



## **Analysis Report**

**CS 491: Senior Design Project**

**Toproffer**

**Doğacan Kaynak**

**Burak Kırımlı**

**Mert Çerçiler**

**Servan Tanaman**

**Yiğit Kutay Gülben**

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# Contents

1.	Introduction .....	2
2.	Current System.....	5
3.	Proposed System.....	6
3.1.	Overview.....	7
3.2.	Functional Requirements.....	7
3.2.1.	Customer	
3.2.2.	Restaurant's Owner	
3.3.	Nonfunctional Requirements.....	8
3.3.1.	Maintainability	
3.3.2.	Adaptability	
3.3.3.	Performance	
3.3.4.	Usability	
3.3.5.	Reliability	
3.3.6.	Installability	
3.3.7.	Security	
3.4.	Pseudo Requirements.....	9
3.5.	System Models.....	10
3.5.1.	Scenarios	
3.5.1.1.	Burak's Scenario	
3.5.1.2.	Mert's Scenario	
3.5.1.3.	Doğacan's Scenario	
3.5.1.4.	Servan's Scenario	
3.5.1.5.	Cemre's Scenario	
3.5.1.6.	Kutay's Scenario	
3.5.2.	Use Case Model	
3.5.3.	Object and Class Model	
3.5.4.	Dynamic Models	
3.5.4.1.	Sequence Diagrams	
3.5.4.1.1.	Login Sequence	
3.5.4.1.2.	Apply Campaign Sequence	
3.5.4.2.	Activity Flow Diagram	
3.5.4.2.1.	Flow Diagram for User	
3.5.4.2.2.	Flow Diagram for Owner	
3.5.5.	User Interface - Navigational Paths and Screen Mock-ups	
3.5.5.1.	Owner Mockups	
3.5.5.2.	Customer Mocukups	
4.	Other Analysis Elements .....	32
4.1.	Consideration of Various Factors.....	32
4.2.	Risks and Alternatives.....	33
4.3.	Project Plan.....	35
4.4.	Ensuring Proper Team-work.....	46
4.5.	Ethics and Professional Responsibilities.....	46
4.5.1.	Sensitive User Data	
4.6.	New Knowledge and Learning Strategies.....	47
5.	Glossary.....	48
6.	References.....	50

# **1. Introduction**

This report provides information related to Toproffer Application, regarding the current system, proposed system, and analysis. The report will pay attention to analysis related to the Toproffer Application. The readers may easily follow the features of the application via a report. Before describing what will be the conditions and terms will be handled in the report, firstly we focus on the description of the application in order to make easier the report understanding then secondly there will be information about the report.

## **1.1. Description of Toproffer Application**

For a couple of years, the status of the Turkish economy has deteriorated. Inflation has been increasing among these years and Turkish Lira has been losing its value against foreign currencies especially American Dollar, and Euro. Thus, the prices of all kinds of products of all kinds of industries (such as technology, fabric, etc.) have been explicitly increasing. Specifically, the increasing price of the food and beverage industry has a huge effect on peoples' daily lives. When it comes to socializing, especially with friends whether it is a special day or not the economy side of having fun sometimes becomes a burden on one's shoulders.

Therefore, restaurants have special campaigns in order to attract their potential clients to visit their restaurants. They put their low priced or under-sold products to the campaigns for a specific time interval. However, there is no way to announce their campaigns to a social platform except social media to the possible customers.

Therefore Toproffer came as an idea to help people to save their time and preserve their economy with less effort compared to searching restaurants blindly on the streets. 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 promotions related to restaurants.

In Toproffer there are two types of users: restaurant clients and owners. Restaurant owners can create two different types of campaign such as a permanent campaign and momentarily campaign. A permanent campaign will have no time limit, on the other hand, the momentarily campaign will have a time limit that is granted by the restaurant owners. Momentarily campaign will be potentially created by restaurant owners in the case of when their restaurant has a few customers than usual. Restaurant owners can create this kind of campaign for a limited hour such as one hour, two hours, etc. Restaurant clients will be able to observe the available campaigns that are created by the restaurant owners. There are two different ways of getting information about the campaigns in Toproffer: the first one is by streets' view in a similar way as Google Maps does but there is an important difference. Toproffer shows the restaurants if and only if the restaurant has an active campaign. Secondly, restaurant clients will have the option to follow their favorite restaurants if they wish so that they can get notifications about those places. The notification system works in such a way that, when there is a change occurs in any campaign including adding a campaign, changing ingredients, restaurant clients will be informed via the notification system.

The most important feature of Toproffer is the machine learning algorithm that works in the back-end. Restaurant owners are going to enter all the products that they sold to a list which will serve as a data set to be analyzed by that machine learning algorithm. With the help of this algorithm, restaurant owners can see which of their products are being sold less than other products and which of their products are being sold commonly. Based on the analysis of the algorithm, Toproffer is going to give the campaign recommendations that can increase that particular restaurant's sales. If the owner does not enter the products the restaurant sold, the algorithm cannot create a new campaign for that time. The limitation and the specific conditions related to it will be discussed in the related chapter briefly.

Toproffer is going to release for IOS, Android, and web. So far, Savor Döner, Federal Coffee Company, Lokal'71, Sözeri Pide&Kebap, Back House, Route, Nil

Rock Bar, Zone Bar, and Gaga Manjero agreed to work with us and there are lots of places that we are connected.

## **1.2. Description of the Report**

The report basically consists of 6 different parts which are Current System, Proposed System, Analysis Elements, Glossary, and References.

Current System is about the similarities and the differences between the other application which work like Toproffer or similar. This part will easily show us the additional features of Toproffer and why users should prefer Toproffer instead of the other similar applications.

The proposed system part is more complicated since it has functional and nonfunctional requirements in it. Functional requirements describe the behavior of the application according to the system's functionalities. On the other hand, non-functional requirements are related to accessibility, capacity , efficiency etc. Moreover, the Proposed System part includes the most exciting part as scenarios. Scenarios are the most effective part of describing how the application works and what is the target. This part also includes Models, Diagrams and User Interfaces.

Other Analysis Elements include Considerations, Risks and Alternatives, Project Plan, Ensuring Proper Team-work, Ethics and New Knowledge part. This part is more likely the general perspective of the application. The question such as what are the risks of the application or how will be the Project plan or What are the Ethics related to application will be answered briefly in this part of the report.

This Analysis report is intended to provide an overview of the application related to the pros and cons. It briefly describes the application attitudes and includes a clear description of what are the features and why they exist.

## 2. Current System

The table below shows the comparison of features among the similar projects with Toproffer. The having features will be marked with ✓ and not having will be marked with ✗.

Name of Application	Toproffer	Zomato	Glovo	Yemeksepeti	Grupanya	indirimkuponum.net
Promoting Campaigns	✓	✓	✓	✓	✓	✓
Promoting Campaigns for Short Time Limit	✓	✗	✗	✗	✗	✗
Showing Restaurants on Map	✓	✓	✗	✗	✓	✗
Showing Restaurant View with Pictures	✓	✓	✗	✗	✓	✗
Searching in a Specific Area	✓	✓	✓	✓	✓	✗
Navigation to Restaurant	✓	✗	✗	✗	✗	✗
Analyzing Efficiency of Sales by Restaurants	✓	✗	✗	✓	✗	✗
Recommending Campaign	✓	✗	✗	✗	✗	✗
Notification System	✓	✓	✓	✓	✓	✗
E-mail Confirmation	✓	✓	✓	✓	✓	✓
Filtering Restaurants	✓	✓	✓	✓	✓	✗
User Profile Settings	✓	✓	✓	✓	✓	✗
Showing Popular Restaurant	✓	✓	✓	✓	✓	✗
Contact and Support	✓	✓	✓	✓	✓	✗
Frequently Asked Questions	✓	✗	✓	✗	✗	✗

Time Serving Approximation	✓	✓	✓	✓	✓	✗
Time Limit of Promotions	✓	✓	✗	✓	✓	✗

### 3. Proposed System

#### 3.1. Overview

This report has detailed and explained information related to Toproffer Application, therefore, there will be possible scenarios in order to increase understanding of the application and how it achieves its purposes such as making easier the accessing good campaigns, economic save, sales and good places for opportunities.

Group members' duties and works will be explained in detail to make feel the group soul and how members communicate with each other and how the works done by each of the group members are synchronized.

Moreover, Toproffer is a good tool for people who are seeking for campaigns and even for the people who are irresolute when they want to hang out with friends or whoever. It gives the opportunities by giving the selection list on the map or just like a basic list. More information related to the application and how will be the process what the group members will follow will be explained in detail in this report.

After people read this report, they will be able to use the application and they will be aware of the features that Toproffer will provide.

#### 3.2. Functional Requirements

##### 3.2.1. Customer

- Having a valid email address that has not been used before should be enough to sign up for the Toproffer.
- The sign-up process should be protected with a verification link mailed to the user's email addresses to avoid spam.
- Toproffer should send 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.
- Clients 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 occurs in campaigns such as adding a new campaign or changing the content.
- Toproffer should support 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.
- 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 user is living in, customer can see all restaurants that are in the same city with customer.

### **3.2.2. Restaurant's Owner**

- 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.
- Using the machine learning algorithm, Toproffer should be able to recommend optimum campaigns to restaurant owners to maximize their profit, to provide them more efficient campaigns.



- 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 customer 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 add the restaurant's products to Toproffer after registering. After registration, new products can be added by restaurant owners.

### **3.3. Nonfunctional Requirements**

#### **3.3.1. Maintainability**

- The architecture of Toproffer's system is going to be 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 is going to be written with a native language, it is going to be compatible with both IOS and Android and this helps us to release new versions easily.

#### **3.3.2. Adaptability**

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

#### **3.3.3. 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 technologies are going to be searched regularly.

### **3.3.4. Usability**

- 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 planning to implement in a way that every user can easily understand and use it without any help.
- Colors that are going to be used in the application's screens will be selected in a way that will not disturb users.
- In addition, after the user registered to Toproffer, basic information about the usage of Toproffer will be shown briefly.

### **3.3.5. Reliability**

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

### **3.3.6. Installability**

- When the new version of Toproffer is released, every user that has any old version of Toproffer can install the new version.

### **3.3.7. Security**

- The system of Toproffer protects sensitive data depending on KVKK laws.
- In Toproffer, user passwords are going to be stored in salted hash forms.
- In Toproffer, user information is going to be encrypted with a common symmetric key.

## **3.4. Pseudo Requirements**

- Toproffer will be released for both Android and Mac Operating Systems and also it will be used on the website.
- React-native framework will be used for front-end development and JavaScript, HTML and CSS software languages, and some UI libraries will be used with this framework to make UI more user-friendly.
- Genymotion will be used as an emulator for Android devices and Appetize.io will be used as an emulator for Mac devices.
- Amazon DBS will be used as a server and its response time should be at most 1 second.

- PostgreSQL relational database language will be used for the database and every query should respond within 2 seconds. PgAdmin4 web application will be used for PostgreSQL.
- ASP .net Core framework will be used for back-end development and C# software language will be used with this framework.
- The project has to be completed before May 8, 2020.
- The number of developers for implementation is limited as 5 people.
- The application should have a minimum number of 10 restaurant owners and 100 restaurant clients in the same district for the appropriate usage.
- New campaigns should be able to be added to the map within at most 5 seconds.
- Campaigns should be recommended if restaurants entry their sold products at least 4 days a week.
- Campaign codes should be verified by the restaurant owners within at most 2 seconds if there is sufficient internet connection in that area.

