

**Group Assignment Cover Sheet**

*Every member of the group must keep a photocopy or electronic copy of the assignment.*

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| Unit name: | ITS Capstone Project | | | |
| Unit code: | 9785 | | | |
| Semester: | 2 | | Year: | 2023 |
| Assignment Name/Number: | | A2 Project Proposal Report Group | | |
| Project Title | | Metamovers-Metahuman powered by Brain Computer Interface | | |

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| Group Name/Number: | 9785-23-30 |

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| U3233520 | Question 5-9 | 15 |
| U3229457 | Question 2-3 | 5 |

“**The people are pieces of software called avatars. They are the audiovisual bodies that people use to communicate with each other in the metaverse."**

**NEAL STEPHENSON**

A person wearing futuristic glasses

Description automatically generated

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# **Introduction:**

A child wearing a virtual reality headset

Description automatically generatedThe interconnectivity of metahuman technology with brain-computer interface technology to help disabled people to perform extraordinary tasks in their daily life. The project is named MetaMovers. This Project mainly focuses on preliminary research on metahuman technology as both technologies are in an innovative phase, we are combining them to find better outcomes and usage of these technologies in future. The BCI integrated with Metahuman presents an unrivaled opportunity for special people to empower their disabilities by providing new enhanced ways of living with extraordinary capabilities and autonomy in their daily lives. Our aim is to enhance the lives of disabled and paralyzed people with proper research, project management and possible literature review. In this project, Project management hold 30% percent weightage of the project which include roles, jobs, project challenges, project analyses, stakeholder engagement and management. Literature Review covers a brief description and explanation of authenticated research conducting on project that hold 35% weightage of the project. At last, we left with marketing strategy which could provide evidence to support statistical and investing segment for the project by holding 35% of the weightage in this project. According to Australian Institute of Health and Welfare 2022 Around 1 in 6 people in Australia that is around 18% (4.4 million) of Australian population have some kind of disability. There are various organisations and government agencies that spend millions of dollars each to support new startups to help their disabled people. The following graph illustrates the level of disability with certain age limit which is shows high trend in higher age group.

Source: ABS 2004, ABS 2010, ABS 2013,ABS2016,ABS2019b;see also Table PREV2A graph of a person with disability

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# **Objective & Goals:**

Metamover aims to ease the life of disabled people. The main objective of this project is to:

* Design a virtual environment specifically for disabled people by using metahuman technology.
* Interconnecting Brain-computer Interface technology with metahuman technology
* Compatibility of Brain Computer Interface technology in a specific virtual environment.
* Safe and feasible to use for disabled people.
* Research on both technologies to elaborate future usage and challenges.
* Government standardization for the project in future.

## **Scope & Requirement:**

### **Scope:**

The project aims to find an advanced way of communication for disabled people to utilize metahuman technology with BCI technology to perform extraordinary tasks with their neural signals in a virtual environment. This project will be preliminary research that briefly describe the upcoming challenges and their recommended solutions of using these technologies on disabled people. This may include the current progress and compatibility of these technology and how upgraded version of these technologies will play their role in future with their own pros and cons.

* **Boundaries:**The project is based on the research of integration of BCI technology with metaverse technology to provide feasible solution for disabled and paralyzed persons. Integration of both technologies will have certain boundaries at different level of upgradation that may change according to time in future with further development. As this stage project both technologies are not commercial developed yet there will various boundaries on this project. This project entirely relies on these technologies so at initial stage we are limited to perform easy and specific pre-defined tasks to help disabled people.
* **Deliverable:**  Extensive in-depth report of integration of BCI and metaverse. The report will cover all the aspects of this innovation ranging from requirements, risks, project management to quality, success factors, ethical and authenticated finding by research or literature review, people feedback and suggestion through marketing survey and pilot programs.
* **External Stakeholders:** Disabled people participant, government, researcher, academics, medical experts, third-party developers, and technical expert individuals from both technologies.
* **Internal Stakeholders:** Project team members, sponsor, mentor, tutor, project manager, Research manager and marketing manager.

### **In Scope:**

Feasible and preparatory study to explore the current phase and limitation of both technologies because both technologies still require more innovation. Studying and understanding existing software models and existing related projects will provide help to highlight the capabilities and deliverables of the project with their limitations and identify the potential benefits that a disabled individual can get from this project.

From the technical aspect design and blueprint of the final product how BCI technology could be worked with metahuman. Acquiring and understanding hardware, software, and technical requirements with their potential limitations. Analysis the user interaction with the system including how disabled individuals are currently interacting with BCI technology and what are possible challenges and hurdles users face while interacting with this technology. Conducting interviews and surveys with all the stakeholders to acquire their suggestion and feedback especially from doctors and medical experts to analyse possible long term interaction side effects and challenges involved in these both technologies. Documenting all the crucial findings, challenges, expert’s feedback, and recommendation to help design an accurate roadmap for further research and development to complete this project.

### **Requirement:**

This project includes the vast majority of domains when it comes to the final product for commercial use. This requires important understanding to deliver the crucial part of requirements to complete the project. This project includes important factors such as Project Management, Research and Marketing strategy. The functional and nonfunctional requirements are dependent on these three factors.

*Image1.2.2.1.1: Architecture of Metamover project*:

Project Management

Marketing

Research

### **Functional Requirements:**

According to the project description there are a number of functional requirements that could be included to successfully complete the task. Managing Project is considered as the backbone of the project. Management includes task prioritization, ability to categories and prioritize tasks according to BCI and metahuman development. Integration points which make this project capable of dealing with both technologies (BCI & metahuman) platform and allow smooth communication between them. Involvement of stakeholders by providing feedback and suggestions to make changes or do addition in the project. Under the research phase this project requires authenticated and ethical consideration to highlight the current innovations related to the project and mechanism to implement these ethical considerations and implication of merging these technologies on vulnerable people. This may include integration analyses, special research and list of factors that impact the project on completion or at any phase after completion. Under marketing strategy this project requires special targeted surveys that provide feedback and suggestions from both normal and disabled people about these technologies. This feedback from the various people helps this project to find the authenticated problem that can be solved accordingly. Pilot program enrolment especially for disabled communities will help to acquire more statistical information for projects that could be highlighted in project concerns.

