



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

2022-2023

PROJECT TITLE
VR-Based Game: Restaurant Simulation
PROJECT ADVISOR
Prof. Reda Alhajj
TEAM MEMBERS
İpek Yılmaz - 63180008



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project


Project Code
Project Title: VR-Based Game: Restaurant Simulation
Project Advisor: Prof. Reda Alhajj
Project Team Members: İpek Yılmaz
Sponsor Company (if any) : -


BUDGET (TL)	PROPOSED	CONSENTED
SELF FUNDING	134.000 TL	133.870 TL
TOTAL	134.000 TL	133.870 TL

PROJECT PLAN	PROPOSED	CONSENTED
PROJECT PLAN Duration in Weeks	28 Weeks	28 Weeks
STARTING DATE	03.10.2022	



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

Project Code	
PROJECT ADVISOR	DEPARTMENT CHAIR
Name: Prof. Reda Alhajj	Name: Asst. Prof. Mehmet Kemal Özdemir
Contact Information: Tel : E-mail : ralhajj@medipol.edu.tr	Contact Information: Tel : 0216 681 5626 E-mail: mkozdemir@medipol.edu.tr
Signature: 	Signature:

TEAM MEMBER
Name: İpek Yılmaz
Contact Information: Tel : 05380429740 E-mail : ipek.yilmaz@std.medipol.edu.tr
Signature: 

Sponsor Company
Name: -
Contact Information: Tel : E-mail :
Signature:



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

Project Title:

VR-Based Game: Restaurant Simulation

Project Advisor: Prof. Reda Alhajj

Team Members: İpek Yılmaz

Project Group Title:

PROJECT OVERVIEW/SUMMARY/ABSTRACT

In the adult entertainment industry, games occupy a very large place. Simulation games occupy a large area in the game industry and are one of the most played categories. In addition, the games in the field of VR, that is virtual reality, which has emerged in recent years, can provide users with more experience in getting into the game and more fun. The aim of this project is to produce a comprehensive 3D simulation game in the VR field and to contribute to consumption in the gaming industry. It is aimed to come up with different game content, to introduce Turks and spread their culture to generations with Doner Kebab, one of the most well-known food culture of Turkish culture, to make a difference by using VR headset, one of the latest technological tools, and to improve the place that Turks took in the game industry. The target audience is adults and teenagers, regardless of gender. Also, another benefit of the game industry to mention is the contribution of playing such games to the language level. A literature review was conducted on the game industry, the effects of the game industry on society, statistics, Unity, VR and existing games similar to the project and differences. Unity is used for the development, and C# is used as the coding language. VR connection is made correctly for player controls, main in-game functions such as cooking and customer system are done and all bugs are fixed for success criteria. As preliminary results, VR connection was made, Customer order & AI systems, Doner Kebab Preparation and Order Completion System Construction and Budget, Materials, Inventory and Skills Systems, Testing & Build work packages were done.

Keywords: 3D Game Development, Simulation Game, Turkish Culture, Unity, Kebab Restaurant Game, VR, VR-Based Game



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

1. OBJECTIVE OF THE PROJECT:

In the adult entertainment industry, games occupy a very large place. As the demand level in this area is high, the opportunities in the market are very wide and there is almost no chance that this sector will run out. Since the players consume the games very quickly, they always keep the consumption level high in this area in order to discover new games. Especially with the pandemic period and the new technological age, people usually prefer to spend time playing games by staying at home. Simulation games occupy a large area in the industry and are one of the most played categories. In addition, the games in the field of VR, that is virtual reality, which has emerged in recent years, can provide users with more experience in getting into the game and more fun.

The aim of this project is to produce a 3D comprehensive simulation game in the VR field and to contribute to consumption in the gaming industry. While doing that, another important subject aimed in the construction of this project is the dissemination of Turkish culture within the game industry. One of the important areas reflecting Turkish culture is the food industry. In the field of the food industry, one of the most well-known dishes in the world is doner kebab. The aim of the game is to make a game that focuses on making doner kebab as a restaurant worker, which reflects the Turkish culture to a large extent, with the latest technology, that is, using VR technology, to make a splash and ensure that Turks have a significant place in the game industry. Also, another benefit of the game industry to mention is the contribution of playing such games to the language level. Most people have improved themselves in language, especially English, and many other areas by playing games.

2. LITERATURE REVIEW

2.1. Game Industry

According to the Turkey Game Industry Report published in 2019, the total game revenue in Turkey, where there are 32 million players, is 830 million dollars. [1]

These numbers increased in 2020, to 36 million players and 880 million dollars and in 2021, to 42 million players and 1.200 million dollars. Looking at the numbers, it is seen that there is a great interest in digital games in Turkey. [2-3]

In 2021, 67.9% of the population of 84 million people is between the ages of 15-64. The 25-34 age group of this segment covers 35% of the total number of players. 47% of the total number of players are female and 53% are male. In addition, 82.6% of the population is connected to the internet. According to player distribution, there are 40 million mobile, 24 million PC and 20 million console players. Turkey is in the 18th place in the world income ranking in the gaming industry. [2] Since 2020, with the pandemic, as people stay at home, the playing time has increased and records have been broken in-game consumption.

The digital game industry generally progresses through simple and cost-effective games such as mobile and hyper-casual. Because these game types have a low risk of failure, game companies generally release games in this category. [4]



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

Independent, freelancer, and small game companies have a significant presence in the gaming industry. Digital games, such as Stardew Valley (2016), that do not have a large budget and are developed by a small developer team, have sold millions of units. [5] Steam, which is the platform where the games developed by these developers are published, is one of the largest game stores in the world, receiving a commission of 30% from all sales made on its platform. [6]

Leading companies in the digital gaming industry produce slightly modified versions of previously successful games to minimize risk and maximize profits. Because of the high prices, players prefer games they are familiar with and believe they will enjoy. [7] As a result, the games are more similar to each other and the diversity is decreasing. While male players prefer game types such as action, strategy, sports, and fighting, women have a limited gameplay catalog. The Sims is among the games that are thought to be played by women because it contains female behavioral patterns such as family life, home decoration, and social relationships. Because women are unlikely to play football or war games, digital game companies frequently focus their marketing efforts on men. As a result, the perception that playing video games is a masculine activity is growing. However, according to a study conducted by Newzoo, 46% of gamers were female. [8] One of the most common types of games for both genders to play is simulation games. A new era has begun in which the fundamental dynamic shaping society has shifted from production to simulation. [9] Digital games are often an imitation of something that already exists. [6]