### **3.5. System Models**

#### **3.5.1. Scenarios**

##### **3.5.1.1. Burak's Scenario**

Burak has been using Toproffer for 6 months now. After a long tiring day, Burak wanted to drink a cup of coffee but he didn't have much money so that he gave up the idea of drinking coffee. Suddenly, he remembered that he had Toproffer application on his phone which can help him to find the proper campaign that includes coffee in it. He opened Toproffer, after he opened the application, he filtered the search options just to see coffee shops. After the filtering process was done, on the map, he saw that Federal Coffee Company had a campaign that includes coffee in it. He selected that campaign to see its content. In that campaign, it is written that, if a customer buys one chocolate cake and one latte, he/she pays 20 Turkish liras instead of 27 Turkish liras. Burak wanted to take advantage of this campaign with his friend Yiğit. He called Yiğit and invited him to drink coffee in Federal Coffee Company. After half an hour, they met at the entrance of Bilkent University but none of them knew where the Federal Coffee Company is. To find where it is, Burak

opened Toproffer, using the navigation feature of Toproffer they found Federal Coffee Company easily and they entered. After they found an empty table to sit, the waiter came and asked them what they wanted to order. Burak showed the campaign to the waiter from Toproffer and he ordered this campaign menu which includes one chocolate cake and one latte. Yiğit said that he wanted to order the same menu, too. Since they are using Toproffer, both of them can benefit from this campaign. After the waiter brought their orders, they started to talk about their senior project. They ate their cake and drank their coffee. Then they said to the waiter that they want to use the campaign code to benefit from the campaign which they ordered. Burak opened Toproffer, selected the campaign and told the campaign code to the waiter. Waiter checked the code, he saw the campaign code is correct and he confirmed the code, Burak and Yiğit paid 20 Turkish liras instead of 27 Turkish liras for the menu that they ordered. After the waiter confirmed the code, the information that they benefited from this campaign was added to Burak's and Yiğit's profile. Burak loved Federal Coffee Company very much, for this reason, he followed it from Toproffer to receive campaign notification from Federal Coffee Company.

### **3.5.1.2. Mert's Scenario**

One day Mert and Asena wanted to go to a restaurant to celebrate Mert's birthday but they had no idea about where they could go. They had been trying to decide this for two hours. They heard a notification sound from Mert's phone and after a second they heard a notification sound from Asena's phone, too. They looked at their phone and saw that both notifications were from Toproffer. They have been using Toproffer for 3 years. Mert opened Toproffer and pressed the "Notifications" option which is on the lower menu to learn about the content of the notification. The notification that was sent to Mert's phone was about a campaign that was created newly from Lokal'71. This notification was sent to Mert's phone because he was following Lokal'71. This campaign was offering that one hamburger and one cola is for 32 Turkish liras instead of 40 Turkish liras. Then Asena opened Toproffer. The notification that was sent to Asena's phone was about a campaign that was created newly from Savor Döner. She started following Savor Döner four months ago. It is

offering that one roasted meat and one buttermilk is for 30 Turkish liras instead of 34 Turkish liras. After a long discussion, they decided to go Lokal'71, they went Lokal'71 and they found a table to sit. They said to the waiter that they want to benefit from the campaign that they got notified. Waiter said that the campaign that Mert is talking about momentarily campaigned which was valid for 2 hours and its time has expired. Then they went to Savor Döner. They said to the waiter that they want to benefit from the campaign. The momentary campaign that Savor Döner created was still valid. After Mert and Asena finished their meal Asena said to the waiter that they want to use the campaign code before payment. Asena said the campaign code to the waiter, the waiter confirmed the code and they paid 30 Turkish liras instead of 34 Turkish liras for each. After the waiter confirmed the code, the information that they benefited from this campaign was added to Mert's and Asena's profiles.

### **3.5.1.3. Doğacan's Scenario**

Doğacan was an owner of a pizza restaurant with the name Pizza House. His restaurant had great campaigns but just a few amounts of customers had an idea about Pizza House's campaigns. One day, while Doğacan was talking with one of his customers whose name is Yaşar about this issue, Yaşar said that there is an application which Doğacan can announce Pizza House's campaign. Suddenly Doğacan got very excited and asked for the name of the application. Yaşar said that the name of the application is Toproffer. Doğacan downloaded Toproffer to his phone and opened the application. After registering as a restaurant owner, he created a permanent campaign. The content of this campaign was if a customer buys a large size pizza with a beverage, he/she pays 24 Turkish liras instead of 31 Turkish liras. 2 hours later, a customer whose name is Su entered Pizza House and said that she wanted to benefit from the campaign. Doğacan asked her that how did she learn the campaign. Su said that she saw this campaign on Toproffer. After she ate her pizza and drank her cola, she said the campaign code to Doğacan, and Doğacan confirmed the campaign code. Then, Su paid 24 Turkish liras instead of 31 Turkish liras. After Doğacan confirmed the code, the information that Su benefited from this campaign was added to Su's profile.

### **3.5.1.4. Servan's Scenario**

Servan was an owner of kebab restaurant with the name Tanaman Kebab. He has been using Toproffer for 8 months. He announced a lot of campaigns to customers by using Toproffer. One day, at 3 PM, there were very few customers in Tanaman Kebab. Servan was thinking about how he could increase the amount of customers. Suddenly, he remembered that he can create a momentarily campaign using Toproffer. He opened the application, moved on to the "create campaign" page and filled the required information about the campaign. For the type of campaign option, Servan selected the "momentarily campaign" option and for the valid period option of this selection, he determined 3 hours which means the campaign that Servan created was valid for 3 hours. After a while, Ayçe entered to Tanaman Kebab. She said she wanted to benefit from the campaign. Ayçe ordered her meal and after that when she wanted to pay for her dinner, she said campaign code to Servan. Servan confirmed the campaign code. After Servan confirmed the code, the information that Ayçe benefited from this campaign was added to Ayçe's profile.

### **3.5.1.5. Cemre's Scenario**

After her exam was finished, Cemre wanted to drink a coffee. Since she didn't have much money, she had to spend her money sparingly. Suddenly, Cemre remembered that her friend Yağmur told her about Toproffer which can help her to find a campaign that includes coffee in it. Cemre downloaded Toproffer and opened it. After she filled the sign-up form, the "Interest Selection Page" opened. "Interest Selection Page" is for newly registered users to let them select their food and beverage interests. Since Cemre was a new user, she didn't follow any restaurant yet. Because of that, when she moved on to the "Notification" page, she saw the campaigns of the restaurants with the types that she selected in the "interest selection page". If there were restaurants that Cemre followed, these would appear on the "Notification" page. Then she moved on to the "Restaurants" page to look at all the restaurants that are located in Ankara which is the city that Cemre is living. She found that there is a coffee shop in Çukurambar with a very advantageous campaign which is if a customer buys 2 coffees between 2 PM and 4 PM, one of the

coffees will be free. To benefit from this campaign, Cemre called Yağmur to go to this coffee shop. They met in front of the coffee shop and entered. They said to the waiter that they want to benefit from the campaign. After Cemre and Yağmur finished their coffees, Cemre said to the waiter that they want to use the campaign code before payment. The waiter confirmed the campaign code. After the waiter confirmed the code, the information that Cemre benefited from this campaign was added to Cemre's profile.

### **3.5.1.6. Kutay's Scenario**

Kutay has been using Toproffer for 11 months. He was an owner of the café with the name Coffee Lab. Kutay benefited from Toproffer very much such as he created permanent campaigns, he created momentarily campaigns and he used the "Campaign Generator" feature. "Campaign Generator" feature of Toproffer, generates campaigns with combining products of the restaurant using statistical information of this restaurant's products. This function basically combines two products, one of the products that "Campaign Generator" selects is best-selling product of this restaurant and other products that "Campaign Generator" selects is the less sold products compared to other products, after combining these products, "Campaign Generator" creates a campaign and offer this campaign to the restaurant owner. In Kutay's café, tea is the best-selling product and the cheesecake is the less sold product compared to other products, after combining these products. "Campaign Generator" generated a campaign by combining tea and chocolate cake. This generated campaign's content is if the customer buys one tea and one cheesecake, he/she pays 14 Turkish liras instead of 18 Turkish liras. Kutay found that campaign logical and created momentarily campaign on the "Create Campaign" page. Customers that come to Coffee Lab liked this campaign so much.

### **3.5.2. Use Case Model**

In this section, there will be use-case models related to the system. The system's requirements and functionalities are easy to observe in UML diagrams via use case diagrams. It is a basic view of the dynamic behavior of the system. In order

to make it clear, there will be 2 different use case diagrams for login, sign up and initialization of system. These diagrams are shown on the next page.

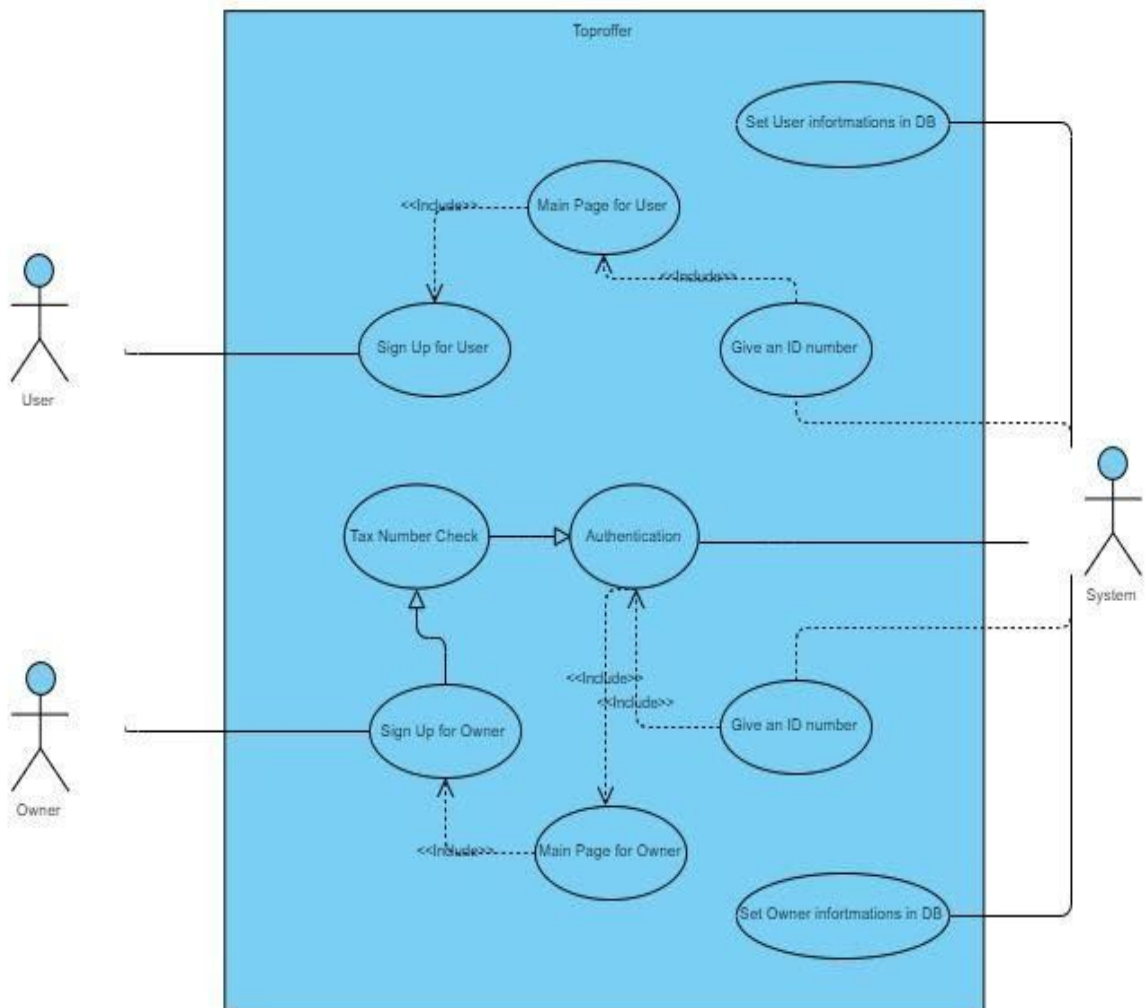


Figure 1: SignUp Use Case for Non-Registered Customers

Figure 1 shows the functionalities of the application that involves signing up, logging in and initialization of the Toproffer for the possible customers when they open the application and try to register.