### **Non-Functional Requirement:**

These non-functional requirements are also part of the in-scope requirements. It can include:

*1.2.3.1 Table showing non-functional requirement:*

|  |  |  |
| --- | --- | --- |
| **#ID** | **Non- functional Req.** | **Description** |
| 1. | **Performance** | the system must be compatible to interpret neural signal and compile the related information and data in real time with very less error. |
| 2. | **Scalability** | The system able to able manage and handle multiple requests from user without interrupting ongoing request. |
| 3. | **Security** | All the information in system related to user’s personal information, request information and sensitive information such as neural signal must encrypted according to ISO27002 standard |
| 4. | **Safety** | The must not harm user’s mental and physical health while interacting with system. |

Data security in the project management phase to help all the team members to have the access of all the required information related to the project with specific software and consider this software has capability to provide secure information and communication between team members and stakeholders. Under research phase data integrity that provides evidence that all the information and data is accurate and untampered. Allowing access to different libraries and research articles to collect relevant information and collaboration with researchers if needed. While doing research you may require adding more information in previous tasks so there must be extendibility which allows easy methods to add more information anywhere before completion without developing hurdles in the research. Under marketing strategy data privacy is considered more vital because this project needs to ensure responded data, especially sensitive data which includes participant data must be protected all the time. While doing surveys these User experiences should be simple and clear that help the first-time user to understand technical questions of the survey.

### **Out of Scope:**

Since it’s a complex project with still research going on, the possibilities of collaboration of BCI and metaverse is tremendous. Mass marketing campaigns or strategies may encourage more institutes or departments to work or engage in this project for possible development of other products out of it. MetaMovers in future can be expand to various domains with the help of future development. Here are some entertainment options where disabled people can perform more extraordinary task in future or further development of the project.

* Online jobs: Disable people can do programming with text writing tool and learning to complete various to earn money. E.g., Freelancing, and Ecommerce
* Meta Education: this platform will allow disable people to study and complete various certification and learn different course via metahuman and BCI technology.
* Game streaming: allow disabled people to play or stream various games or other multimedia activities to spend their leisure time.

The possibilities are huge, but these are the areas that are out of scope of this project and this project only focuses on paralyzed and disabled persons. However, with time technologies involve so does the Metamovers project. Some out-of-scope functionalities can be integrated after the successful launch of the project.

# **Requirement Analysis & Options:**

## **2.1. Analysis and recommendation:**

As this project has very vast domain and it require crucial understanding and planning to complete the project management, research, and marketing. It requires certain analysis that provide evidence that all the domain of the project will be beneficial for project in future. In this part for project management, we will do some analysis to define the specification and available option or recommendations.

*Table2.1.1 show all the analysis and recommendations.*

|  |  |  |
| --- | --- | --- |
| **Analysis Type** | **Description** | **Recommendations** |
| Feasibility Analysis | This analysis requires technical, economical, and operational expertise in which there are rapid innovation in technology, high initial cost to operate and extensive user-training and user support involve to complete | Collaboration with existing projects and platform to share relevant information, seeking capital fund or partnership with tech companies, and design easy to clear training program to help user easy and fast interaction with system. |
| Risk Analysis | Quantitative and qualitative analysis will help to highlight accurate risky figures, technical faults, and various challenges | Involvement and collaboration with relevant challenges solution provider will provide easiness in completion. |
| Stakeholder Analysis | Comparing interest and power of all the stakeholder of the project will provide accurate understanding to project involvement and contribution. | Conducting meeting with less interested and high-power stakeholder to encourage them about project vision and scope will increase the project credibility. |
| SWOT Analysis | Strength: emerging technologies metahuman & BCI have wide scope and domain.  Weakness: Very high initial cost in start, sponsor may show less confident at initial stage.  Opportunities: could expand in different fields such as medical, gaming and tech industry for further enhance development.  Threats: Government regulations, medical experts opinions, and competition, | Regular updating technology and policy in the favour of user’s interest will help to succeed. |

### **Three Main Requirements:**

#### **Project Management:**

Overview: To discuss the use of the Scrum methodology and include Trello screenshots.

* **Method 1: Trello**
* Write a detailed report to explain the Scrum methodology the team uses.
* Create Trello boards for the project and keep updating day by day.
* Take screenshots of the Trello boards to show in the report.
* Explain the screenshots when presenting.

A screenshot of a computer

Description automatically generated

* **Method 2: Presentation**
* Using a PowerPoint or Google Slides for the presentation.
* Use slides to explain the Scrum methodology the team uses .
* Put Trello screenshots directly into the presentation.

* **Method 3: Interactive meeting**
* Organize a virtual or f2f meeting.
* Invite team members and all stakeholders.
* Use a live Trello board to demonstrate Scrum.
* Encourage both question and answer sessions and active participation.

The ideal option is the interactive workshop since it enables direct interaction with stakeholders and team members. It encourages a greater comprehension of Trello's practical implementation and the Scrum methodology. This facilitates successful learning since participants can ask questions and receive prompt answers.

### **Research:**

Overview: Discuss the personnel required to complete the task, including developers, medical experts, project manager, product owner, and Scrum master.

* **Method 1: Detailed Report**
* Write a report to express the roles and responsibilities of each team member and their special tasks related to BCI.
* Evaluate the level of knowledge and ability of members.
* Explain and describe how important each role is in the project.

* **Method 2: Organizational Chart**
* Create an organizational chart showing the team members hierarchy and roles.
* Use visuals to represent the Scrum master, project manager, product owner, medical experts, and developers.
* Describe in detail what each person's duties are?

* **Method 3: Team Interview Video**
* Conduct interviews with each team member or stakeholders.
* Have team members discuss their tasks, completions, questions, ...

The best choice is an organizational chart because it gives a clear visual representation of the team structure and roles. It is simple to comprehend and aids stakeholders in quickly understanding the organizational dynamics of the project.

### **Marketing strategy:**

Overview: Discuss how to engage the media and consider using surveys and worldwide campaigns.

* **Method 1: Media Engagement Plan**
* Develop a plan for engaging with media outlets.
* Include strategies for  interviews, and social media.
* Prepare for media interactions.

* **Method 2: Survey-Based Insights**
* Conduct surveys to gather data on target audience preferences, especially paralyzed and disabled persons.
* Deeply analyse survey results with the team and try to gain as much information.
* Research and create campaigns based on survey insights.