2.2. Games & Education

A survey in an article states that the most taught topic in game development is the intro to programming as games are being used to educate in many areas. Visual programming frameworks, C# and Java are being mostly used for development. Motivation and engagement are experiences derived from learning-based game development. In this study, it is investigated whether the effect of computer games on academic achievement differs according to variables such as gender, school averages, preferred game types, and reasons for playing computer games. 103 participants were surveyed via Google Forms, and when the data were analyzed, no significant difference was found between gender and university success average due to the reason for playing computer games. It is seen that the engineering faculties prefer the game genres the most, and the most preferred game type has been strategy and adventure. [10] In terms of student motivation and interest, the observations with games in education are generally positive, and it appears to work well for helping promote CS/SE and attracting students. [11]

In an article, Can and Turkmen [12] investigated the effect of computer games on foreign languages on 100 higher education students whose native language is Turkish. As a result of their studies, it has been observed that both single-player and multiplayer games are effective in learning foreign languages. [10]



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

2.3. Games & Culture

Digital games are cultural transfer tools in which players are implicitly exposed to cultural elements on the digital platform in an entertaining environment, and they learn and live these cultural elements as a result of this exposure. Despite the fact that it includes players of all ages, digital games primarily target children and young people, and the games reach this audience in the quickest and most intense way. The incorporation of Turkish cultural elements into these games will ensure that these cultural elements are effectively reached by new generations. Kids and teenagers will recognize and adopt any cultural elements they encounter in digital games. It is true that digital games have had a significant impact on the popularity of Greek and Scandinavian mythologies today. Turkish folk cultural elements should be used more frequently and correctly in the Turkish digital game world. [13] “The game industry is well aware of the importance of localization for our country. Especially large and medium-sized game companies are trying to appeal to Turkish players in many subjects, from voiceovers to translation and even in-game cultural elements.”, “The concept of "Metaverse", which our industry is already familiar with but generally reaches everyone, left its mark at the end of the year.” are some of the research findings. [2]

2.4. Games & Virtual Reality

The concept of "immersion," which means "being surrounded," is essential for artificial reality technologies, particularly games. Tools like virtual, augmented, and mixed reality technologies are essential for the development and growth of the Turkish gaming industry and community, and they are useful in revealing the effects of such new technological tools on the game industry and players. [14]

The idea underneath VR providing a more immersive gameplay experience is that users can feel as if they are fully a part of their surroundings which is difficult to achieve in standard desktop gaming. One other research into the effectiveness of VR as a more entertaining gaming platform found that players found the use of VR in gaming more enticing than a 2D monitor, which in this survey was a tablet. [15]

An experimental study was conducted as a two-factorial (gaming platform x game genre) mixed design in a reviewed article. The gaming platforms used were VR and PC, and the game genres were Strategy and Racing. There were 36 student participants. Despite of game genre, the level of presence was higher in the VR condition compared to the (PC) condition. There were no significant differences in Player Experience (PX) across game platforms, but the strategy game had a higher PX than the racing game. [16]



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

2.5. Game Development

When developing games, it is important to give enough time to clearly define project goals. [17] Unity is a multiplatform game engine that is offered on Mac, Linux, and Windows. It contains tools for designing game worlds for implementing high-performance gameplay [18], it supports 3D and 2D game development. Unity also includes a navigation system that allows the creation of NPCs that move logically around the gaming world. [19] It also allows for the creation of high-quality games as well as some additional features such as [20] accessing the components, coroutine and return types, creating and destroying GameObjects, dealing with vector variables and timing variables, events for GameObjects, and physics-oriented events. [21-22] When implementing projects on multiple platforms, Unity can help with asset tracking, scripting, and physics. Professionals have stacked the unity engine at the top of the ladder of multiplatform game dev. A survey found that 47% of game developers prefer Unity as a tool. [23] Unity IDE supports C# and Javascript for scripting. Developers can buy assets from the Unity Asset Store and use the published demo scenes as the foundation for their own game. Unity has some issues, such as its editor crashing without warning if a developer runs out of memory. It does not have that many tools for making high quality graphics as other game development engines. To get the best deployment, graphics, and performance advances, developers must be licensed. Purchasing these licenses is costly. However, Unity 3D is also simple to learn and provides a low-cost pricing solution to meet the needs of developers. The majority of the functions are available in the free version of Unity. However, if developers require advanced features, they can always upgrade to the paid version.

2.6. Project-Related Games Review

In the game industry, some players like to play games in the style of cooking and restaurant/cafe management. Normally, there are many games in this category. But in the VR field, the number of games developed in this category is limited. In Oculus Store, which sells VR Games, Apps and More, there are some related games as Lost Recipes, Cook-Out and Clash of Chefs VR. On Steam, a similar game can be stated as Cooking Simulator VR. Also, there are small games developed for VR as Small Shop. Although this game is very simple and basic, the developer has released it anyways and it has been purchased which shows that the game can be simple but can be noticed anyway.

Lost Recipes is a cooking game for traditional kitchens across ancient Greek, Chinese and Maya civilizations. This game introduces these 3 cultures in a relaxing way without a hurry.

Cook-Out is a sandwich-making game for customers. The game can be played with up to 4 players.

Clash of Chefs VR is a competitive cooking game as you race to finish the orders of customers.

Cooking Simulator VR is a cooking game for completing recipes and the physics of the game functions are realistic.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

Small Shop is a VR game that is about running a shop with few objects and this game is in early access. This game also has a customer waiting system.

Kebab Simulator is also a game that has not been released yet and is in early access. This game is not for VR. [24-25].

