American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

PROJECT TITLE

Robo Hatch - A Robotics Development Platform

A Software Engineering Project Submitted
By

Semester: Fall_24_25		**Section: v**	**Group Number: 07**	
SN	Student Name	Student ID	Contribution (CO3+CO4)	Individual Marks
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The project will be evaluated for the following Course Outcomes

CO3: *Select* appropriate software engineering models, project management roles, and their associated skills for the complex software engineering project and evaluate the sustainability of developed software, taking into consideration the societal and environmental aspects	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5 Marks]	
Evidence of Argumentation Regarding Process Model Selection	[5Marks]	
Analysis of the impact of societal, health, safety, legal, and cultural issues	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar, and Organization of the Project report	[5Marks]	
CO4: *Develop* a project management plan to manage software engineering projects following the principles of engineering management and economic decision process	Total Marks	
Develop the project plan, its components of the proposed software products	[5Marks]	
Identify all the activities/tasks related to project management and categorize them within the WBS structure. Perform detailed effort estimation correspond with the WBS and schedule the activities with resources	[5Marks]	
Identify all the potential risks in your project and prioritize them to overcome these risk factors.	[5Marks]	

1. PROJECT PROPOSAL

1.1 Background of the Problem

The robotics industry shows fast expansion through technological advancements that cover healthcare and manufacturing and agriculture and entertainment purposes in recent years. The rising demand for robotic solutions produces important hurdles during the development cycle. The primary development obstruction in robotics stems from professionals within hardware, software, design and testing fields who work independently in diverse organizations. Multiple developmental stages between teams lead to performance issues and delayed schedules as well as make collaboration throughout the entire project timeline challenging.

Root Cause of the Problem: Robotic technology has progressed notably throughout the years, which caused advancements across automation technology and artificial intelligence along with industrial implementation. The industry persists in confronting substantial problems which produce obstacles toward innovation and commercialization advancement. Product development delays from initial ideas through production stages represent the main limiting factor for the robotics industry. Robotics development fragments naturally because professionals dividing themselves among mechanical design, software development, artificial intelligence and electronic engineering work independently from each other. Without proper integration between teams programming costs become elevated while project completion needs longer durations.

The robotics industry faces a primary challenge because it lacks an organized marketplace which enables freelancer professionals to work hand in hand with startups as well as established companies. Robotics professionals with talent encounter employment difficulties because they face distance restrictions combined with insufficient specialized platforms for their industry. The key process of hardware prototyping for robotics development remains too costly for independent innovators and small companies. Standardized processes aimed at integrating robotics development aspects do not exist which result in project failures.

Impact on the Industry: The parts-based organization of the robotics industry generates significant negative effects. Standing innovation at bay appears as the most critical disadvantage because promising concepts often perish because of insufficient resources combined with a shortage of qualified personnel. Robotic startup failures occur due to financial problems alongside insufficient development guidance during their initial operational period. Groundbreaking research discoveries remain isolated in laboratories since they fail to enter the commercial market as marketable products. The underusage of available talent represents a significant problem amongst robotics professionals. The lack of suitable project assignments for skilled professionals creates career stagnation by diminishing their professional advancement as well as withholding field-related contributions to research.

1.2 Solution to the Problem

Objective: The objective of Robo Hatch is to create an integrated platform that brings together freelancers and companies in the robotics industry. By leveraging state of the art technologies, Robo Hatch aims to streamline the development of robots by facilitating seamless collaboration across different stakeholders.

Proposed Solutions: A structured robotics development marketplace exists as the proposed solution for resolving these challenges. The platform integrates all robotics development activities by allowing professionals to work with startups and companies who collaborate on planning stages alongside designing and prototyping and programming and testing and deployment and maintenance procedures. The platform applies artificial intelligence functions to provide recommendations about freelancers along with outsourcing partners that fit particular project needs. The platform will assist organizations to discover appropriate candidates which minimizes their expenses in talent recruitment.

The marketplace introduces pricing arrangements to help businesses lower their expenditures for prototype development and hardware testing. Through this process companies can delegate particular development work to expert professionals who will operate under their project oversight. The platform will use an escrow system which protects secure financial transactions between buyers and sellers and avoids fraudulent transactions. The platform develops a research and development hub specific to robotics which enables businesses to work together on innovations and speed up their robot commercialization process.

Functionalities: Through its main offerings the platform enables users to achieve complete collaboration with step-by-step innovation functions.

- **Freelancer Accounts:**
  Robotics professionals who are planners, 3D model designers along with software developers can make account registrations that enable them to list their services. Through the platform freelancers can offer their research papers as well as their 3D designs together with software codes and other development assets for purchase to companies which need help in their projects.

- **Team Accounts:** The platform offers registration access for robotics project teams. The minimal team membership must exceed ten members because it enables teams to possess both essential expertise and a large-scale workforce needed for significant robotics development responsibilities. Every team have the ability to provide specialized services while testing and debugging and integrating robotic systems thus enabling their participation in projects without establishing a formal company. The absence of direct product selling rights does not prevent them from delivering essential development and troubleshooting services.

- **Company Accounts:** The robotics research, prototyping and commercialization businesses can open validated accounts through the platform interface. Complete marketplace access will be available to these companies so they can both hire freelancers as well as acquire research and assign robotics development tasks to external providers. Companies through this platform can market their robotics products after innovation development finishes to enable commercial operational expansion of their new technologies.

- **AI-Powered Recommendations:** The matchmaking system for professionals to find projects benefits from artificial intelligence optimization as its primary function. The system uses AI to examine project demands then generate recommendations about the ideal candidates between freelancers and outsourcing partners. The system will allow companies to discover local production centers for prototyping and deployment essentials to decrease their cost structure.