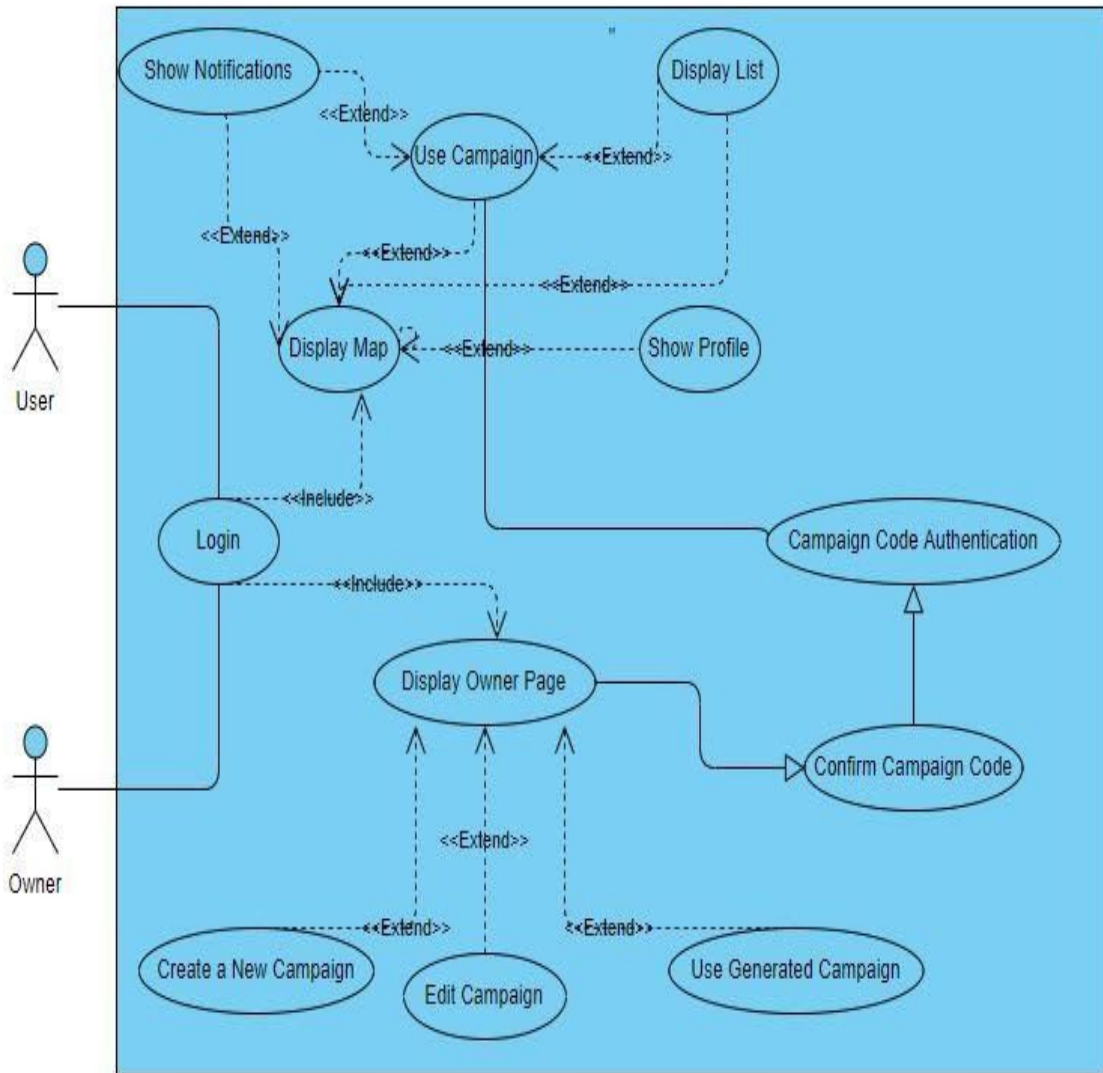


Figure 2: Application Use-Case for registered users and owners

Figure 2 shows the application functionalities for the customers which are users and owners.

