Project Report

Version 1

CENG 407

Innovative System Design and Development I

Çankaya University

HR Simulation Platform for Risk Management Education

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Content

Abstract

Currently ,risk management and control in the business sector has become an increasingly important issue, while educating and raising awareness of people on this issue is equally important. With the changing and developing world conditions, the use of state-of-the-art devices in this training process has become inevitable. In particular, it has been observed that simulations with VR plug-in are very useful and effective in this area. In our project , which aims to train human resources employees against the risks that arise, a virtual working environment has been prepared to enable users to gain real experience.

Özet

Günümüzde iş sektöründe risk yönetimi ve kontrolü gittikçe önem kazanan bir konu olmuşken ,bu konuda insanların eğitilmesi ve bilinçlendirilmesi de aynı oranda önem taşımaktadır. Değişen ve gelişen dünya şartları ile birlikte bu eğitim sürecinde son teknoloji cihazların kullanılması kaçınılmaz bir hal almıştır. Özellikle VR eklentisi bulunan simülasyonların bu alanda oldukça kullanışlı ve etkili olduğu gözlenmiştir. İnsan kaynakları çalışanlarının oluşan risklere karşı eğitilmesi amaçlanan projemizde kullanıcıların gerçek bir tecrübe kazanmasını sağlamak için sanal bir çalışma ortamı hazırlanmıştır.

1.Introduction

1.1 Company Background

SONO Software is a software company that has been providing software consultancy services in Turkey and abroad since its establishment in 2015, and produces software that is fully compliant with relevant laws and standards for public institutions, kits, municipalities, universities and private sectors in various fields by using the latest technologies.
Apart from software development activities, SONO Software has also completed many KOSGEB and Tübitak R&D projects with its experienced team with field expertise in artificial intelligence, machine learning, advice systems, natural language processing and speech recognition systems.

About works;
SONO Software, which started its works with the e-commerce platform called Niyeo, which it developed in 2014, started to provide consultancy services at home and abroad on the latest technologies it uses in a short time and in parallel with this, it started to develop cloud-based mobile projects.

In 2016, Turkey Internal Control Institute mission also conducts working with the Guidelines Group, the existing enterprise management system of Java and Java technologies with SONO continuing to work on developing software, as soon as these projects with experienced teams have also been completed with full success and many public institutions and It was sold to its establishment and received its acceptance.

In 2018, it bought the rights to that developed for the Guidelines Group KIOS v2 named Java-based new version and the old KIOS version SONOMA software can now only turn to consulting jobs Turkey Internal Control Institute technical / software began working as an infrastructure provider.

While the current studies are continuing, the new KIOS v2 software, which has already proven itself and works in many public institutions and organizations, KITs, universities, municipalities, holding companies, has given the name SONIK and developed this project even further and became "SONO KYS - Corporate Management Systems" It has started to work to establish all software infrastructure that an institution may need.

As a result of these studies, it developed first SONIS Strategic Plan, then SONID Internal Audit, SONIV Data Inventory, SONIT Project Tracking and SONAT Project Tracking systems, working in full integration with the previous SONIK Internal Control and Risk Management system and with each other. These systems that he developed have started to be used in many institutions and, like all other systems, they continue to be developed continuously.

SONO Software, which started a factory automation project in 2019 as a result of a joint cooperation with a factory, plans to complete this project by 2021.

In addition to ongoing Corporate Management Systems and factory automation services, SONO Software, which has been providing software consultancy services to a total of 7 countries including America, Italy and Portugal since the last 2015, thanks to its qualified workforce, many TUBITAK and Kosgeb projects in parallel with its existing projects. has also completed the project and is still working on new projects. [1]

1.2 Motivation

We have completed multiple projects together, including three fellow internships, and successfully overcome them all. We wanted to make a simulation project as the type of project that the three of us most wanted to try and complete, and assuming the length of the process of the final project, we chose the simulation project, which is one of the projects in the hands of our consultant. Our team members have knowledge about 3d modeling and simulation games before. One of our teammates, unreal engine, had also developed some different environments before. We also thought that our Unreal engine translation was more accurate, as all team members are familiar with C ++. Being one of our biggest supporters, SONO software appreciates our opinions and helps us at every stage we pass. In this way, we were able to proceed more actively and consistently in the project.

1.3 Problem Statement

There are some risks/problems that may occur during the recruitment process. The first of these;

- It causes a loss of productivity on the business process due to not hiring the right candidate for the position. And this may cause some financial and time problems. Second risk;
- Inadequate application for the position. Thirdly;
- Loss of business continuity due to prolonged recruitment process. And accordingly, other substances;
- Waste of time due to prolonged recruitment process.
- It is a cost loss due to the prolongation of the recruitment process.

1.4 Solution Statement

In this section, we will describe the controls / solutions to the problems we explained in the previous section.

- The first of these is to interview with the relevant department manager about the position requirements. In this way, more precise and controlled decisions can be made during the recruitment period. Secondly,
- If the terms of reference for the position needs to be revised, updating. This update process keeps criteria up to date and can provide a smoother recruiting process. Third,
- Researching current developments regarding the position. The fourth is,
- Reviewing the characteristics of high-performing people who have previously served or are in the position. This can make the recruitment process more efficient in the future.

2. Literature Search

2.1 Utilization of Virtual Reality and Unreal Engine in Training Simulations

In this project, an office environment has been created by using virtual reality to train human resources employees. In a virtual reality environment, real life is carried into virtual life. Developers aim to move real-life environments and their scenarios to virtual environments. Virtual reality is a technology widely used in various fields such as gaming, education ,sports. The recent increased use of virtual reality and the results of these uses prove how useful virtual reality is in educational processes. Today, VR technology can appeal to multiple audiences, such as soldiers, doctors and factory workers. The use of VR benefits users such as employees to experience situations that may be dangerous without any harm, to provide remote access to the VR environment, to anticipate hazards and situations that may occur, and to improve their decision-making abilities. The use of VR allows many companies to save money. The cost of creating scenarios that can be encountered in real life will be much greater than the cost of creating them in a virtual environment.

UnrealEngine was used to improve the simulation for our purpose of one-to-one reflection of the targeted truth in the project. UnrealEngine is a game development engine. It provides the reality necessary for simulations with the performance it shows in its graphics, while achieving many of the features it has in it, which makes it easy for users.

2.2 Related Works

Today, countless companies provide training to their candidates with VR simulation projects and thus contribute to their development. Multiple companies have developed simulations to make the recruitment process more effective and successful. To give an example, Commonwealth Bank of Australia company develops a simulation for new candidates and learns their suitability with the help of this simulation. In simulation, participants measure their smart determinations by encountering real projects. In another example, Jet.com allows potential candidates to observe corporate culture, office space, and even look at how the company celebrates.

In addition to these projects, research articles have been published previously. For instance, Field Educator's simulation project is a simulation project designed to reduce the pressure caused by job interviews, to participate in the interviews more effectively and to overcome the fear that occurs on students.
As can be seen, despite many different projects, researches have been conducted on the risks of people working in human resources to correctly identify candidates to be recruited, and the management of these risks and their skills, but as a result of our research, a project with the desired criteria has not been found.

3.Summary

3.1 Technology Used

Unreal Engine is the game engine we have chosen and is the platform where we have created the scenes we have imagined in our minds and process all the scenarios in simulation.The Unreal engine has been a plus for us in many ways. First of all, it has provided us with a plus due to the fact that it contains C ++, and it has made our work easier at every stage thanks to the blueprint structures. It is also a proof that we made a successful choice in terms of relativity and our team in the environment we have made. Moreover, Unreal Engine has a wide range for VR devices.
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C ++ is the language of the program that we have used for a long time and learned our oop knowledge. Therefore, using Unreal Engine C ++ made us very happy. It also provides more convenient access to C ++ unreling on game mechanics.