- **Project Lifecycle Management:** Project lifecycle management tools will operate at full transparency and maximum efficiency on the platform. The platform allows teams to track project developments through combination of video logs and reporting features and milestone updates. Platform users will receive features which allow them to embed software programs directly into physical test models for checking integration points and operational needs. Testing teams along with debugging personnel will confirm projects for safe deployment through validation processes thereby reducing the chance of system flaws.

Feasibility of the Solution: As it makes use of modern technologies such as artificial intelligence, cloud computing, and secure online transactions, the proposed approach is theoretically feasible. Financially, the platform will enable freelancers, teams, and organizations to make money by providing services while also earning commissions on good transactions. The system is also extremely expandable, since it can enable worldwide collaboration, reach new industries, and connect other features like robotics certifications.

Impact on Societal, Health, Safety, Legal, and Cultural Issues: The platform will be very important in several different areas. From a society point of view, it will open employment for robotics experts and help robotics innovation expand. Regarding health and safety, it will encourage the creation of automated solutions to lower human intervention in dangerous environment so improving workplace safety. Legally, it will create a disciplined framework to control contracts, protect intellectual property, and control transactions. Culturally, the platform will support worldwide cooperation by grouping experts from many backgrounds to work on innovative robotics projects. The impact of Robo Hatch will be deep-seated in many ways.

- **Social Impact:** By facilitating it to be easier for freelancers to collaborate with corporations, Robo Hatch can make the global robotics industry expand, allowing for quicker breakthroughs and robots at affordable prices. It can enable individuals to become capable of selling their expertise remotely, their advantage as well as the corporations with whom they collaborate.
- **Health & Safety:** Robots are being applied more and more in areas like healthcare (surgical robots, elderly care robots) and industrial automation. Robo Hatch's platform will ensure quality and safety standards are upheld, helping to create robots enhancing human life while minimizing risks.
- **Legal and Cultural Issues:** The platform will be based on international labor laws to provide an ethical and transparent work culture. Besides, it will allow cross-cultural interaction through uniting companies and freelancers from different countries and helping them share knowledge.

Target Group of Users: The platform is designed for different numbers of users, including freelancers working with robotics planning, 3D modeling, and software development. It also will serve teams engaged in

robotics research, prototyping, testing, deployment, and maintenance. The products of the platform will also help companies obtaining market-ready robotics solutions.

Benefits to Users: Freelancers working on a worldwide marketplace in which they can sell their skills and research, while companies will benefit from a streamlined development process without a huge overhead. Teams will have the ability to work together, within the context of robotic projects, without needing to invest significant resources up front. Because it will help customers with pre-tested, validated and ready-to-employ robotics solutions.

Scientific Contribution: The platform supports scientific developments through standard operating procedures for robotic development. Different engineering disciplines will improve collaboration through the platform alongside AI-based project optimization by matching engineering teams. The platform enables fast prototyping along with testing support which stimulates emerging technology development leading to the quickest possible innovation in robotic systems.

Literature Review: The robotics development sector has witnessed considerable expansion with a lot of platforms that facilitate interaction between professionals and companies. Most existing solutions primarily address freelancing services as a whole, such as Upwork and Fiverr, that provide a platform for the hiring of talent. These platforms lack a dedicated system for robotics development, wherein there is in-depth technical cooperation over multiple stages, from designing to deployment. Certain industry-specific platforms, such as GrabCAD for 3D modeling and GitHub for software development, mitigate certain aspects of robotic development but fail to provide a complete integrated workflow for both hardware and software integration.

Robo Hatch seeks to fill this vacuum by offering a specialist platform that simplifies the whole robotic development process. Unlike traditional freelancing websites, it facilitates structured project collaboration such that companies can transition from concept to launch with ease by engaging the appropriate specialists at each step. Through AI-driven suggestions, team building, and real-time collaboration tools, Robo Hatch extends the scope of existing solutions and provides a more efficient and scalable method of robotics project management.

Existing Software Solutions: There exist several software solutions that are presently available to address different areas of robotics development. Computer-aided design software like AutoCAD and SolidWorks is usually used for designing robot parts, while freelance sites like Upwork and Fiverr allow companies to look for specialists in many areas. Further, project management software like Trello and Asana help to monitor progress and workflow management. But these solutions are independent of each other, resulting in inefficiencies in collaboration and coordination. Robo Hatch seeks to build upon these available solutions by creating a single platform that integrates freelance services with corporate collaboration seamlessly so that there is improved coordination in all phases of robot development. It will introduce AI-driven matchmaking to pair the right professionals with projects, incorporate expert tools tailored for robotics development, and offer local services to allow companies to scale production efficiently.

Conclusion: The proposed platform serves the purpose of connecting robotics planning activities to prototypes through software development before releasing products for commercialization. The

implementation of AI recommendations together with secure transactions and outsourced support functions will develop a cost-efficient robotics development environment. The established collaboration approach provides assistance to freelancers and corporations along with teams and supports robotic innovation worldwide.

References:

1. IEEE Robotics and Automation Society. "Advancements in Robotics Development Platforms." 2023.
2. Smith, J. "AI-Powered Marketplaces and Their Impact on Engineering Collaboration." Journal of Robotics Research, 2022.
3. European Union. "Legal Framework for Robotics and AI-Based Transactions." 2021.
4. McKinsey & Company. "The Future of Robotics Development: Trends and Challenges." 2023.
5. International Journal of Automation and Computing. "Scalability in Robotics Development Platforms." 2023.

2. PROCESS MODEL SPECIFICATION

Selected Model for Robo Hatch: Spiral Process Model

We selected the Spiral Model for our Robotics Project Platform because it features adjustable design while maintaining risk management order and multiple iteration capabilities. The platform combines three user groups (freelancers, companies and administrators) while requiring steady platform development and user feedback admission. The Spiral Model enables phased development which permits evaluations along with risk analysis at short intervals.

Comparison with other models (Why not other models for Robo Hatch?)