* **Method 3: Global Marketing Campaign**
* Launch a worldwide marketing campaign to reach a broad audience through social media or public websites.
* Utilize digital marketing, social media.
* Monitor campaign performance and make real-time adjustments or updates.

Conducting a survey and using the insights to shape your marketing strategy is the best option as this is a report aimed at specific audiences such as paralyzed and disabled people. It ensures that the strategy is data-driven and tailored to the needs of the target audience, increasing the chances of success.

In summary, for each requirement:

* The best method for project management is interactive workshops because it allows for hands-on participation and learning.
* An org chart is the most effective way to show team roles and hierarchy for BCI Integration.
* Making data-driven decisions for marketing strategy is best accomplished through surveying consumers and utilizing the results to develop campaign plans.

# **Justification:**

### **3.1. Choice of Brain-Computer interface:**

Brain Computer interface technology is in developing phase but there still few solutions available to use those specific solutions in our project. There Is EEG version that is called electroencephalography use electrode place the scalp with special wiring to record the neural signal from brain. There is another called functional near infrared spectroscopy use light infrared light to measure neural signal from brain. The third one is Invasive BCI that use direct implant in brain this will get more precise measurements and still technology used on monkey by Elon Musk on trial phase to control monkey mind activity.

* 1. **Recommendation**

For this project to use functional near infrared spectroscopy that is considered more health safer and reliable technology for current period.

* 1. **Justification:**

While EEG is the most frequent and least intrusive, its accuracy can be altered by external influences and may lack the granularity necessary for metahumans' complicated activities. While invasive BCI is accurate, it entails surgical risks and may not be universally adopted owing to its intrusive nature. functional near infrared finds a compromise in that it is more accurate than EEG while not requiring surgery. Furthermore, advances in functional near infrared are making it more user-friendly, lightweight, and convenient for daily usage.

# **Resource Requirements and Activities:**

### **4.1. Resources Requirements:**

4.1.1. **Human Resources:**

* Project manager: has ability to make crucial decisions at any time according to circumstances.
* Project team: all the team members working throughout the project.
* Research team:  team members doing research on BCI and metahuman Technologies.
* Research Manager: Team member leading the research and have abilities to make important changes and decisions in literature review.

4.1.2. **Technical Resources:**

* Project Management tools and software (Microsoft Project and Trello)
* Survey conducting software.
* Access to metahuman technology devices and literature such as libraries, authenticated research materials, Developers, and system architectures.
* Access to BCI devices and literature such as libraries, research materials, medical experts, and developers.

**4.1.3. Financial Resources:**

* Budget for conducting research: this may include buying a paid article and journal or appointment charges with a medical expert for an interview if required.
* Budget for marketing this may include promoting people to participate in Survey with Rewards.
* Budget for lending or buying hardware devices that may be used in research projects.

## **Work Breakdown Structure (WBS):**

This project is expected to complete in 12 weeks. Work breakdown structure is in Tabular form.

*Table 4.2.1 shows work breakdown structure in tabular form.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ID** | **Tasks** | **Duration** | **Dependencies** | **Resources Required** |
| **1.1** | Project Initiation | 1 week | Resources | Project manager, Sponsor, and project team |
| **1.2** | Planning | 2 weeks | 1.1 | Project manager and project team |
| **1.3** | Risk Assessment | 1 week | 1.2 | Project Manager and Project team |
| **2.1** | Preliminary Research | 2 weeks | Resources | Research Manager and project team |
| **2.2** | Literature Review | 3 weeks | 2.1 | Research manager and Research team |
| **2.3** | Integration Challenges | 2 weeks | 2.2 | Research team |
| **3.1** | Marketing Analysis | 2 weeks | Resources | Marketing manager and marketing team |
| **3.2** | Surveys | 2 weeks | 3.1 | Marketing team |
| **3.3** | Pilot Study | 2 weeks | 3.2 | Marketing team |

## **4.2.2. Work breakdown structure Activities (WBS):**

Work breakdown structure activity is shown in 4.3.1 image.

*Image 4.2.2. image displays the work breakdown structure activities.*

*A diagram with text on it

Description automatically generated*

## **Critical Path Analysis:**

According to the list of activities included in the work breakdown structure we can highlight critical paths for the project. This project includes three main dependencies, project management, research, and marketing strategy. All three dependencies can start independently, but with ethical considerations we must follow according to project requirements.

The project management path: Project initiation -> Planning -> Risk Assessment these activities have a total duration of 4 weeks by adding all of them.

