**Mindflex Rehabilitation**

B.S. (CS/SE) Final Year Project Proposal

# Maryam Raza

# Nameera Siddiqui

# Bushra Jamal

# Hiba Ghazal

Batch: CS-21

Date: 4/3/2024

Department of Computer Science and Software Engineering

Jinnah University for Women

**JINNAH UNIVERSITY FOR WOMEN**

**Department Of Computer Science & Software Engineering**

**FINAL YEAR PROJECT APPROVAL FORM**

The Chairperson Date:

Computer Science & SE Department, Batch: \_\_\_\_\_\_\_\_\_\_\_

Jinnah University for Women,

Karachi.

Subject:  **Bachelor of Science in Computer Science Final Year Project**

Madam,

We, the below listed students of Final Year BS 2021 class, desire to undertake work on the following project MindFlex Rehabilitation under the supervision of Ms. Hafiza Anisa Ahmed.

We request you to kindly grant approval for undertaking the work on the above-cited project. I abide by all terms and conditions mentioned below.

1. I have selected this project on my own.
2. I am sure I can complete this project till December 2024.
3. I am eager to work under the supervision of advisor assigned to this project.
4. I understand that FYP committee can modify the scope of the project as and when required.
5. I know that if do not appear in regular project progress presentations my project will be disqualified.
6. I know that if I do not appear in mid project presentation, whenever it is scheduled, I will not be eligible for final project viva.
7. I fully understand that “***cheating***”**\*** may lead to cancelation of my project.
8. I understand that the decision of the FYP evaluation committee, for all issues, would be final, and no objections will be accepted.
9. I have no objection presenting my project to external or internal examiner assigned by the Head of the Department.
10. I understand that it is my responsibility to update my advisor and FYP committee members with the status of my project and submit reports on time.
11. I am choosing supervisor and group members on my own and that change request will not be allowed.
12. After the approval of the project proposal, if any FYP group decides to change the group members or split the group:

(a) They have to resubmit the proposal and go through the project defense cycle again

(b) Any marks given on the basis of previous project will be considered void.

(c) No special viva would be conducted

1. In case of dispute among students (group members), the project will be cancelled and all students will be marked “**fail**”.

**\*-**Copying code from any resources

-Using off the shelf components without prior permission

-Outsourcing your project

Yours sincerely,

|  |  |  |  |
| --- | --- | --- | --- |
| S.No. | Name | Roll No. | Signature |
| 1 | Maryam Raza | 2021/Comp/BS(CS)/26981 |  |
| 2 | Bushra Jamal |  |  |
| 3 | Nameera Siddiqui |  |  |
| 4 | Hiba Ghazal | 2021/Comp/BS(CS)/26968 |  |

**TABLE OF CONTENTS**

Project Summary 1

Overview 1

Scope 1

In scope: 1

Out of scope: 1

Deliverables produced: 1

Objectives 2

Assumptions 2

SDG Goal 2

Project Approach 2

Tools and Technologies 2

Estimated Duration 3

Market and Competition 3

Project Approvals 5

# Project Summary

MindFlex Rehabilitation is a pioneering initiative delivering mental and physiotherapy rehabilitation to homes via Virtual Reality (VR). It features an AI chat companion for initial health inquiries, personalized progress tracking via a user dashboard, and online doctor appointments for accessible healthcare support. MindFlex aims to revolutionize rehabilitation by blending technology, tracking, and professional guidance to enhance accessibility and engagement for users.

## Overview

Mindflex rehabilitation is an innovative project that brings mental and physiotherapy rehabilitation to individuals homes through Kinect-based virtual reality (VR). This platform integrates an AI chat features, acting as a virtual friend to provide initial solutions for mental and physical health inquiries. The application and web interface include a personalized dashboard for users to track their progress, fostering engagement and empowerment. Additionally, the platform offers the convenience of online virtual doctor appointments, ensuring accessible healthcare support.

## Scope

The project scope of MindFlex Rehabilitation encompasses the development of a groundbreaking platform that brings mental and physiotherapy rehabilitation directly into individuals' homes through Virtual Reality (VR). This comprehensive platform integrates various key features, including an AI chat feature designed to act as a virtual friend, offering initial solutions for mental and physical health inquiries. The application and web interface are equipped with personalized dashboards, enabling users to track their progress seamlessly. MindFlex revolutionize rehabilitation by combining advanced technology, personalized tracking mechanisms, and professional support, ultimately making mental and physiotherapy services more accessible, engaging, and effective for individuals seeking rehabilitation from the comfort of their homes.