Waterfall Model:

- **Reason not suitable**: The process has limitations because it operates with strict sequential direction. Any phase that ends becomes resistant to alterations which must be harder to implement.

- **Impact on our project:** The Robotics Platform must deal with frequent updates because it requires dynamic user responses. A multi-user evolving system requires iterative feedback and modifications since the Waterfall Model does not provide these capabilities.

Agile Model:

- **Reason Not Suitable:** Agile promotes flexibility and quick iteration but lacks formal documentation and strong risk management.
- **Impact on Our Project:** The project faces restrictions due to legal and national requirements such as GDPR and IP laws that need structured planning and traceable documentation which could be compromised by Agile.

Incremental Model:

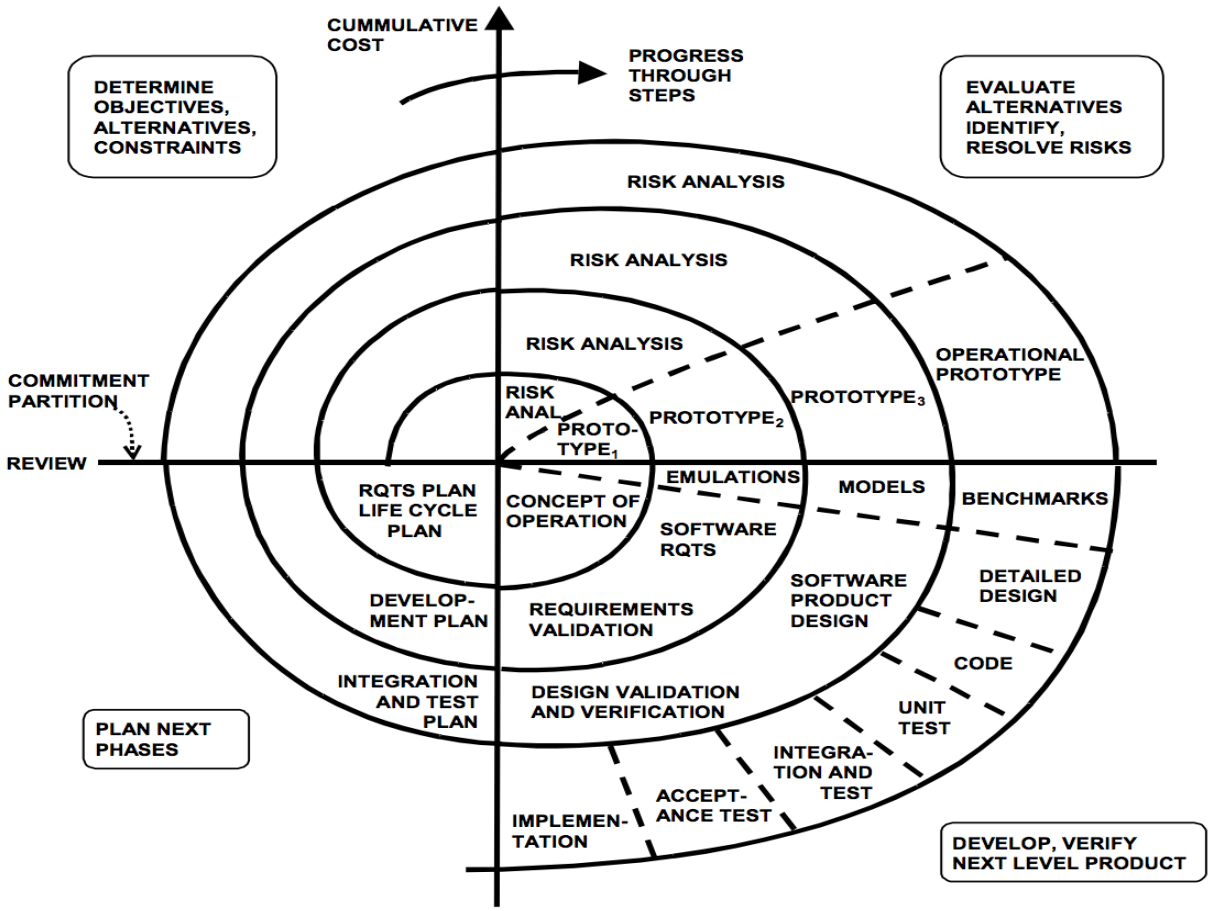
- **Reason Not Suitable:** The method lacks an effective risk management framework that should be implemented from the start of development.
- **Impact on Our Project:** The assessment of potential dangers including legal requirements and payment security and user data privacy protection should take place in advance of both platform development and individual feature implementation.

V-Model:

- **Reason Not Suitable**: The V-Model enforces rigid planning and assumes all requirements are fixed from the beginning.
- **Impact on our project**: Evolution of requirements needs to be enabled by the Robotics Platform according to emerging technologies and user feedback, but the V-Model lacks this capability.

Advantages of the Spiral Model for Robo Hatch

- **Iterative Development:** The system builds progressively through successive iterations to introduce programming steps that start with AI recommendations followed by project
- tracking capabilities and secure messaging functions.
- **Risk Management:** Each spiral cycle entails both the discovery of possible risks including legal problems and data security incidents and system capability failures and their subsequent prevention measures.
- **User Feedback Integration:** A continuous feedback loop from stakeholders directs the future development steps to improve the system by implementing actual organizational requirements.
- **Support for Complex Systems:** The Spiral Model serves projects featuring massive development risks where artificial intelligence (AI) meets cloud platforms along with user interface integration.