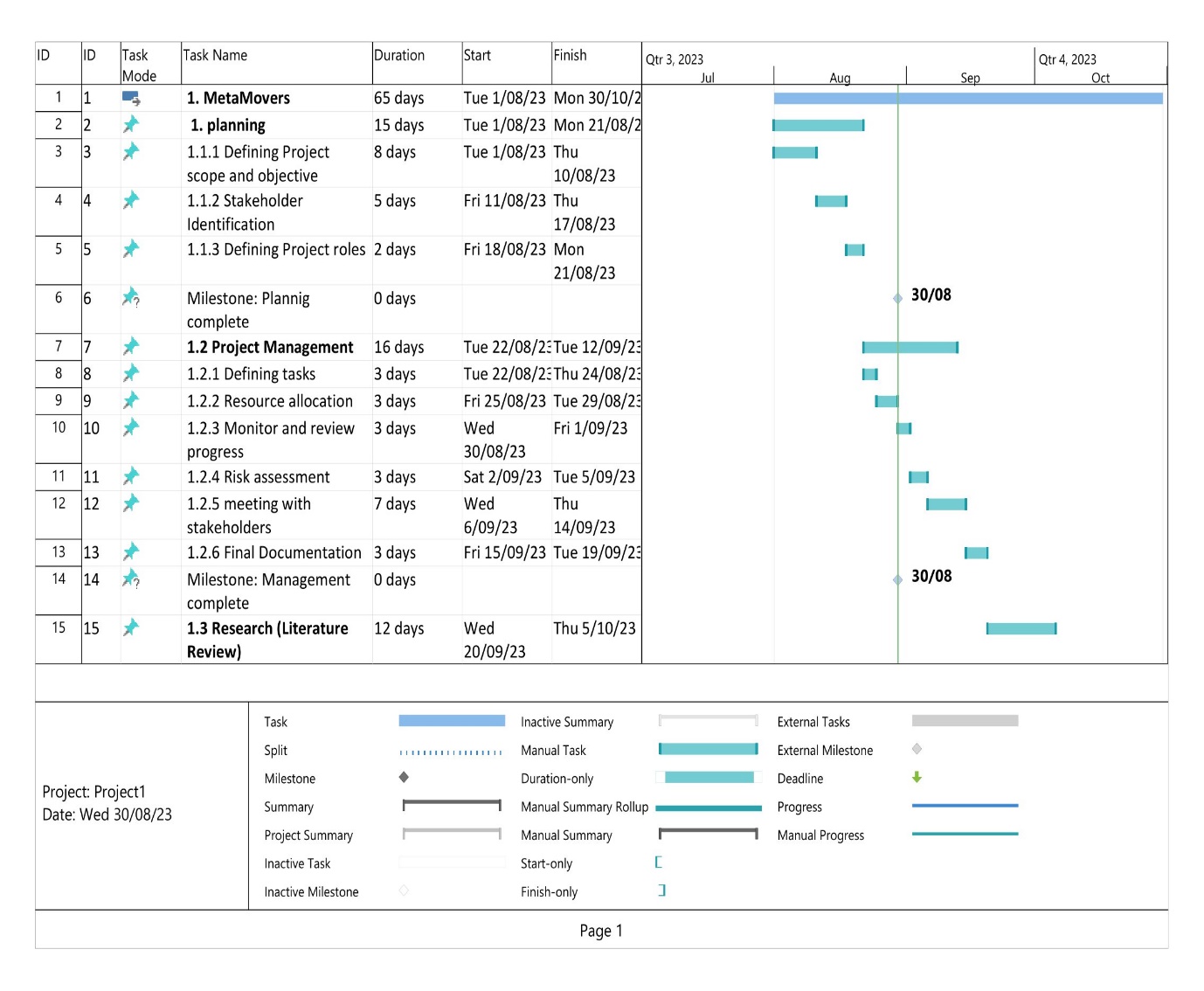
The Research Path: Preliminary Research -> Literature Review -> Integration Challenges. These activities have a total duration of 7 weeks.

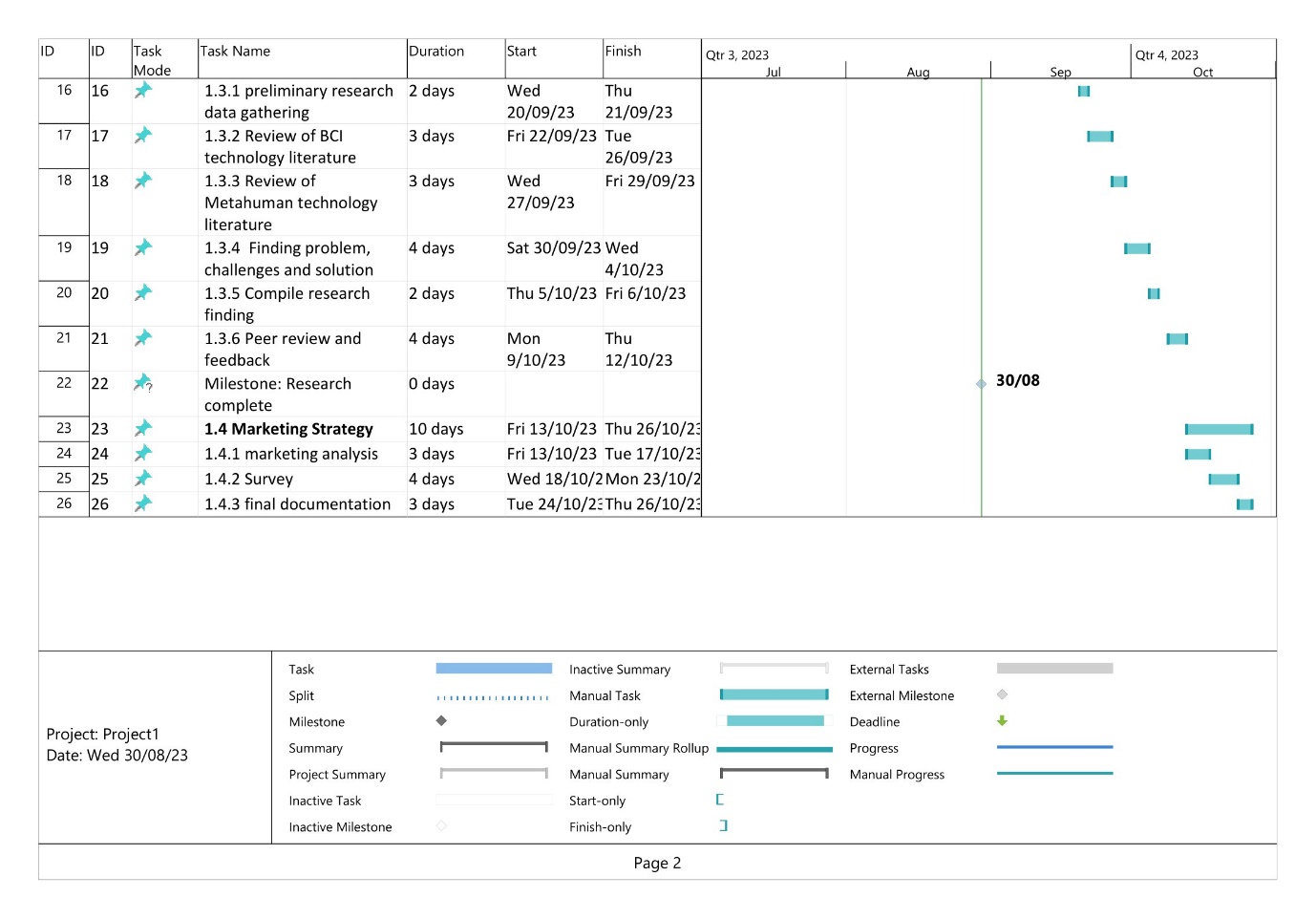
The Marketing Path: Market Analysis -> Survey -> Pilot Study Analysis. These activities have a total duration of 6 weeks.

According to Analysis, the research path has the longest duration of 7 weeks considering it a more critical path than others and must be completed on time.

# **Gantt Chart:**

*Image 5.1 shows the gantt chart part1 :*



*image 5.2. shows the gantt chart part 2.*

# Governance:

The suggested governance structures for the VR project would have certain traits and difficulties. Here are a few illustrations of VR project management.

