P

PARK IT

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Analysis Strategy

1. Business Process Automation

We basically automate the ticketing system of the parking lot company. Instead of using paper for the labeling entrance and exit times, we will be using a QR code system adapted to the parking lots. This digitized information of entrance and exit times, allow us to process data and give some analysis of the day by day densities graph of the parking lots.

Also, we realized that companies fve parking lots are working independently. With our application, the company not only obtains its financial incomes but also centralizes their parking lots and becomes easier to control their five lots.

We used cause analysis because when we started this project we saw that the parking lot company would improve the quality of service they give and the project would ease the check in/out to parking lots.

2. Business Process Improvement

Company had problems advertising and managing. With our app, we will give a chance to control all their parking lots from one application. They can receive feedback from customers too. With this situation, the company becomes institutionalized.

Also, Since the company and the customers know the density information they are now allowed to find the best available parking lot instead of trying to find an empty parking lot by going one by one.

3. Business Process Reengineering

Firstly the idea of Park It was making profit of park lots that not flagship ones, increase density of parking lots. However we realized that the company does not have capacity to manage five parking lots. All parking lots are managed like they belong to different companies. Different rules, different prices, obvious differences in service quality etc. With our app, all lots work as one parking lot. Also thanks to our feedback system, customers can give feedback about their experience in the parking lot. So that company will be able to respond to problems immediately.

Requirements Elicitation Techniques

We used the interview elicitation technique in order to gather information from the parking lot company. Firstly we explained how the Park It application will affect the business with automated ticketing system, live density checking. After the explanation, we asked a couple of questions to have detailed information about the business process.

Question 1: What kind of automation system you are using on your parking lots
Answer: We don't have any automation system. All parking lots using ticket based payment system but they don't have any connection each other
Question 2: How many parking spaces do you have for each of the parking lots?
Answer: We have five parking lot facilities. two of them our main ones named flagship parking lots. Parking lot capacities are below:
#1: 100; #2: 200; #3: 300; #4: 300; #5: 400
Question 3: Are you keeping entrance and exit information of customers?
Answer: We just collect daily entrances of customers of parking lots and number of members.
Question 4: Do you have a certain pricing strategy for your parking lots ?
Answer: We don't have any strategy. We determine our prices according to opponent companies prices.
Question 5: How many cars do the parking lots have on an average day?

We used the questionnaire elicitation technique in order to gather information from the customers of the parking lots. We asked a couple of questions about the several topics to each customer who arrives at the parking lot.

Question 1: Rate your satisfaction with the service of parking lots.
1 not satisfied / 10 very satisfied

	Parking Capacity	Cleaning and behaviours of employees	Payment System	Pricing Policy
#1	3	4	1	2
#2	2	5	2	3
#3	7	7	3	5
#4	8	3	2	6
#5	9	2	5	8

Question 2: Rate the given sentences (non-member customers)
1 I am not agreed 10 I completely agreed

	#1	#2	#3	#4	#5
Most of the time, parking lot is full	9	8	3	1	2
Pricing policy is good.	3	4	5	6	7
I would like to get membership from this company	3	2	4	5	4
There is a queue at the exit due to parking payment	10	9	7	4	2

Question 3: Rate the given sentences (member customers)
1 I am not agreed 10 I completely agreed

	#1	#2	#3	#4	#5
Company reserve enough free parking spaces for members	1	2	10	10	10
Pricing policy is good	2	4	6	7	6
I recommend your services to my friends	1	1	4	5	4
I will extend my membership	2	3	6	7	6

Question 4: Do you have anything to add to the above survey.
Customer 1 from #1: I don't want to wait at the entrance and exit due to non-member customers.
Customer 2 from #1: Sometimes I can't enter the parking lot because the parking lot is over.
Customer 3 from #3: Parking officer taking more money from the price list.

Note: After this feedback, The company investigated this issue and realized that some of the parking officers defraud the company. This situation demonstrated how necessary a radical change in the payment system is.

Customer 4 from #5: Parking officers are very rude. I am not surprised why the whole parking lot is empty.
Customer 5 from #4: Even #3 is very near to #4, #4 membership price is 50$ expensive than #3.

Requirements Definition

1.   Functional requirements

a. Information-oriented functional requirements

- The application should collect data of the customer entrance and exit information for all time.
- The application should have the real-time density information of the parking lots.
- The application must include the information about the monthly memberships.
- The application must include payment features.

b. Process-oriented functional requirements

- The application must allow registered users to view their payment details for anytime.
- The application must allow users to check in/out to the parking lot anytime with the QR code system.
- The application must allow the users to make their payments online.
- The application must show the density of each parking lot to customers and direct customers to parking lots have lower density

2.   Nonfunctional requirements

a. Operational non-functional requirements

- The system will be able to run on android and ios devices since we use the flutter framework to develop it.

b. Performance non-functional requirements

- The application should be available for use all time.
- The application should show the density of the parking lots live.
- The check in/out QR system
- The application should have easy interface

c. Security non-functional requirements

- The user information should not be leaked to the third parties.
- The payments of all users should be seen by only managers of the company.