3. ORIGINALITY:

The game to be made in the graduation project will be a fun simulation game for the player's experience of working in the food industry. The target audience is adults and teenagers, regardless of gender. Using virtual reality headsets and hand-held controls, users will complete orders from customers manually, which customers will be coded as artificial intelligence, and try to make money. The place where they work is doner kebab restaurant, which has a great place in the food industry and is unique to Turkish culture. Cooking parts such as doner cutting and wrap preparation will be done manually with VR headset elements/controllers. With the money earned by completing orders, the restaurant and the player will unlock and achieve new abilities and levels. This game, which is basically a doner kebab restaurant simulation, will be developed more comprehensively over time and its content will be expanded as much as the popular games in the sector. In addition, although there are games similar to this game, there is no game developed exactly on this subject and with VR technology, thus, it can be expected that the interest and purchase rate of the game will be high.

Originally, to come up with different content, to introduce Turks and their culture to generations with Doner Kebab, one of the most well-known food culture of Turkish culture, to make a difference by using VR headset, one of the latest technological tools, and to improve the place that Turks took in the game industry. Generally, well-known Turkish game companies work on mobile games and successful computer games are limited in number. It is aimed to reach larger masses by taking the risk of failure by releasing computer games. While the players are exposed to the elements of Turkish culture, they will have the opportunity to have more fun and feel in the moment by entering the game with the option of playing with a VR headset. With these differences, this project will be a first in the Turkish gaming industry.

In the game industry, a certain mass of players like to play games in the style of cooking and restaurant/cafe management. Although there are many games in this category, the number of VR games developed in this category is limited. The fact that the consumption of VR games has not yet become widespread may be due to the fact that not everyone can acquire these tools, but those who have these tools are likely to notice and consume the newly released games due to the limited number of games. Therefore, it is expected that this game will be highly purchased because of these users.

In the literature review, similar games are found but there is no game in this topic as VR game. There is a similar game called Kebab Simulator but not with the same desired content and not as VR game. Other VR cooking games do not contain Turkish cultural contents which is the aim of this project.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

4. SCOPE OF THE PROJECT AND EXPERIMENTS/METHODS:

In this game project, which aims to spread Turkish culture with one of the latest technology tools, VR, Unity is used for the development, and C# is used as the coding language. In-game objects, namely assets, are purchased from places such as Asset Store. Mixamo is used for artificial intelligence animations such as customers inside the game. Sketchfab is used for NPCs and game objects. VR controls is made with a VR headset obtained from the school. This headset is connected to the computer and the necessary libraries is imported in the game, so that the game can be played using a VR headset. Oculus Quest is used as a VR headset.

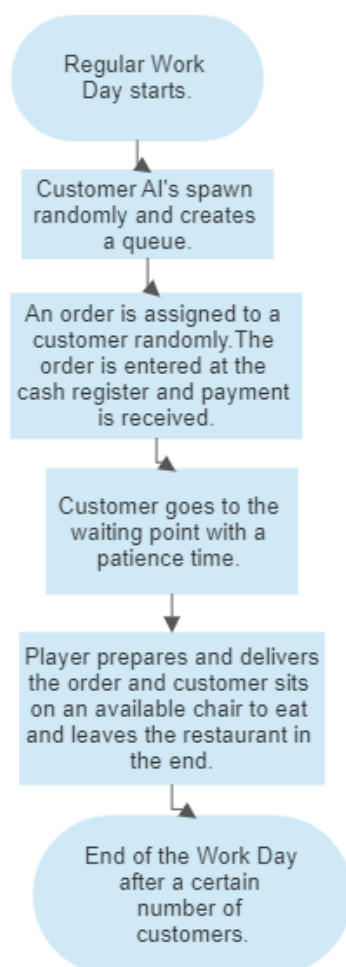


Figure 4.1. Customer Serving System

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

The detailed flowchart for the above customer serving system is in the figure below.

