photoshop Work Package

**Work Package Name:** Photoshop

**Duration:** 3 Months (**Start:** November 11, 2019 - **End:** February 11, 2020)

**Group Leader:** Servan Tanaman

**Group Members:** Burak Kırımlı

**Description:** Photoshop is important for the marketing of the product. Shapes, distinctness, and expressiveness are crucial if photoshop work is done correctly.

**Evaluation:** The work package completed within the specified time.

## Database

**Work Package Name:** Database Tables & Keys

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 20, 2019)

**Group Leader:** Doğacan Kaynak

**Group Members:** Mert Çerçiler, Yiğit Kutay Gülben, Burak Kırımlı

**Description:** Database systems will be set. The 2 sub-work packages are listed:

Database Tables - Servan Tanaman

Database Keys - Mert Çerçiler

**Evaluation:** The work package completed 1 month earlier than the specified time. By the extra work made by group members, the work package completed faster than predicted.

### Database Tables Work Package

**Work Package Name:** Database Tables

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 20, 2019)

**Group Leader:** Servan Tanaman

**Group Members:** Mert Çerçiler, Doğacan Kaynak, Burak Kırımlı

**Description:** Tables are significant because of the CRUD operations and also for the connection between the user, owner, and the system. Creating tables must be synchronized for efficiency and for the true information returns.

**Evaluation:** The work package completed 1 month earlier than the specified time. Every group member had a great contribution to it.

### Database Keys Work Package

**Work Package Name:** Database Keys

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 20, 2019)

**Group Leader:** Mert Çerçiler

**Group Members:** Doğacan Kaynak, Yiğit Kutay Gülben, Burak Kırımlı

**Description:** All tables' entire keys, including all primary and foreign keys, will be created in this section very precisely.

**Evaluation:** The work package completed 1 month earlier than the specified time. The database tables work package has finished earlier than expected finish time.

## Back-End

**Work Package Name:** Back-End

**Duration:** 4 Months (**Start:** January 10, 2019 - **End:** May 11, 2019)

**Group Leader:** Yiğit Kutay Gülben

**Group Members:** Mert Çerçiler, Doğacan Kaynak, Servan Tanaman, Burak Kırımlı

**Description:** Engine and all Back-End systems will be implemented and tested. List of 5 work packages are on the below:

Authentication - Yiğit Kutay Gülben

Following Restaurants - Yiğit Kutay Gülben

Registration of User, Owner - Doğacan Kaynak

Notification System - Doğacan Kaynak

Creating Code for Verification - Mert Çerçiler

**Evaluation:** The work package couldn't be completed within the specified time. The COVID-19 shifted the timeline and duration. It finished on May 27.

## Authentication Work Package

**Work Package Name:** Authentication

**Duration:** 4 Months (**Start:** January 10, 2019 - **End:** May 4, 2019)

**Group Leader:** Yiğit Kutay Gülben

**Group Members:** Mert Çerçiler, Doğacan Kaynak

**Description:** Authentication and authorization, which will be used for confirmation of valid code between customer and restaurant owner, will be created.

**Evaluation:** The work package completed 1 month earlier than the specified time. Since the creation for code verification work package completed earlier than expected, this situation boosted the authentication work package.

### Following Restaurants Work Package

**Work Package Name:** Following Restaurants

**Duration:** 4 Months (**Start:** January 10, 2019 - **End:** May 11, 2019)

**Group Leader:** Yiğit Kutay Gülben

**Group Members:** Mert Çerçiler, Servan Tanaman, Burak Kırımlı

**Description:** Users who visited a restaurant via our application, if he likes the service, he will have the option to follow that restaurant. This feature is important for increasing the feature of our dataset for machine learning. We can analyze the desired restaurants. Also for sending a notification to the users, users should have followed the restaurant because when a followed restaurant makes a change in campaigns, that information goes to the user a notification.

**Evaluation:** The work package couldn't be completed within the specified time. It finished on May 26. The UI of the restaurant profile page provided late and COVID-19 extended this process.

### Registration of User & Owner Work Package

**Work Package Name:** Registration of User & Owner

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 27, 2019)

**Group Leader:** Doğacan Kaynak

**Group Members:** Mert Çerçiler, Servan Tanaman, Yiğit Kutay Gülben

**Description:** There are two types of users that will be in our program in order to distinguish restaurants from people who visit those restaurants. When users register Topproffer, he or she will have to continue with one of those two registration types. There will be an email confirmation for preventing multiple accounts.

**Evaluation:** The work package completed 2 months earlier than the specified time. The UI of sign up pages for owner and user were already ready. They just integrated with the database.