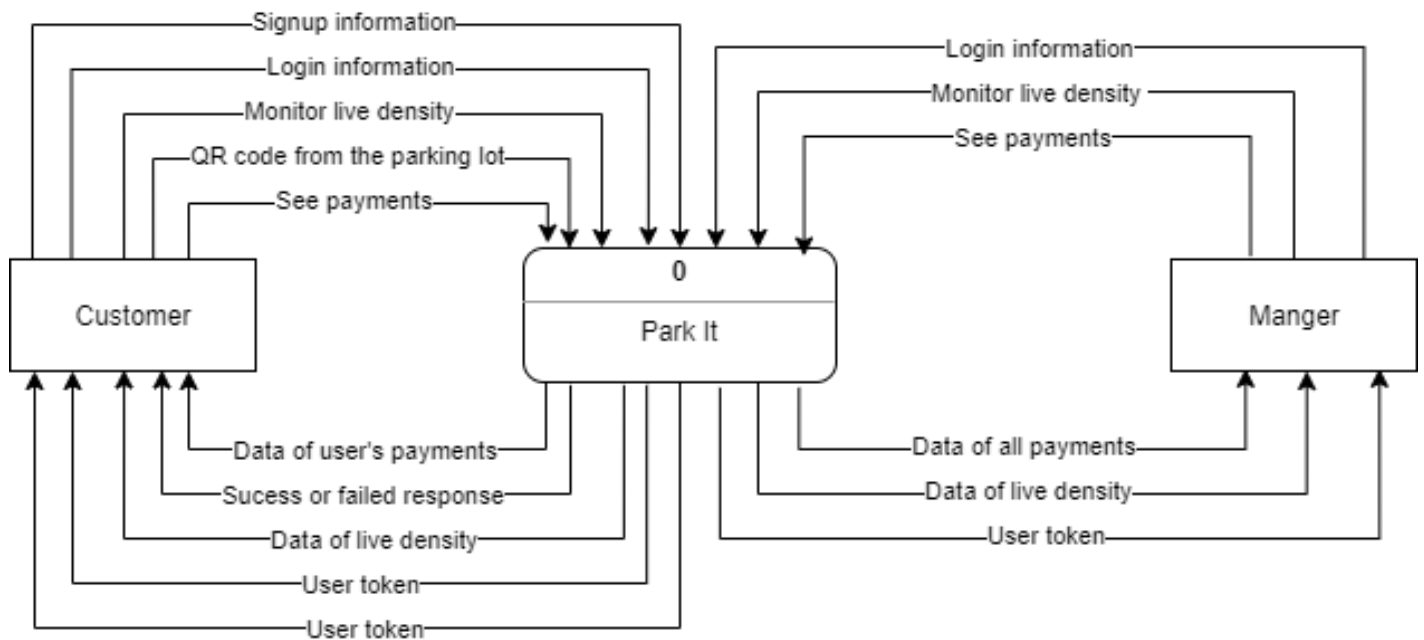### d. Cultural and political non-functional requirements