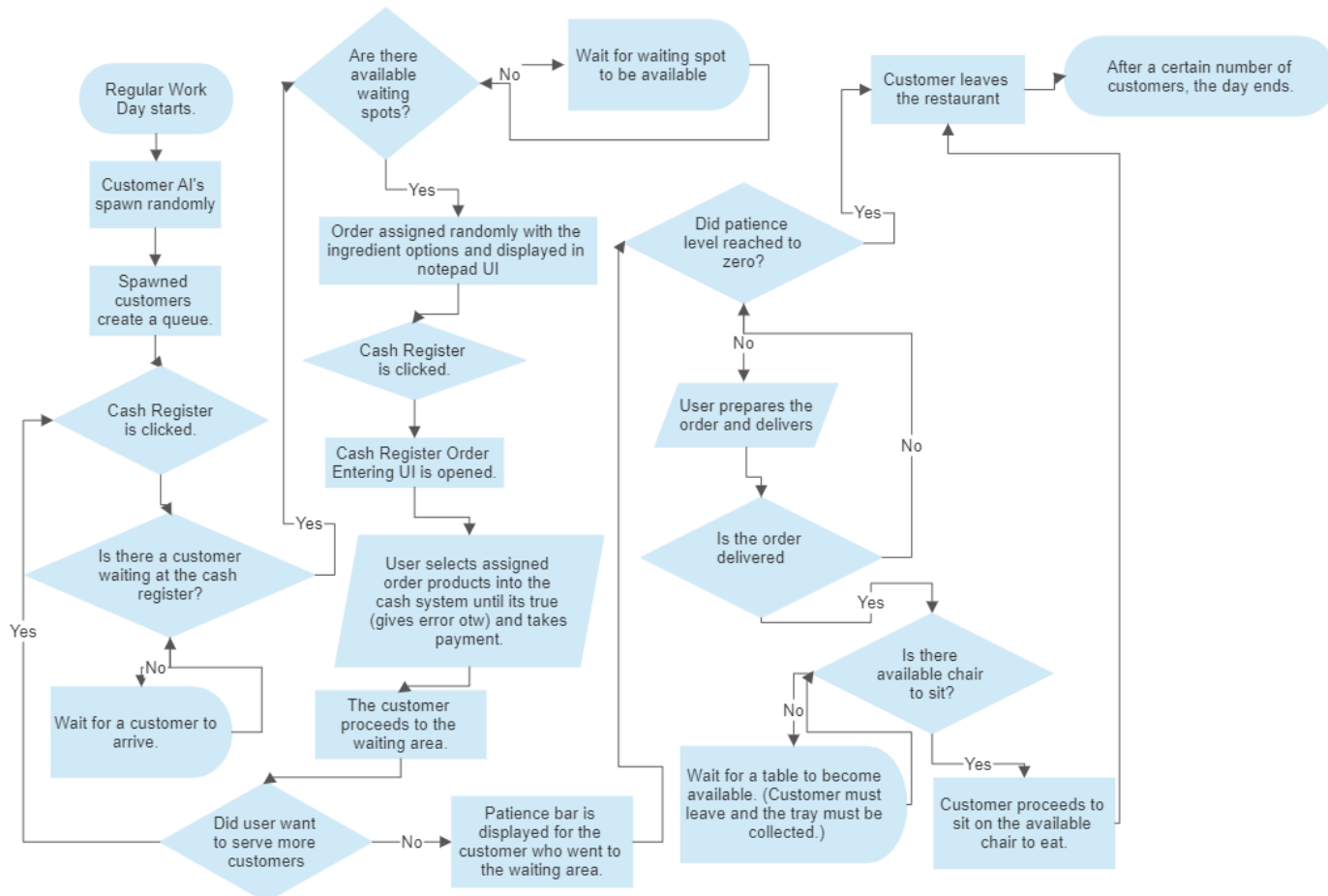


Figure 4.2. Detailed Customer Serving System Flowchart

The most important system in the game is the customer serving system and it is shown above. The basis of the game is the working days in the kebab restaurant.

A variety of programming techniques and tools were used as part of the methodology used in the development of this game to produce a rich and engaging gaming experience. Object-oriented programming (OOP) principles with classes, objects, and inheritance as well as Unity's NavMeshAgent component for navigation and pathfinding, event handling for collision detection, UI elements for player interaction, array and list manipulation for effective data storage, and coroutines for asynchronous code execution are examples of these methodologies. These methods were used to control player behavior, handle user input, manage game logic and state, and create an immersive gaming environment.

To give examples of written codes, optimal order calculation can be given as the simplest one. The goal of the code is to determine the ideal menu within a certain price range. Two nested for loops are used to cycle through all main course and beverage combinations. In the



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

end, it returns the best combination of food and drink that is closest to the customer budget in terms of price.

A dialogue system that uses a tree structure to create dialogues is yet another example and it is about the NPC dialog system. Containing properties for the dialogue text, options, and children (which are other DialogueNode instances), the DialogueNode class represents a node in the dialogue tree. With properties for the option text, the next node in the conversation, and an action to take when the option is selected (represented by the Action delegate), the DialogueOption class represents an option within a DialogueNode. A hierarchical structure with many child nodes and options for each DialogueNode is formed by connecting DialogueNode instances together via their children property. This enables conversational branching, where various selections may lead to various nodes and produce a non-linear dialogue flow.

One technique to link actions or behaviors to specific dialogue options is through the usage of Action delegate in the DialogueOption class. The related action can be carried out when an option is selected, allowing custom logic or functionality to be activated in response to the player's choice in the dialogue.

5. PROJECT TARGETS AND SUCCESS CRITERIA:

It is aimed to come up with different game content, to introduce Turks and spread their culture to generations with Doner Kebab, one of the most well-known food culture of Turkish culture, to make a difference by using VR headset, one of the latest technological tools, and to improve the place that Turks took in the game industry. The target audience is adults and teenagers, regardless of gender.

To evaluate the success of the project, success criteria are shown in the table below.

Success Criteria	Contribution to overall success (%)
Connect the VR headset to the game and make necessary player controls. Ensure that the consoles and headset are working when playing the game.	%15
Plan the game content, develop the game accordingly and finish the main necessary functions of the game as food preparation using VR consoles, budget&inventory control and customer order & AI systems etc.	%70
Test the game, fix all bugs and ensure that all desired and planned main functions are working perfectly without any errors or bugs.	%15

Table 5.1. Success Criteria

All three success criteria were completed. The first criterion is about WP3, the second criterion is about WP1, WP2, WP4, WP5, WP6, WP7. The third criterion is about WP8. All work packages and their success criteria were done.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

In detail, WP1 success criterion is to obtain a project plan (SC2), WP2 success criterion is to review at least 10 articles (SC2), WP3 success criterion is to obtain a successful VR connection (SC1), WP4 success criterion is to set game scene (SC2), WP5 success criterion is to complete AI & Order System Part (SC2), WP6 success criterion is to complete restaurant worker part (SC2), WP7 success criterion is to complete Inventory & System Part (SC2), WP8 success criterion is to obtain smooth gameplay after fixing all bugs. (SC3).

6. RISKS AND B PLANS:

Work Package #	Risk	B-Plan
WP 5, 6, 7, 8	Sudden deletion/disappearance of the game codes.	The codes can be saved and stored on Drive or any other platform regularly.
WP 3	Problems using VR headsets as broken, disabled or missing.	A new VR headset can be obtained with the help of the university.
WP 1, 5, 6, 7, 8	Failing to complete the game.	Important main functions of the game can be determined and these parts can be completed first to obtain a game that is considered finished at the end of the year without spending time on unnecessary details.

Table 6.1. Risks and B Plans

No risk has occurred. Game codes were saved regularly in order to avoid risk 1.

7. WORK TIME PLAN OF THE PROJECT:

Tables are attached at the end of the report (Table 16.1, Table 16.2, Table 16.3, Table 16.4). There are 4 tables as project activities and work plan, list of work packages, and work package distribution. Measurable outcomes in the Table 16.4 were obtained successfully.

8. DEMO PLAN:

The demo will be done by running the game while using VR headsets and consoles. A workday in the game will be simulated and played. A demo video can be shown to prevent possible mishaps.

9. FINANCIAL EVALUATION:

Table 17.1 and Table 17.2 show planned and actual budgets. The planned budget was not exceeded. Actual material expenses for game assets were lower.