4. Software Requirement Specification

4.1 Introduction

4.1.1 Problem Definition

Learning methods used in risk management today are limited to traditional methods. According to studies, the duration and rate of memorability of many traditional education methods in the audience is quite low. The listener can remember only 10% of the information after 72 hours. When impressive photo, video and story additions are made to educational tools, this rate rises to 35-40% within 72 hours. On the other hand, when methods such as simulation, gamification and animation, which are among the most impressive methods of experiential learning, are included in the learning process, the memorability duration of knowledge can be 80% even after 6 months. This also applies to risk management training.

This project aims to teach risk management to employees and interested parties through a simulation platform using innovative and modern methods.

4.1.2 Purpose

The main reason for creating this document is to explain the HR Risk Management System simulation with Virtual Reality Simulation. This project aims to develop an experiential learning method for business actors in risk management and increase the effectiveness and efficiency of corporate education. With this document, the purpose ,needs and solutions produced in response to these needs are explained in detail and clearly.

4.1.3 Scope of the project

This paper aims to clearly explain the project HR Simulation Platform for Risk Management Education Project. It basically includes the requirements for managing the personal data and scores received by users, controlling authentication and authorization mechanisms, and evaluating human resource employees' performance.
In this platform, an employee and admin can be able to login to the system with his/her username and password. A score is created based on the points received.
In addition, the simulation has a team mode, with the team mode, it is aimed that the teams come together over the risks. As a result, each team gets a score.

4.1.4 Definitions,Acronyms, and Abbreviations (Glossary)

SRS: Software Requirements Specification

HR: Human Resource

Admin: Administrator

HR Employees: Human Resource Employees

4.1.5 References

[1] IEEE Std 830-1998: IEEE Recommended Practice for Software Requirements Specifications. [Online]"http://cengproject.cankaya.edu.tr/wp-content/uploads/sites/10/2017/12/SRS-ieee-830-1998.pdf"

4.1.5 Overview Of The Project

This SRS document has been arranged so that every user working in the human resources department can easily understand and use the HR VR Simulation Platform for Risk Management Education.

Fundamentally, this document begins with a brief description of the problems. After that, it proceeds with the specific solutions that we proposed. Furthermore, the diagrams of our solutions to visualize the solutions and the system fairly, non-functional and functional requirements, external interface requirements, limitations that may be encountered while developing software or hardware that may be insufficient, the relationship between admin and HR employees.

4.2 Overall Description

The general description of our project can be expressed as creating and managing VR simulation, developing a clear user interface to make the simulation understandable, logging in from the website to become a member, and providing an authentication mechanism to perform the above-mentioned tasks securely.

4.2.1 Product Perspective

The aim of this project is to train employees working in the HR department of companies against possible risks through a VR simulation.
In our simulation project, there are three modes: training ,office mode and office team mode. It is intended to clearly explain to the user how to use the simulation with training mode.
In Office mode, the user encounters questions selected from the question pool. The user tries to find the correct answers to these questions. The application user moves to the stage where they can perform their duties by going step by step on the recruitment process steps. After this part, the user is subjected to two different methods. The user encounters risks and hazards appropriate to the steps he or she has experienced in previous steps. By finding the correct control stage suitable for these risks and dangers, the user tries to get points. In the second method, a risk occurs at the stage in which the user is concerned. The user is asked questions to prevent this risk, and the user tries to eliminate the risk by answering these questions correctly.
In Office team mode, the simulation has the same steps and features with office mode and moreover it is the mode where the employees play together as an extra to the office mode.

4.2.2 Development Methodology

For developing the project, we have planned to use a Waterfall development methodology where stakeholders and our advisor requirements are gathered at the beginning of the project. This methodology is used for long-term and structured projects because requirements have already been determined, the product has been defined, and the resources to be used are specified already.

There are some advantages of a Waterfall that is one of the easiest models to manage, because of its nature, each phase is already defined and has terminated. It relies on teams following a sequence of steps. Before the next steps of development, each step must be done. For our project, another benefit is that when the product is ready, the product can be delivered to the user without any changes.

4.2.3 User Characteristics

- **4.2.3.1 HR Employees**

➢ Employees must be an employee in the department of HR.
➢ Since the simulation language is Turkish, employees should understand and read the Turkish language.

➢ Employees should know the basic level of computer usage.

- **4.2.3.2 Admin**

➢ Admin must be an employee in the department of HR.
➢ Since the simulation language is Turkish, the admin should understand and read the Turkish language.
➢ Admin must have the ability to add, remove and edit employees to the system.
➢ Admin must have the ability to add, remove employees to the teams.

- **4.2.3.3 Teams**

➢ Teams must consist of HR elements.

4.2.4 Product Functions

HR VR Simulation Platform for Risk Management Education implements functions required to meet the desired properties. All of these functions are necessary for the system to work regularly.

4.2.4.1 Authentication and Authorization

➔ Users registered in the database by the administrator can log into the system. To access assignment information, the user account must be authorized, as well as the username and password must be verified. These tasks are essentially performed by functions implemented under the title of Authentication and Authorization main function.

4.2.4.2 Process Data

➔ Our data is about scores, user information, and assignments that include different recruitment questions and psychological test questions and their answers. Its major functions are essentially providing users to manage the database according to the desired task. These management tasks are the basis feature of the simulation.

4.2.5 Constraints,Assumptions and Dependencies

Regularity Policies:

➢ Users must be part of the company that owns the product and must be a human resources employee. It means that every user has an account already created by Admin.

❖ **Hardware limitation:**

➢ Our simulation will work on each operating system.

4.3 Requirement Specification

This project has some defined functional/non-functional requirements about the modes and users to be executed.

4.3.1 External Interface Requirement

This section specifies hardware, software, or database items that a system or component should interface.

4.3.1.1 User Interfaces

Whole of the users will see the same page when they enter the simulation. On this page, the user enters the password and username.

Later on authentication, users will see the interface. This interface includes different tabs according to their role types. These tabs can be named as; Personal Data Tab, Add New User Tab, Manager Tab, Users List Tab and Arrange Roles Tab. These tabs can be explained in detail as:

Figure 1 : Login screen

4.3.1.1.1 Personal Data Tab

In this tab, employees will be able to see their personal information that appears in a user-friendly layout, and, thanks to this tab, they will be feasible to edit and update non-assignment, name-surname information in others.

4.3.1.1.2 Add New User Tab

In this tab, Admins can add new users to the system. Admin can add users with user ID,password and username. This user will be created by synchronizing with an employee with the same identity from the employee database.

4.3.1.1.3 Manager Tab

In this tab, managers can see registered users. They can remove and add users with the help of this tab. With the search button in this tab, the manager will be able to see the user list(similar with User List Tab but here there are options to edit) and edit the information of the users in this list. If the manager wants to view the user, it will see the user's information in an editable state.
Also managers can add and remove employees to a team.

4.3.1.1.4 User List Tab

In that tab, the Admin can list whole human resource employees. Moreover, there exists a search button in the Manager tab which lets the admin select employees from the list by searching. Later, choosing the employee a new window is opened with knowledge about that employee.

4.3.1.1.5 Arrange Roles Tab

In this tab manager can create new roles, assign created roles or existing roles to users, and view them according to the roles that users have.

4.3.1.2 Hardware Interfaces

This application will run on computers. The simulation will be played using a VR headset.

4.3.1.3 Software Interface

This application will run on computers regardless of operating system.

4.3.1.4 Communication Interfaces

The application will use the HTTP protocol for access over the internet. The Web-side of the project will be connected to the internet through Wi-Fi or 3G.