- The application should be able to distinguish between Turkish currency and other currencies.
- The billing of the parking lot payments should be at the same format of Turkish billing standards.
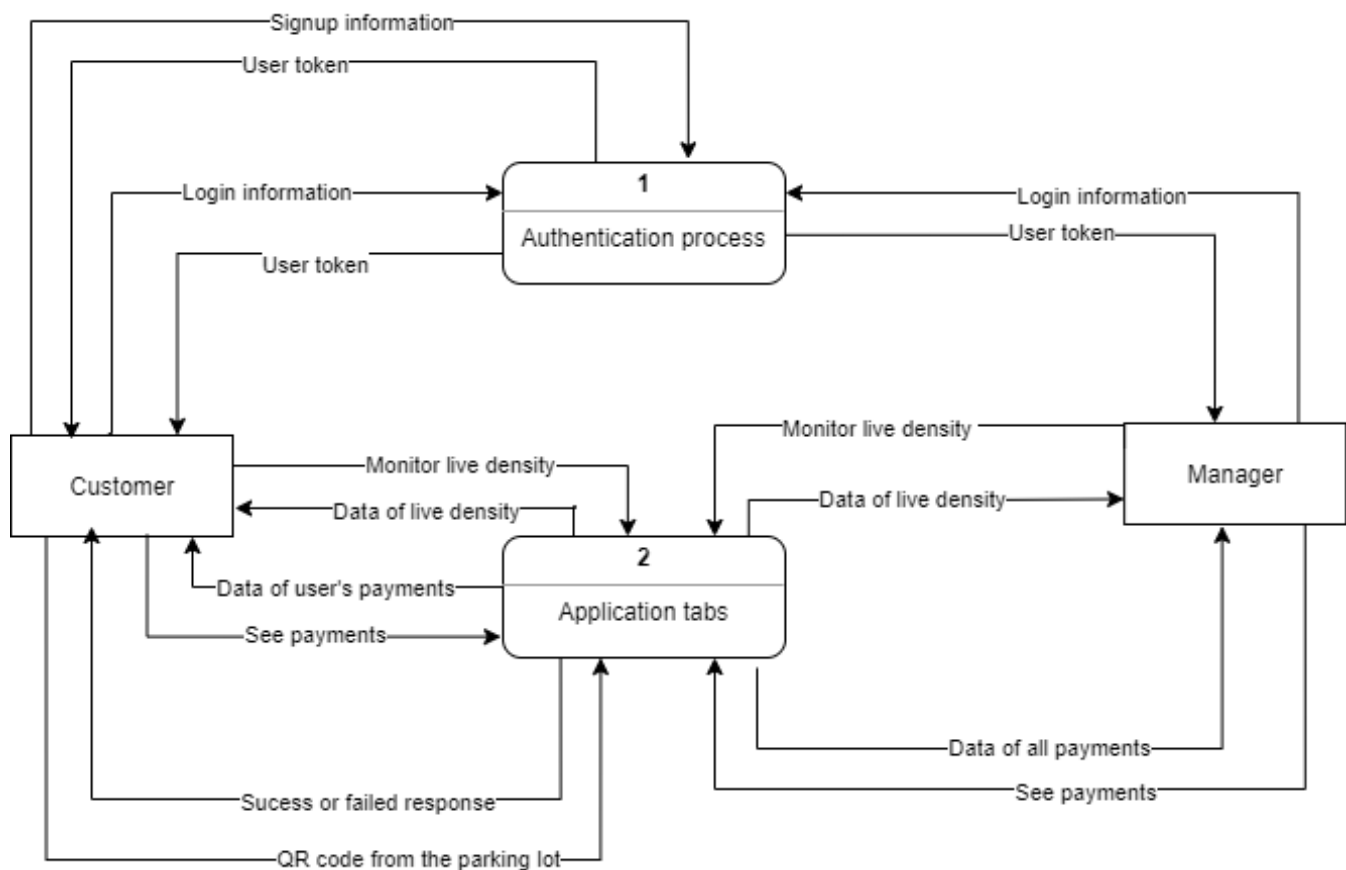
Use Case Analysis

- **Use case 1:** Register
  Description: The customers of the parking lot must register to the system with email and password.
  Priority: High
  Actor: The customers of the parking lot.
  Trigger: Signup button.

- **Use case 2:** Login
  Description: The customers and the managers of the parking lot company must login to the system with email and password.
  Priority: High
  Actor: The customers of the parking lot and the managers of the company.
  Trigger: Login button

- **Use case 3:** View density of the parking lots live
  Description: The customers and the managers of the parking lot company can monitor the density information of each parking lot.
  Priority: Medium
  Actor: The customers of the parking lot and the managers of the company.
  Trigger: Live density tab of the application.

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  Description: The customers of the parking lot company can enter or exit the parking lot with the QR code system.
  Priority: High
  Actor: The customers of the parking lot.
  Trigger: QR code tab of the application.

- **Use case 5:** See the payment details
  Description: The customers of the parking lot company can view the payment details of his/her past service of parking.
  Priority: Medium
  Actor: The customers of the parking lot.
  Trigger: Payment history tab of the application.

- **Use case 6:** See the payment details
  Description: The managers of the parking lot company can view the payment details of all customers.
  Priority: Medium
  Actor: The managers of the parking lot.
  Trigger: Payment history tab of the application.

