# **Product Design Framework: Alpha Wave - Phantom Reach**

## **The Problem**

### **High-Level Description**

Amputees often experience phantom limb pain (PLP) and face challenges in maintaining motor coordination. Current rehabilitation tools are limited in accessibility and engagement, leading to inconsistent use and reduced therapeutic effectiveness.

## **Users**

### **User Personas**

1. **Amputees**
   * Individuals with hand or limb amputations experiencing phantom limb pain or reduced mobility.
   * Techsavvy users who can access AR tools.
2. **Clinicians**
   * Occupational and physical therapists integrating technology into rehabilitation plans.
3. **Caregivers**
   * Family or professional caregivers assisting amputees in rehabilitation.

## **Pain Points**

1. **Amputees**:
   * Lack of engaging rehabilitation tools (high priority).
   * Limited access to advanced therapy solutions.
   * Difficulty tracking progress over time.
2. **Clinicians**:
   * Inadequate tools to monitor patient progress remotely.
   * Difficulty customizing therapy to individual patient needs.
3. **Caregivers**:
   * Challenges in providing effective assistance during rehabilitation.

## **Ideas**

### **Brainstormed Solutions**

1. **AR-based gamified rehabilitation**:
   * Engages users through interactive gameplay.
2. **Real-time limb tracking**:
   * Improves precision and tracking of residual limb movement.
3. **Progress tracking and feedback**:
   * Provides users and clinicians with actionable insights.
4. **Customizable therapeutic goals**:
   * Tailored gameplay for diverse needs.

## **The Solution**

### **Description**

The solution is an AR game-driven rehabilitation tool that overlays a virtual hand using real-time limb detection through a standard webcam. Users engage in interactive games to improve motor skills, reduce phantom limb pain, and track progress over time.

### **From the User's Perspective**

1. **Amputees**:
   * Play an engaging AR game that tracks and mirrors their limb movements in real-time.
   * Receive feedback on performance and therapeutic progress.
2. **Clinicians**:
   * Monitor patient progress via data visualization and feedback reports.
3. **Caregivers**:
   * Support patients with setup and engagement, leveraging clear instructions and progress tracking.

## **Design Principles**

* **Accessibility**: Use a standard webcam for broad compatibility.
* **Engagement**: Gamified mechanics to maintain user interest.
* **Therapeutic Value**: Designed with clinical insights for effective rehabilitation.
* **Privacy**: Ensure compliance with GDPR and HIPAA standards.

## **The New Workflow**

### **Core Questions**

1. **What does the new workflow look like from the user's point of view?**
   * Amputees set up a webcam, start the game, and engage in interactive gameplay that tracks their limb movements.
2. **What is the user's need being answered at every step?**
   * Need for rehabilitation, engagement, and progress tracking.
3. **What are the main questions in the user's mind at each step?**
   * "How do I set this up?"
   * "Is my progress being tracked?"
   * "How does this help my rehabilitation?"
4. **Can we rank the features we listed?**
   * **High Priority**: Real-time tracking, engaging gameplay, progress tracking.
   * **Medium Priority**: Customizable therapeutic goals.
   * **Low Priority**: Advanced visuals.

### **Old Workflow for Comparison**

* Traditional rehabilitation often involves repetitive, manual exercises with minimal interactivity and feedback.

### **Inputs and Outputs**

* **Inputs**:
  + Webcam video feed.
  + User interactions.
  + Clinical therapeutic goals.
* **Outputs**:
  + Real-time virtual hand movements.
  + Progress reports.
  + Gamified feedback and scores.