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

10. RESULTS:

VR headset connection with Unity was established. Walking, turning, selecting, grabbing and moving with VR consoles were done. The restaurant assets were purchased via Asset Store and the game scene was set. Customer NPCs and AI controls were made. Animations and characters were taken from Mixamo. Also, NPCs and game objects were taken from Sketchfab. All features of the customer serving system were completed which is shown in Figure 1. Customer spawning and queue creation, random order assigning and payment&tip taking, tray adding, collecting, filling, customer patience and penalty, order delivery, available table assigning, sound FX and animations were done. The cooking part was done containing selecting the recipe to be made for the customer from the recipe screen, preparing the meal according to these steps such as putting pita on the plate, cutting it with a knife, slicing doner with a doner knife, and adding doner slices to the pita, adding requested ingredients to the pita. Extra features were added to the game that can be done from the laptop interface; hiring staff for the kitchen to obtain meal ingredients, grocery shopping to buy supplies for restaurant stock that will be delivered by market truck, a dialogue system to interact with NPCs that have an impact on relationships, unlocked characters and messaging with them, paying restaurant bills and rent etc. Also, customer satisfaction level and restaurant popularity, giving optimal orders according to the customer budget which doesn't have specified orders, penalties for missing or late deliveries with decreasing popularity and increasing popularity when the order is delivered correctly or early are added. The game has been created and is being developed in two different versions, both for VR and for playing on PC as FPS.



Figure 10.1. Customer Queue & Orders



Figure 10.2. Customer Patience Level



Figure 10.3. Unspecified orders with budget

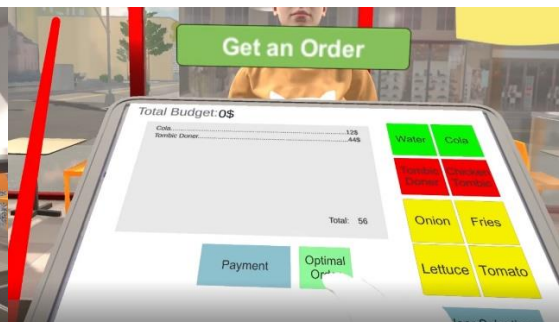


Figure 10.4. Automatic optimal order calculation for customer budget.

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project



Figure 10.5. Specified Order



Figure 10.6. Recipe Screen



Figure 10.7. Recipe steps for preparing the meal. Figure 10.8. Ingredients for the recipe.

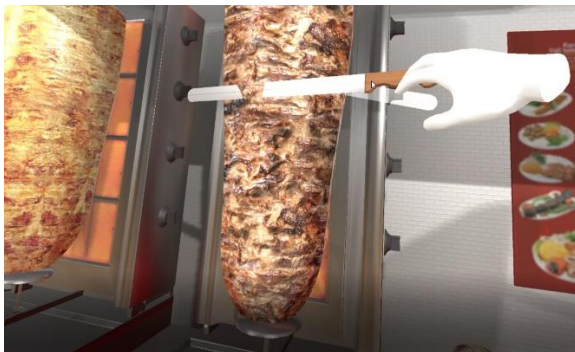


Figure 10.9. Doner slicing with a knife.



Figure 10.10. Kitchen Staff for ingredients.



Figure 10.11. Cola filling and grabbing objects with VR hands using consoles.

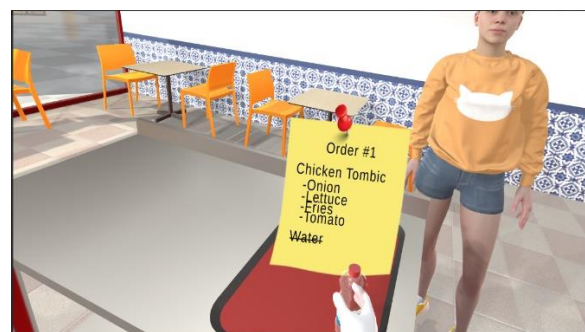


Figure 10.12. Order completion and crossing out what is placed on the tray.

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project



Figure 10.13. Customers receive their orders.



Figure 10.14. Customers eat their meals by sitting on an available chair after delivery.



Figure 10.15. Material renewal and purchase

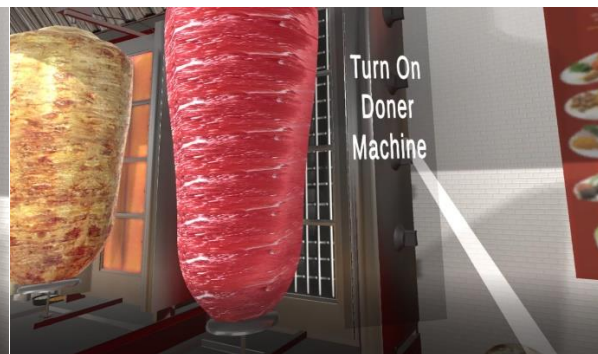


Figure 10.16. Doner grilling

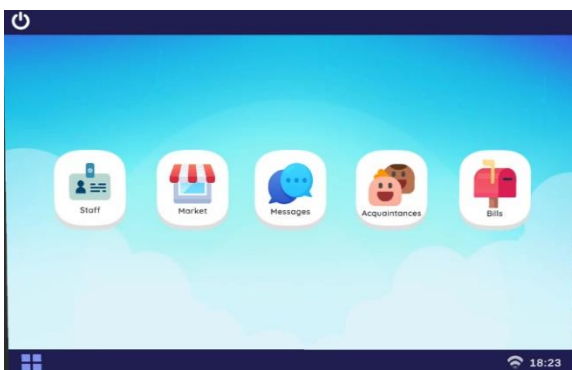


Figure 10.17. Laptop interface and menu.