**In scope:**

* Development of a VR-based exercise recommendation system that assesses user rehabilitation goals.
* Integration of an AI chat feature within the platform to provide initial solutions for mental and physical health inquiries.
* Creation of personalized dashboards within the application by selecting specific exercises, setting goals, adjusting difficulty levels, and tracking progress over time.
* Implementation of online virtual doctor appointments to offer accessible healthcare support.
* Implementing gamification elements and motivational incentives within the VR environment to enhance user engagement.

**Out of scope:**

* Physical hardware manufacturing for VR devices.
* Multi-Language Support
* General Health Monitoring Features

### Deliverables produced:

## 

1. User Interface Design:

elements for the rehabilitation application, including screens, navigations, and interactive components.

1. AI Chatbot Module:

A fully functional AI chatbot module integrated into the rehabilitation application's interface.

1. VR-Based Exercise System:

A VR-based exercise system accessible within the rehabilitation application.

1. Software Development Kit (SDK) Integration:

Integration of the VR Kinect device's SDK into the project's software framework.

Enables communication between the project's software and the VR Kinect device for data exchange, sensor calibration, and motion tracking.

1. Virtual Environment Creation:

Development of virtual environments compatible with the VR Kinect device.

3D modeling, texturing, lighting, and physics simulations to create realistic and engaging virtual spaces.

1. Integration of AI and VR Technologies:

Seamless interaction between the AI chatbot and VR-based exercise recommendation system,

API integration, data exchange protocols, synchronization of user data and preferences between AI and VR modules.

1. Rehabilitation Exercise Modules:

Development of rehabilitation exercises tailored for use with the VR Kinect device.

Exercise selection menu, exercise instructions, real-time feedback on user performance, progress tracking.

1. Tele-rehabilitation Features:

Remote monitoring and tele-rehabilitation functionalities integrated into the rehabilitation application.

Users can participate in tele-rehabilitation sessions with healthcare professionals.

1. User Education Resources:

Educational resources and instructional materials accessible within the rehabilitation application.

Users can access videos, tutorials, articles, and FAQs through the AI chatbot and VR interface to learn about rehabilitation techniques, self-care strategies, and general health-related topics.

## Objectives

The MindFlex project will meet the following objectives:

1. **Objective 1: Develop a User-friendly Interface for the Rehabilitation Application**
2. Specific: Design and implement an intuitive user interface that allows easy navigation and access to rehabilitation exercises and telehealth therapy sessions.
3. Measurable: Achieve a minimum user satisfaction rating of 4 out of 5 in usability tests conducted with a sample group of target users.
4. Achievable: Utilize best practices in user experience (UX) design and conduct iterative user testing to refine interface elements based on user feedback.
5. Realistic: Allocate sufficient resources for UI/UX design and development, ensuring that the interface meets the needs and preferences of diverse user demographics.
6. Time-based: Complete the development of the user interface within six months of project initiation, allowing ample time for testing and refinement.
7. **Objective 2: Implement AI-driven Personalization Features**
   1. Specific: Integrate AI algorithms to analyze user performance data and personalize rehabilitation exercises and therapy plans based on individual progress and capabilities.
   2. Measurable: Demonstrate a minimum 20% improvement in user engagement and adherence to prescribed therapy routines compared to non-personalized approaches.
   3. Achievable: Collaborate with AI experts to develop and fine-tune machine learning models capable of analyzing user data and generating personalized recommendations.
   4. Realistic: Leverage existing research and technologies in AI-driven personalized healthcare to inform the development of tailored rehabilitation interventions.
   5. Time-based: Implement and validate the AI-driven personalization features within eight months of project initiation, allowing time for algorithm development and validation.
8. **Objective 3: Ensure Seamless Integration with Kinect-based Devices**
   1. Specific: Enable seamless connectivity and interaction between the rehabilitation application and Kinect-based devices for accurate motion tracking and feedback.
   2. Measurable: Achieve a motion tracking accuracy rate of 90% or higher in user trials conducted with Kinect devices across different rehabilitation exercises.
   3. Achievable: Collaborate with Kinect SDK developers to leverage APIs and tools for smooth integration and calibration of Kinect sensors with the application.
   4. Realistic: Conduct rigorous testing and calibration procedures to address potential technical challenges and ensure optimal performance of Kinect-based motion tracking.
   5. Time-based: Complete the integration and calibration of Kinect-based devices within four months of project initiation, allowing time for testing and optimization.
9. **Objective 4: Enable Secure and Reliable Telehealth Therapy Sessions**
   1. Specific: Develop a secure telehealth module within the application to facilitate remote therapy sessions, including video conferencing, real-time communication, and data sharing.
   2. Measurable: Ensure 99% uptime and reliability of telehealth sessions based on system monitoring and user feedback.
   3. Achievable: Implement industry-standard encryption protocols and security measures to protect user privacy and comply with healthcare regulations.
   4. Realistic: Conduct thorough testing and validation of the telehealth module to identify and address potential vulnerabilities or performance issues.
   5. Time-based: Launch and validate the telehealth module within ten months of project initiation, allowing time for development, testing, and regulatory compliance.
10. **Objective 5: Provide Comprehensive Documentation and Training Materials**
    1. Specific: Create comprehensive documentation and training materials to guide users in navigating the application, performing rehabilitation exercises, and accessing telehealth therapy sessions.
    2. Measurable: Develop user guides, tutorial videos, and FAQs covering all key features and functionalities of the application, with a completion rate of 100% for user training sessions.
    3. Achievable: Collaborate with healthcare professionals and instructional designers to create clear and accessible educational resources tailored to the needs of diverse user groups.
    4. Realistic: Allocate dedicated resources for content development and instructional design, ensuring that documentation and training materials meet quality standards and are regularly updated.
    5. Time-based: Finalize and publish all documentation and training materials prior to the official launch of the rehabilitation application, allowing users to access support resources from day one.

## Assumptions

1. **User Familiarity with Technology**: It is assumed that users have a basic level of familiarity and comfort with technology, including smartphones, computers, and Kinect-based devices. Users should be able to navigate the application interface, follow instructions, and perform rehabilitation exercises with minimal assistance.
2. **Availability of Qualified Healthcare Professionals**: The success of telehealth therapy sessions depends on the availability of qualified healthcare professionals, including physical therapists, occupational therapists, or rehabilitation specialists, who are trained to conduct remote assessments, provide guidance, and monitor progress effectively.
3. **Reliable Performance of AI Algorithms**: The application relies on AI algorithms for tasks such as analyzing user movements, providing personalized feedback, and adapting therapy plans based on user progress. It is assumed that these AI algorithms perform reliably and accurately under various conditions, contributing to the effectiveness of the rehabilitation program.
4. **Continued Technological Support and Updates**: The application assumes continued technological support and updates from developers to address any technical issues, improve user experience, and enhance the functionality of the AI-driven features and Kinect-based devices over time.
5. **User Safety and Well-being**: The application assumes that appropriate measures are in place to ensure user safety and well-being during telehealth therapy sessions, including emergency protocols, clear communication channels, and safeguards against potential risks or adverse events.

## SDG Goal

1. **GOOD HEALTH & WELL BEING:**

**Empowerment Through Education and Self-management:** By fostering health literacy, self-efficacy, and self-management capabilities, the project enables individuals to take control of their health and make informed decisions about their care, leading to better health outcomes and improved well-being.

**Prevention of Secondary Health Conditions:** By facilitating regular physical activity and exercise, the project helps prevent secondary health conditions associated with immobility, such as muscle atrophy, joint stiffness, and cardiovascular deconditioning.

**Remote Monitoring and Tele-rehabilitation**: Tele-rehabilitation, facilitated through applications, allows healthcare providers to remotely monitor patients' progress, provide guidance, and adjust treatment plans as needed.

**Prevention and Early Intervention**: Rehabilitation applications can also play a role in preventive healthcare by promoting early intervention and addressing risk factors before they escalate into more serious health problems.