4.3.2 Functional Requirements

4.3.2.1 Login Use Case:

➔ Buttons:

- Start
- Login as Admin
- Exit
- Forgot Password

➢ Diagram:

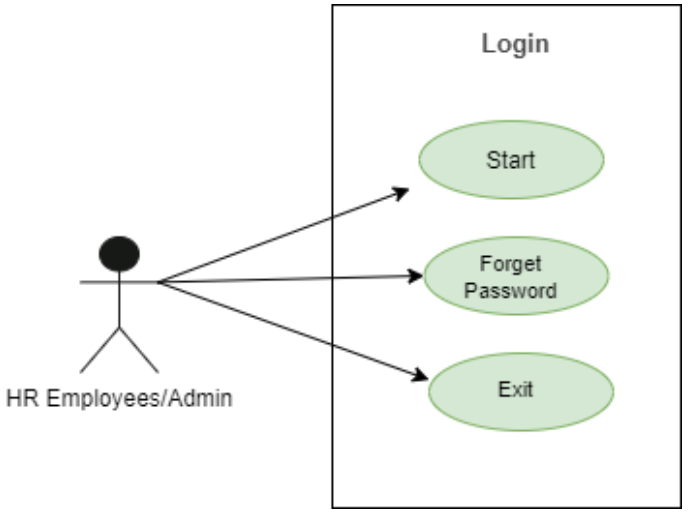


Figure 2: Login Use Case

➢ Brief Description:

As can be seen from the diagram, admin and user can log in to the application using the start button. Admin and user can log out of the application using the exit button.

➢ Step by Step Description:

1.) Admin and user log in to the application with password and user.
2.) If the user entered his password incorrectly, he will receive an "invalid password" warning. He/she must enter the correct password to log in.
3.) If the user forgets his / her password, he / she clicks the Forget Password button and a new random login password is sent to his / her mail.

4.3.2.2 Options Menu Use Case For Setting

➔ Buttons:

- Pause
- Continue
- Change Volume Settings
- Start Over
- Display Instructions
- Exit

➢ Diagram:

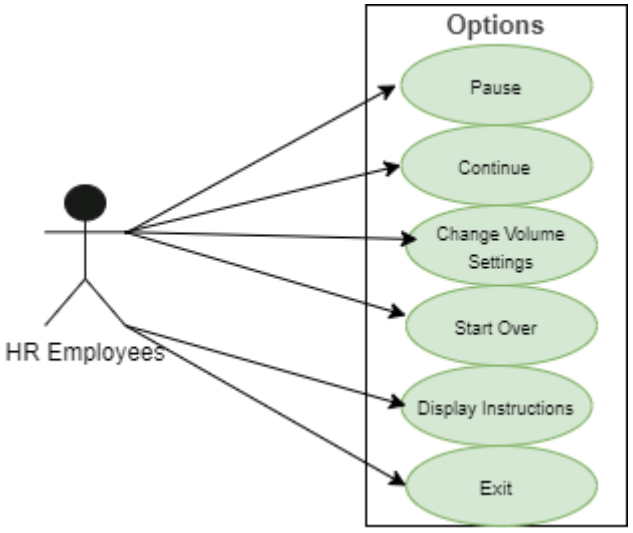


Figure 3: Options Use Case

➢ Brief Description:

As seen in figure 3 user option menu use case diagram. When the user enters training, office mode or office team mode within the system, he/she can display the options menu. Users can click on Pause, Continue, Change Volume Settings,Start over, Display Instructions, and exit the Options menu.

➢ Step by Step Description:

- The user must click the pause button to stop the simulation.
- The user must click the continue button to resume the simulation from where it left off.
- If the user clicks on the Change Volume Settings button, a voice panel is displayed on the screen.
  - The user can increase the volume by selecting the plus sign "+" button.
  - The user can decrease the volume by selecting the minus sign "-" button.
- If the user clicks on the start over button, the simulation will restart.
- If the user clicks on the display instructions button, a panel that shows the instructions of the simulation is displayed.
- If the user clicks on the exit button, simulation will end and the main menu will be seen.

4.3.2.3 Profile Setting Use Case for Personal Information

➔ Buttons:

For Employee Profile: (Figure 4)

- Edit
- See the assignments result
- Start the quiz
- See the team score that were enrolled
- See the teams
- Exit

For Admin profile: (Figure 5)

- Teams (This button is explained in detail in the Figure6/Admin-team profile case.)
- Add Questions

- Delete Questions
- Update Questions
- See all the score of the Participants
- Edit
- Exit

For admin-teams profile: (Figure 6)

- Edit the team
- Create New Team
- Delete the Team
- See the teams' score
- Exit

➢ Diagram:

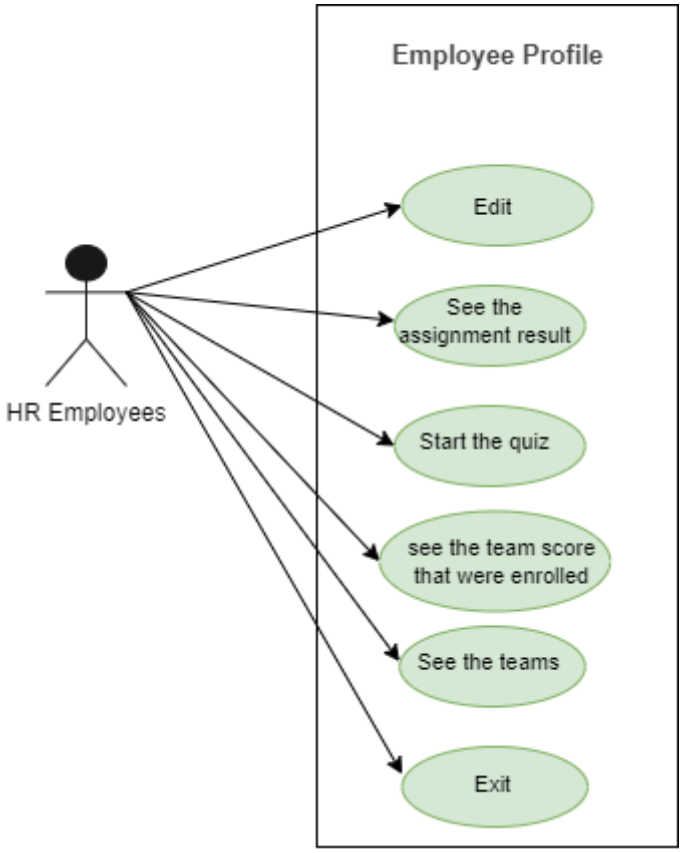


Figure 4 :Employee Profile Use Case Diagram

Figure 5: Admin Profile Case Diagram

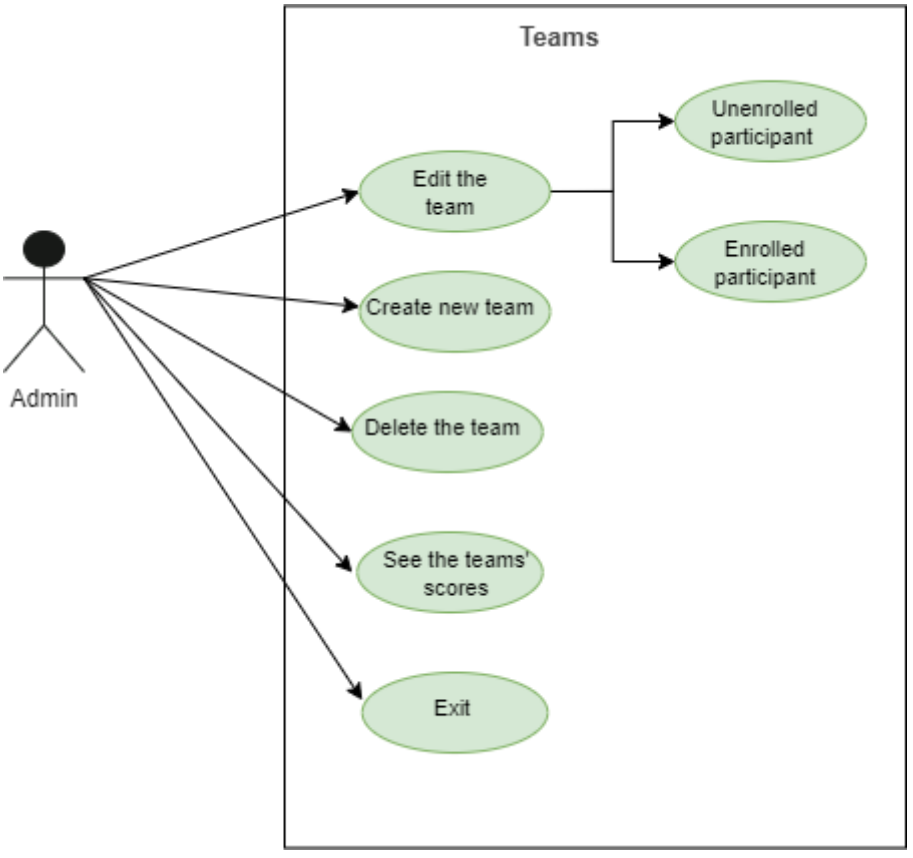


Figure 6: Admin-teams profile setting case diagram

➢ Brief Description:

The employee profile diagram (Figure 4) shows the employee profile management setting part. When the employee logs in the main page has a panel that contains these buttons.

- ➢ Step by Step Description:
    - If the employee clicks on the edit button, see the main information, username, password,email, and can edit except name,surname and assignment scores.
    - If the employee clicks on the see the assignment result button, the simulation will display all the assignment scores.
    - If the employee clicks on the quiz button, simulation will lead to office mode and quiz will start.
    - If the employee clicks on the see the teams button, simulation will open the team list that the employee has been enrolled by admin.
    - If the employee clicks on the see the team score that were enrolled button, simulation will open the team list with their assignment scores.
    - If the employee clicks on the exit button, the employee will log out and the login page will come to display.

- ➢ Brief Description:

The admin profile diagram (Figure 5) shows the admin profile management setting part. When the admin logs in the main page has a panel that contains these buttons.

- ➢ Step by Step Description:
    - If the admin clicks on the teams button, the teams page will open and the teams panel will be seen.
    - If the admin clicks on the add questions button, the page for adding questions will be opened and admin can add a new question.
    - If the admin clicks on the delete questions button, the page for deleting questions will be opened and admin can delete the question that was selected.
    - If the admin clicks on the update questions button, the page for updating questions will be opened and admin can update the question that was selected.
    - If the admin clicks on the see all the score of participants button, the page for the score page will be opened and the admin can see the scores of the participants.
    - If the admin clicks on the edit buttons, the admin first sees all the participants after selecting a participant, admin can edit all the information except assignment scores.
    - If the admin clicks on the exit button, the admin will log out and the login page will come to display.

- ➢ Brief Description:

The teams profile diagram (Figure 6) shows the teams management setting panel. When the admin clicks on the teams button this panel.

- ➢ Step by Step Description:
    - If the admin clicks on the edit the team button, the simulation will open a new panel that includes the teams and after choosing the team, the unenrolled participant and enrolled participant panel will be opened.

        - If admin clicks on the unenrolled participant button, simulation will open the participant list and the selected user will be removed from the list.
        - If admin clicks on the enrolled participant button, simulation will open the participant list and the selected user will be added from the list.
    - If the admin clicks on the create new team button, the simulation will open a new panel that includes the participants and after choosing the participants, the team will be created.
    - If the admin clicks on the delete the team button, the simulation will open a new panel that includes the teams and after choosing the team, the team will be deleted.
    - If the admin clicks on the see the teams' scores button, the simulation will open a new panel that includes the teams and their scores next to them as a list.
    - If the admin clicks on the exit button, the admin will be back to the profile management page.

4.3.2.4 Training Mode Use Case

➔ Buttons:

- Displaying Score
- Display Options
- Take Quiz
- Answer Questions
- Skip Training
- Exit

➢ Diagram:

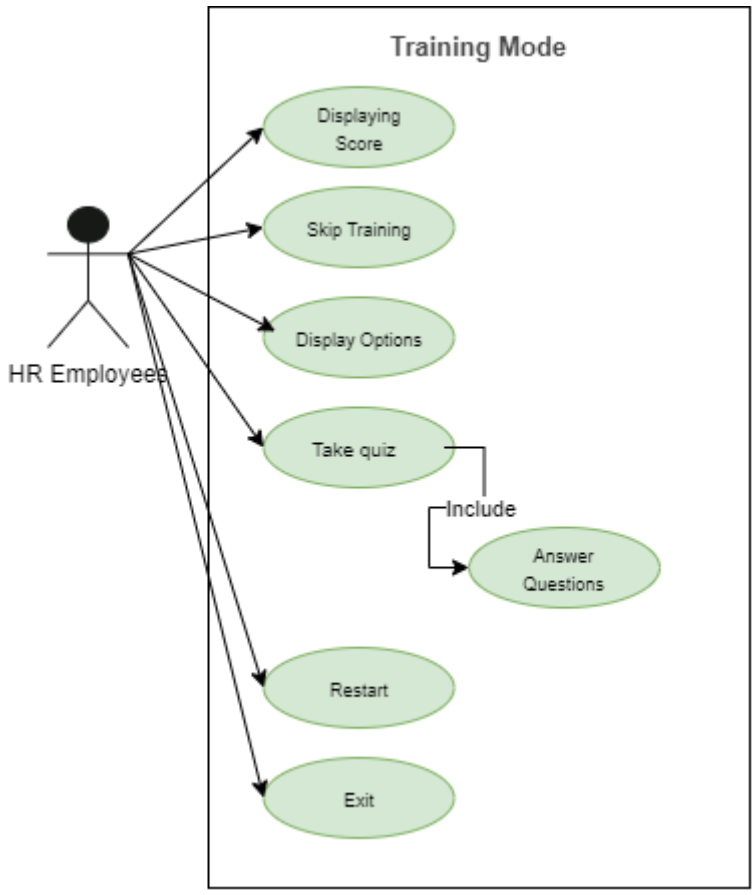


Figure 6: Training Use Case

➢ Brief Description:

This mode is intended to teach office mode for users who have not used the simulation before or want to remember how to use it. There will be a preview of the quiz that the user will be subject to and how to use the application with instructions will be explained. In the preview of the quiz, the user will try to answer the questions asked to her/him with instructions.

➢ Step by Step Description:

- First, if the user receives a quiz for the first time, training mode comes automatically. If the user does not take the first quiz, the user can select the skip training button.
- The user can view the settings by clicking the display options button.
- When training mode starts, the user faces questions that are not in office mode.
- After the user answers the questions by clicking on them in the quiz with the instructions, the training mode ends.
- After completing this mode, the user can switch to office mode using the switch office mode button if he wants, or join training mode again with the restart button.
- Finally, the user can see his/her own score by clicking the displaying score button at the end of the quiz.
- If the employee clicks on the exit button, the employee will log out and the login page will come to display.