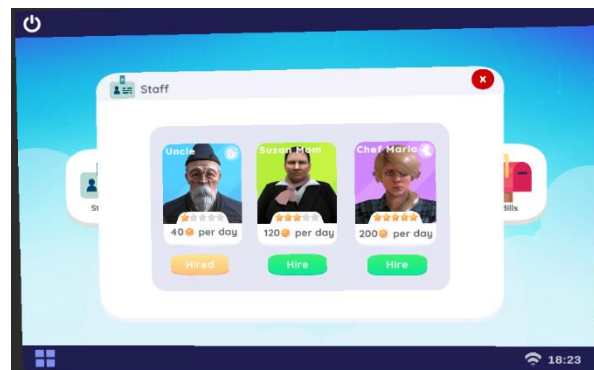


Figure 10.18. Staff Page

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

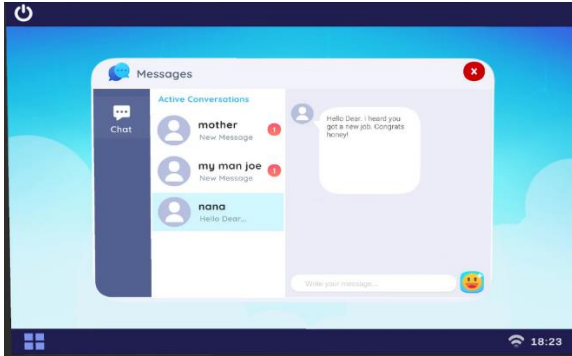


Figure 10.19. Messages Page

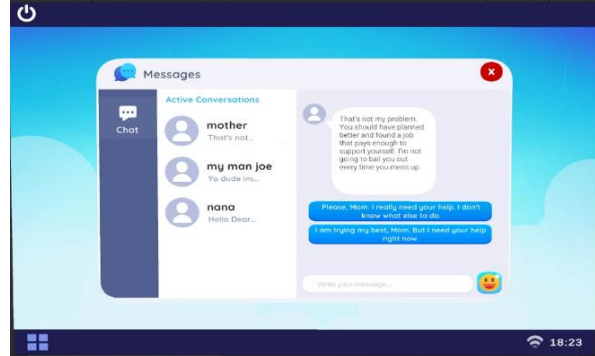


Figure 10.20. Dialog system in messages page



Figure 10.21. Acquaintances Page

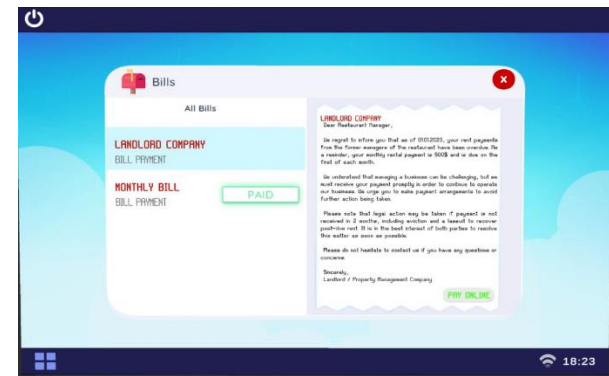


Figure 10.22. Bills Page

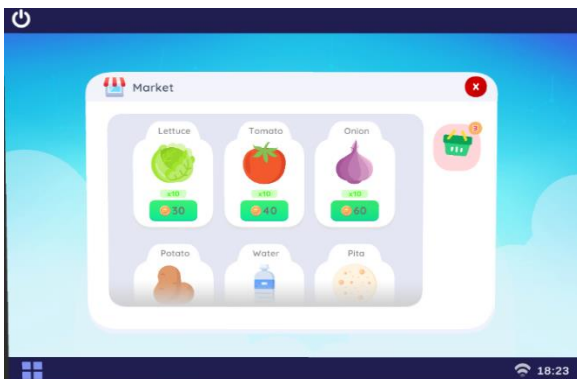


Figure 10.23. Market Page

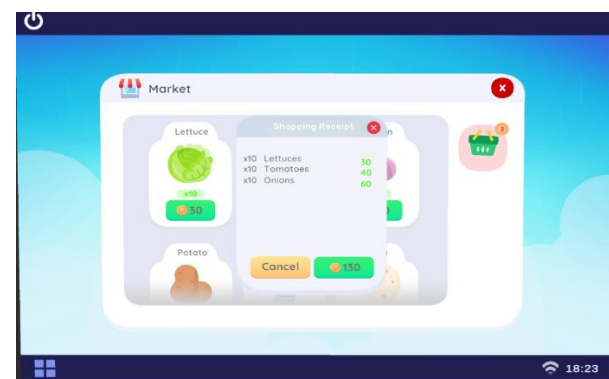


Figure 10.24. Grocery Shopping

Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project



Figure 10.25. Market Delivery



Figure 10.26. Dialog system with kitchen staff

11. DISCUSSION:

Customer AI, order, and serving systems were done in the first semester. The cooking part was done as selecting the recipe to be made for the customer, preparing the meal according to these steps such as putting pita on the plate, cutting it with a knife, slicing doner with doner knife, and adding doner slices to the pita, adding requested ingredients to the pita. Extra features were added to the game that can be done from the laptop interface; hiring staff for the kitchen, grocery shopping to buy supplies for restaurant stock that will be delivered by market truck, a dialogue system to interact with NPCs that impacts relationships, unlocked characters and messaging with them, paying restaurant bills and rent etc. Also, customer satisfaction level, giving optimal orders regarding customer budget, and penalties for missing or late deliveries are added. The game has been created and is being developed in two different versions, both for VR and for playing on PC. Since the control and UI systems work differently, they are developed as separate projects, but they will be merged at the time of publication and the player will be given the right to choose. The game was first created as a PC (FPS) game and then the same project was duplicated as a VR game by making changes and controller settings. The first criterion of the success criteria table (Table 5.1) was done by using a VR headset which is obtained from the university and the necessary settings were done using VR libraries and packages (XR Interaction Toolkit etc.) for Unity. For the second criterion, game content was planned, Customer order & AI systems, Doner Kebab Preparation and Order Completion System Construction and Budget, Materials, Inventory and Skills Systems were done. The third criterion was done for testing the game and fixing bugs. The project is completed by 100%.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

12. CONCLUSION:

All success criteria and work packages were completed. VR headset connection with Unity was established. The game scene, customer NPCs and AI controls, waiting queue system, order and serving system, sound FX, UI and animations, order preparation, dialog systems, laptop interactions, staff hiring, grocery shopping, messaging with characters, bill payments, customer satisfaction, optimal order assignment, penalties for missing or late deliveries were made. Customer order & AI systems, Doner Kebab Preparation and Order Completion System Construction and Budget, Materials, Inventory and Skills Systems, Testing & Build were done.

13. PLAN FOR FUTURE STUDIES:

In the future, it is aimed to improve the game content with more details that will attract more people to purchase it when it is published. The base of the game is completed but more details and gameplay content can be added in order to obtain longer gameplay time as restaurant customization, more NPC interactions, story background, more staff, more recipes, etc.

14. ASSESSMENT OF ENGINEERING COURSES:

Programming courses such as Introduction to Programming, Object-Oriented Programming, and Programming for Engineers led to the development of coding logic. From, Data Structures course, queue structure was learned and it is used in the customer waiting queue system. Arrays, lists, loops, algorithms, methods, libraries, tree structure, classes and much more coding information were used in the development of this game with the necessary logic learned from the university using the C # language.