## Notification System Work Package

**Work Package Name:** Notification System

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 27, 2019)

**Group Leader:** Doğacan Kaynak

**Group Members:** Servan Tanaman, Yiğit Kutay Gülben, Burak Kırımlı

**Description:** When a user follows a restaurant on our application, he will have the option to follow that restaurant. If a change occurs about that restaurant's promotions, the system will send a notification about those changes to the user who is following the restaurant. Also based on the frequently visited restaurants or frequently used campaigns in addition to the interests at the very first usage of the Topproffer, sometimes users will get notifications about the restaurants with similar servings.



**Evaluation:** The work package couldn't be completed within the specified time. The group leader workload increased a lot due to COVID-19. The work package finished on May 25.

### Creating Code for Verification Work Package

**Work Package Name:** Creating Code for Verification

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 27, 2019)

**Group Leader:** Mert Çerçiler

**Group Members:** Doğan Kaynak, Burak Kırmı, Yiğit Kutay Gülben, Servan Tanaman

**Description:** Users are needed to verify the code if they want to use the campaign from our application. This algorithm is for both ensuring the user and restaurant to which campaign is used and by verifying the code, our machine learning dataset will improve because we get the information on which campaign is used in which restaurant.

**Evaluation:** The work package completed 2 months earlier than the specified time. When the predictions made for the work package, it seemed so hard to do. However, it was not that hard depending on our predictions.

### Machine Learning Model Selection & Development Work Package

**Work Package Name:** Machine Learning

**Duration:** 4 Months (**Start:** January 10, 2019 - **End:** May 8, 2019)

**Group Leader:** Mert Çerçiler

**Group Members:** Doğan Kaynak, Servan Tanaman, Yiğit Kutay Gülben, Burak Kırmı

**Description:** The best machine learning algorithm selected among several classification models, such as Linear Regression, suitable for Toproffer's purpose.

**Evaluation:** The work package couldn't be completed. The model would be used for Toproffer selected as Logistic Regression but it couldn't be developed due to COVID-19. The dataset couldn't be prepared for this model since the creation of it led to biased or overfitted predictions.

### Machine Learning Dataset Package

**Work Package Name:** Machine Learning Suggestion Algorithm

**Duration:** 3 Months (**Start:** February 8, 2019 - **End:** May 11, 2019)

**Group Leader:** Mert Çerçiler

**Group Members:** Doğan Kaynak, Servan Tanaman, Yiğit Kutay Gülben

**Description:** Machine Learning algorithm will recommend the optimum campaigns to restaurants. This algorithm needs the restaurants to list products with their times and will check the campaigns in the surrounding area for the most accurate results. a dataset that will be created with the help of restaurant owners.

**Evaluation:** The work package wasn't complete due to COVID-19. It prevented getting data from the restaurants. Since the dataset has a big role in machine learning, the model couldn't be trained and developed.

### Creation and Showing Campaigns Concurrently Work Package

**Work Package Name:** Creation and Showing Campaigns Concurrently

**Duration:** 3 Months (**Start:** January 10, 2019 - **End:** April 27, 2019)

**Group Leader:** Mert Çerçiler

**Group Members:** Doğacan Kaynak, Burak Kırımlı

**Description:** After a campaign is created by the restaurant, it has to be added to the map concurrently because users should be informed about the campaigns if restaurants create the campaign while users are searching to map.

**Evaluation:** The work package completed earlier than the specified time. It finished in 2 months. When the predictions made for the work package, it seemed so hard to do. However, it was not that hard depending on our predictions.

### **Final Report & User Manual Work Package**

**Work Package Name:** Final Report & User Manual

**Duration:** 4 Days (**Start:** May 23, 2020 - **End:** May 28, 2020)

**Group Leader:** Servan Tanaman

**Group Members:** Mert Çerçiler, Doğacan Kaynak, Burak Kırımlı, Yiğit Kutay Gülben

**Description:** Final requirements and final design details will be inside the final report with the whole description including a manual of the project.

**Evaluation:** The work package's timeline shifted due to COVID-19 but it's completed within the specified time.

### **Presentations & Demonstrations Report Work Package**

**Work Package Name:** Presentations & Demonstrations

**Duration:** 4 Days (**Start:** May 23, 2020 - **End:** May 27, 2020)

**Group Leader:** Burak Kırımlı

**Group Members:** Mert Çerçiler, Servan Tanaman, Yiğit Kutay Gülben, Doğacan Kaynak

**Description:** At the end of the second semester, after the project is done, a presentation about the project is going to be prepared and the demonstration is going to be prepared.