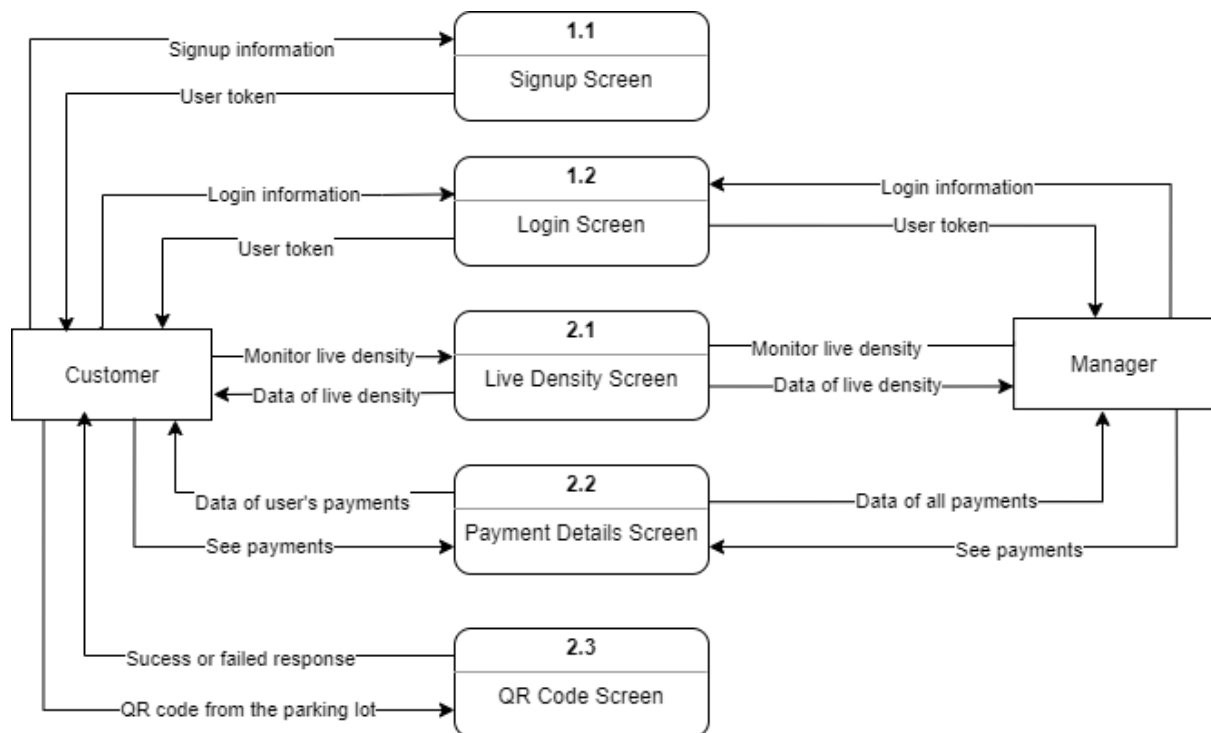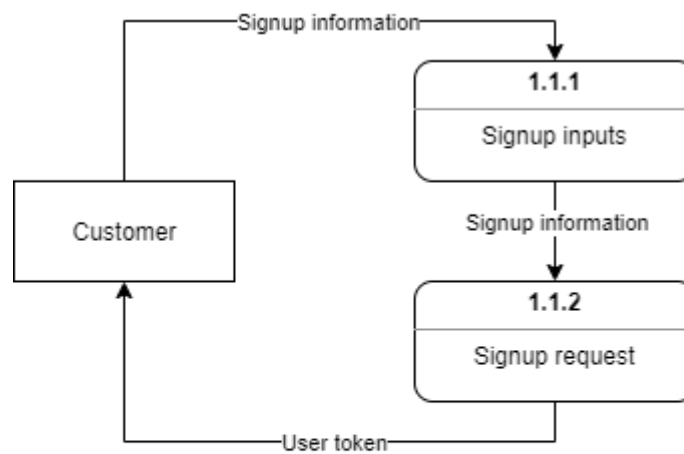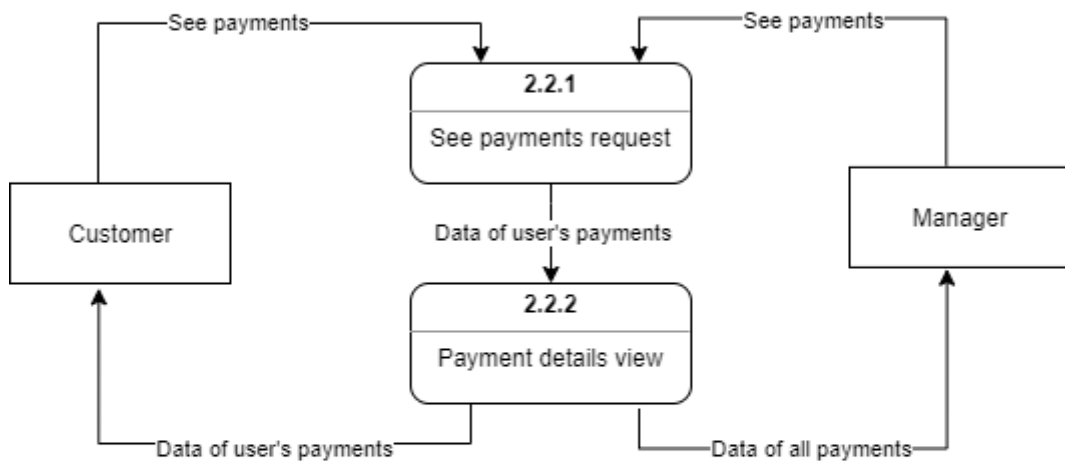# Data Flow Diagrams/Process Models
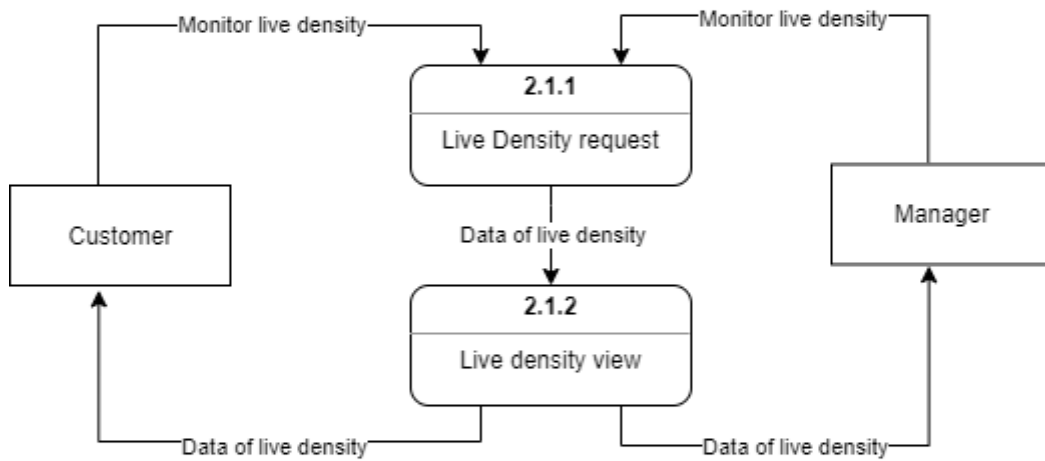
Context Diagram