4.3.2.5 Office Mode Use Case

➔ Buttons:

- Scenario
- Displaying Score
- Display Options
- Chat Box
- Move
- Take Quiz

➢ Diagram:

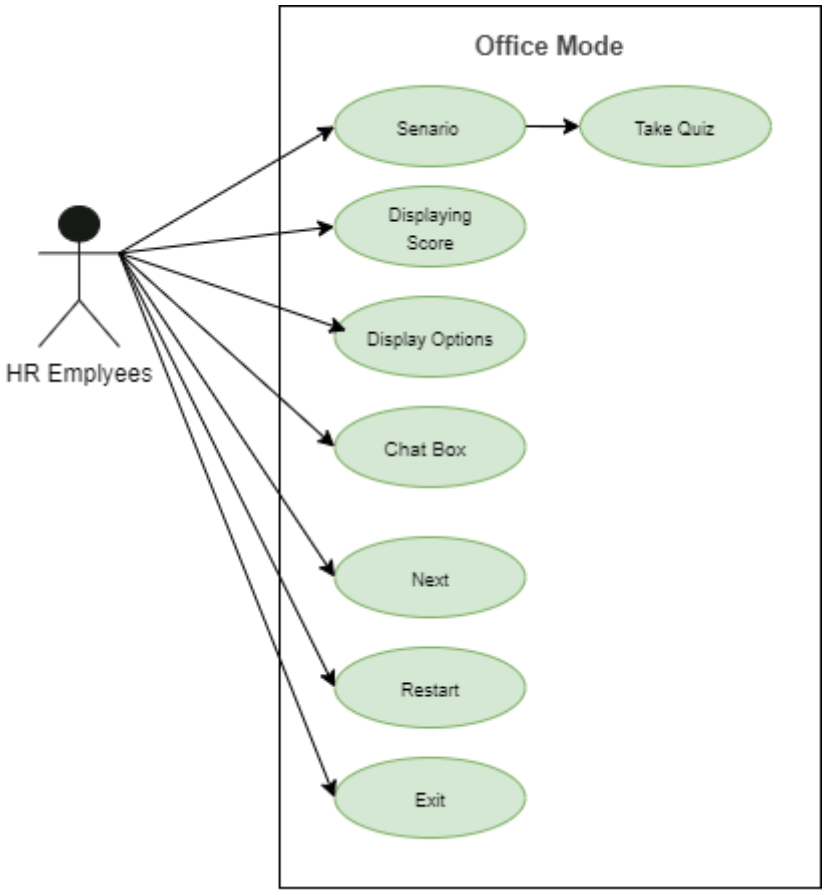


Figure 7: Office Use Case

➢ Brief Description:

In office mode, the user is asked several questions selected from the questions in the question pool on topics such as business instructions, duties and responsibilities. After the user answers these questions, the application user is tested by two different methods. The first method shows several risks/hazards related to the process step experienced by the application user, from the risks/hazards previously included in the risk pool. The user tries to eliminate the

risks by finding the correct control. In the second method, a risk occurs in the area where the user is located (selected from the risks in the risk pool) . The user is asked what to do to prevent this. Scoring is done according to the correct and incorrect answers of the user.

➢ Step by Step Description:

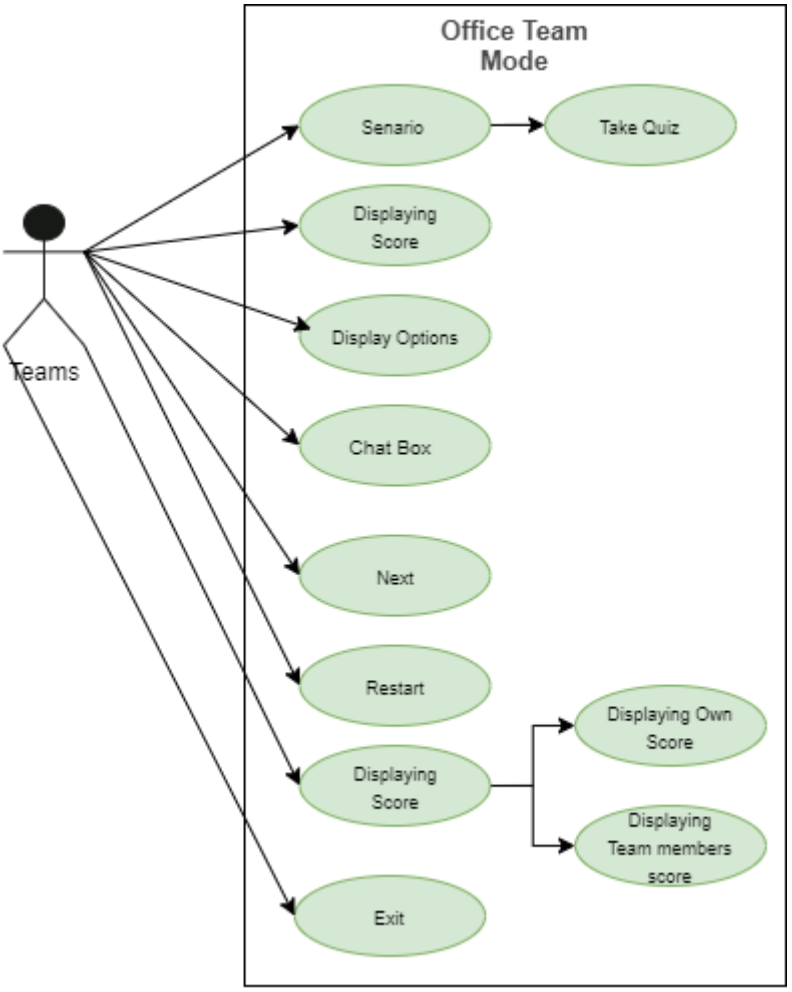
- The user encounters questions.
- The app user answers the questions by clicking on the answer they find correct, and their answers are scored.
- The user can switch to the next step with the next button.
- The application user moves to the stage where they can perform their duties by progressing through the process steps of the recruitment process.
- At this stage, the application user is tested by two different methods.
- The first method shows several risks from the risks in the risk pool.
- To avoid these risks, the user is asked to find the correct control activity option.
- If the user has found the right option, the danger is eliminated. If the user does not find the correct option, the danger becomes a risk. The user is given a point.
- Corrective control activities are shown to the user.
- If the user has found the correct control, the risk is reduced or eliminated. The user is given a point.
- In the second method, a risk occurs in the user's area (selected from the risks in the risk pool), the user is asked what/what to do to prevent it. Scoring is done according to the correct and incorrect answers of the user.
- The user can see the score from the display panel during the application process and at the end of the application.
- The user can view the options from the display options button.
- After the user has finished the quiz or when answering the quiz, he / she can enter the quiz again using the restart button if he / she wishes.
- If the employee clicks on the exit button, the employee will log out and the login page will come to display.

4.3.2.6 Office-Team Mode Use Case

➔ Buttons:

- Scenario
- Take Quiz
- Displaying Score
- Display Options
- Chat Box
- Next
- Restart
- Displaying Own Score
- Displaying Team Members Score
- Exit

➢ Diagram:



➢ Brief Description:

In this mode, users answer questions as a team. Users observe the implementation of the activity in the process step. Users get points by trying to answer the questions asked to them correctly.

➢ Step by Step Description:

- The team encounters questions.
- The team must choose a common option to move on to the next question.
- Then, users go through the steps that single users go through as a team.
- After the quiz is finished, the team can display their score using the displaying score button.

4.3.3 Nonfunctional Requirements

4.3.3.1 Performance Requirements

Simulation design must run smoothly without any latency to keep the level of immersion high. This requirement depends on the various features of the user's computer. Minimum requirements are listed below.

- CPU:Intel® Core™ i5-4590 equivalent or better
- GPU:NVIDIA GeForce GTX 1050 Ti ,AMD Radeon R9 290 equivalent or better
- RAM:4GB of system memory
- Video Output: HDMI 1.4, DisplayPort 1.2 or newer
- USB port:1x USB 2.0 or better port
- Operating System: Windows 10 (64-bit), Ubuntu 16.10 equivalent operating systems or better versions

4.3.4 Software System Attributes

4.3.4.1 Portability

- This simulation was designed using Unreal Engine 4.
- This project can run on all types of computer platforms, including Windows, Linux and MAC.
- This project works in harmony with virtual reality glasses such as Samsung Gear VR,Sony Playstation VR and Oculus Rift.

4.3.4.2 Performance

- Objects, which are not seen by the user, should not be rendered until the user sees the object.
- Animations of objects should not be executed until the user sees the object.