# Project Approach

* **Research & Development:** Conduct thorough research on rehabilitation practices, VR technology, and AI chatbots.
* **User-Centric Design:** Design intuitive interfaces based on user feedback for VR, AI chat, and dashboards.
* **Technology Integration:** Collaborate to seamlessly integrate VR, AI chat, and online appointments.
* **Personalization & Tracking:** Implement algorithms for personalized experiences and robust progress tracking.
* **Professional Support:** Partner with therapists for virtual consultations and guidance.
* **Sustainability & Growth:** Develop a long-term plan for maintenance, updates, and expansion.

## Tools and Technologies

1. **Microsoft Kinect Sensor**: The core hardware component used for tracking body movements and gestures. It provides depth sensing, skeletal tracking, and RGB camera functionalities.
2. **Kinect for Windows SDK (Software Development Kit)**: Microsoft provides an SDK specifically designed for developing applications using Kinect sensors. It includes APIs for accessing Kinect's features such as skeletal tracking, depth sensing, and audio processing.
3. **Programming Languages**: Depending on the platform and requirements, programming languages such as C#, C++, or even Python could be used for application development.
4. **3D Modeling and Animation Software**: Tools like Blender, Autodesk Maya, or 3ds Max might be used for creating 3D models of virtual environments, characters, and objects.
5. **User Interface (UI) Design Tools**: Software like Adobe XD, Sketch, or Figma could be used for designing the user interface and user experience of the application.
6. **Database Management System**: The application involves user profiles, progress tracking, or data analytics, a database management system such as MySQL, SQLite, or MongoDB might be used for data storage.
7. **Testing and Debugging Tools**: Various debugging and testing tools are used to ensure the application functions properly across different environments and scenarios.
8. **Documentation Tools**: Tools for documenting the project, such as Confluence or Microsoft Word, are essential for maintaining project requirements, design documents, and user manuals.

## Estimated Duration

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Tentative Date** | **Deliverable(s) completed** |
| Project planning | 4/28/24 | 1. defining project objectives, outlining the scope of work, identifying key stakeholders, and creating a detailed project plan. It includes tasks such as conducting needs assessments, defining requirements, and establishing project timelines and milestones. |
| AI Chatbot Development & Integration | 5/28/24 | 1. Integration of AI & VR technologies |
| VR Kinect Integration and Exercise Recommendation System Development | 8/17/24 | 1. Tasks include setting up Kinect sensors, implementing motion tracking algorithms, creating virtual environments for exercises, and developing algorithms for personalized exercise recommendations based on user data. |
| Rehabilitation Exercise Development and Testing | 9/17/24 | 1. Tasks include designing exercise programs targeting specific rehabilitation goals, creating interactive exercise simulations, conducting usability testing with target user groups, and refining exercises based on user feedback. |
| User Testing and Iterative Improvement | 11/10/24 | 1. Tasks include conducting usability tests with target user groups, gathering feedback on usability, functionality, and user experience, and making iterative improvements based on user input. This milestone may also involve optimizing AI chatbot responses and refining the exercise recommendation algorithms based on user feedback and performance data. |
| Project conclusion | 12/20/24 |  |

# Market and Competition

1. What research have you conducted to understand your market, including your industry, regions, customers, competitors?

**Survey Questionnaire**:

To gather insights into the needs and preferences of our target market, we conducted a comprehensive survey questionnaire distributed among individuals receiving services from Karachi Down Syndrome Program (KDSP) and Brain and Mind Diagnostic and Rehabilitation Center (BMDRC). The questionnaire aimed to understand the challenges they face in accessing mental and physiotherapy services, their technology usage habits, and their willingness to engage with virtual rehabilitation platforms like MindFlex. Additionally, we sought feedback on features they would find most beneficial in such a platform, ensuring that MindFlex meets the specific needs of our users.

**Focus Group:**

In collaboration with KDSP and BMDRC, we organized focus group sessions facilitated by clinical remedial therapist Ms. Maryam Naeem and clinical psychologist Ms. Sana. These sessions provided a deeper understanding of the experiences, concerns, and expectations of individuals and their caregivers regarding mental and physiotherapy rehabilitation. Participants shared valuable insights into the effectiveness of virtual rehabilitation methods, their preferences for user interfaces, and the importance of personalized support in their rehabilitation journey. The feedback gathered from these focus groups informed the development of MindFlex to ensure it meets the diverse needs of our target audience.