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

15. REFERENCES:

- [1] Gaming in Turkey.. 2019. "Türkiye Oyun Sektörü 2019 Raporu" Retrieved October 22, 2022, from <https://www.gaminginturkey.com/tr/turkiye-oyun-sektoru-raporu-2019/>
- [2] Gaming in Turkey.. 2020. "Türkiye Oyun Sektörü 2020 Raporu" Retrieved October 22, 2022, from <https://www.gaminginturkey.com/tr/turkiye-oyun-sektoru-raporu-2020/>
- [3]Gaming in Turkey.. 2021. "Türkiye Oyun Sektörü 2021 Raporu" Retrieved October 22, 2022, from <https://www.gaminginturkey.com/tr/turkiye-oyun-sektoru-raporu-2021-tanitim/>
- [4] BilişimVadisi. 2021. "Re-Think Dijital Oyun e-çalışmayı Sonuç Raporu"
- [5] Taylor, M. 2018. " Stardew Valley has sold over 15 million copies as creator shifts to new project.". Retrieved October 24, 2022, from <https://www.pcgamer.com/stardew-valley-has-sold-over-15-million-copies-as-creator-shifts-to-new-project/>
- [6] Demirel, E., 2007. "Sosyolojik Bir Araştırma Nesnesi Olarak Dijital Oyunlar", 25(2), 1-21.
- [7] Boulton, E., Cremin, C. 2011. " The Sociology of Videogames", 341-357.
- [8] Newzoo. 2017. " Male and Female Gamers: How Their Similarities and Differences Shape the Games Market.". Retrieved October 24, 2022, from <https://www.pcgamer.com/stardew-valley-has-sold-over-15-million-copies-as-creator-shifts-to-new-project/>
- [9] Best, S., Kellner, D. 1991. "Postmodern theory".
- [10] Özcan B., Eriş G. 2021. "Bilgisayar Oyunları Oynamanın Akademik Başarıya Etkisinin İncelenmesi.", 5(2), 130-144.
- [11] Wang A., Wu B. 1970. "Use of Game Development in Computer Science and Software Engineering Education."
- [12] Can, M., Türkmen, B. 2017. "Bilgisayar oyunlarının yabancı dil eğitime katkısının araştırılması: Anadili Türkçe olan 100 yükseköğretim öğrencisi üzerinde yapılan araştırma örneği", 10(31), 399-435.
- [13] Sarpkaya, S. 2021. "Dijital Oyun/Video Oyunu Folkloru Üzerine Bir Yöntem Denemesi", 6, 155-172.
- [14] Doğan, K. 2020. "Türkiye’de ve Türkiye’den Oyun Çalışmaları", 3(2), 176-183.
- [15] . Slater, M., Usoh, M. 1993. "Presence in immersive virtual



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

environments. 1993”, 90 - 96.

[16] Carroll, M., Osborne, E., Yildirim, C. 2019. “Effects of VR gaming and game genre on player experience”

[17] Hussain, A, Shakeel, H., Hussain, F., Uddin, N., Ghouri, T. 2020. “Unity Game Development Engine: A Technical Survey.”, 4(2), 1-10

[18] Canossa, A. 2013. "Interview with nicholas francis and thomas hagen from unity technologies." 137-142.

[19] Nurym, N., Sambetova, R., Azybaev, M., Kerimbayev, N. 2020. "Virtual Reality and Using the Unity 3D Platform for Android Games." 539-544.

[20] Garousi, V., Mahmoud, A., Olsson, T., Stalberg, O. 2019. "Video Game Development in a Rush: A Survey of the Global Game Jam Participants."

[21] Thabo N., Moruti, K., Swaabow T., Jamisola, R. 2019. "EEG-based Control of a 3D Game Using 14-channel Emotiv EPOC+.", 463-468.

[22] Kim, S. L., Suk, H. J., Kang, J. H., Jung, J. M., Laine, T. H., & Westlin, J. 2014. “Using unity 3D to facilitate mobile augmented reality game development.”, 21-26.

[23] Blackman, S. 2013. “Beginning 3D Game Development with Unity 4: All-in-one, multi-platform game development.”

[24] Steam store. Welcome to Steam. Retrieved October 26, 2022, from <https://store.steampowered.com/>.

[25] Oculus quest store: VR Games, Apps, & More. Oculus. Retrieved October 26, 2022, from <https://www.oculus.com/experiences/quest/>



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

16. PROJECT ACTIVITIES AND WORK PLAN

Table 16.1 The Work-Activity Plan for Project 1

Work and Activity	Responsible Group Member	Timeline													
		1. week	2. week	3. week	4. week	5. week	6. week	7. week	8. week	9. week	10. week	11. week	12. week	13. week	14. week
1. Project and Game Content Plan Determination.	İpek YILMAZ	√	√												
2. Literature Review.	İpek YILMAZ		√	√	√	√	√	√	√						
3. Game Development Tools, Platforms Installation and VR Settings.	İpek YILMAZ				√	√	√	√							
4. Game Scene and Asset Settings.	İpek YILMAZ						√	√							
5. Customer NPC Functions and Order System Construction.	İpek YILMAZ							√	√	√	√	√	√	√	√
6. Doner Kebab Preparation and Order Completion System Construction.	İpek YILMAZ												√	√	√
7. Budget, Materials, Skills, and Inventory Systems Construction.	İpek YILMAZ														
8. Testing & Build	İpek YILMAZ														

Note: Work Packages 6, 7, and 8 in the table are planned to be completed in the second semester .