### 3.5.3. Object and Class Model

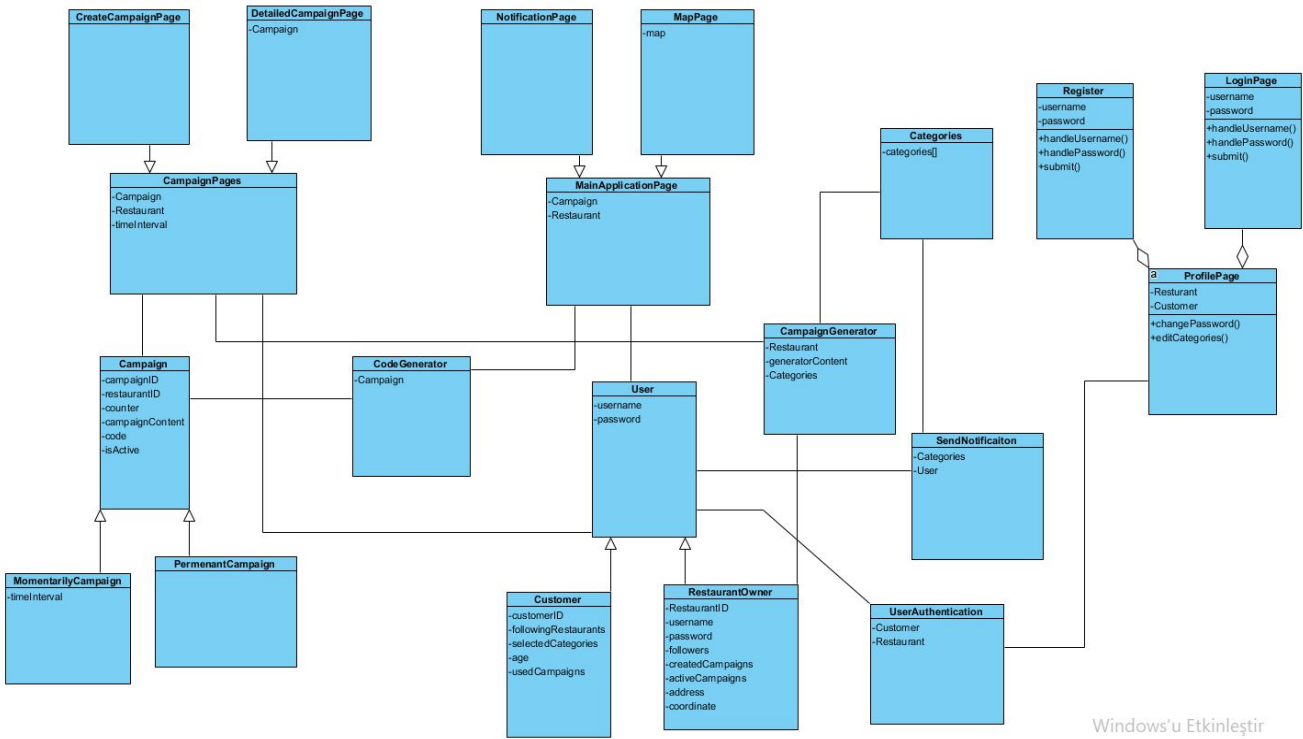


Figure 3: Class Diagram of Our System

### 3.5.4. Dynamic Models

#### 3.5.4.1. Sequence Diagrams

##### 3.5.4.1.1. Login Sequence

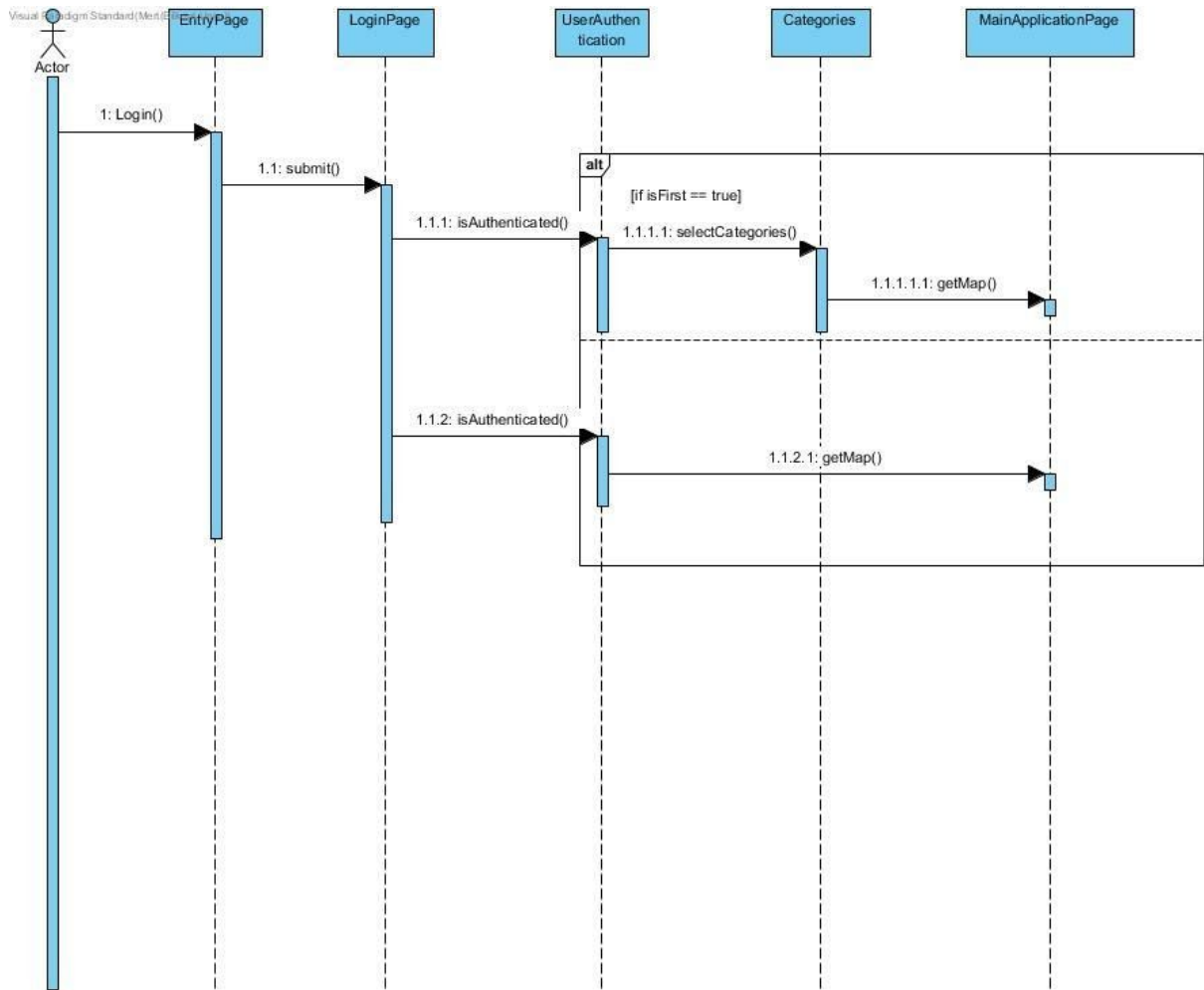


Figure 4: Sequence Diagram of User Login

### 3.5.4.1.2. Apply Campaign Sequence

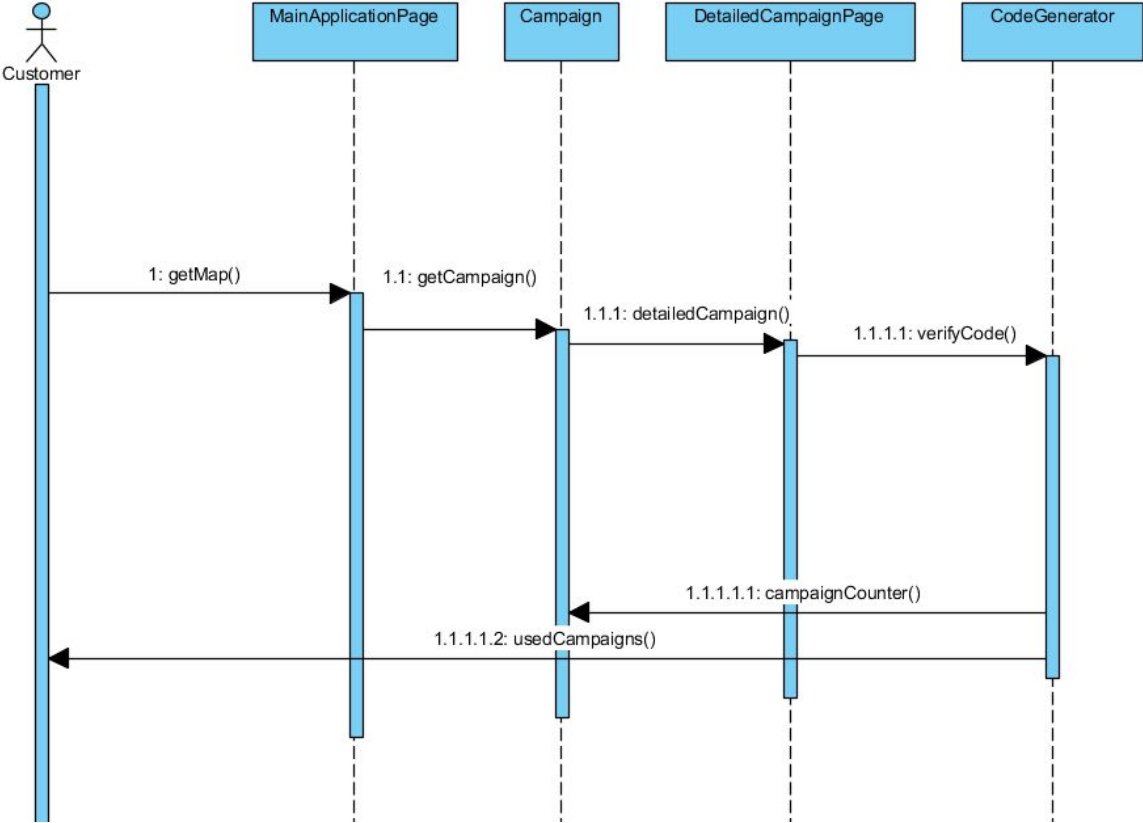


Figure 5: Sequence Diagram of Applying Campaign

### 3.5.4.2. Activity Flow Diagram

#### 3.5.4.2.1. Flow Diagram for User

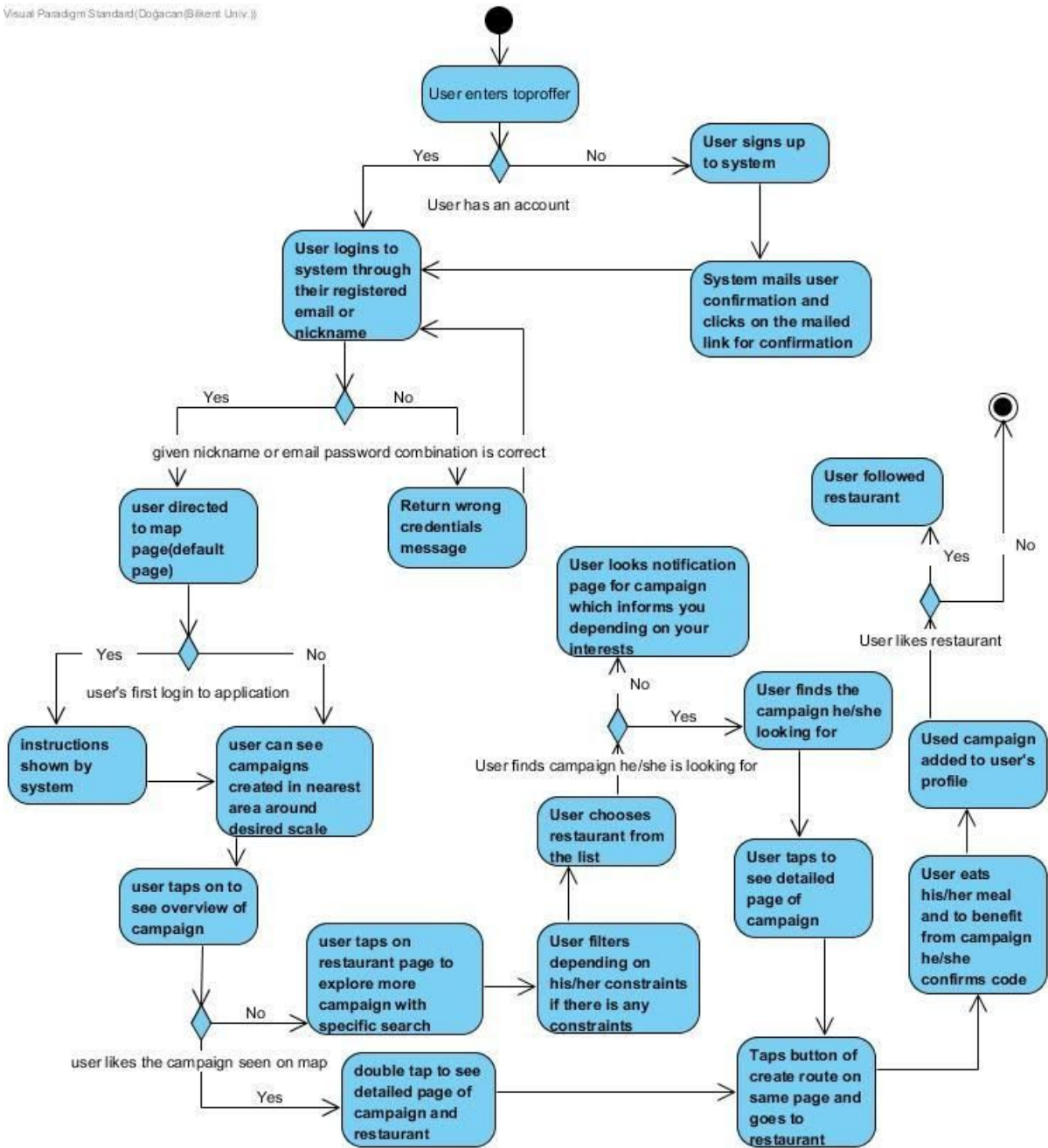


Figure 6: Activity Flow Diagram for User

### 3.5.4.2.2. Flow Diagram for Owner

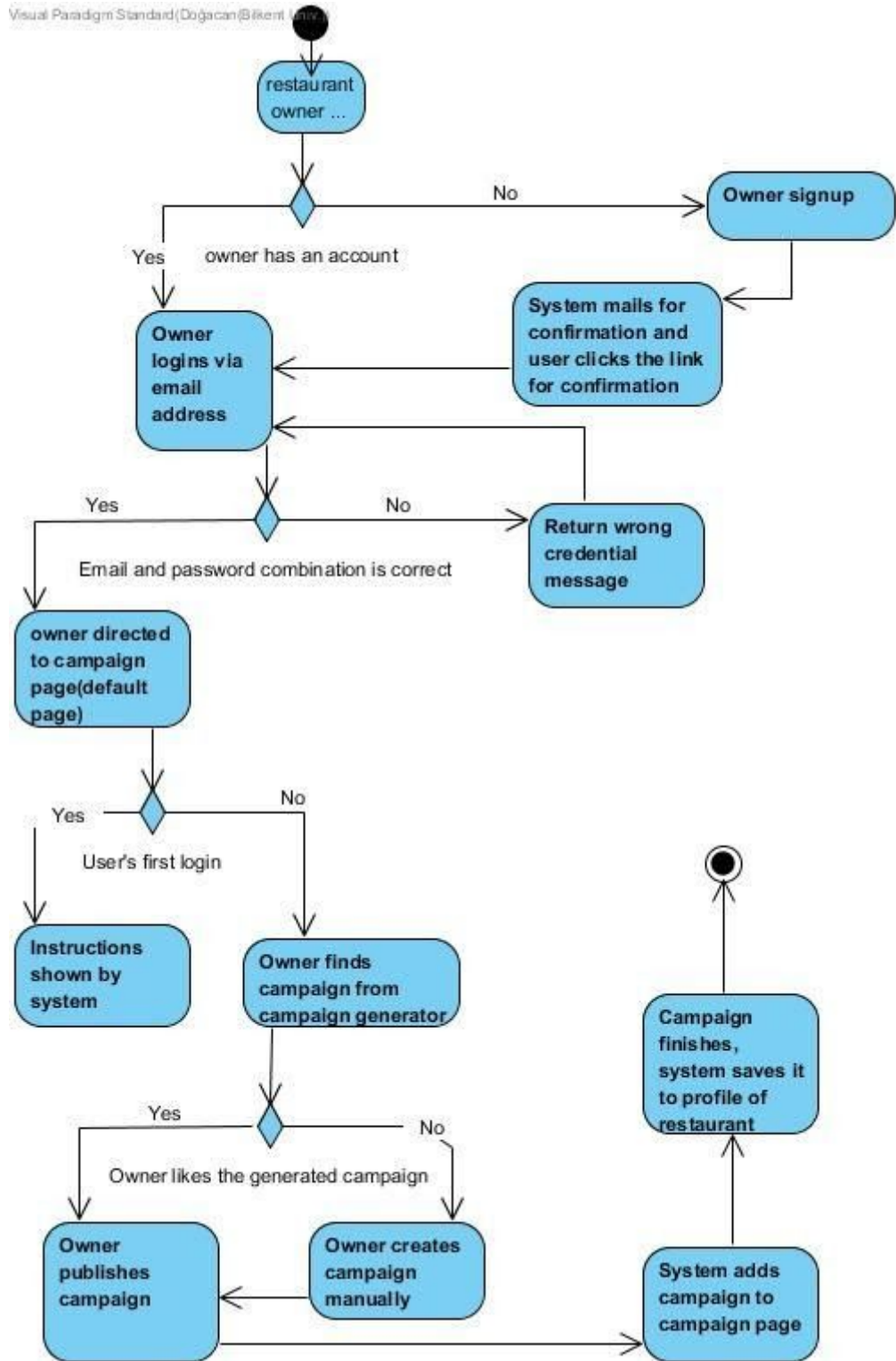


Figure 7: Activity Flow Diagram for Owner

### 3.5.5. User Interface - Navigational Paths and Screen Mock-ups

### 3.5.5.1. Owner Mockup

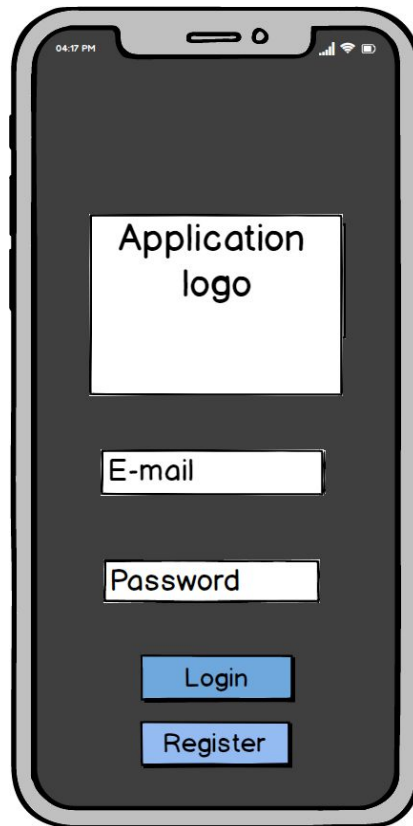


Figure 8: Mock up of Entry Page

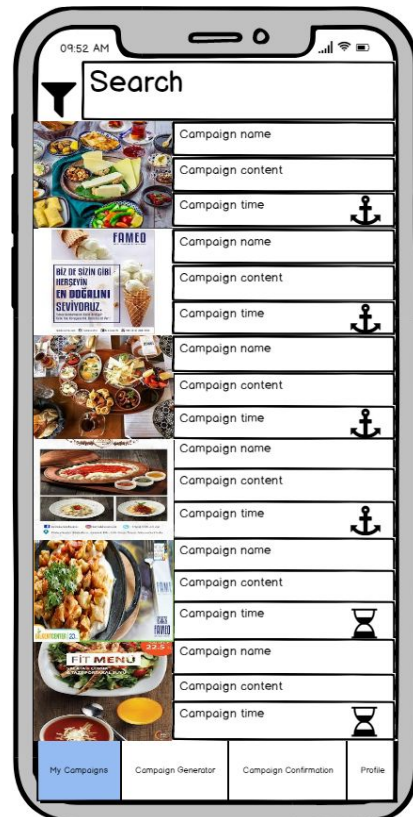


Figure 9: Mock up of Campaign Page

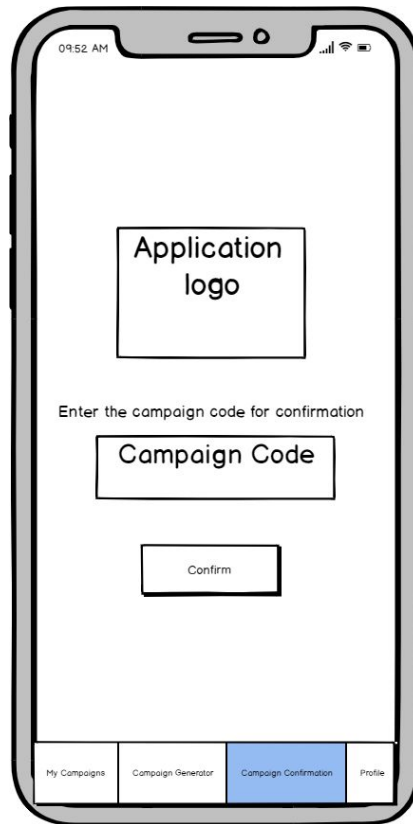


Figure 10: Mock up of Campaign Confirmation Page



Figure 11: Mock up of Campaign Page



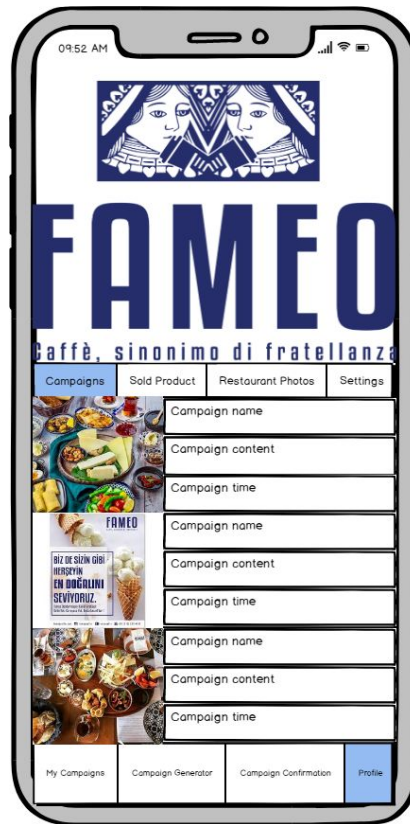


Figure 12: Mock up of Profile Page on Campaign Tab



Figure 13: Mock up of Profile Page on Sold Out Tab

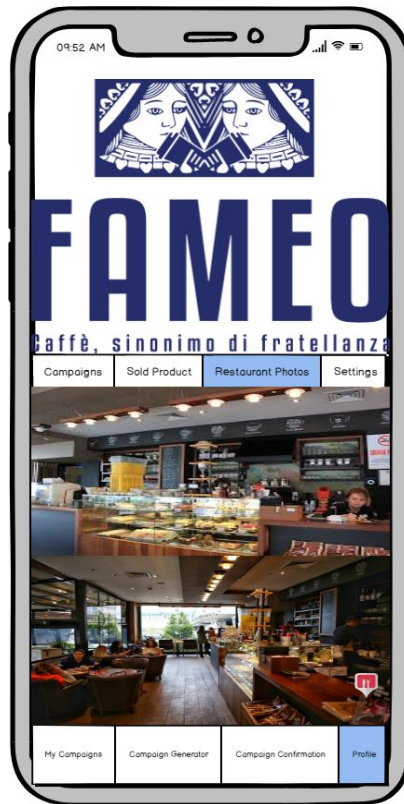


Figure 14:Mock up of Profile Page on Restaurant Photos Tab



Figure 15:Mock up of Profile Page on Restaurant Settings Tab

### 3.5.5.2. Customer Mockup

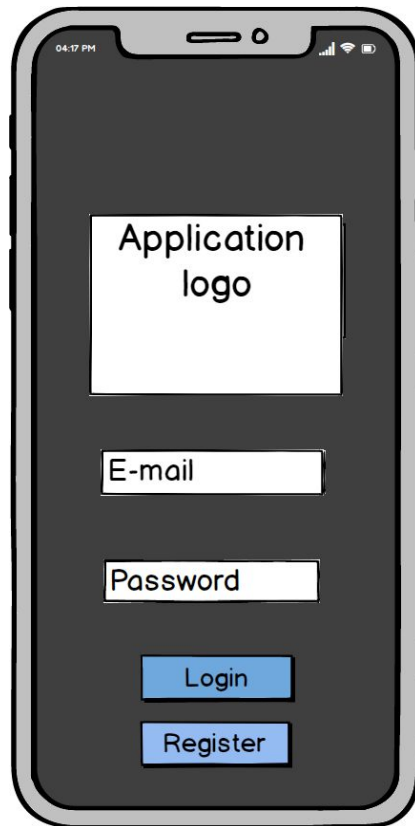


Figure 16: Mock up of Entry Page

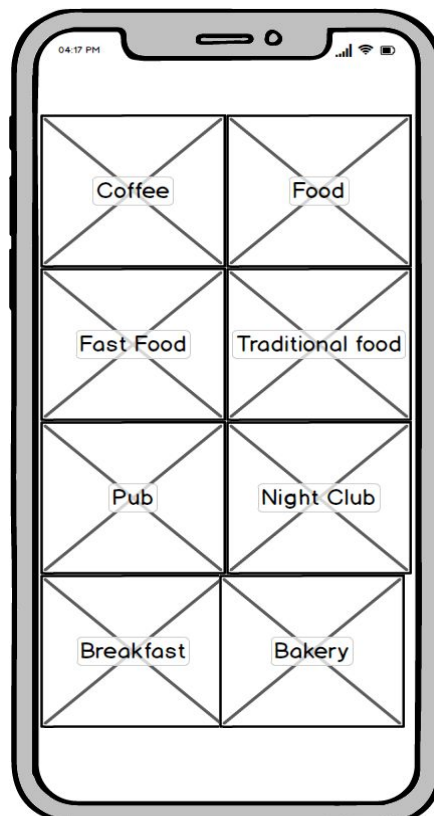


Figure 17: Mock up of Selecting Categories Page

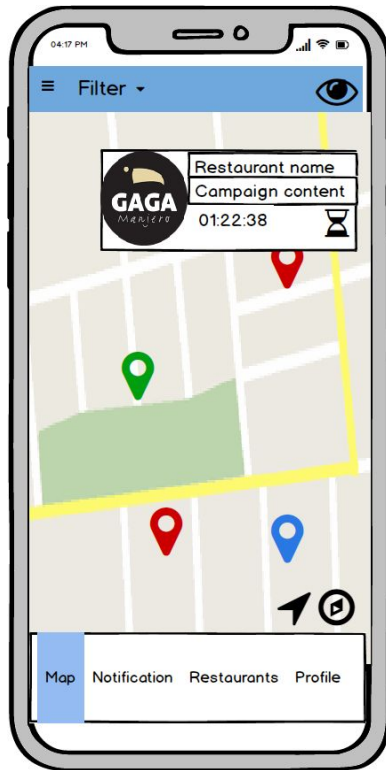


Figure 18: Mock up of Map page

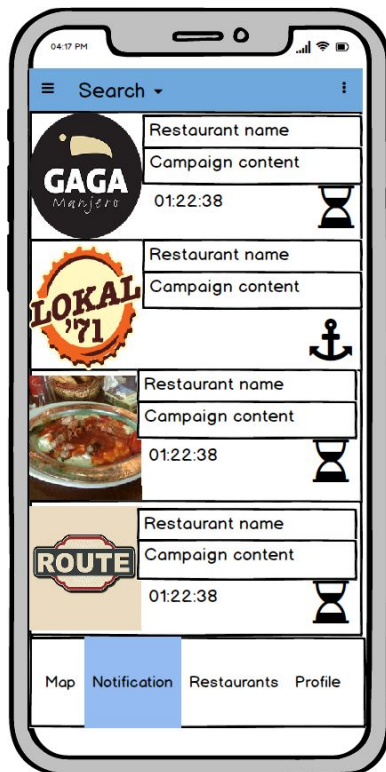


Figure 19: Mock up of Notification Page



Figure 20: Mock up of Restaurant List Page

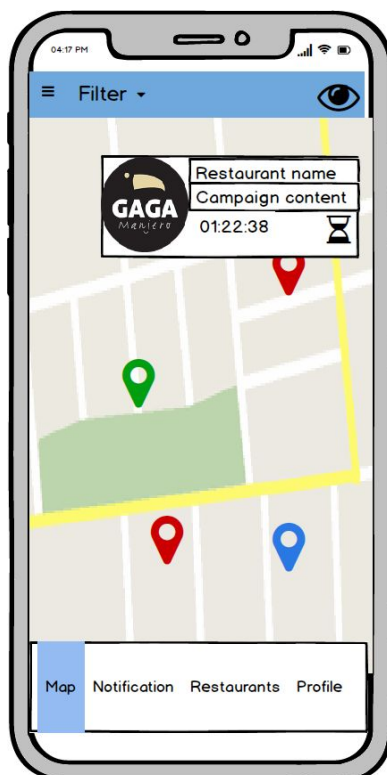


Figure 21: Mock up of Campaign Description in Map



Figure 22: Mock up of Detailed Campaign Page

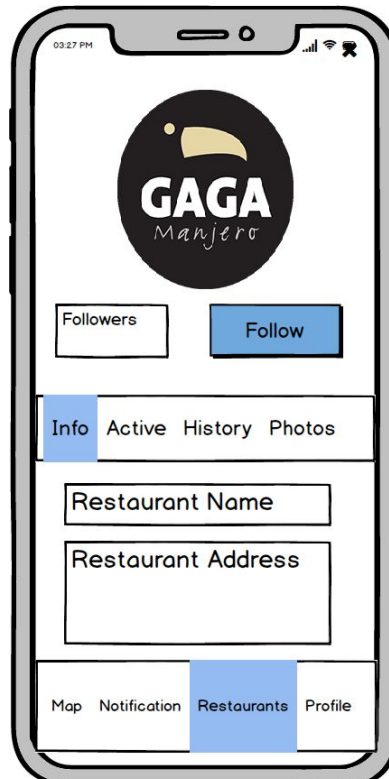


Figure 23: Mock up of Restaurant Description Page Information Tab



Figure 24: Mock up of Restaurant Description Page Active Campaigns Tab



Figure 25: Mock up of Restaurant Description Page Old Campaigns Tab



Figure 26: Mock up of Restaurant Description Page Photos of Restaurant Tab

### 3.5.5.3. Navigational Paths for Customer

#### 3.5.5.3.1. Login

When a user enters our application, he or she needs to login to the system with a registered account and the user is forwarded to the screen in Figure 1. Then, if a user has a registered account, clicks the login button and the screen in Figure 2 will appear. After he or she enters the account details asked in Figure 2 and log in to the system there are two cases. The first one is if that user login to the system for the first time, he or she has to choose their interests according to the categories shown on the screen in Figure 3 and goes to Figure 4 by default after user chooses their interests. The second one is if that user has a login to the system before, he or she directly forwarded to the screen in Figure 4. In both ways, the user successfully login to the system at the end.

#### 3.5.5.3.2. Seeking Campaigns and Applying a Campaign

After the user successfully login to our system, be on the map page shown in Figure 4 by default and wants to seek the campaigns that are registered by the restaurants, he or she needs to click the pop-ups that are appeared on the map, which means there is a campaign over there. After clicking one of the desired pop-ups, a brief description of that campaign is shown to the user, as shown in