**Market Testing**:

To validate the feasibility and acceptance of MindFlex in the Karachi market, we conducted extensive market testing. This involved piloting the platform with selected clinics, women's groups, corporate organizations, and young generations across different demographics. Through this testing phase, we assessed user engagement, satisfaction, and perceived effectiveness of MindFlex in addressing mental and physiotherapy needs. Feedback from the market testing phase guided iterative improvements to the platform, ensuring its readiness for widespread adoption.

**Meeting with Suppliers:**

We engaged in meetings with suppliers and technology partners to explore the integration of cutting-edge technologies into the MindFlex platform. Collaborating with VR hardware suppliers, software developers, and telemedicine service providers, we ensured seamless integration and optimal performance of the platform. These meetings also facilitated negotiations for competitive pricing and reliable technical support, essential for the successful implementation and sustainability of MindFlex.

**Social Media Research:**

In-depth research into social media trends and behavior patterns of our target audience helped us tailor our marketing and outreach strategies effectively. Analyzing engagement metrics, demographics, and user feedback on platforms such as Facebook, Instagram, and LinkedIn provided valuable insights into audience preferences, interests, and pain points. Leveraging this data, we crafted targeted messaging and content to raise awareness and generate interest in MindFlex among our target audience.

**Family and Friends:**

Engaging with family members and friends of individuals with mental and physical health challenges provided invaluable perspectives and support throughout the development process. Their firsthand experiences, concerns, and suggestions served as a constant reminder of the impact MindFlex could have on improving the lives of individuals and families. Their encouragement and feedback fueled our determination to create a solution that truly makes a difference in the lives of our loved ones and communities.

1. Similar Products Available

**Competitor 1:**

***Name, location, website****:*

Karwan-e-Hayat, Institute for Mental Health Care, Karachi, Pakistan, <https://keh.org.pk/>.

***Strengths***: Extensive experience in mental health care, offering consultation, hospitalization, and rehabilitation services.

***Weaknesses:*** Services may not be VR-based, which limits remote accessibility and innovative engagement methods.

**Competitor 2:**

***Name, location, website***:

Ruhbaru, Pakistan, <https://www.ruhbaru.com/>.

***Strengths***: Premier online platform for mental health counseling and therapy, offering tele-mental health services.

***Weaknesses:*** Lacks the integration of VR technology for an immersive experience.

**Competitor 3:**

***Name, location, website:***

Corpus VR, International, <https://corpusvr.com/>

***Strengths***: Specializes in VR for physical conditions, mental health issues, and neurological disorders.

***Weaknesses:*** May not have a localized presence in Karachi or Pakistan, potentially affecting accessibility and local support.

1. What sets your product/project apart from your competitors?

**Strengths:**

* Integrates VR technology to provide an immersive experience for mental and physiotherapy rehabilitation.
* AI chat feature acts as a virtual friend, offering initial solutions and support.
* Personalized dashboard for users to track progress, enhancing engagement and empowerment.
* Online virtual doctor appointments for accessible healthcare support.

**Current or future opportunities:**

* Potential to revolutionize rehabilitation services with a combination of technology and personalized care.
* Opportunity to expand services to remote areas, making healthcare more accessible.
* Future developments could include multi-language support, broader device compatibility, and integration with other health services

1. How do you or will you promote your business?
2. **Social Media:**

Social media platforms like Facebook, Instagram, and Twitter are powerful tools for reaching a broad audience. By creating engaging content that highlights the unique features of MindFlex, such as VR integration and AI chat support, you can attract potential users who are interested in innovative rehabilitation solutions. Social media also allows for direct interaction with your audience, providing a platform for feedback and fostering a community around your product.

1. **Website:**

Clearly communicate the key features and benefits of the VR Kinect rehabilitation service on the website's homepage. Highlight how the technology improves rehabilitation outcomes, enhances user engagement, and provides personalized care.

1. **Business objectives met**:

Increases brand awareness, engages with the target audience, and builds a community of users.

1. **Events and Exhibitions:**

Participating in health tech events, exhibitions, and conferences can provide an opportunity to showcase MindFlex to industry professionals, potential investors, and users. Live demonstrations of the VR experience and presentations on the benefits of at-home rehabilitation can create buzz and establish credibility in the healthcare market.