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

Table 16.2 The Work-Activity Plan for Project 2

Work and Activity	Responsible Group Member	Timeline													
		1. week	2. week	3. week	4. week	5. week	6. week	7. week	8. week	9. week	10. week	11. week	12. week	13. week	14. week
1. Project and Game Content Plan Determination.	İpek YILMAZ														
2. Literature Review.	İpek YILMAZ														
3. Game Development Tools, Platforms Installation and VR Settings.	İpek YILMAZ														
4. Game Scene and Asset Settings.	İpek YILMAZ														
5. Customer NPC Functions and Order System Construction.	İpek YILMAZ														
6. Doner Kebab Preparation and Order Completion System Construction.	İpek YILMAZ	√	√	√	√	√	√								
7. Budget, Materials, Skills, and Inventory Systems Construction.	İpek YILMAZ				√	√	√	√	√	√	√	√	√		
8. Testing & Build	İpek YILMAZ											√	√	√	√

Note: Work Packages 1, 2, 3, 4 and 5 in the table were completed in the first semester.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

16.1 LIST OF WORK PACKAGES

Table 16.3 Detailed Definition of Work and Activity

WP No	Detailed Definition of Work and Activity
1	To plan the content of the game for the graduation project to make it original and in line with its purpose, make a detailed game content plan in order to determine core necessary functions and set a path in this direction by developing the game.
2	Literature review with at least 10 articles to search existing games in order to make an original Project with clear objectives and to review the game industry, game development, VR, and user effects.
3	To develop the game, install and set the necessary platforms, get & connect the VR headset tools, and make player control settings.
4	Game Scene and Asset Settings by purchasing restaurant ambiance assets from Asset Store and designing.
5	Customer NPC assets, animations, and functions settings as customer spawning, navigation, customer queue system, food ordering and order options, UI settings, customer order delivery and sitting on the available table, waiting, paying, eating, and leaving. Piling of orders, tray preparation for the relevant customer, customer patience level, and delivery when the order is complete.
6	The gamer as a Restaurant Worker will make Doner Kebab Preparation and Order Completion manually by using VR controllers. Orders will be completed. The order will be prepared according to the ingredients requested by the customer.
7	The Budget System that is related to customer delivery, material supply, and other stuff purchasing, Skills, Materials and Inventory Systems for the restaurant will be made.
8	Testing the game and fixing all bugs in order to maintain smooth gameplay and building the game in the end.

Table 16.4 Work package targets, their assessment, and the contribution of each work package to the overall project success.

Work Package	Target	Measurable Outcome	Contribution to Overall Success (%)
1	Project and Game Content Plan	Make Project Plan	5%
2	Literature Review	Review at least 10 articles	5%
3	VR Headset & Console Connection and Player Control Settings	Successful VR Connection	10%
4	Assets, Scene and Ambiance Settings	Game Scene Setting	5%
5	Customer NPC & Order System	AI & Order System Completion	20%
6	Doner Kebab Preparation and Order Completion	Restaurant Worker Part Completion	25%
7	Budget, Materials, Inventory and Skills Systems	Inventory & System Settings	20%
8	Testing & Build	Smooth Gameplay	10%



Istanbul Medipol University
School of Engineering and Natural Sciences
Graduation Project

Table 16.5 The work package distribution to project team members

WORK PACKAGE DISTRIBUTION								
Project Member	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8
İpek Yılmaz	%100	%100	%100	%100	%100	%100	%100	%100
Total	100	100	100	100	100	100	100	100

17. BUDGET

Table 17.1 Proposed Budget in TL

	ITEMS				
	PEOPLE	MACHINE-INSTRUMENT	MATERIALS	SERVICE	TRAVEL
SELF FUND	100.000 TL	30.000 TL	2.000 TL	2.000 TL	-
TOTAL	100.000 TL	30.000 TL	2.000 TL	2.000 TL	-

Table 17.2 Actual Budget in TL

	ITEMS				
	PEOPLE*	MACHINE-INSTRUMENT**	MATERIALS***	SERVICE****	TRAVEL
SELF FUND	100.000 TL	30.000 TL	1.870 TL	2.000 TL	-
TOTAL	100.000 TL	30.000 TL	1.870 TL	2.000 TL	-

*1 person, 10.000 TL monthly salary for 10 months.

** 20.000 TL for laptop, 10.000 TL for Oculus Quest VR Headset

*** 80\$ for game assets (1.870 TL)

**** 2.000 TL for 10-month internet service.



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

18. CURRICULUM VITAE



İpek Yılmaz

Address:Neighbourhood of Selami Ali, İspir road, 14/5 Üsküdar, Istanbul 34674

Phone:05380429740 **E-Mail:**ipekylmz111@gmail.com

Experienced in C# language with game development background in Unity.

EDUCATION

2018-2022	Medipol University Industrial Engineering - Bachelor's Degree (GPA: 3.37)
2019-2023	Medipol University Computer Engineering (Double Major) - Bachelor's Degree (GPA: 3.37)

WORK EXPERIENCE

Aug 2020 - Sep 2020	TEI - TUSAS Engine Industry Inc. Production Planning Intern Industrial Engineering Summer Internship
Oct 2020 - Jun 2021	Gedik Investment Information Technology Intern Computer Engineering Summer Internship
Sep 2021 - Oct 2021	Skane Hansa Holding AB Project Management Intern Industrial Engineering Summer Internship
Oct 2021 - Dec 2021	Skane Hansa Holding AB Software Application Developer (Part-Time) .NET Windows Forms (C#) Application Development with SQL Server
Aug 2022 - Sep 2022	CompuGroup Medical Information Systems Inc. Information Technology Intern Computer Engineering Summer Internship
May 2022 - Dec 2022	CompuGroup Medical Information Systems Inc. Human Resources Staff Part-Time
Oct 2020 - Jun 2021	Google DSC Medipol University Executive Board Member Co-founder, Social Media & Design Team Lead



Istanbul Medipol University

School of Engineering and Natural Sciences

Graduation Project

LANGUAGES

English ★★★★★
German ★
Turkish ★★★★★

SKILLS

C#, Python, Java, Game Development (Unity), C, AutoCAD, Adobe Design ,
Microsoft SQL Server, .NET Windows Forms, Microsoft Office, GAMS,
Arena Simulation Software, LINGO, SAP, HTML & CSS

REFERENCES

**Company Name: CompuGroup Medical Information Systems Inc. - Job
Title: Human Resources Manager**
Person Name: Özge Aktan - Phone Number: 0 (532) 310 97 62

**Company Name: Gedik Investment - Job Title: Head of Trading,
International Capital Markets**
Person Name: Çağatay Aksoy - Phone Number: 0 (535) 351 49 50

HOBBIES

Game Development

PERSONAL

Date Of Birth: 26.07.2000
County: Istanbul
Driving Licence: B (Passenger car)
Marital Status: Single