Figure 7. If the user wants to use that campaign, he or she needs to go to that restaurant and show the code that is gotten from the button 'Use Code' in Figure 8 and make use of the campaign.

Also, the user is able to see the campaign list on the notification page as shown in Figure 5. In that list, campaigns that have hourglass icon means that the campaign momentarily campaigns and it is valid for a short time interval, which is at most 1 day. Campaigns that have anchor icon, means that this campaign is valid for a long time interval, which is at least 1 week. After clicking the desired campaign user is forwarded to Figure 8, which is the detailed description of the campaign and may make us of the campaign from this page.

### **3.5.5.3.3. Following Restaurants**

When a user wants to get notification from the desired restaurant campaigns, he or she needs to follow that restaurant. To do that, the user should go to the restaurant list page that is shown in Figure 6. After the user searches the restaurant or clicking one of the listed restaurants, it is forwarded to the restaurant's profile page as shown in Figure 9, and click the follow button. Also, the user is able to see the restaurant's active campaigns and old campaigns. Users can get notification from the restaurant when it creates or deletes a campaign.

## **4. Other Analysis Elements**

### **4.1. Consideration of Various Factors**

Toproffer has great potential in terms of social and economic impacts on society. Since the project aims to create a bridge between companies that are having campaigns and customers, in case of catching success, the project will have contributions in the economy. The customers who visit restaurants via Toproffer will exchange money with service. At this point, we can say that the application is also aiming to create awareness about not only the campaigns but also about the restaurants which are not detected by customers. It is possible that a person even if he visits a certain area for meals frequently, he did not realize there is a restaurant. This restaurant might also serve meal options that he can prefer. It is also possible to create new routines for users after visiting some popular restaurants on the

application. Toproffer can also help people with a low budget to get better service since the restaurants in the application will serve the same dish at a lower price compared to the other restaurants. In this way, users can make savings and use their money for other needs. Topoffer can encourage people to go out and find the optimal service. Because users of the application can possibly go and discover the new restaurants, social impact will eventually occur.

## 4.2. Risks and Alternatives

The table below will show the potential risks, the possibility of occurrence, the impact of those risks in case of occurring and the alternative solutions for them.

<b>Risk</b>	<b>Possibility</b>	<b>Impact</b>	<b>Alternative solution and plan for emerging risk</b>
Missing one of the group members because of an illness	Medium	Medium	Rest of the members will share the sick one's work and responsibilities
Requirements Inflation	High	High	Rescheduling the Gantt chart and deadlines with workflow
Risk of a data loss	Very Low	Very High	Uploading the data from the backup server