Level 0 DFD

Level 1 DFD

Level 2 DFD

1.2.1 Login Inputs

Customer —Login information→ 1.2.1 Login Inputs ←Login information— Manager

1.2.1 Login Inputs —Login information→ 1.2.2 Login request

Customer ←User token— 1.2.2 Login request —User token→ Manager

2.1.1 Live Density request

Customer —Monitor live density→ 2.1.1 Live Density request ←Monitor live density— Manager

2.1.1 Live Density request —Data of live density→ 2.1.2 Live density view

Customer ←Data of live density— 2.1.2 Live density view —Data of live density→ Manager

2.2.1 See payments request

Customer —See payments→ 2.2.1 See payments request ←See payments— Manager

2.2.1 See payments request —Data of user's payments→ 2.2.2 Payment details view

Customer ←Data of user's payments— 2.2.2 Payment details view —Data of all payments→ Manager

QR code from the parking lot

```
┌─────────────────────┐
│        2.3.1        │
├─────────────────────┤
│   QR code scanner   │
└─────────────────────┘
```

┌─────────────────────┐
│   │
│   Customer   │
│   │
└─────────────────────┘

QR code from the parking lot

```
┌─────────────────────┐
│        2.3.2        │
├─────────────────────┤
│ Check in/out request│
└─────────────────────┘
```

Sucess or failed response

Data Model

For the beginning we have data models shown in the diagram.
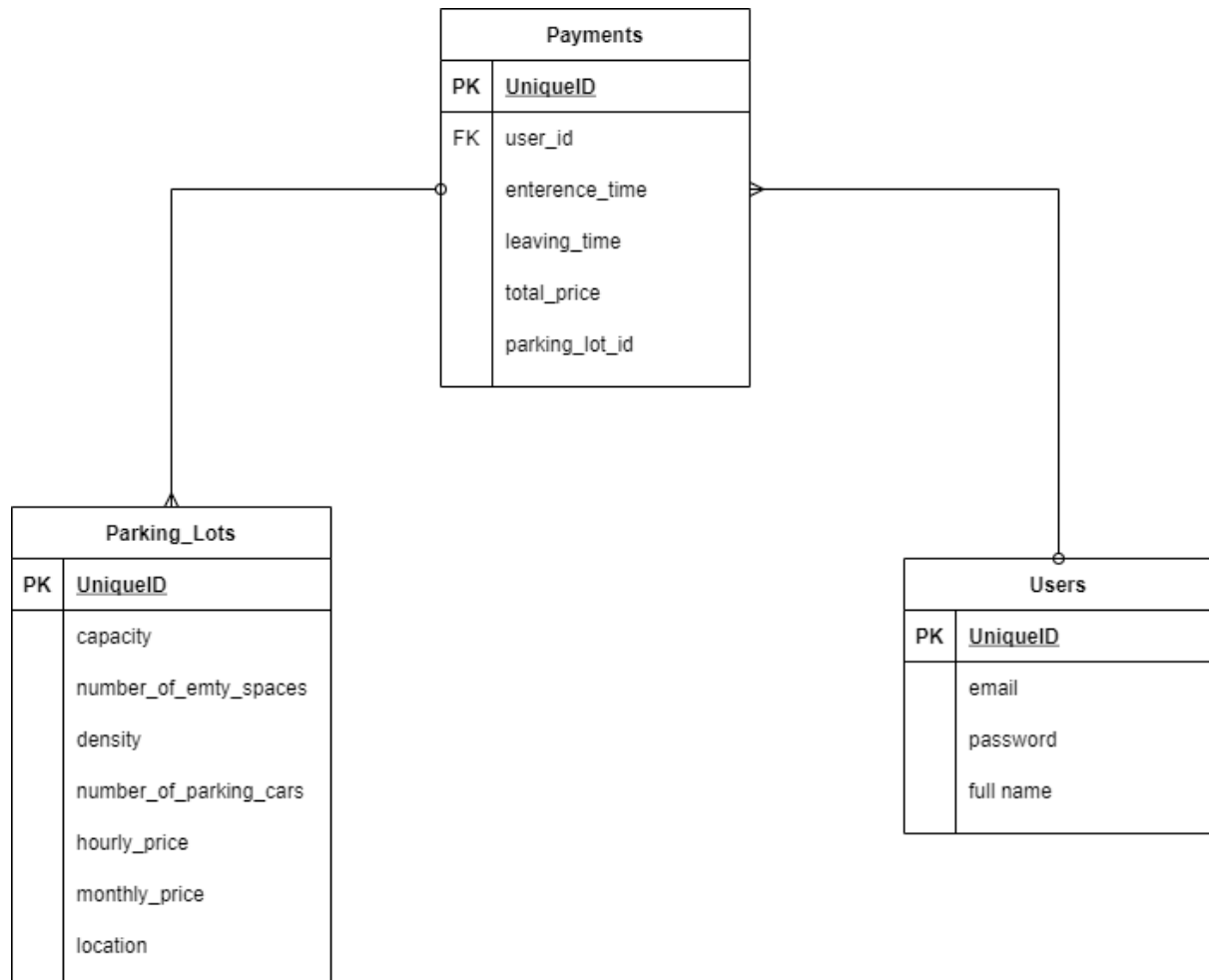
        In the data model, we need Users entity to hold the user information. We will be able to authenticate the user with email and password. Also, There will be a token which is basically a uniqueID of the user. Finally, the user's full name.