4.3.4.4 Usability

- Each quiz in training mode has 3 questions and their scores seen after choice has been made.
- Each question in the quizzes has 4 choices.
- When the user has scored under 50 points, an error message, which explains the reason why the user had that point, should be displayed.

4.3.4.5 Adaptability

- After each new assignment, we need to save the results and make changes in the database because the scores of the people are important for evaluation.

4.3.4.6 Scalability

- According to the teams assigned by the administrator, the application can be used simultaneously by more than one person.

4.3.5 Safety Requirement

- VR glasses can lead to various problems in long term use. Therefore, the duration of use should not be ignored. VR glasses can sometimes lead to various side effects. The effects it “ gives" are usually the effects that arise from the general effects of using glasses and show temporary properties. These are explained in the form of fatigue, ligament pain and nausea. In order to avoid damage to the glasses, it is necessary to pay close attention to the design and technology of the device. Both the image quality and the transitions of the images should be well adjusted and selected so as not to harm the eye. Because the image is three-dimensional, if there are no quality glasses, the eye has to make an effort to sharpen the image. The point to be noted is that in addition; when using VR glasses, there should be no objects that can be broken around.

5. Software Design Document

5.1 Introduction

The aim of the project is to teach the solution of these risks by considering the risks that may occur in recruitment of people working in human resources. In this way, human resource employees know how to act with the same risks in real life.

5.1.1 Purpose

This SDD aims to implement the details of the project titled "HR Risk Management System with Virtual Reality Simulation".

Users of the product are HR employees. Simulation includes the choices that employees will make to eliminate some of the risks they will face while working. We offer users an environment that contains objects from real offices that should be when recruiting in an office environment.

The HR simulation project aims to design "teaching the risks that may arise in the recruitment process" as both a standalone application and a VR system that includes realistic scenarios. The simulation includes 3 different modes: education, office, Office Suite mode. The purpose of the Training Mode is to guide the user on how to use the simulation. In this mode, it teaches you how to choose from a few questions. If the user is playing for the first time, the simulation starts with the training mode, and if it is not the first time, they can choose one of the 3 modes instead of the training mode. The purpose of office mode is to measure risk management by asking users questions such as job instructions, duties, and responsibilities. The purpose of the office-team mode is to teach the teams, created by the manager, by playing simulation together. Assignment information is kept in each mode in the database.

To give a better understanding, this SDD includes numerous diagrams such as activity diagram, block diagram, and UML diagram of the project.

5.1.2 Scope

In this SDD document, it is clear and detailed how the project was designed. The simulation environment in the project and the events that occur in this created environment are created using Unreal Engine. Creating figures, organizing the educational environment ,testing where the HR

employee will be subjected, and providing VR support will be provided using the Unreal Engine game engine. Unreal Engine is an open source game development engine. Unreal Engine can work with many operating systems such as Windows, Linux and IOS. Although multiple factors were effective in selecting Unreal Engine for our project, one of the most important factors was that it provided high quality graphics performance. The second most important factor is the blueprint feature that Unreal Engine provides. Thanks to this feature, we can save time and effort, and provide better access to visual debugging. Since we will use VR technology in our project, we aimed to achieve the best quality. In terms of image quality, Unreal Engine has proven itself on most platforms and devices. Rendering technology is fairly fast in Unreal Engine. Considering all the reasons mentioned, Unreal Engine was the best option for our project as a game engine.

For the script part of our project , it mainly consists of C++ scripts. C++ is a high-performance ,object-oriented programming language that runs on many platforms. Because all members of our group are familiar with C++ and Unreal Engine uses the C++ language, we chose this language as the main programming language of our project.

The user can use three different modes. The first mode is a kind of training mode for users who use the simulation for the first time. Users try to answer the quiz by following the instructions. The second mode is office mode. In this mode, users answer the quiz without instructions. Answer the questions they face by selecting the answer they think is correct from the answer panel. In this section , users can see their scores from the score panel. In the third mode, users can join the quiz as a team. As a team, they can view the score of the quiz they answered from the score panel. Users can edit their own profiles from the GameMaster page and view their own information.

5.1.3 Glossary

SDD:Software Design Document
Unreal Engine:Game Engine
VR: Virtual Reality
HR: Human Resources
UML: Unified Modelling Language

5.1.4 Overview Of the Document

The summary of our document is listed below.

- In section2, we talked about the database, its design and diagram, and explained the operation of our application and the modes available in our application.
- In Section3, we talked about our objects in our simulation in the environment design section and the user interface in our gui design section. We also talked about the sound arrangements of the application and the quizzes that are the main application of our project.
- Section 4 is about the environment. We have shown the sample outline of the environment from the prototype and have described the scenario.
- We attached our references to Section5.

5.1.5 Motivation

We are a group interested in artificial intelligence, VR simulation and Unreal Engine fields. For VR image quality, we found it appropriate to work with the Unreal engine engine in this project. We have also taken an Unreal Engine course for this project. We purchased VR glasses to include virtual reality technologies in our project.

5.2 System Design And Architecture Design

5.2.1 Simulation Design Approach

To develop this simulation, we planned to use the waterfall development methodology that allows for step-up and control. We set a schedule with deadlines for each development phase, and this project progresses one by one through the development process model phases without any disruption. Although the current stage designs, it is almost complete in this process. Our project team participates at least 4 days a week and at least 1 hour to complete these stages. The next step, the implementation part will be done through the documents we have created.

5.2.1.1 Class Diagram

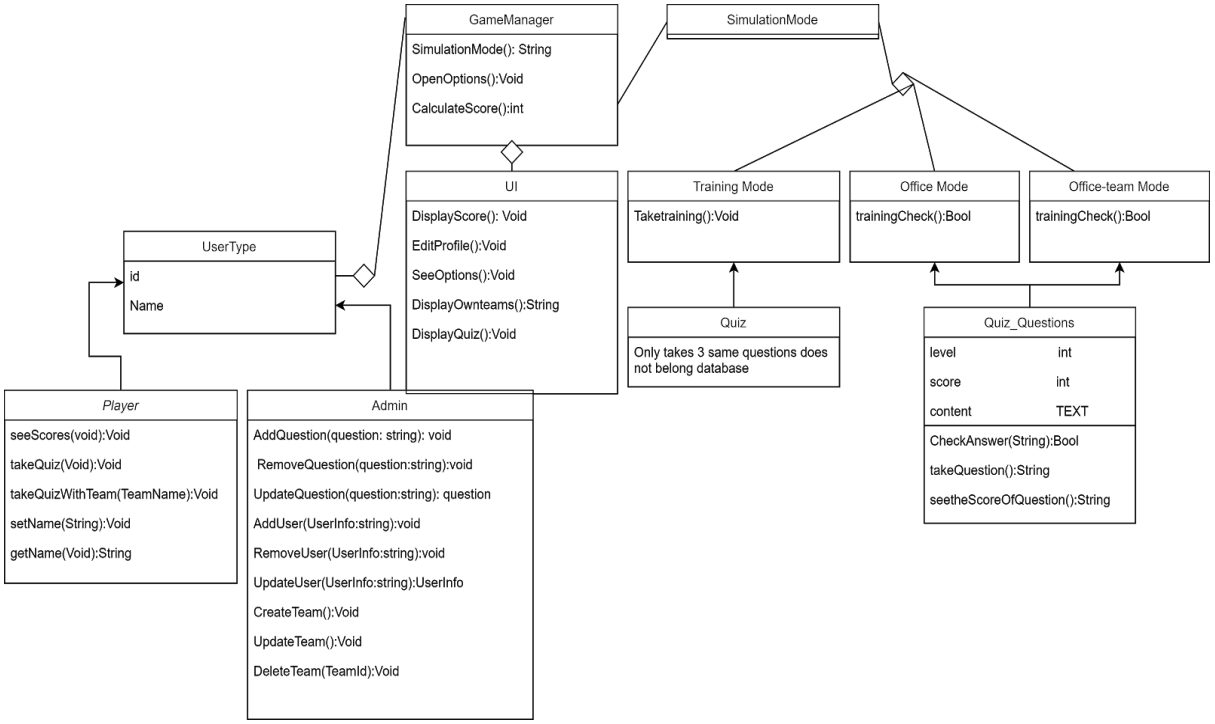


Figure 1: Class diagram

5.2.2 Architecture Design Of the Simulation

5.2.2.1 Login Management

Summary:This system is only used by manager and the employees working in the Human resources department. The user must login otherwise the user cannot access the application.