Role identification and responsibility allocation

Role	Responsibilities
Project Manager	The project leader guarantees both task completion deadlines and achievement of milestones while maintaining team-wide communication.
System Analyst	Collects requirements, interprets user needs, and translates them into technical documentation.
UI/UX Designer	Designs user-friendly interfaces that reduce complexity and improve task efficiency.
Frontend Developer	Implements responsive and functional user interfaces using React or ASP.NET Razor Pages.
Backend Developer	Secure implementation of APIs and data integration, server-side programming logic along with business logic elements will follow.
Database Administrator	The implementation of data models and schemas by the data engineer ensures secure storage of users, projects, payments together with transactions.
AI/ML Engineer	Trains and maintain recommendation algorithms for project-user matching.
Quality Assurance (QA)	Performs manual and automated testing using tools like Selenium; ensures feature integrity before releases.

DevOps Engineer	Handles cloud deployment (AWS/Azure), CI/CD pipelines, and system scaling.
Security Analyst	Ensures GDPR compliance, data encryption, and role-based access controls.

Impact Identification

Freelancer:

- Defined project development stages (displaying design then prototype and deployment sections) can be accessed for verification.
- The system provides AI-generated project-to-skills-history recommendations.

Companies:

- Streamlined hiring and collaboration process.
- Centralized platform reduces time and costs for prototyping and delivery.

Industry impact:

- Facilitates legal and technical collaboration among verified entities.
- The platform promotes both modular robotics advancement together with shared innovation projects.

Student and researchers:

- Exposure to real-world applications and professional environments.
- Opportunities to monetize research and gain experience.

Economic impact:

- Boosts local tech economies by connecting talent to demand.
- Secure and legal outsourcing within national boundaries reduces risk

Technological impact:

- Encourages real-world AI use in project matchmaking.
- Cloud-native development for scalable robotics infrastructure.

Conclusion

The Spiral Model best suits the Robotics Project Platform because it effectively balances control measures

with flexibility and continuous development needs.

References

- AIUB Software Engineering lab manual.
- Boehm, B. (1988). A Spiral Model of Software Development and Enhancement.
- Sommerville, I. (2016). Software Engineering, 10th Edition.
- Pressman, R. S. (2014). Software Engineering: A Practitioner's Approach.
- Agile Alliance: https://www.agilealliance.org/agile101/
- ISO/IEC 29110: Systems and Software Engineering — Lifecycle Profiles for Very Small Entities

6. TEST PLANNING

Robo Hatch Test Plan: Robo Hatch is an innovative platform designed to connect freelancers, companies and teams in the field of robotics. The platform allows users to create, manage, and collaborate on robotics-related projects, receive AI-based project recommendations and manage payments and contracts. This test plan aims to ensure the reliability, usability, and performance of the platform, focusing on both functional and non-functional requirements.

Testing Objectives:

Objective	Description
Functionality	Ensure that core functionalities such as project management, AI-based recommendations, and user profiles work as intended.
Edge Case Validation	Test boundary conditions like invalid form data, incomplete user profiles, or missing project details to ensure robustness.
Integration of Components	Ensure smooth integration between project posting, freelancer matching, messaging, and notifications.

Performance Testing	Test the platform's performance under various loads (e.g., concurrent users, high network latency).
User Experience	Validate the interface's responsiveness, cross-device functionality, and usability for all user roles.
Security Validation	Confirm that access restrictions, data encryption, and role-based access control are in place, especially for sensitive data.
System Reliability	Test the system's ability to recover and function properly after disruptions like logouts, network drops, and page refreshes.

Testing Approach:

1. Unit Testing:

- **Objective:** To validate individual UI elements and backend functionalities.
- **Focus Areas:**
  - User registration and login forms
  - Profile setup and skill management
  - AI-based project recommendations
  - Freelancer project application logic
  - Project submission buttons (For example: Submit Proposal, Create Project)
  - Project status updates (Pending, In Progress, Completed)
  - Messaging and notification toggles
- **Execution:**
  - Use both valid and invalid dummy data to test each component.
  - Check button interactions, error messages, user form validations, and correct state changes.
- **Automation:**
  - Use Jest for React component testing and PyTest for backend logic.
  - Link unit tests into Continuous Integration (CI) to automate testing with each code update.

2. Integration Testing:

- **Objective:** Ensure seamless integration between modules across different UI pages.
- **Focus Areas:**
  - User registration data flowing into profile setup
  - AI-based freelancer suggestions being displayed based on profile data
  - Project details and freelancer application data interaction
  - Notification system triggering on project updates
  - Messaging system between freelancers, companies, and teams
  - Secure payment gateway handling and its effect on project access
- **Execution:**
  - Simulate real workflows such as project creation → freelancer application → project assignment → notifications → project completion.
  - Test communication between API endpoints and the frontend components.
- **Automation:**
  - Use Postman to test APIs (for user data, project data, payments).
  - Use Selenium WebDriver to simulate user interactions and ensure seamless workflow between modules.

3. System Testing:

- **Objective:** Validate the entire Robo Hatch system as a unified application.
- **Focus Areas:**
  - Complete user journey from login to project completion (freelancer and company views).
  - Page transitions: Login → Dashboard → Explore Projects → My Projects → Profile → Settings
  - Real-time messaging functionality between users (freelancer, company, team).
  - AI-based project recommendations and their relevance.
  - Secure project creation, submission, and milestone tracking.
  - Payment processing and verification with escrow functionality.

- **Execution:**
    - Perform end-to-end testing using real-world user scenarios across different browsers and devices.
    - Replicate failure scenarios like API service failure, slow network, or incomplete form data submission.
- **Automation:**
    - Use Selenium for automating UI workflows and Lighthouse to audit performance and accessibility.

4. Acceptance Testing:

- **Objective:** Ensure that the Robo Hatch platform meets user expectations and is ready for release.
- **Focus Areas:**
    - Relevance of project recommendations for freelancers and companies
    - Simplicity and accuracy of project application forms
    - Effectiveness of notifications and project status updates
    - UI accessibility, especially for managing projects and team collaboration
    - Overall user satisfaction with the system's performance and usability
- **Execution:**
    - Engage real users (e.g., freelancers, project managers, and companies) to conduct test cases simulating everyday use.
    - Collect feedback regarding design clarity, content usefulness, and overall system performance.
- **Automation:**
    - Not applicable as this phase is manual. Feedback will be based on user observations and guided testing workflows.