        In addition, we have a Parking_Lots entity to identify parking lots of the company. We have capacity, number_of_empty_spaces attributes, and number_of_parking_cars to calculate density. With density information, users can monitor the live data. Hourly price and monthly price variables to calculate the payments. Finally the location of the parking lot.

        Lastly, Payments entity is to bill the user. We will show the payment details of the user and all payments for managers.

System Proposal Document

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F) Use Case Analysis

G) PROCESS MODEL

H) DATA MODEL

I) APPENDICES

A. Executive summary: A summary of all the essential information in the proposal so that a busy executive can read it quickly and decide what parts of the plan to read in more depth.

B. System Request
1. Project Sponsor

The company we are working with is a parking lot company which has 5 parking lots nearby. Since they want to ease their problems with this system, the project sponsor is the manager of the parking lot company.

2. Business Need

This project has been initiated to create a system which allows them to keep track of the density of their parking lots, keep track of payments which include monthly memberships. Currently,

- The company does not know the density of their parking lots such that, when they are able to redirect the customers to nearby parking lots instead, they lose customers because the parking lot is full.
- The company keeps track of customers with a ticketing system. So, they have to write down all the payments instead of having them easily with the system.

3. Business Requirements

Using this system over Android or Ios, customers will be able to find the nearest available parking lot and check in the parking lot easily. The specific functionality that system should have include the following:

- Check the nearest available parking lots which the company has.
- Check in and check out the parking lot with a QR code system.
- Easy payment with an online payment system.
- Keep track of their payments.

● Establish a customer subscription into the parking lot for a monthly fee.

4. Business Value
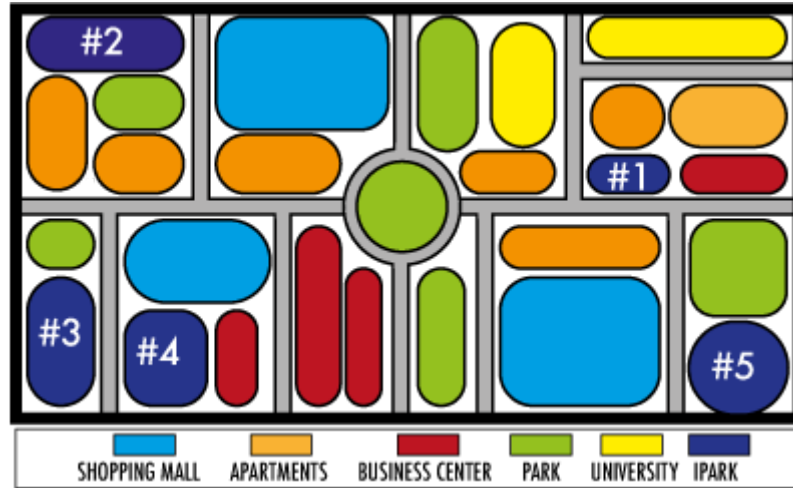
Our mobile app is one example of inner entrepreneurship. Company has 5 parking lots. These parking lots have different capacities for cars. Their flagship parking lot #2 is nearby to a very famous shopping mall and other flagship parking lot #1 is on a very famous street. However this parking lot has the lowest capacity for parking among our parking lots. Average occupancy rate and capacities of our parking lots is below.