Detailed information on many properties of our program, including processes and major features of the application, will be in the user manual. It will give a wide range of information.

**Evaluation:** The work package's timeline shifted due to COVID-19 but it's completed within the specified time.

## 7.5.2 Objectives Met

In this project, most of the proposed objectives are complete. There are also some objectives that were not completed because of the COVID-19 pandemic. However, there are some proposed objectives for the failed ones that have been accepted by the supervisor of this project. In this section there will be an argument about the failed objectives. Since most of the objectives are complete, this part will be more reprehensible for the reader.

At the beginning of this project we proposed a Campaign Generator feature for the application. It was supposed to take a daily list of all the consumed foods from the restaurant owner and then recommend certain campaigns to the restaurant owner. There are three recommendation groups; which are created according to various activities made on certain days. The first group includes; Wednesday, Friday, and Saturday, while the second group includes; Monday and Sunday, and finally the last group includes Tuesday and Thursday. This recommendation system was meant to be created using the "linear regression" model because according to the articles that we have read, this model when compared to other models, has better results in its predictions. However, we were not able to get the data required to train our model from the restaurant owners. Also we weren't able to negotiate enough with the restaurant owners to be able to get the entire list of the consumed foods. Since sharing the price list for the food list is a privacy issue for the restaurants, they were precautious on giving that information. We were about to solve this problem right

before the COVID-19 breakout, which restrained us from developing the major feature of the project. Instead of developing this feature, we implemented a page that shows a graph indicating the relation between each of the groups created according to activities and groups of interests on food.

## **7.6 New Knowledge Acquired & Learning**

### **Strategies Used**

In this section we didn't separate the gained knowledge and learning strategies used. We thought it might be much more appropriate to give knowledge and how we gain it by using specific strategies. We have used cross-platform technologies for the project and this is new to all of our group members. As a framework Flutter has been used for the frontend. We have been learning the Dart language because Dart is a client-optimized programming language for apps on multiple platforms which is exactly what we need for our project. To work with Android and IOS this framework has the best performance compared to other cross-platform frameworks. Flutter is very suitable for our project because of its unique rendering system. Unlike React Native and other platforms, Flutter uses its widgets to render therefore whichever device is used, the screen which users interact with the user interface will be the same. Udemy, Course Hero, Youtube are the top three websites that have been providing us with reliable information. At some point, we consulted our teachers and professionals about their experience and expertise. Also we got help from our Innovation Expert Burcu Coşkun Şengül. After she gave some guidance at the beginning of creating our project, we progressed more confidently. In the very first beginning of learning new technologies, we practiced a lot. For example, we made login pages, signup pages, buttons that have different functionalities such as date picker, image picker, etc. When we became familiar and confident about the new technologies, then we were able to use them for the implementation of our project. After that, some of us were studying machine learning, some of us were practicing Flutter and Database technologies. For authentication in our project, we used Firebase's authentication mechanism, and

also for the database system we used Firebase. If we would write our database authentication system manually on a node js web server, in the long term that will decrease our scalability and maintainability thus effectiveness. When we considered these mentioned above, for this infrastructure, we planned to use Google Firebase in the end. Also when we considered that both flutter and Google Firebase created and managed by Google, their compatibility is high which will increase our efficiency at the implementation phase and after. Also, Firebase provides us a real time update on our system. For the machine learning training model, we were planning to use a Logistic Regression model because it could give more accurate results on our platform. As some of us have taken Machine Learning classes and have some interest in this subject, they have handled the situation well.

## **8. Conclusion & Future Work**

### **8.1. Conclusion**

To conclude, Toproffer is ready to help the restaurant owners to share their campaigns to a large customer community and help customers to find the most suitable campaign offer that restaurants offer. Because of Covid-19 restaurants are closed for now, but after this pandemic ends Toproffer will help restaurant owners to overcome the economic difficulties experienced in this pandemic as soon as possible. As a developer team, we had some difficulties during this semester because of Covid-19 pandemic but we overcome these problems by working more. We learned a lot from this project such as being a leader, using current software technologies, being a part of a team and being a team etc.

### **8.2. Future Work**

We planned to add some features to Toproffer after this semester. Features that we are going to add are:

- We are going to add a "Rating" feature to Toproffer. With using this feature customers can rate restaurants in terms of their hygiene quality, service

quality, food quality etc. This feature will help restaurant owners to see their shortcomings.