Test Cases:

Test Case: Sign Up Role Selection

Project Name: Robo Hatch	Test Designed by: Basudeb Kundu
Test Case ID: RH_001	Test Designed date: 23/05/2025

Test Priority (Low, Medium, High): High		Test Executed by: Basudeb Kundu
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify role selection options and navigation links on sign-up page		
Description: Ensure users can select roles and navigate to corresponding registration pages.		
Precondition (If any): • Sign-up role selection page is accessible		
Test Steps	Test Data	Expected Results
1. Open sign-up page		Page loads with role options
2. Click “Freelancer”	Click button	Redirects to Freelancer Registration page
3. Click “Company”	Click button	Redirects to Company Registration page
4. Click “Team”	Click button	Redirects to Team Registration page
5. Click “Back to Login”	Click link	Redirects to Login page
Post Condition: • Role selection and navigation work correctly.		

Test Case: Freelancer Registration

Project Name: Robo Hatch		Test Designed by: Basudeb Kundu
Test Case ID: RH_002		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Basudeb Kundu
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify freelancer registration input validation and submission		
Description**:** This test ensures that all login-related fields, checkboxes, social buttons, and links function correctly on the login page.		
Precondition (If any): • Freelancer registration page is accessible		
Test Steps	Test Data	Expected Results
1. Go to the login page		Registration form loads successfully
2. Enter email and password	Dip Khastagir	Input accepted
3. Click “Remember Me” checkbox	dipkhastagir@example.com	Email field accepts valid email
4. Click “Sign In” button	Abcd1234!	Password meets requirements
5. Click “Forgot Password”	Abcd1234!	Confirm matches password
6. Click “Continue with	Check checkbox	Checkbox toggles

Google”		
7. Click “Continue with Facebook”	Click button	Registration succeeds, redirected to verification
Post Condition: • Freelancer is registered and sent to email/phone verification.		

Test Case: Company Registration

Project Name: Robo Hatch		Test Designed by: Basudeb Kundu
Test Case ID: RH_003		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Basudeb Kundu
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify company registration input validation and document upload		
Description: Ensure company registration accepts valid inputs and verification documents upload.		
Precondition (If any): • Company registration page is accessible		
Test Steps	Test Data	Expected Results
1. Open company registration		Registration form loads successfully
2. Enter valid company name	ABC Robotics	Input accepted
3. Enter company email	contact@abcrobotics.com	Email field accepts valid email
4. Upload verification doc	Valid business license	File uploaded successfully
5. Accept terms and conditions	Check checkbox	Checkbox toggles
6. Click “Sign Up” button	Click button	Registration succeeds, redirected to verification
Post Condition: • Company is registered and verification pending.		

Test Case: Team Registration

Project Name: Robo Hatch	Test Designed by: Dip Khastagir
Test Case ID: RH_004	Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High	Test Executed by: Dip Khastagir

Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify team registration with minimum 10 members		
Description: Ensure team registration form collects details and enforces member count.		
Precondition (If any): • Team registration page is accessible. • User has necessary information for all team members.		
Test Step	Test Data / Input	Expected Result
1. Open Team Registration page	Navigate to Team Registration URL/page	Team registration form loads successfully
2. Enter Team Name	"Future Bot Team"	Team Name input accepts text
3. Enter Member 1 Name	"Dip Khastagir"	Member 1 Name field accepts input
4. Enter Member 1 Email	"dipkhastagir@example.com"	Member 1 Email field accepts valid email
5. Enter Member 1 Role	"Mechanical Engineer"	Member 1 Role input accepted
Enter Member 1 Field of Study	"Robotics"	Member 1 Field of Study input accepted
6. Repeat steps 3–6 for Members 2 to 9	Valid info for each member	Each member's details accepted
7. Enter Member 10 Name	"John Doe"	Member 10 Name field accepts input
8. Enter Member 10 Email	"dipuroy@example.com"	Member 10 Email field accepts valid email
9. Enter Member 10 Role	"Software Developer"	Member 10 Role input accepted
10. Enter Member 10 Field of Study	"Computer Science"	Member 10 Field of Study input accepted
11. Try to submit form with only 9 members	Leave Member 10 empty or incomplete	Validation error: "At least 10 members required"
12. Complete all member fields (10 members)	All inputs valid	All member fields accepted without errors
13. Check "Agree to Terms & Conditions" checkbox	Click checkbox	Checkbox is checked
14. Click "Sign Up" button	Click button	Registration submitted successfully; redirect to verification page
Post Condition: • The team is registered successfully with at least 10 valid members. • Team is redirected to email/phone verification step. • Validation errors shown if team member count is insufficient or data is invalid.		

Test Case: Email/Phone Verification

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_005		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify OTP input and resend functionality		
Description: Ensure users can enter OTP and request resend if needed.		
Precondition (If any): • Verification code sent to email or phone.		
Test Steps	Test Data	Expected Results
1.Open verification page	N/A	Page loads with 6 input boxes
2.Enter correct OTP	123456	OTP accepted, proceed to next page
3.Enter invalid OTP	000000	Error message displayed
4.Click “Resend Code”	Click button	New OTP sent, confirmation message shown
5.Timeout for OTP input	Wait 5 minutes	OTP expired message and resend option active
Post Condition: • OTP verification completed or resend handled correctly.		