Actor**:** Manager, HR employees

Preconditions: User must run the simulation.

Basic Sequence**:**

- Users must be added to the system by the manager otherwise he/she cannot access.
- Users should login to the system using the given company email address and password.

Exception**:** Database connection can be failed because of low bandwidth.

Post Condition**:** There is no post condition.

Priority**:** High

5.2.2.2 Options Management

Summary**:**The user can pause the simulation, resume the game from where it left off, change the audio settings, view the instructions, and start the game over.

Actor**:** HR employees

Preconditions**:** The user must have started the program, logged in to the system, and selected the options button.

Basic Sequence:

1.The user can pause the simulation by selecting the options button.
2.The user can resume the simulation by selecting the continue button.
3.The user can change the sound settings of the simulation by selecting the change volume settings button.
4.The user can select the display instructions button and view the instructions.
5.The user can exit the simulation by selecting the exit button.

Exception**:** None

Post Condition: None

Priority**:** Medium

5.2.2.3 Profile Management

Summary: Users can view their profiles and make changes in certain areas. Manager can delete profiles of users, create profiles for new users and make changes in some areas.

Actor: Manager, HR employees

Preconditions: User must be logged in.

Basic Sequence:

- For Admin:
  - Admin can create new users and manage with their profile information.
  - Admin can edit whole information about employees except assignment information.
  - Admin can add new questions, delete questions, and edit questions.
  - Admin can view users' scores.
  - Admin can create teams, add new team members, delete teams, delete team members.
  - Admin can view team scores, team members and their own scores.
  - Admin can exit from profile using the exit button.
- For Users:
  - Users can edit every information except name,surname and assignment scores.
  - Users can view assignment scores.
  - The user can view which team user is in, team sports and user's own score.
  - Users can exit from profile using the exit button.

Exception: Database connection may be lost, but data is not lost with synchronization and user information can be saved later.

Post Condition: User must be logged in and clicks on the profile button.

Priority: Medium

5.2.2.4 Training Mode

Summary: This system is used by the user. User can display scores, display options, take quizzes, answer questions, skip training, switch to the office mode and exit.

Actor: HR employees

Preconditions: The user must have started the program, logged in to the system and selected training mode.

Basic Sequence:

1. The quiz will be started when the user starts training mode.
2. The user can answer questions by following the instructions.
3. The user can complete the training mode and switch to office mode with the switch office mode button at the end.
4. The user can pass the training with the skip training button.
5. The user can view the score using the display score button.
6. The user can view the options by selecting the display options button.
7. The user can exit training mode with the exit button.

Exception: None

Post Condition: None

Priority: Medium

5.2.2.5 Office Mode

Summary: The user encounters multiple questions from the question pool and tries to eliminate the risks by finding the right controls.

Actor: HR employees

Preconditions: User must be logged in, past the training mode and entered office mode.

Basic Sequence:

- User encounters a question from the question pool
- While answering the question, if the user chooses the correct control, the risk will be eliminated and this will be given to the user as points.

Exception: None

Post Condition: To see the next question, you should say next and transfer the user's score to the database.

Priority: High

5.2.2.6 Office-Team Mode

Summary: The team of human resources employees encounters multiple questions from the question pool and tries to eliminate the risks by finding the right controls.

Actor: HR employees

Preconditions: Whole human resources employee of teams must be logged in, past the training mode and entered office team mode.

Basic Sequence:

- ❖ Team encounters a question from the question pool.
- ❖ While answering the question, if the team chooses the correct control, the risk will be eliminated and this will be given to the team as points.

Exception: None

Post Condition: To see the next question, you should say next and transfer the user's score to the database.

Priority: High

5.2.3 Software Database Architecture

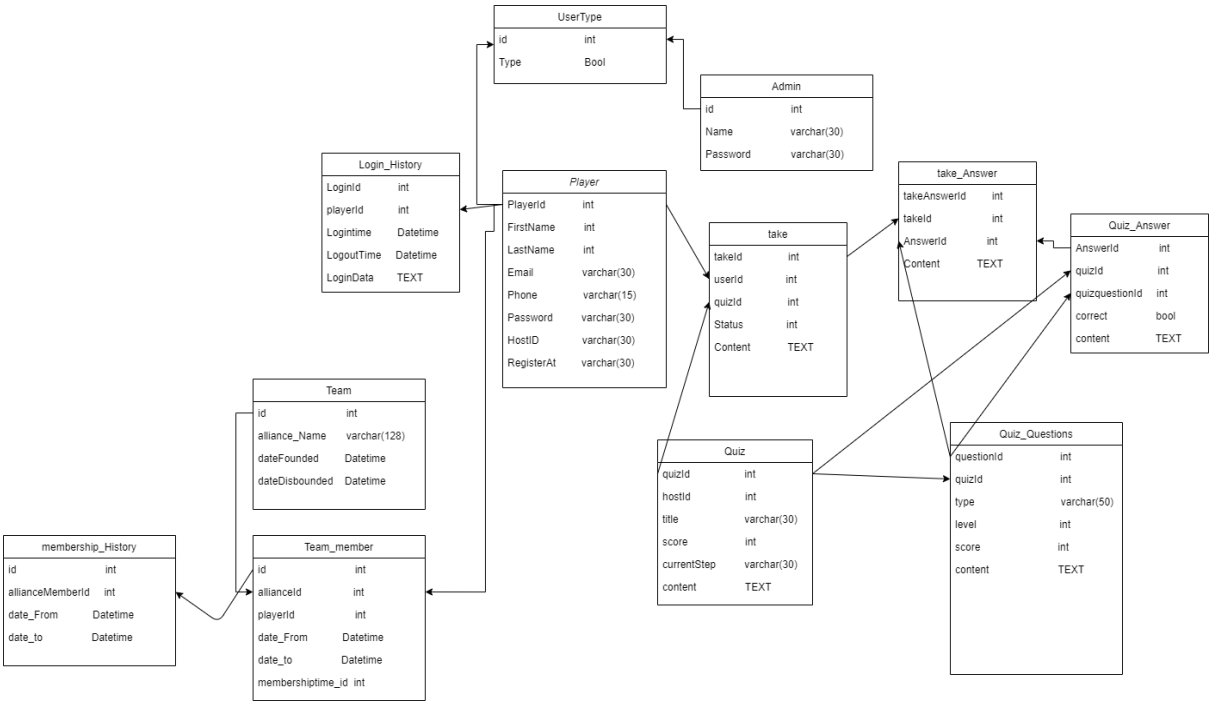


Figure 2: Database Diagram

The project design by using the MYSQL database and the tables are shown in figures.

5.2.3.1 Table Descriptions

Player
PlayerId :The unique id to identify the user.
FirstName : User first name
LastName :User last name
Email :Each user have own company mail and enters sytem with it
Phone :User personal phone number
Password :Each password is personal
HostID :The flag to identify whether the user can host a quiz.
RegisterAt :calculate the life of the user with the application.

Figure 3: Player table detailed information

Quiz
quizId :The unique id to identify the quiz.
HostId : User first name
title :The quiz title to be displayed on the Quiz Page and the lists.
Score: The total score of the quiz
currentStep: To determine the quiz type
Content :used to store the test/quiz data.