PARKING LOT	CAPACITY	DENSITY %	DAILY PRICE FOR NON MEMBERS	NON MEMBER PRICE (DAILY)	DENSITY (CAR)	MEMBERS HIP RATE %	MEMBERS HIP (CAR)	MEMBERS HIP PRICE
#1	100	%90	54	$30	90	%40	36	$300
#2	200	%60	84	$25	120	%30	36	$250
#3	300	%30	81	$20	90	%10	9	$200
#4	300	%20	54	$15	60	%10	6	$250
#5	400	%15	57	$10	60	%5	3	$150

Density is calculated by daily occupancy of parking lots.
Total parking lot capacity of the company is 1300 however density of occupancy is 420(%32,307). Total membership is very low overall. Company has 90 members and it is %6,923.
Our first goal is directing customers to empty parking lots. Thanks to app customers and members realize our other lots and park their car to our all parking lots. Our expectation is to increase members to around %30 of our total capacity. We will

increase our members to 390 from 90. Our decided membership price for the Park It app is $250. Now from members, the company earns $23.100 per month. From our expectation, income from members increased around %422 ($97.500) per month. We believe that we can reach our goal within 6 month after releasing the Park It app. Daily income from non-members is $6720 per day. Our decided non-membership price per day for the Park It app is $20. Our expectation is for non-member occupancy up to %40 from %25,384. Our income will increase to $10.399 (%154,761).

We will add loyalty awards for our customers such as Diamond membership (priority for parking), discounts etc. These will prevent our members from going to our opponents.

Special Issues or Constraints
The company we are working with is very excited with this idea. Thus, they want this project to be done as soon as possible.

C. Work Plan

1. Time estimation

Planning	Analysis	Design	İmplementation
1 week	1 week	2 weeks	4 weeks

Total Project Length: 9.43 weeks

2. Task Identification

1. Design user mobile application - Mock.
2. Design admin mobile application - Mock.
3. Create NoSQL database.
4. Develop user mobile application frontend.
5. Develop admin mobile application frontend.
6. Connect database with user mobile application.

7. Connect database with admin mobile application.
8. Testing

3. Work Breakdown Structure

1. **Design user mobile application - Mock.**
   a. Design authentication screens
   b. Design available parking lots live screen.
   c. Design check in/out with QR code screen
   d. Design payments details screen.
   e. Design profile screen
      i. Design payment methods screen
      ii. Design monthly membership subscription and management screen

2. **Design admin mobile application - Mock.**
   a. Design authentication screens
   b. Design available parking lots live screen.
   c. Design available parking lots day by day screen.
   d. Design payment history screen.
   e. Design push notification screen.
   f. Design see memberships screen.

3. **Create NoSQL database.**
   a. Define the NoSQL database attributes.

4. **Develop user mobile application frontend.**
   a. Develop authentication screens
   b. Develop available parking lots live screen.
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f. Develop see memberships screen.

6. **Connect database with user mobile application.**
    a. Connect authentication screens
    b. Connect available parking lots live screen.
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1. PERT chart
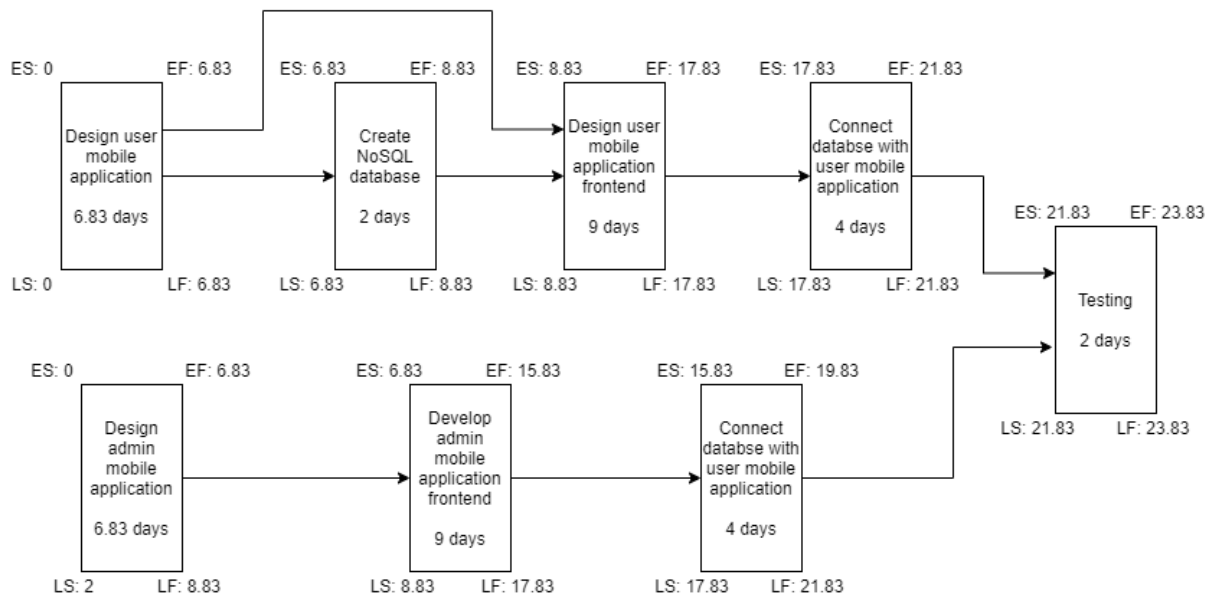
2. Gantt chart