### **6.1. Project Leadership and Roles:**

**Project management:** be in charge of managing all planning, team members, and performance.

**VR Specialist:** Control the technical viewpoint of the VR project management.

**Content Creators:** The producer of the VR content will be designer, artist, developer.

**Quality Assurance:** Find out that the VR project is perfect, bug-free, and in line with its objectives.

## **Decision-Making and Communication**:

Meetings should be held on a regular basis to discuss decisions, difficulties, and progress related to VR.

### **Stakeholder Engagement:**

Early participation of stakeholders and potential VR users to get their opinions. Users' preferences are considered during beta testing of VR experiences

### **Risk Management:**

Recognising dangers unique to VR, such as motion sickness, device compatibility problems, or content performance challenges. Prevention methods to deal with the dangers and difficulties thrown on by VR technology.

### **Performance Metrics and Evaluation**:

Defining criteria unique to VR, such as responsiveness, frame rate, and user engagement.

### **Budget and Resource Allocation**:

Assigning funds for VR hardware, software, development equipment, and specialized employees. Tracking and controlling the expenses connected with the adoption and advancement of VR technology.

### **Project Reporting and Documentation**:

Reporting on the evolution of the VR project on a regular basis, with updates on technological achievements and content creation. Technical requirements, design choices, and procedures relevant to VR should all be documented.

### **User Experience and Feedback**:

Improving VR experiences by including iterative user testing and feedback loops. Obtaining customer feedback to direct improvements and changes.

# **Risk Analysis and mitigation strategy:**

During the development of the project, there are some potential risks and challenges associated with developing a system that enables paralyzed and disabled individuals to interact as metahumans in a virtual world. According to a study done in Israel by TRaz and E.Michael on the usage or benefits of tools for project risk management, out of 38 risk management tools, brainstorming, checklists and risk registers were ranked the highest. MetaMovers project will use these three RM tools.

### 7.1. **Risk Management Tools:** Certain RM tools can be implemented additionally to ensure the avoidance of maximum risks.

**7.1.1: Brainstorming:** In each sprint, new ideas from all stakeholders or developing teams will be encouraged. Each member will be asked for creative ideas from all various departments. Experiences and insights shared by everyone can help identify potential risks beforehand. Everyone can give their opinion that can reduce risks immensely.

**7.1.2: Checklists:** Checklists can be made to review and completed over time. They can be implemented at various stages of the project. They can even be added to the Product Backlog. Few below things can be added to ensure smooth project performance.

1.Prioritizing the tasks: 2. Quality Assurance 3. Communication 4.RiskIdentifications. 5.Critical Activities:

**7.1.3: Risk Registers:** A document will be created to register the potential risks throughout the project cycle. It will contain all the potential risks that can affect the life cycle of a project. Having a risk register will ensure development of Meta Movers. Some things to consider in Risk Registers could be:

* Risk analysis:
* Risk Monitoring.
* Mitigation
* Contingency Plans
* Risk Ownership.
* Recover from Crisis

## **7.2: Risks and Probabilities:**

7.2.image

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Insignificant** | **Minor** | **Moderate** | **Major** | **Catastrophic** |
| **Almost Certain** |  |  |  | **Stakeholder**  **Requirement**  **Variation** |  |
| **Likely** |  | **Competition** | **Abuse in**  **The Virtual**  **World** |  | **Regulatory Approval** |
| **Possible** |  |  | **Medical Issue** |  | **Technical**  **Challenges** |
| **Unlikely** |  | **User Training** |  |  |  |
| **Rare** | **User Fatigue** |  |  |  |  |

**Impact**

**Impact**

**Probability**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **User Fatigue** |  |  |  |  |

**7.2.1.**  **Technical Challenges:** There can be technical challenges for adjusting BCI to accurately transfer brain neuron signals to the virtual world. The probability of such risk is low.

**7.2.2.**   **User Training:** It will be challenging to train paralyzed humans to effectively use metahuman in the virtual world. They would need to be trained via the virtual world by others. Poorly trained users can have poor experience. The probability of such risk is low.

**7.2.3.**   **Medical issues:** The BCI (brain computer interface) may be implanted to the human brain depending on the disability. Implantation can lead to potential infections or inflammations. The probability of such risk is moderate.

**7.2.4**.   **User fatigue:** Person can face fatigue due to prolonged usage of BCI. The probability of such risk is moderate.

**7.2.5.**   **Regulatory approval**: The devices required to interact with the virtual world are implanted to blood vessels and can require approval from the government that can be complex to achieve. The project can go in vain without approval. The probability of such risk is low.

**7.2.6.**   **Competition:** During the development of the project, it can face potential competition from the other implementing the same goal. The project can lose first mover advantage if such a thing happens. The probability of such risk is high.

**7.2.7**.   **Abuse in virtual world:** Since there can be anyone that can enter the virtual world, there can be certain persons that can potentially abuse or torture the paralyzed human from the virtual world. Those limitations should be looked over. The probability of such risk is high.

**7.2.8.**   **Stakeholder requirement variation:** Constantly changes in the requirements by stakeholders can lead to delayed outcome of the project and it will increase the cost of the project due to changes in those requirements since those new requirements need to be implemented. The probability of such risk is high.

**7.3. Mitigation Strategy** To minimize these risks that will occur during and after development of the project, we will be using several mitigation strategies that will help reduce the impact of these risks.

**7.3.1**.   **Technical Challenges:** Collaborating with experts in neuroscience to design and implement algorithms and programming for accurate signal transfer. Also validate and test during the feature development to address technical issues.

**7.3.2.**   **User Training:** Train the user through the virtual world with effective communication. Training to be given by certified professionals. Communicate according to the nature of the individual. License to be issued for users who complete the training.

**7.3.3.**   **Medical issues:** Partner closely with medical professionals for perfect surgical implants. Keep in contact with professionals for monitoring the user's health. Regularly check for any signs of infection. Already unfit individuals may avoid implants.

**7.3.4**.   **User fatigue:** Monitoring the fatigue levels of humans from the virtual world and also allowing paralyzed humans to take substantial breaks from prolonged usage. Proper sleep would be recommended.

**7.3.5.**   **Regulatory approval**: Starting the regulatory approval process as a first step in a project to ensure all documents, safety tests, devices required for the project meets the regulatory standards.