- We are going to add an “Image Recognition” feature to Toproffer for restaurant owners. With this feature, restaurant owners can take a picture of the report which includes the number of specific products that the restaurant sold on that day. After uploading that picture to Toproffer, with the help of image recognition features those numbers are going to be uploaded to Toproffer’s database. In the future, we will make campaign recommendations to restaurant owners using these numbers.
- We are going to add an “Achievement” feature to Toproffer. With this feature, restaurants are going to earn some achievements which are going to be placed on their profile such as hygiene master, campaign master etc. For example, if a restaurant has hygiene master achievement, customers will understand that this restaurant is clean.

## 9. Glossary

**Back-end** : that part of a hardware or software system that is farthest from the user

**Beverage industry** : The drink industry produces drinks, in particular ready to drink products.

**Bug**: The bug refers to an error, fault or flaw in any computer program or a hardware system.

**Campaign**: Attractive offers which are discounted from normal prices

**Compatible** : Capable of existing or living together in harmony

**Commencing business** : Simple term that basically means starting a business

**Cross-platform** : This is best described as a standard that a computer system can be developed Operating systems such as Windows and DOS are examples of platforms that work on the PC platform only Likewise, MacOS can only be run on an apple Mac computer When you have a “Cross Platform”; you are referring to hardware or software that can be used on BOTH PC’s and Macintosh computers

**Database** : A database is a collection of information that is organized so that it can be easily accessed, managed and updated.

**E-Commerce laws:** In the United States, the proposed Uniform Computer Information Transactions Act (UCITA) intends to bring uniformity and certainty to the laws that apply to information technology transactions, just as the Uniform Commercial Code does for the sale of goods.

**Encrypt data:** Data encryption translates data into another form, or code, so that only people with access to a secret key (formally called a decryption key) or password can read it.

**Firestore :** Firestore is Google's mobile application development platform that helps you build, improve, and grow your app. Here it is again in bigger letters, for impact: Firestore is Google's mobile application development platform that helps you build, improve, and grow your app.

**Framework :** A framework, or software framework, is a platform for developing software applications.

**Front-end :** That part of a hardware or software system that is closest to the user

**GDPR :** The General Data Protection Regulation (GDPR) is a legal framework that sets guidelines for the collection and processing of personal information from individuals who live in the European Union (EU).

**Genymotion :** The Genymotion emulator uses x86 architecture virtualization and OpenGL hardware acceleration which makes running your apps more efficient.

**HTTPS :** Hypertext transfer protocol secure (HTTPS) is the secure version of HTTP, which is the primary protocol used to send data between a web browser and a website.

**Inflation :** A decline in the value of money.

**Installability:** It is the value of how easy to install the application.

**ISO :** The International Organization for Standardization (ISO; /<sup>1</sup> aɪsoʊ/) is an international standard-setting body composed of representatives from various national standards organizations.

**JSON :** The JSON format is often used for serializing and transmitting structured data over a network connection.

**KVKK :** The law that protects user's rights and protects their information in Turkey.



**Maintenance** : The purpose of maintenance is to ensure the maximum efficiency and availability of production equipment, utilities and related facilities at optimal cost and under satisfactory conditions of quality, safety and protection for the environment.

**Milestones** : A milestone is a marker in a project that signifies a change or stage in development.

**Model-view-controller** : MVC is an application design model comprising three interconnected parts. They include the model (data), the view (user interface), and the controller (processes that handle input). The MVC model or "pattern" is commonly used for developing modern user interfaces.

**Native language** : Creation of software programs that run on specific devices and platforms.

**NoSQL** : NoSQL provides high scaling out capability. NoSQL allows you to add any kind of data in your database because it is flexible. It also provides distributed storage and high availability of the data. Streaming is also accepted by NoSQL because it can handle a high volume of data which is stored in your database.

**Open-source** : Open-source software (OSS) is any computer software that's distributed with its source code available for modification.

**Reliability**: The ability of an apparatus, machine, or system to consistently perform its intended or required function or mission, on demand and without degradation or failure.

**Schema-less**: Schema less means the database don't have fixed data structure, such as MongoDB, it has JSON-style data store, you can change the data structure as you wish.

**System architecture**: A system architecture is the conceptual model that defines the structure, behavior, and more views of a system.

**User-friendly**: Refers to anything that makes it easier for novices to use a computer or an application.

**User manual**: A guide for the person using the product, instructions

**Verify code**: A verification code is a security protection method used by form owners to avoid Internet robots from abusing and spamming their web forms.

**WHO** : The World Health Organization (WHO) plays an essential role in the global governance of health and disease; due to its core global functions of establishing,

monitoring and enforcing international norms and standards, and coordinating multiple actors toward common goals.

## 10. References

[1] "OpenStreetMap". <https://www.openstreetmap.org/about> . [Accessed: March 12, 2020]