Test Case: Password Recovery

Project Name: Robo Hatch		Test Designed by: Basudeb Kundu
Test Case ID: RH_006		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Basudeb Kundu
Module Name: Authentication		Test Execution date:25/05/2025
Test Title: Verify password reset request and validation		
Description: Test password recovery form input and response.		
Precondition: • Password recovery page accessible		
Test Steps	Test Data	Expected Results
1. Open password recovery page		Form loads with email input
2. Enter registered email	nijhum@example.com	Input accepted

3. Submit recovery request	Click “Send Reset Link”	Confirmation message shown
4. Enter unregistered email	nirjhor@noemail.com	Error message shown
5. Click back to login	Click link	Redirects to login page
Post Condition: • Password recovery requests processed correctly.		

Test Case: Profile Setup Wizard

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_007		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify multi-step profile setup and data validation.		
Description: Ensure profile wizard collects data correctly across steps..		
Precondition: • User logged in and first time accessing profile setup		
Test Steps	Test Data	Expected Results
1. Open profile setup wizard	N/A	Step 1 (Basic Info) loads
2. Enter valid name and email	Dip Khastagir, dipkhastagir@example.com	Inputs accepted
3. Click Next	Click button	Moves to Step 2 (Skills)
4. Enter skills and experience	Robotics, 3 years	Inputs accepted
5. Click Next	Click button	Moves to Step 3 (Portfolio)
6. Upload portfolio files	Valid files	Files accepted
7. Click Finish	Click button	Profile saved, redirected to dashboard
Post Condition: • Profile data saved and wizard completes successfully.		

Test Case: Freelancer Dashboard Overview

Project Name: Robo Hatch	Test Designed by: Dip Khastagir
Test Case ID: RH_008	Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High	Test Executed by: Dip Khastagir

Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify dashboard display of projects, notifications, and AI suggestions		
Description: Check that dashboard widgets load correct data and navigation works.		
Precondition: • User logged in as freelancer with active projects		
Test Steps	Test Data	Expected Results
1. Load freelancer dashboard		Dashboard loads with stats and widgets
2. Click on project card	Click project	Redirects to project details
3. Check notifications		Notifications list shows new alerts
4. Click AI suggestions	Click suggestion	Opens AI suggestions page
Post Condition: • Dashboard functions as expected with updated data.		

Test Case: AI Based Project Suggestions

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_009		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify personalized AI project suggestions and refresh		
Description: Ensure AI suggestions are relevant and refresh updates the list.		
Precondition: • Freelancer profile complete with skills		
Test Steps	Test Data	Expected Results
1. Open AI suggestions page		Suggestions list loads
2. Review suggested project	Click project card	Project details displayed
3. Click “Refresh Suggestions”	Click button	New suggestions generated
Post Condition: • AI suggestions relevant and refresh properly.		

Test Case: Password Strength Validation

Project Name: Robo Hatch	Test Designed by: Dip Khastagir

Test Case ID: RH_010		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify personalized AI project suggestions and refresh		
Description: Ensure AI suggestions are relevant and refresh updates the list.		
Precondition: • Registration or password reset page is open		
Test Steps	Test Data	Expected Results
1. Enter short password	“abc123”	Show error: "Password too short"
2. Enter password without numbers	“abcdefgh”	Show error: "Include numbers"
3. Enter password without uppercase	“abc1234!”	Show error: "Include uppercase letter"
4. Enter strong password	“Abc1234!”	Accept password, no errors
5. Submit form with strong password	Click submit	Registration/password change proceeds
Post Condition: • Password strength validated and enforced.		

Test Case: Email Confirmation Link

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_011		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): Medium		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify personalized AI project suggestions and refresh		
Description: Ensure AI suggestions are relevant and refresh updates the list.		
Precondition: • New user registered with valid email		
Test Steps	Test Data	Expected Results
1. Register new account	Valid email	Confirmation email sent
2. Click confirmation link	Click link in email	Account marked as active
3. Attempt login before confirm	Attempt login	Denied with “Confirm email” message

4. Attempt login after confirm	Attempt login	Login succeeds
Post Condition: • Email confirmation activates the user account.		

Test Case: Multi Factor Authentication (MFA)

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_012		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): Medium		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify MFA prompt and validation during login		
Description: Ensure MFA code is required after password and correctly validated.		
Precondition: • MFA enabled for user account		
Test Steps	Test Data	Expected Results
1. Login with username/password	Valid credentials	Prompt for MFA code displayed
2. Enter correct MFA code	Valid code	Login success and dashboard loads
3. Enter invalid MFA code	Wrong code	Error message displayed
4. Request new MFA code	Click resend	New code sent and prompt refreshed
Post Condition: • MFA process functions as expected.		

Test Case: Freelancer Messaging Functionality

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_013		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify freelancer can send and receive messages with file attachments		
Description: Check chat functionality, message delivery, and file upload.		
Preconditions: • Freelancer and company/team user logged in		
Test Steps	Test Data	Expected Results

1. Open messaging center		Messages load successfully
2. Send text message	"Hello, I am interested"	Message appears in chat
3. Receive reply	From other user	Message received
4. Upload file attachment	Upload PDF or image	File attached and sent successfully
Post Condition: • Messaging system works with text and file.		

Test Case: Freelancer Notification Display

Project Name: Robo Hatch		Test Designed by: Dip Khastagir
Test Case ID: RH_014		Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): Medium		Test Executed by: Dip Khastagir
Module Name: Authentication		Test Execution date: 25/05/2025
Test Title: Verify notifications show correct alerts and link to related pages		
Description: Check notification display and click through.		
Precondition: • User has new notifications		
Test Steps	Test Data	Expected Results
1. Open notifications center		Notifications list loads
2. Click notification	Click first alert	Redirects to relevant page
3. Clear notification	Click clear	Notification removed from list
Post Condition: • Notifications display and navigation work properly.		