**7.3.6.**   **Competition:** Focusing on unique features. Regularly monitor the competition and adjust the strategy accordingly. Sign NDA’s to not leak any critical information while the project is in the development stage.

**7.3.7**.   **Abuse in the virtual world:** Implementing security measures to prevent unauthorized access to the virtual world. Implement user prompts and reporting systems, so the users can report certain persons misusing the virtual world.

**7.3.8**.   **Stakeholder requirement variation:** Establishing a consistent communication to let the stakeholders be informed about the project process and potential impact of requirement changes. Gather all the requirements at the early of the project development.

**7.4. Contingency Plans** Since the brain computer interface is complex and every paralyzed human using it will produce different outcomes and risks, we will be overcoming them with our contingency plans.

**7.4.1.**   **Technical Challenges:** Have a backup team of experts with a different perspective of plan for BCI signals, if the first one does not work.

**7.4.2.**   **User Training:** Remove the access for individuals and ensure retraining before using Metahuman again.

**7.4.3**.   **Medical issues:** Develop a strong bond with medical experts and create an effective response plan to address any reported cases of infection. Work on the advice of medical professionals when it is safe to use MetaHuman technology again.

**7.4.4.**   **User fatigue:** If the user constantly faces fatigue, add an auto pause system to the virtual world or possibly to save state and exit the virtual world.

**7.4.5**.   **Regulatory approval**: If the approval is delayed, ask the regulators for a temporary approval to enable development of the project while the complete approval is awaiting.

**7.4.6.**   **Competition:** Innovating the system continuously by getting the user feedback. Look for lacking features in competitor products and implement those features to gain customer interest.

**7.4.7**.   **Abuse in the virtual world:** Block any individual that causes the disruption. Legal action could be taken in case of serious offenses.

**7.4.8**.   **Stakeholder requirement variation:** If the stakeholder changes the requirement, let them know its impact on the project timeline and new resources required for the project.

# **Stakeholder Engagement and communication plan**

## 8.1.  **Stakeholders:**

The project is complex and can have a wide range of stakeholders due to its usage of brain computer interface, virtual reality, paralyzed human, regulated approval and training. These are the following list of the stakeholders.

* Paralyzed individuals and their families
* BCI developers
* Medical team
* Virtual reality experts
* Government agencies
* Researchers.
* Sponsor
* Team Members
* *Project Managers*

*Image 8.1.2: shows stakeholder engagement:*

**A screenshot of a computer

Description automatically generated**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Stakeholder** | **Strategic Direction** | **Finance** | **Market Shape** | **Service Quality** | **Legal and**  **Regulations** | **Operational**  **Changes** | **Pr/Media** |
| **Paralysed Individuals and their Families** |  |  |  |  |  |  |  |
| **Sponsor** |  |  |  |  |  |  |  |
| **Government** |  |  |  |  |  |  |  |
| **Researchers** |  |  |  |  |  |  |  |
| **Medical Team** |  |  |  |  |  |  |  |
| **Team Members** |  |  |  |  |  |  |  |
| **Project Managers** |  |  |  |  |  |  |  |
| **BCI Developers** |  |  |  |  |  |  |  |
| **Virtual Reality Experts** |  |  |  |  |  |  |  |

Image 8.3 shows stakeholder identification:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **External** | **Name** | **Organization**  **Position** | **Location** | **Role** | **Contact**  **Information** | **Interest/**  **Expectations** | **Power** |
| 1: | Paralysed Individuals and their Families | None | Private | Users | Can be collected at registration | LOW | HIGH |
| 2: | Government Agencies | Variable | Public  Sector | Regulation and Compliance | Relevant Authority can be contacted | HIGH | HIGH |
| 3: | Researchers | PHD Professors | Private/  Public | Further Research | Can be collected at Expression of Interest | HIGH | LOW |
| **Internal** | **Name** | **Organization**  **Position** | **Location** | **Role** | **Contact**  **Information** | **Interest/**  **Expectations** | **Power** |
| 1: | Sponsor | Unit Convener/Sponsor | University of Canberra | Project  Sponsor | mohammad.abualsheikh@canberra.edu.au | HIGH | HIGH |
| 2: | Team Members | Students | University of Canberra | Project Designers | [U3237207@uni.canberra.edu.au](mailto:U3237207@uni.canberra.edu.au)  U3229091@uni.canberra.edu.au  [U3233520@uni.canberra.edu.au](mailto:U3233520@uni.canberra.edu.au)  U3229457@uni.canberra.edu.au | HIGH | LOW |
| 3: | Virtual Reality Experts | Junior/Senior Experts | Project Initialization Office | Developing Interface and 3D Environment | Project Manager can be contacted | LOW | LOW |
| 4: | Medical Team | Junior/Senior Scientists | Project Initialization Office | Taking Care of Medical Aspects of Metamovers | Project Manager can be contacted | LOW | LOW |
| 5: | BCI Developers | Junior/Senior Developers | Project Initialization Office | Developing BCI and adjusting neural signals | Project Manager can be contacted | LOW | LOW |
| 6: | Project Managers | Scrum Master/  Product Owner | Project Initialization Office | Managing Project | Project Manager can be contacted | HIGH | HIGH |

## **Understand stakeholder needs:**

Exploring the needs of each stakeholder group. This can elaborate and clear all the concerns and expectations of each stakeholder group. This process can include surveys and interviews of stakeholders.

## **Define important key points:**

Share the important key points of the project with the stakeholders that can show the purpose, goals and benefits of the project.

## **Role of social media:**

Social platforms can be used where we will be able to find each stakeholder group both internal and external. Following are some examples of planforms where stakeholder could be found.

* Facebook
* Twitter
* LinkedIn
* Telegram
* Email
* Webinars
* Press releases
  1. **Cultural Sensitivity:**

Take into account the cultural diversity of your stakeholders and adjust your communication strategy as necessary. Make sure your messages are inclusive and considerate of all viewpoints. This process can include research about each stakeholder individually by studying their history, values, beliefs and communication styles and their non-verbal communication as per their culture. The study of cultural attitudes will also vary. Some would like to have a punctual approach while some would like a relaxed approach. Tailoring cultural sensitivity of stakeholders shows that you genuinely care about the needs and perspective of everyone in the stakeholder group.