Figure 4: Quiz table detailed information

Quiz Questions
QuestionId : The unique id to identify the quiz question
quizId :The unique id to identify the quiz.
Score: The total score of the quiz
type :The type can be a single choice(Yes/No), multiple-choice or select.
Level :Each question's difficulty level is different and their score is different as well
Score: The score of the question
Content: used to store the question

Figure 5: Quiz Questions table detailed information

Quiz Answer
AnswerId : The unique id to identify the quiz answer
quizId :The unique id to identify the quiz.
QuestionId : The unique id to identify the quiz question
Correct: whether the answer is correct or not.
Content : used to store the answer

Figure 6: Quiz Answer table detailed information

Take
TakeId : The unique id to identify the take
UserId :The unique id to identify the quiz taker.
QuizId : The unique id to identify the quiz
Status: It can be enrolled, started, paused, finished, declared
Content : used to store the take remarks

Figure 7: Take table detailed information

Figure 8: Take Answer table detailed information

Admin
Id: The unique id to identify the admin
Name: Admin name
Password : Personal password

Figure 9: Admin table detailed information

Figure 10: Usertype table detailed information

Login History
LoginId: The unique id to identify login
PlayerId : The unique id to identify participant
Logintime:The time that participant enter the simulation
Logouttime: The time that participant logout the simulation
LoginData: used to store total amount of time in the simulation

Figure 11: Login history table detailed information

Team
Id: The unique id to identify teams
alliance_Name: Teams' name
Datefounded:The time that team created
DateDisbounded: The time that team disbounded

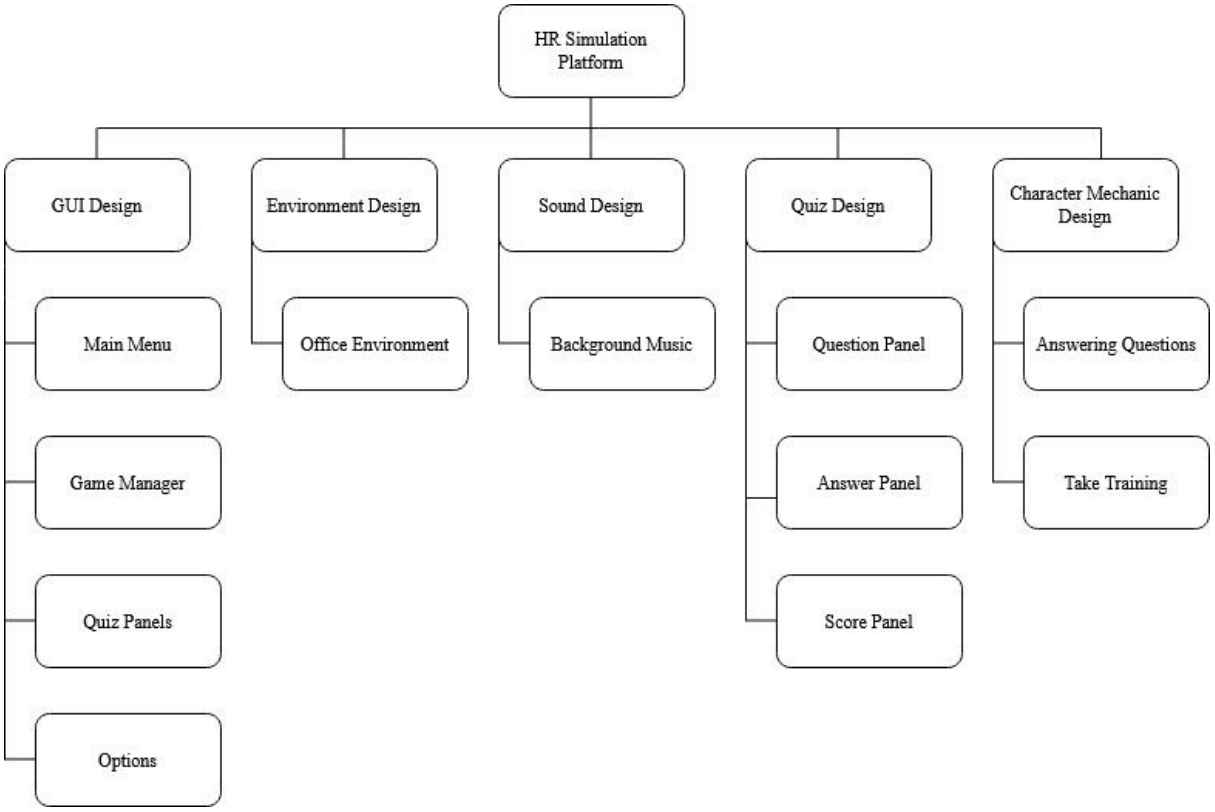
Figure 11: Team table detailed information

Team Member
Id: The unique id to identify of team member
allianceId: The unique id to identify of Teams' Id
Date_From:The time that participant added to team
Date_To: The time that the participant left the team
PlayerId:The participant unique id
Membershiptime_id: it stores the current level of players' rights in the alliance.

Figure 12: Team member table detailed information

Figure 12: Membership History table detailed information

5.3 Use Case Realizations



5.3.1 Brief Description Of Figure

Each box in the block diagram constitutes the components of our project. The main components of our project are its sub-components.

5.3.1.1 GUI Design

Users can use and interact with the system using the GUI. Our GUI system consists of three main components. The first of these is the Main Menu. In the main menu, users can log in to the simulation using their usernames and passwords. The Game Manager page welcomes logged-in users. On this page ,users can see their own profiles and edit parts of this profile that have edit permissions. They can view the scores they receive from quizzes and the teams they are involved in. Users can start a quiz with the help of the buttons on this page and take the training mode if they want. In the Quiz Panel, users are shown questions and answers that are the content of the quiz. How the user interacts with these panels is described in the quiz design section. The options component can be accessed both on the Game Manager page and on the three modes of the simulation from the buttons in the upper-right corner of the screen. In the Options section , the user can continue the paused game, change the audio settings, start the quiz from the beginning, or display the instructions.

5.3.1.2 Environment Design

There is just one specific environment, in which the game takes place is the same for all modes and takes place in a certain office environment.

5.3.1.3 Sound Editing

In the simulation, it is aimed to increase the reality with sound effect.There are some sound effects during the quiz.

5.3.1.4 Quiz Design

In quizzes, questions are designed to teach managing risks by coming up with an algorithm we have determined, not sequentially. The questions have different score values with different fields. Therefore, users are scored with different solutions according to the risks they take. The answers to the questions can also be of different types such as true / false or alternative. The panel includes answers and also users can see scores from the score panel.

5.3.1.5 Characteristic Mechanic Design

This module is used to determine the participant's abilities. The participant can answer the quiz questions individually and as a team, and participate in training in training mode.

5.4 Environment

5.4.1 Modelling Environment

The office environment, which is the only environment in our project, was designed by three-dimensional modeling and staying true to a real-life office environment. The office environment is created using Unreal Engine.
In our project, the office environment was used in three modes. Because users ' main goal is to complete the quiz, they do not interact with most objects in the office environment. The user starts the game by sitting at a table. Then she/he starts the quiz by entering a dialog with the other person. Quiz questions and answers appear in front of the user by taking part in the panel they are related to. At this stage, the user clicks on the answer that they think is correct and moves to the next question of the quiz. By repeating these steps, the user completes the quiz.
Unlike other modes in training mode, the user is not subjected to a real quiz. Again ,he tries to complete a quiz that takes place in an office environment, a demo of office mode, with the help of instructions that appear on the screen.
In office team mode, users are kept as quiz teams. Again, the office environment is used as the environment. Users move on to the next question by clicking on the answer they think is correct. The correct answer is considered stylish, with the highest number of votes. When users complete the quiz as a team, their scores are recorded and displayed on their profile pages.

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