Test Case: Submit Proposal

Project Name: Robo Hatch	Test Designed by: Dip Khastagir
Test Case ID: RH_015	Test Designed date: 23/05/2025
Test Priority (Low, Medium, High): High	Test Executed by: Dip Khastagir
Module Name: Authentication	Test Execution date: 25/05/2025
Test Title: Verify proposal submission for projects	
Description: Ensure freelancers can submit proposals with required data.	
Precondition:	

• Freelancer logged in and viewing project details		
Test Steps	Test Data	Expected Results
1. Open project details		Project details page loads
2. Click “Submit Proposal”	Click button	Proposal form opens
3. Enter proposal amount	500 USD	Input accepts value
4. Enter cover letter	“I have 5 years experience”	Text input accepted
5. Attach files	Resume.pdf	File uploads successfully
6. Submit proposal	Click submit	Confirmation message displayed
Post Condition: • Proposal is submitted and visible to company/team.		

7. WBS & EFFORT ESTIMATION

Work Breakdown Structure (WBS)

Serial	WBS Phase	Task	Sub Task	Duration	Resources	Predecessor
1	Planning	Requirement Gathering	Stakeholder meetings	2 days	System Analyst, Project Manager	
			Needs analysis & documentation	3 days	System Analyst	
		Feasibility Study	Technical feasibility	1 day	Project Manager	1
			Legal & regulatory review	1 day	Security Analyst	1
			Financial assessment	1 day	Project Manager	1
		Risk Analysis	Identify key risks	1 day	QA, Project Manager	2

			Mitigation strategy development	1 day	Security Analyst	2
2	Design	UI/UX Design	Create wireframes	3 days	UI/UX Designer	3
			Design user flows	2 days	UI/UX Designer	3
			Build interactive prototypes	2 days	UI/UX Designer	3
		Database Design	ER Diagram creation	2 days	DBA	3
			Schema design & normalization	2 days	DBA	3
		System Architecture	Define modules and tech stack	2 days	Project Manager	3
			Define data flow & integration plans	3 days	Backend Developer	3
3	Development (Iter 1)	Authentication Module	Registration & login UI	2 days	Frontend Developer	4,5,6
			Backend: login, OTP, 2FA logic	3 days	Backend Developer	4,5,6
		User Roles & Dashboards	Freelancer dashboard	2 days	Frontend Developer	7
			Company/Team dashboard	2 days	Frontend Developer	7
			Admin dashboard	1 day	Backend Developer	7

		Research Upload Module	File validation	2 days	Backend Developer	8
			Preview and licensing UI	2 days	Frontend Developer	8
		CAD Upload Module	Format filtering	2 days	Backend Developer	8
			Purchase logic and UI	2 days	Frontend Developer	8
4	Development (Iter 2)	AI Matching Engine	Collect preferences and train ML model	4 days	AI/ML Engineer	9,10
			Integrate matching with tasks	4 days	AI/ML Engineer	9,10
		Task Assignment Module	Task assignment interface	2 days	Frontend Developer	11
			Accept/Reject logic	3 days	Backend Developer	11
		Marketplace Module	Project listing UI	2 days	Frontend Developer	12
			Media preview and pricing logic	4 days	Backend Developer	12
5	Integration & Testing	Unit Testing	Write test cases per module	3 days	QA Engineer	13
			Execute and document results	2 days	QA Engineer	13
		Integration Testing	Scenario planning and setup	2 days	QA Engineer	14

			System integration verification	3 days	QA Engineer	14
		Security Testing	Encryption and auth testing	2 days	Security Analyst	15
			GDPR/data compliance audit	1 day	QA, Security Analyst	15
6	Deployment	Server Setup	AWS/Azure instance setup	2 days	DevOps Engineer	16
			Domain, DNS, backup setup	1 day	DevOps Engineer	16
		CI/CD Pipeline	Docker setup and GitHub Actions	2 days	DevOps Engineer	17
			Kubernetes deployment configuration	2 days	DevOps Engineer	17
		Production Launch	Final staging test	1 day	Entire Team	18
			Go-live and monitoring	1 day	Entire Team	18
7	Feedback & Maintenance	Monitor Feedback	Setup feedback collection and bug logs	1 day	Project Manager, QA	19
			Analyze feedback reports	Ongoing	UI/UX Designer	19
		System Updates	Patch deployment	Iterative	Backend, Frontend	20
			New feature rollout	Iterative	Entire Dev Team	20