* 1. **Deep understanding of stakeholder:**

Engaging with each stakeholder individual from a group to gather his expectations and requirements for the project. Explaining briefly about the project progress and details according to his interest and role in the project to remove all the doubts of the project. Also reaching out to the person individually will let stakeholders feel that he is being recognized about his position in the project. Also sharing how the stakeholder will benefit from the project as per their involvement in the project will also build transparency.

* 1. **Crisis communication plan:**

Sharing with the stakeholders about what to do in the circumstances where the project goes into the crisis stage and handling and resolving the crisis accordingly. The crisis can include technical issues, regulatory changes, data breaches that can negatively have an impact on the project. These issues can be overcome within a short period of time due to the technical team that will include medical team and technical team for brain computer issues, developers for virtual reality and software issues. These issues, when arises, will be shared with the stakeholders through communication channels. These messages will be pre prepared to be shared with stakeholders to build transparency and trust with the project.

* 1. **Long-term engagement:**

Make plans for how your engagement activities will continue in the long run. Continue to modify your communication plan as the project develops to reflect the shifting demands of your stakeholders. The engagement process can lead to several points.

* Constantly collecting feedback from stakeholders
* Maintain consistent communication during the project development.
* Highlighting achievements and challenges to stakeholders that are occurring during the project development.
* Showing stakeholders their value about the involvement and contribution to the project.
  1. **Evaluation:**

Gather the feedback from the stakeholders and evaluate the effectiveness of your communication. Regularly get insights and feedback to improve the plan that leads to a stronger relationship with the stakeholder. Continuously report the progress and updates to the stakeholder and receive that they wanted the outcome vs what they were expected from the output. This will clarify their doubt and remove the areas of dissatisfaction by the stakeholder.

**8.10.**   **Engagement strategy:** To engage with each stakeholder group, we will be sharing updates about:

* Investors being ready to invest for the project
* Education webinars for medical professionals and researchers.
* Persons playing the game will be getting feedback for continuous improvement of the project.

There will be a great chance and opportunity for BCI developers and VR experts. These teams can collaborate with each other and can grow accordingly.

***Table 8.1:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Stakeholder/ Team Member | Key issue | Communication Methods | Frequency | Responsible Team |
| Sponsor | Budget, scope | Email, video calls | Weekly | Project Manager |
| VR developer | VR world design,  MetaHuman development | Email, video conference | Weekly | Tech Lead |
| Medical team | Brain implant, surgery, human health checks | Email, meetings | Sprint Review Meetings | Tech Lead |
| BCI developers | Brain computer interface signal adjustments, testing | Email,Video Conference | Daily Scrum Meeting,Sprint Review Meeting | Project Manager |
| Internal stakeholders | Requirements Feedback | Emails,Meetings, | Daily Scrum Meeting,Sprint Review Meeting | Project Manager |
| External stakeholders | Feedback, paralyzed human feedback | Application feedback,Social Media,Frequent Surveys | When needed | Project Manager |

**Table 8.1.2:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Communication Objective | Method | Frequency | Goal | Owner | Audience |
| Provide Instructions on how to use BCI | Instruction book, PDF | When required | Ensure how users can effectively use BCI | Technical Manager | Users |
| Provide Instructions on how to use VR world | Tutorial videos and articles, Trainers | Once a week | Helping disabled to use VR succesfully | Technical Manager | Users |
| Request feedback | Prompts on Metaverse | Anytime as required | Gather feedback to improve the VR metahuman experience | Marketing team | Customers who have used the new platform |
|  | Email, phone | On demand | Resolve customer issues facing in virtual reality | Customer service team | Customers who have used the platform |
| Provide maintenance updates | VR notifications, email | Real-time when needed | Keep customers informed about the upcoming updates or maintenance | Project Manager | Customers using the platform |

# **Quality Assurance & Criteria Measure:**

The overall project qualityincludes various checks and assurances to ensure that the end product is of high quality. Some of the main things to consider while checking for quality are:

**9.1:  Performance:** The performance ofthe BCI and Metaverse reflects the quality of the product.It should exceed standard practices and test results.Some of the measures taken can be::

* **Criteria*:*** **Frame Rate**

**Description** *:* To avoid motion sickness and offer an enjoyable experience. The VR application needs to keep a steady and high frame rate.

**Measure**: Maintaining frame rate per second (FPS) above a predetermined level. Using powerful hardware to maintain a pleasurable Experience.

* **Criteria: Latency**

**Description:**  To reduce the period between the user input and the system response to maintain involvement and ease discomfort.

**Measure:** Minimizing the time between input and display when tracking head and hand movements.with real time BCI processing.

* **Criteria: Visual Quality**

**Description:** Create images that are both realistic and eye-catching to increase immersion.

**Measure:** Implementing high resolution, texture quality, lightning effect and graphic integrity.

* **Criteria:Optimization**

**Description:** Make sure the application is optimized to work well with a range of hardware setups.

**Measure**: Assuring appropriate performance by testing the programme on various VR hardware configurations.

* **Criteria: Audio Quality**

**Description:** Provide high quality and spatial audio to increase immersion.

**Measure:** Ensuring positional audio clarity, synchronization with visual and 3D sounds.

**9.2.** **Functionality:**

The process of developing a virtual reality (VR) application includes building a virtual environment that users can interact within a 3D space. Here are some fundamental functionality criteria to keep in mind while creating this metahuman application.

* **Criteria:** **3D Environment Creation:**

**Description:** Design and develop a 3D environment that the user may explore.

**Measure:** The ability to interact with objects and move around in three dimensions created by Metaverse Developers.

* **Criteria**: **Interaction and Navigation:**

**Description:**Possibility for the user to navigate around the VR environment and pick up, modify, and move objects.

**Measure:** Make it possible for users to communicate with the virtual environment using controllers, gestures, or other input devices.

* **Criteria:MetaHuman Representation**:

**Description:** Allow customers to engage with the environment virtually via avatars or other representations.

**Measure:** Metahuman(Avatars) can be customized by users, who can see them move in response to their activities and communicate with other avatars.

* **Criteria:Object Interactivity:**

**Description:** Allow to the customer to interact with the environment object by picking them up, moving them around and modifying them

**Measure:** By using gestures and controls the user has the ability to interact with the virtual objects.

* **Criteria:Social Interaction:**

**Description:** Support communication amongst several users in a virtual environment.

**Measure:** Shared interactions, real-time communication, and the presence of several individuals sharing the same space.