Poor Productivity	Low	Medium	Searching similar projects, making questionnaires with people and understanding the needs, finding new possible features
Changing the technology we used for implementation	Very Low	Very High	Finding a new cross-platform available technology
Coding Mistakes	Very High	Between Very Low to Very high	Tracing the code and finding the error part and fixing it
Design mistakes which decreases the understanding of the program	Low	High	It may require redesign or change a part of the design
Wrong time estimation	Medium	High	It may require speeding up the work or reschedule the workflow in time
Not having enough data to train machine learning algorithm	Medium	Very High	Searching and finding enough data, if necessary making observation for data
Creating a complex product for implementation	Low	High	Redesign the structure and product. It may require recreation of product

The need for a technology that does not exist yet	Very Low	Medium	Changing the project's relevant part with that technology and make it suitable for alternative one
Performance issues about expected response time and needed memory for the program.	Low	Very High	Expected respond time and needed memory for the program should be in an acceptable range. Thus optimization may require
Unrealistic Expectations from COTS(Commercial Off the Shelf)	Medium	Very High	Need to make a strategic plan for marketing strategy
Reduced use of the program by users	Low	High	Finding the reason behind the drop in usage and taking the necessary action for it
Giving support for the application in case of bug occurrence	Low	Low	Creating a system to detect and fix the bugs
Infiltrating in the program and even into the database	Low	Very High	Encrypting all data again and keep data up to date
The operating system doesn't support the application	Very Low	Very High	Change the project in a way that it can adapt with OS
When a server problem occurs	Low	High	Getting in touch with company who provide server for us
When customer satisfaction is low	Low	Medium	Making feedback and changing the undesired features with desired ones
Miss-communication between team members	Very Low	Low	Arranging a meeting & talk about why it happened
Changes in government policy about extracting and working on the user data	Very Low	Medium	Consulting a lawyer to find an alternative way to get the user data to work and process on it
Becoming and outdated application because of new technology from a rival company arrived	Low	High	Always planning for new features to add in the program plus making the program better for customer usage to keep it updated
Not having appropriate subject training	Medium	High	Finding the information about the subject and consult the professionals for help if it is necessary
After one year, the application will ask payment from restaurant owners to continue usage and if owners do not agree to pay	Low	Low	Different payment plans according to the restaurant will be prepared and will find a compromise

### 4.3. Project Plan

Teamwork and work distribution will be done by considering the experiences of the members. Also the lectures each member is taking this semester will take into consideration. In this section we provided screenshots of gantt chart from MS Project. After that we listed the work packages in chronological order. These work packages explained with their table according to initial order. The Gantt Charts are on the below:

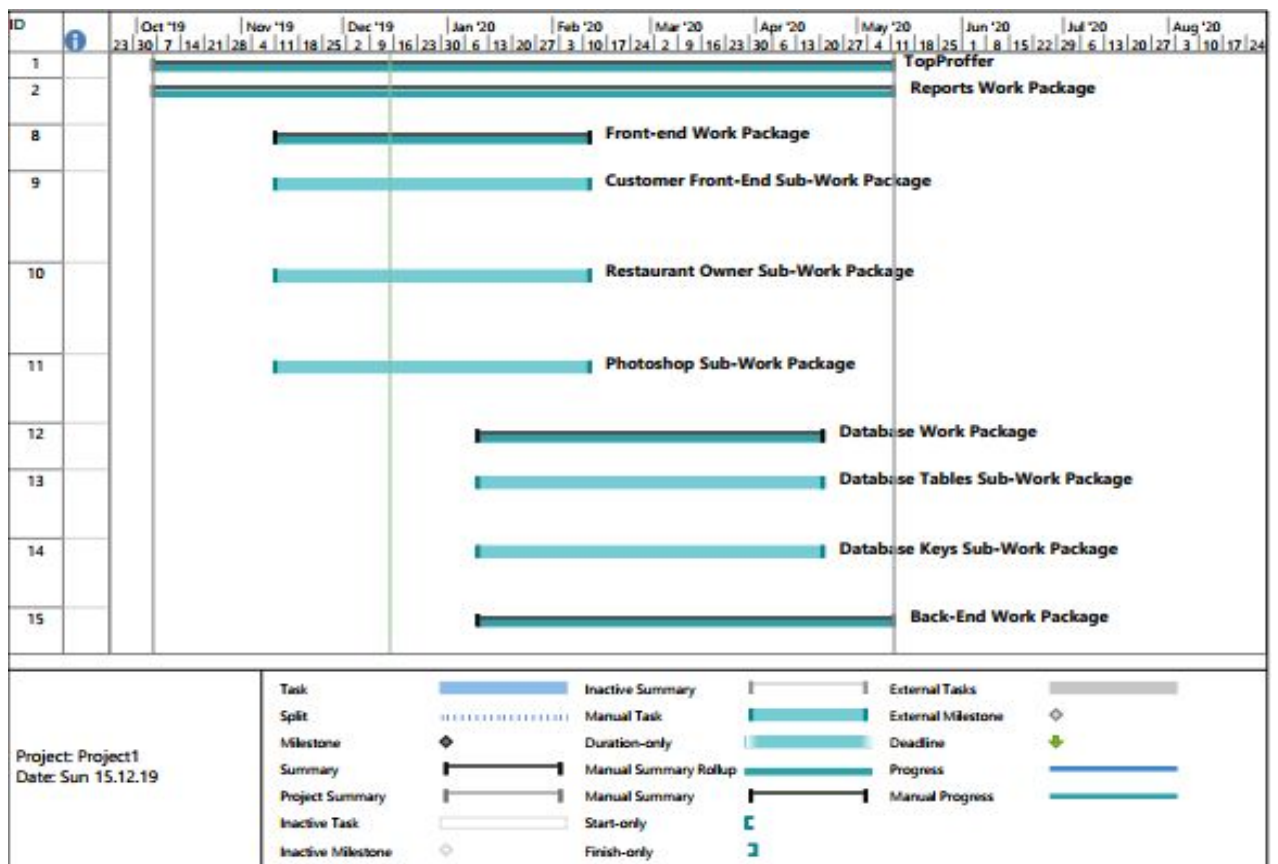


Figure 27: First Screenshot of Gantt Chart

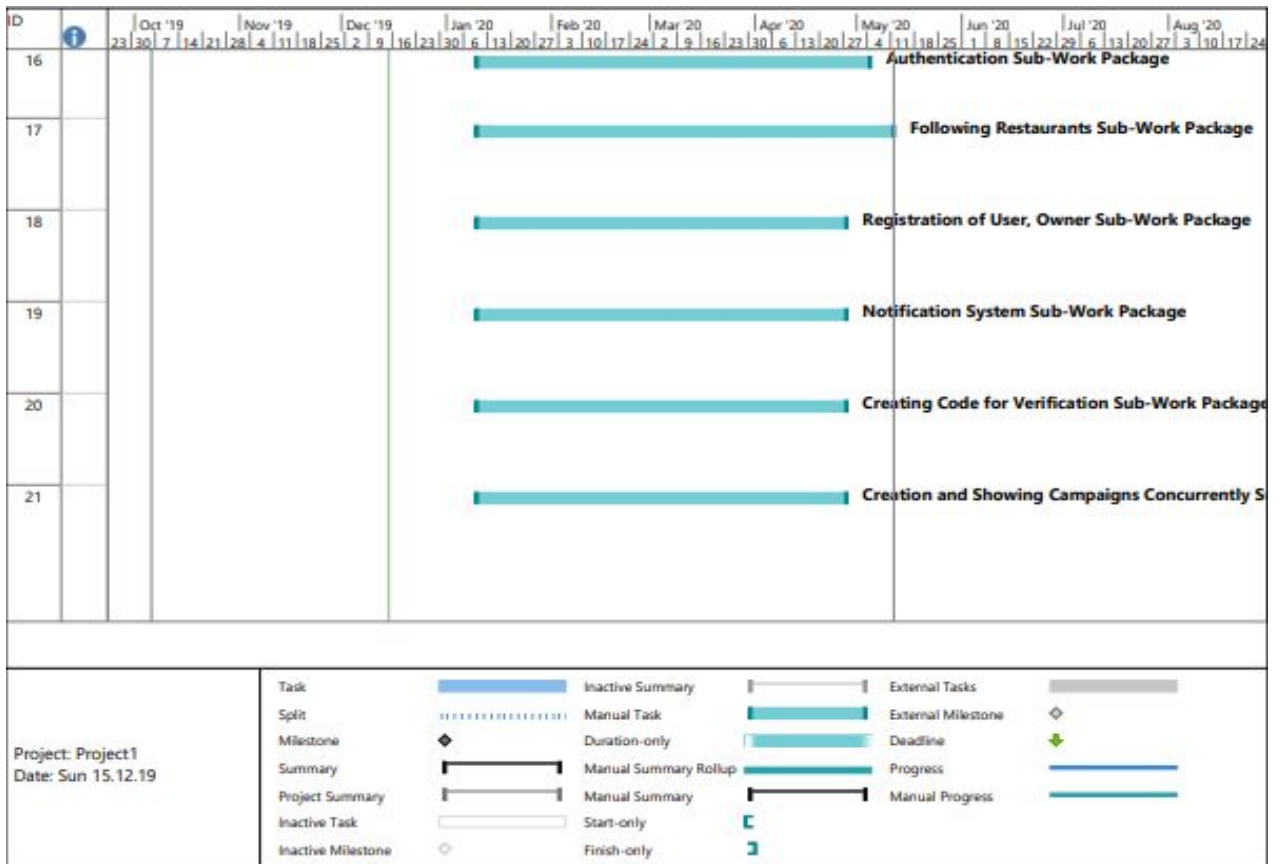


Figure 28: Second Screenshot of Gantt Chart

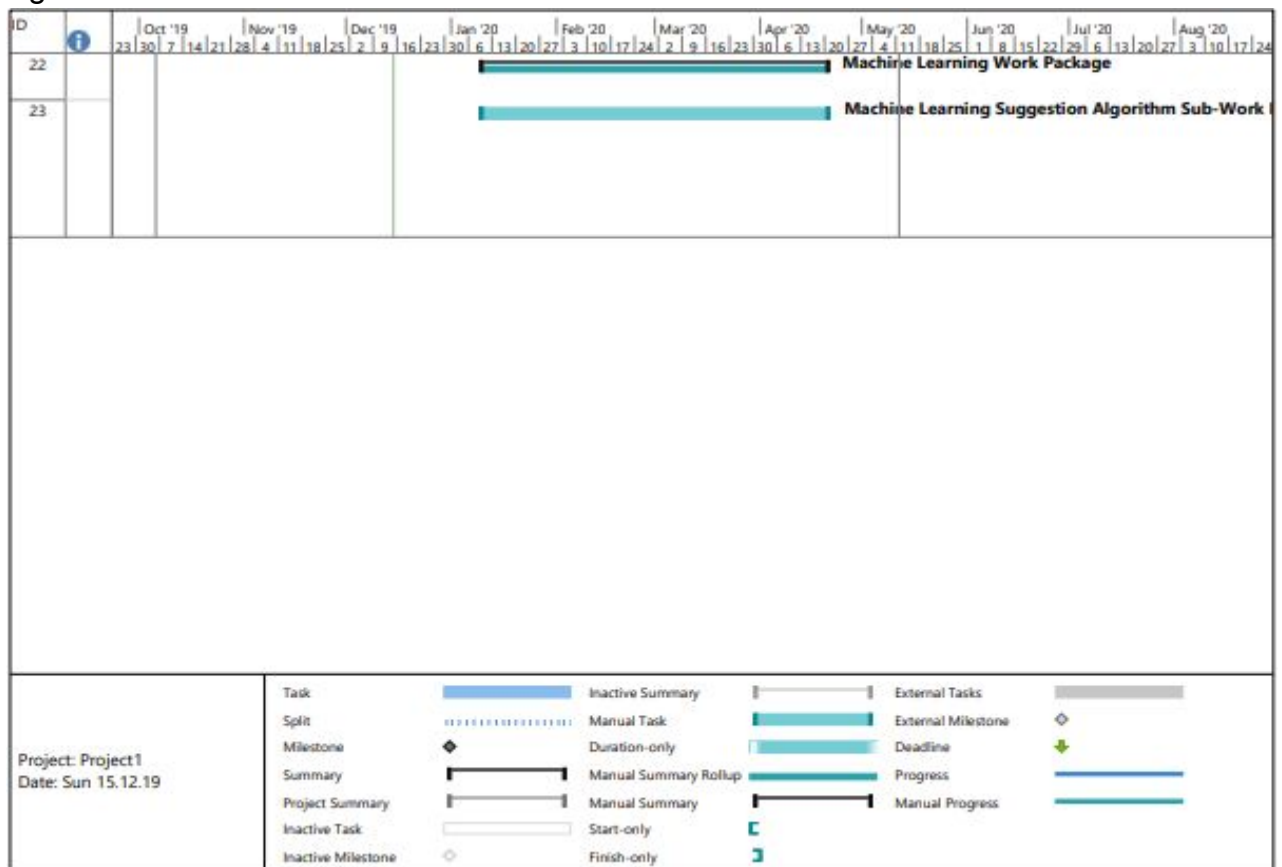


Figure 29: Third Screenshot of Gantt Chart

## **List of Work Packages:**

Work Packages will be divided into five major parts and they have multiple sub work packages.

### **4.3.1. Reports - Servan Tanaman**

- 4.3.1.1. Analysis Report - Dođacan Kaynak
- 4.3.1.2. High-Level Design Report - Yiđit Kutay Gölben
- 4.3.1.3. Low-Level Design Report - Burak Kırımılı
- 4.3.1.4. Final Report - Servan Tanaman
- 4.3.1.5. Presentations & Demonstrations & User Manual - Burak Kırımılı

### **4.3.2. Front-End - Burak Kırımılı**

- 4.3.2.1. Customer Front-End - Burak Kırımılı
- 4.3.2.2. Restaurant Owner Front-End - Burak Kırımılı
- 4.3.2.3. Photoshop - Servan Tanaman

### **4.3.3. Database - Dođacan Kaynak**

- 4.3.3.1. Database Tables - Servan Tanaman
- 4.3.3.2. Database Keys - Mert Çerçiler

### **4.3.4. Back-End - Yiđit Kutay Gölben**

- 4.3.4.1. Authentication - Yiđit Kutay Gölben
- 4.3.4.2. Following Restaurants - Yiđit Kutay Gölben
- 4.3.4.3. Registration of User, Owner - Dođacan Kaynak
- 4.3.4.4. Notification System - Dođacan Kaynak
- 4.3.4.5. Creating Code for Verification- Mert Çerçiler

### **4.3.5. Machine Learning - Mert Çerçiler**

- 4.3.5.1. Machine Learning Suggestion Algorithm - Mert Çerçiler
- 4.3.5.2. Creation and Showing Concurrently Campaigns - Mert Çerçiler

## Tables of Work Packages:

### 4.3.1. Reports Package

Work Package Name: Reports
Duration: 7 Days ( <b>Start:</b> Monday, October 7, 2019 - <b>End:</b> Monday, October 14, 2019)
Group Leader: Servan Tanaman
Group Members: Mert Çerçiler, Burak Kırımlı, Servan Tanaman, Yiğit Kutay Gülben, Doğacan Kaynak
Description: Reports Sub Packages:  4.3.1.1. Analysis Report - Doğacan Kaynak 4.3.1.2. High-Level Design Report - Yiğit Kutay Gülben 4.3.1.3. Low-Level Design Report - Burak Kırımlı 4.3.1.4. Final Report - Servan Tanaman 4.3.1.5. Presentations & Demonstrations & User Manual - Burak Kırımlı

#### 4.3.1.1. Analysis Report Sub-Work Package

Sub Work Package Name: Analysis Report
Duration: 7 Days ( <b>Start:</b> Monday, October 7, 2019 - <b>End:</b> Monday, October 14, 2019)
Group Leader: Doğacan Kaynak
Group Members: Mert Çerçiler, Burak Kırımlı, Servan Tanaman, Yiğit Kutay Gülben
Description: 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.