Kimlik	Ad	Öncüller	Optimistic	Most Likely	Pessimistic	PERT Estimate
1	Design user mobile application - Mock.		5 gün	7 gün	8 gün	6,83 gün
2	Design admin mobile application - Mock.		5 gün	7 gün	8 gün	6,83 gün
3	Create NoSQL database.	1	1 gün	2 gün	3 gün	2 gün
4	Develop user mobile application frontend.	1;3	7 gün	9 gün	11 gün	9 gün
5	Develop admin mobile application frontend.	2	7 gün	9 gün	11 gün	9 gün
6	Connect database with user mobile application.	3;4	3 gün	4 gün	5 gün	4 gün
7	Connect database with admin mobile application	3;5	3 gün	4 gün	5 gün	4 gün
8	Testing	6;7	1 gün	2 gün	3 gün	2 gün
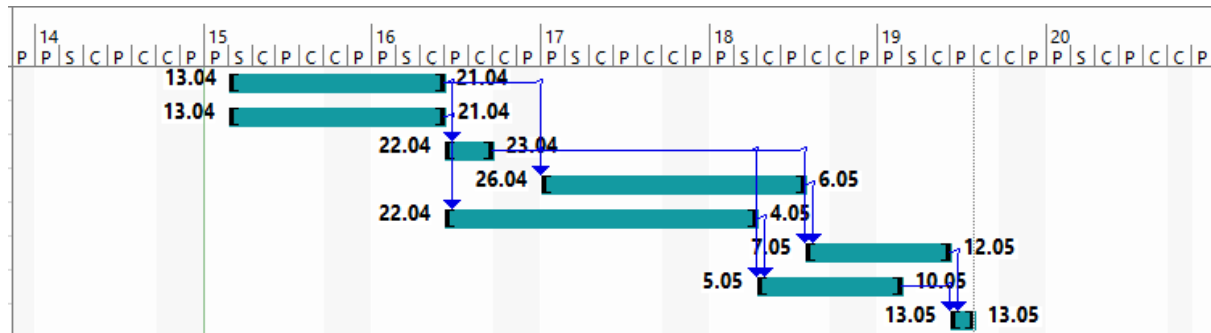
D. Feasibility Study

1. Technical Feasibility

The Park It is a hybrid mobile application. The main technologies and tools that are associated with Park It are:
● Flutter
● Dart
● Firebase
● Figma
● Diagram drawing tools
    ○ Microsoft Project
    ○ Draw.io

Each of the technologies are freely available and the technical skills required are manageable. Time limitations of the product development and the ease of implementation using these technologies are synchronized.

The project size is relatively small. There are only 5 parking lots that we need to work with. Also the hybrid application that we are building will be developed with a

framework called Flutter which means one platform developing. Therefore, the project can be done remotely with 2 software developers.

Initially, we will be developing our system with a free hosting server with firebase, but for later implementations, it will be hosted on a paid server with sufficient bandwidth. Bandwidth required in this application is very low, since it does not incorporate any multimedia aspect.

2. Economic Feasibility

●

3. Organizational Feasibility

Once the project starts, there will be marketing strategies in the area which enable it to reach the users. Thus, the parking lot will be known by many car owners in the area.

Once the development is done, the analysis of the density of the parking lots by days will be available. So, the company may make discounts to take attention of the customers on the days when the density levels are really less.

When there is no available space in the parking lot, the customer could park elsewhere. Since, the customers can check the availability of the parking lots, they can park to the nearest available parking lot.

E. Requirements Definition

2. Functional requirements
a. Information-oriented functional requirements

● The application should collect data of the customer entrance and exit information for all time.
● The application should have the real-time density information of the parking lots.
● The application must include the information about the monthly memberships.
● The application must include payment features.

b. Process-oriented functional requirements

- The application must allow registered users to view their payment details for anytime.
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3. Nonfunctional requirements
a. Operational non-functional requirements

- The system will be able to run on android and ios devices since we use the flutter framework to develop it.

b. Performance non-functional requirements

- The application should be available for use all time.
- The application should show the density of the parking lots live.
- The check in/out QR system
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c. Security non-functional requirements

- The user information should not be leaked to the third parties.
- The payments of all users should be seen by only managers of the company.

d. Cultural and political non-functional requirements
- The application should be able to distinguish between Turkish currency and other currencies.
- The billing of the parking lot payments should be at the same format of Turkish billing standards.

F) Use Case Analysis

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  Priority: High
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  Trigger: Signup button.

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  Description: The customers and the managers of the parking lot company must login to the system with email and password.
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  Description: The managers of the parking lot company can view the payment details of all customers.
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  Actor: The managers of the parking lot.
  Trigger: Payment history tab of the application.

H) Data model: A set of data models and descriptions for the to-be system. This may include data models of the as-is system that will be replaced. Use the one that you have prepared for item #6 of this document.

I) Appendices: These contain additional material relevant to the proposal, often used to support the recommended system. This might include results of a questionnaire survey or interviews, industry reports and statistics, etc.