* **Criteria:Feedback and Notifications:**

**Description:** Users should receive feedback via aural, auditory, or visual cues.

**Measure:** User awareness of interactions, notifications, and environmental changes.

**9.3. Scalability:**

**Definition:** The ability of a programme to manage increased demand, user load, and data processing while keeping performance and user experience is known as scalability criterion in the context of building virtual reality (VR) applications. Here are some scalabilities following criteria while building the scalable VR application.

* **Criteria:User Load Handling:**

**Description:** A rising number of simultaneous users should be able to use the programmes.

**Measure:** Keeping performance, responsiveness and interaction at high level even as user load grows.

* **Criteria:Server Infrastructure:**

**Description:** The server should be able to deal with more interactions and requests.

**Measure:** To deal with expanding traffic, scalable cloud resources, load balancing, and auto-scaling capabilities.

* **Criteria:Data Processing and Rendering:**

**Description:** Even with complicated scenes and interactions, maintain fluid display and connection. And for the communications, make sure the network is reliable and low latency.

**Measure:** improved graphics lines, LOD (level of detail) methods, testing the motion sickness, latency, and data loss of a network under different conditions.

* **Criteria:Cost-Efficiency:**

**Description::** Increase capabilities while controlling the expenses and check the application's performance in high customer workload

**Measure:** Analyzing costs and resource consumption while the checking of speed of response, and stability during load testing.

**9.4.Reliability:**

**Definition:** When developing a virtual reality (VR) application, reliability requirements are used to make sure that the set performs continuously, accurately, and without problems. Here are some reliability criteria:

* **Criteria:** Stability:

**Description:** There shouldn't be errors or shutdowns of the software.

**Measure:** keeping an eye on breakdown reports, reducing off memory leakage, and putting error handling

* **Criteria:Error Handling:**

**Description:** The application should handle the errors and provide the notification.

**Measure:** Feedback from customers on errors and testing different fault conditions.

* **Criteria:Data Integrity:**

**Description:** Make sure that user data, and progress are all remained safe.

**Measure:**  Regularly backing up data, and testing data recovery systems.

* **Criteria:Updates and Maintenance:**

**Description:** Maintain and fix bugs, improve functionality and fix security breaches.

**Measure:** System will update a new function and fix some errors by the feedback of the customer.

* **Criteria:Performance Under Stress:**

**Description:** The software should be working properly while having a load, stress or some challenging scenes

**Measure:** Analyzing application behaviors under stress examination, and load testing.

**9.5. Security:**

Poor Security Security criteria for building a VR software are compulsory to keep data safe, prohibited misuse and providing reliable and safe user experience. Here are some security criteria following.

* **Criteria:Data Privacy:**

**Description:** Secure the customer data and make sure confidentiality regulations (such as the GDPR) are followed.

**Measure:** Clear user consent for data gathering, encryption of user data, and open data usage policies.

* **Criteria:Authentication and Authorization:**

**Description:** Utilize reliable gatekeepers and login systems.

**Measure:** Role-based access control (RBAC), multiple factor authentication (MFA), and safe account regulations.

* **Criteria: Logging and Monitoring:**

**Description:** To identify or react to security incidents, use logging and monitoring.

**Measure:** System for detecting intrusions, and security event logging.

* **Criteria:incident Response Plan:**

**Description:** Create a strategy for handling security-related incidents well.

**Measure:** Rules for dealing to incidents, roles, and responsibilities are all documented.

* **Criteria: Regulatory Compliance:**

**Description:** Make that all relevant security and data protection laws are followed.

**Measure:** The recording of monitoring activities, routine audits, and collaboration with regulatory agencies.

## **9.4. Lean Six Sigma:**

For project management side, Principles of lean Six Sigma can be adapted toachieve process improvement,waste reduction and quality enhancement.  Following 5 key concepts can be adapted be to improve the process.

* To reduce and identify the wastes,reduce defects or other process risks can be pass through DMAIC principles to enhance overall quality.
* A diagram of a company

  Description automatically generatedAllocating proper resources,technology and time to right teams can smooth process effectively. Tracking progress, Monitoring budget and proper resources utilization can be kept in mind to improve process flow.
* Clear Communication between Stakeholders is the biggest factor for smooth process development. Having clear channels of communication between stakeholders can clear project expectations from start and keep scope in align by having input of everyone.
* Create a culture of continuous improvement, it is important to create an atmosphere where staff members of all ranks feel empowered to look for possibilities of improvement, give ideas and fullu contribute to ideas.
* An essential step in improvement projects is effectively identifying and prioritising problems. Identify problems that affect customer happiness, performance, or other important elements. Prioritisation assists in directing resources towards the most urgent issues first is one of the major factor having quality outcome in the end.

# KPI &CSF:

## 10.1. Key Performance Indicators:

Key Performance Indicators play a vital role to determine the success and completion of the project by meeting its objectives.In this project, the KPI’s include:

**Active Rate:**Number of disabled and paralyzed individuals who are actively engaged and trained to use this technology. Higher numbers predict the success of this technology that is helping the disabled in specific tasks.

**Training**:It would be the time taken for the disabled person to learn and adapt to the technology. The faster they can learn, the better it shows the user friendliness of the metamovers.

**Response Rate:** Number of errors ,security concerns and other harmful outcomes that may violate the system security policy. The faster the report response, the better the customer satisfaction.

**Latency:** Measuring time difference between processing of neural signals generated by BCI and metahuman device response.Less latency means less input lags and better communication.

**Quality Cost:** Comparing cost of various devices associated to different versions of technology with their quality and efficiency.

## Critical Success Factor:

Critical Success Factors are also an important part to measure the success and completion of a project by focusing on things that matter.

**Awareness and Acknowledgement:** Understanding and acknowledging the domain of this technology in wider communities with the help of medical experts and other organizations that help to promote this project for disabled persons to utilize this technology in their daily life.

**Standard Compliance:**Involvement of government and other official authorities to regulate and review the safety or health benefits standards for this project.This may include all the legal,legislative documentation to support the success of this technology.

**Stakeholder Collaboration:**Engaging all stakeholders in one platform. This may include internal and external stakeholders such as developers, lawyers, medical experts or sponsors to ensure that technology is  beneficial.

**User Friendly Interface:**Making sure that technology has a user friendly interface with  predefined tasks for easy learning. It can save users time to perform multiple tasks.

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