#### 4.3.1.2. High-Level Design Report Sub-Work Package

Work Package Name: High-Level Design Report
Duration: 7 Days ( <b>Start:</b> Friday, December 24, 2019 - <b>End:</b> Friday, December 31, 2019)
Group Leader: Yiğit Kutay Gülben
Group Members: 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.

#### 4.3.1.3. Low-Level Design Report Sub-Work Package

Work Package Name: Low-Level Design Report
Duration: 7 Days ( <b>Start:</b> Monday, February 10, 2020 - <b>End:</b> Monday, 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.

#### 4.3.1.4. Final Report Sub-Work Package

Work Package Name: Final Report
Duration: 7 Days ( <b>Start:</b> Thursday, May 1, 2020 - <b>End:</b> Thursday, May 8, 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.



#### 4.3.1.5. Presentations & Demonstrations & User Manual Report Sub-Work Package

Work Package Name: Presentations & Demonstrations & User Manual
Duration: 10 Days ( <b>Start:</b> May 1, 2020 - <b>End:</b> May 11 - 14, 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.

#### 4.3.2. Front-End Work Package

Work Package Name: Front-End
Duration: 3 Months ( <b>Start:</b> Monday, November 11, 2019 - <b>End:</b> Monday, February 11, 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:  4.3.2.1. Customer Front-End - Burak Kırımlı 4.3.2.2. Restaurant Owner Front-End - Burak Kırımlı 4.3.2.3. Photoshop - Servan Tanaman

#### 4.3.2.1. Customer Front-End Sub-Work Package

Work Package Name: Customer Front-End
Duration: 3 Months ( <b>Start:</b> Monday, November 11, 2019 - <b>End:</b> Monday, 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.

#### 4.3.2.2. Restaurant Owner Sub-Work Package

Work Package Name: Restaurant Owner Front-End
Duration: 3 Months ( <b>Start:</b> Monday, November 11, 2019 - <b>End:</b> Monday, February 11, 2020)
Group Leader: Burak Kırımlı
Group Members: Doğacan 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.

#### 4.3.2.3. Photoshop Sub-Work Package

Work Package Name: Photoshop
Duration: 3 Months ( <b>Start:</b> Monday, November 11, 2019 - <b>End:</b> Monday, 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 done correctly.

### 4.3.3. Database

Work Package Name: Database Tables
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 20, 2019)
Group Leader: Dođacan Kaynak
Group Members: Mert eriler, Yiđit Kutay Glben, Burak Kırımılı
Description: Database systems will be set. The 2 sub work packages are listed:  4.3.3.1. Database Tables - Servan Tanaman 4.3.3.2. Database Keys - Mert eriler

#### 4.3.3.1. Database Tables Sub-Work Package

Work Package Name: Database Tables
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 20, 2019)
Group Leader: Servan Tanaman
Group Members: Mert eriler, Dođacan Kaynak, Burak Kırımılı
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 the efficiency and for the true information returns.

#### 4.3.3.2. Database Keys Sub-Work Package

Work Package Name: Database Keys
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 20, 2019)
Group Leader: Mert eriler
Group Members: Dođacan Kaynak, Yiđit Kutay Glben, Burak Kırımılı
Description: All tables' entire keys, including all primary and foreign keys, will be created in this section very precisely.

#### 4.3.4. Back-End

Work Package Name: Back-End
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, May 11, 2019)
Group Leader: Yiğit Kutay Gülben
Group Members: Mert Çerçiler, Doğacan Kaynak, Servan Tanaman, Burak Kırımlı
Description: Engine and the all Back-End systems will be implemented and tested. List of 5 sub work-packages are listed: <ul style="list-style-type: none"><li>4.3.4.1. Authentication - Yiğit Kutay Gülben</li><li>4.3.4.2. Following Restaurants - Yiğit Kutay Gülben</li><li>4.3.4.3. Registration of User, Owner - Doğacan Kaynak</li><li>4.3.4.4. Notification System - Doğacan Kaynak</li><li>4.3.4.5. Creating Code for Verification - Mert Çerçiler</li></ul>

##### 4.3.4.1. Authentication Sub-Work Package

Work Package Name: Authentication
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, 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.

##### 4.3.4.2. Following Restaurants Sub-Work Package

Work Package Name: Following Restaurants
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, 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 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.

#### 4.3.4.3. Registration of User, Owner Sub-Work Package

Work Package Name: Registration of User, Owner
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 27, 2019)
Group Leader: Dođacan Kaynak
Group Members: Mert eriler, Servan Tanaman, Yiđit Kutay Glben
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 Toproffer, he or she will have to continue with one of those two registration types. There will be an email confirmation for preventing multiple accounts.

#### 4.3.4.4. Notification System Sub-Work Package

Work Package Name: Notification System
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 27, 2019)
Group Leader: Dođacan Kaynak
Group Members: Servan Tanaman, Yiđit Kutay Glben, Burak Kırımlı
Description: When a user follows a restaurant on our application, he will have the option to follow that restaurant. If there is 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 Toproffer, sometimes users will get notifications about the restaurants with similar servings.

#### 4.3.4.5. Creating Code for Verification Sub-Work Package

Work Package Name: Creating Code for Verification
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 27, 2019)
Group Leader: Mert eriler
Group Members: Dođacan Kaynak, Burak Kırımlı, Yiđit Kutay Glben, 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 ensures 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.

#### 4.3.5. Machine Learning

Work Package Name: Machine Learning
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 20, 2019)
Group Leader: Mert Çerçiler
Group Members: Doğacan Kaynak, Servan Tanaman, Yiğit Kutay Gülben, Burak Kırımlı
Description: Machine Learning algorithm to work on dataset will be created and the algorithm which will suggest and generate campaigns will generated. List of 2 sub-work packages listed:  4.3.5.1. Machine Learning Suggestion Algorithm - Mert Çerçiler 4.3.5.2. Creation and Showing Concurrently Campaigns - Mert Çerçiler

##### 4.3.5.1. Machine Learning Suggestion Algorithm Sub-Work Package

Work Package Name: Machine Learning Suggestion Algorithm
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, April 20, 2019)
Group Leader: Mert Çerçiler
Group Members: Doğacan Kaynak, Servan Tanaman, Yiğit Kutay Gülben
Description: Machine Learning algorithm will recommend the optimum campaigns to restaurants. This algorithm needs the restaurants sold products list with their times and will check the campaigns in the surrounding area for the most accurate results.

##### 4.3.5.2. Creation and Showing Campaigns Concurrently Sub-Work Package

Work Package Name: Creation and Showing Campaigns Concurrently
Duration: 5 Months ( <b>Start:</b> Monday, January 10, 2019 - <b>End:</b> Monday, 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.

## **4.4. Ensuring Proper Team-work**

Work packages are created and listed in the 4.3 Project Plan part above. In that phase, we considered the weights of each section and the subsections of those sections. There are very important and must new technologies for our project to be completed. Thus the learning phases, research phase and more considered at the preparation phase of work packages. Photoshop Work Package is the smallest group needed in any packages in terms of the number of group members sharing the load. We divided the project into two major parts as Front-End and Back-End. Servan Tanaman and Burak Kırımlı have more experience about Front-End so they will lead the work packages related to Front-End. For the Back-End work packages Mert Çerçiler, Yiğit Kutay Gülben, and Doğan Kaynak have more experience thus they will lead most of the work packages related to the Back-End. In every work packages, there are multiple group members who are contributing. Database systems are also led by Servan Tanaman and Mert Çerçiler.

## **4.5. Ethics and Professional Responsibilities**

### **4.5.1. Sensitive 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 KVKK laws.
- The server should have an SSL certificate and always use HTTPS for the data transfer with clients and restaurants.
- User passwords should be stored in salted hash forms.
- Sensitive information common for multiple users such as personal information should be encrypted with a common symmetric key that can be obtained from the user password.
- Before sharing personal information of a user, Toproffer should ask for the appropriate permissions first.
- To minimize the risk of a data loss that can be valuable for users, there should be frequent database backups stored in a different location.

- Depending on user's request their personal data deleted. So that it's not going to be used after all.
- Information including product names and sales numbers will be stored and only the restaurant owner will be able to see these statistics.
- Toproffer stores the old campaign information just to recommend the restaurant more efficient campaign offers with the help of "Campaign Generator".
- The user's location will not be shared with any restaurant or other users.

## **4.6. New Knowledge and Learning Strategies**

We will use cross-platform technologies for the project and this is new to all of our group members. Native languages potentially will be used. To work with Android and IOS we are looking for information through the internet. Tutorials on some websites are especially useful. Udemy, Course Hero, Lynda are the top three websites that are providing us with reliable information. At some point, we may need to consult with our teachers and professionals about their experience and expertise. We believe our innovation Expert Burcu Coşkun Şengül will help us with her guidance in the process of creating our project. In the very first beginning of learning new technologies, we will need to make practices and adapt ourselves to those technologies. When we become familiar and confident about the new technologies, then we will be able to use them for the implementation of our project. Currently, some of us are studying machine learning, some of us are practicing native cross-platform technologies. We are planning to use .NET in the implementation, thus some of us are working on that topic as well as the others.



## 5. Glossary

**Inflation:** a decline in the value of money

**Machine learning:** a field concerned with the design and development of algorithms and techniques that allow computers to learn

**Algorithm:** a precise step-by-step plan for a computational procedure that begins with an input value and yields an output value in a finite number of steps

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

**OS:** Operating System

**IOS:** operating system of Apple smartphones

**Android:** Linux based operating system for mobile phones

**Social network:** A network of personal or business contacts, especially as facilitated by social networking on the Internet

**Verification link:** the link that is sent to user to verify his/her email address

**Spam:** a collection of unsolicited bulk electronic messages

**Campaign code:** the code that is generated for each campaign in Toproffer

**Error:** failure to complete a task

**Response time:** The period of time between a request for a service and the associated response

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

**Encrypted:** describing something that is in code

**HTML:** HyperText Markup Language

**CSS:** Cascading Style Sheets

**UI:** User Interface

**DBS:** Database System

**SQL:** Structured Query Language

**Emulator:** a piece of software or hardware that simulates other hardware

**UML:** Unified Modeling Language

**Diagram:** a plan, drawing, sketch or outline to show how something works

**Pop-up:** a pop-up advertisement; an advertisement that is triggered to appear on a computer screen when an internet user accesses a particular web page

**Hourglass:** a clock made of two glass vessels connected with a narrow passage, with sand flowing through that passage

**Deadline:** a date on or before which something must be completed

**Workflow:** a process and/or procedure in which tasks are completed. It may be defined with a flowchart to define actors, actions, results, decisions, and action paths

**Backup:** a copy of a file or record, stored separately from the original, that can be used to recover the original if it is destroyed or damaged

**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.

**Optimization:** the design and operation of a system or process to make it as good as possible in some defined sense

**Authentication:** proof of the identity of a user logging on to some network

**Photoshop:** to digitally edit or alter a picture or photograph

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

**Mock-up:** to create a model or demonstration; to create a preliminary version or sample

**Chart:** a graphical presentation of something

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

**SSL:** initialism of Secure Sockets Layer. cryptographic protocols which provide secure communications on the Internet

**HTTPS:** Hypertext Transfer Protocol Secure, (HTTP Secure) an encrypted form of information transfer on the internet

## 6. References

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