Effort Estimation Table

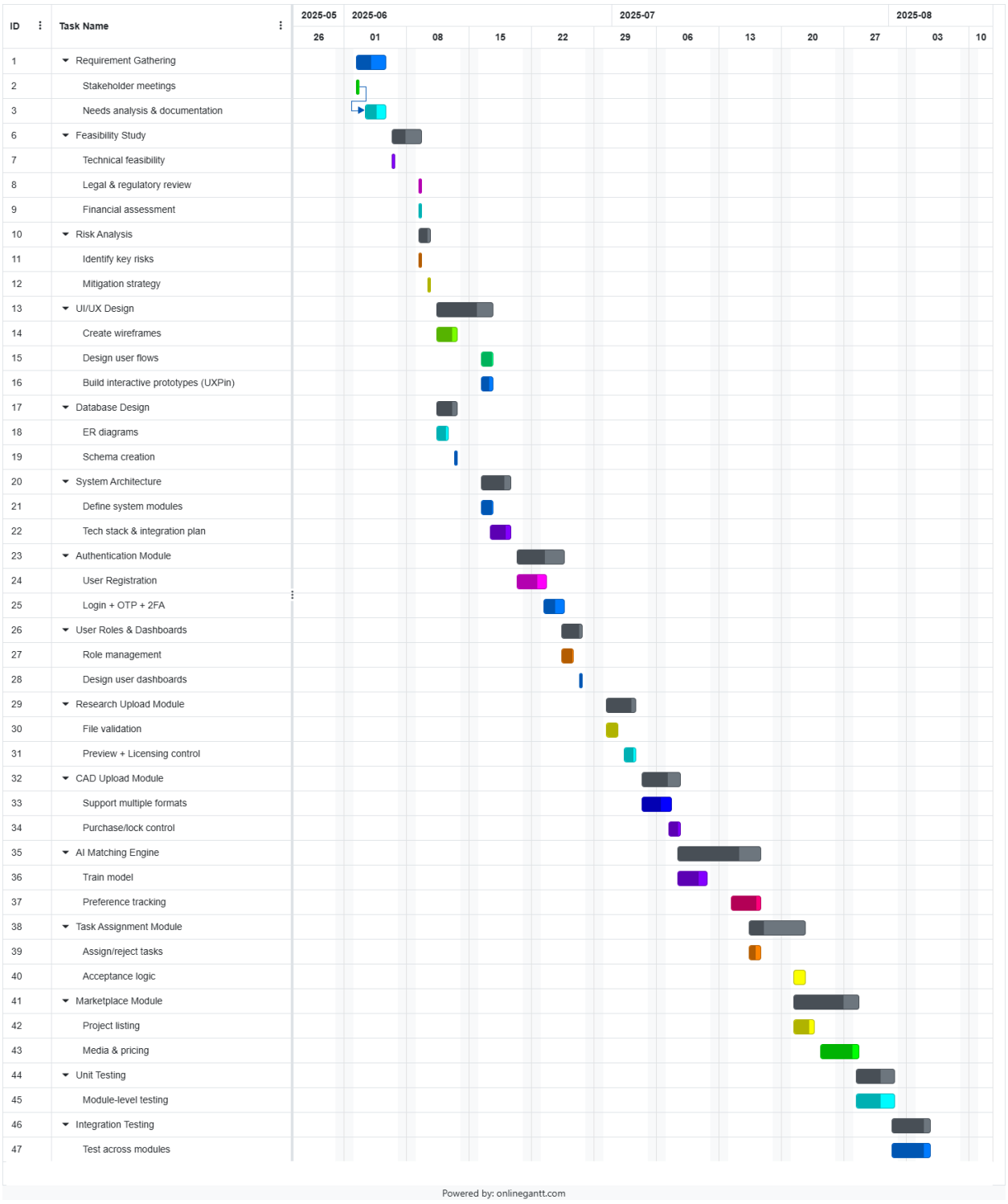
ID	Task	Duration	Start Date	End Date	Working Hour	Role/Position	Dependency
1	Stakeholder meetings	1 day	2025-03-01	2025-03-01	8	Project Manager	
2	Needs analysis & documentation	2 days	2025-03-02	2025-03-03	16	Business Analyst	
3	Technical feasibility	1 day	2025-03-04	2025-03-04	8	Technical Analyst	1
4	Legal & regulatory review	1 day	2025-03-05	2025-03-05	8	Legal Advisor	1
5	Financial assessment	1 day	2025-03-06	2025-03-06	8	Finance Officer	1
6	Identify key risks	1 day	2025-03-07	2025-03-07	8	Risk Analyst	2
7	Mitigation strategy development	1 day	2025-03-08	2025-03-08	8	Project Manager	2
8	Create wireframes	2 days	2025-03-09	2025-03-10	16	UI/UX Designer	3
9	Design user flows	2 days	2025-03-11	2025-03-12	16	UI/UX Designer	3
10	Build interactive prototypes	3 days	2025-03-13	2025-03-15	24	UI/UX Designer	3
11	ER Diagram creation	1 day	2025-03-16	2025-03-16	8	DBA	3
12	Schema design & normalization	2 days	2025-03-17	2025-03-18	16	DBA	3

13	Define modules and tech stack	2 days	2025-03-19	2025-03-20	16	System Architect	3
14	Define data flow & integration plans	2 days	2025-03-21	2025-03-22	16	System Architect	3
15	Registration & login UI	2 days	2025-03-23	2025-03-24	16	Frontend Developer	4,5,6
16	Backend: login, OTP, 2FA logic	3 days	2025-03-25	2025-03-27	24	Backend Developer	4,5,6
17	Freelancer dashboard	2 days	2025-03-28	2025-03-29	16	Frontend Developer	7
18	Company/Team dashboard	2 days	2025-03-30	2025-03-31	16	Frontend Developer	7
19	Admin dashboard	2 days	2025-04-01	2025-04-02	16	Admin	7
20	File validation	1 day	2025-04-03	2025-04-03	8	Backend Developer	8
21	Preview and licensing UI	2 days	2025-04-04	2025-04-05	16	Frontend Developer	8
22	Format filtering	1 day	2025-04-06	2025-04-06	8	Backend Developer	8
23	Purchase logic and UI	2 days	2025-04-07	2025-04-08	16	Frontend Developer	8
24	Collect preferences & train ML model	3 days	2025-04-09	2025-04-11	24	ML Engineer	9,10
25	Integrate matching with tasks	2 days	2025-04-12	2025-04-13	16	ML Engineer	9,10
26	Task assignment interface	2 days	2025-04-14	2025-04-15	16	Frontend Developer	11

27	Accept/Reject logic	1 day	2025-04-16	2025-04-16	8	Backend Developer	11
28	Project listing UI	2 days	2025-04-17	2025-04-18	16	Frontend Developer	12
29	Media preview and pricing logic	2 days	2025-04-19	2025-04-20	16	Frontend Developer	12
30	Write test cases per module	2 days	2025-04-21	2025-04-22	16	QA Engineer	13
31	Execute and document results	2 days	2025-04-23	2025-04-24	16	QA Engineer	13
32	Scenario planning and setup	1 day	2025-04-25	2025-04-25	8	QA Engineer	14
33	System integration verification	2 days	2025-04-26	2025-04-27	16	QA Engineer	14
34	Encryption and auth testing	2 days	2025-04-28	2025-04-29	16	Security Analyst	15
35	GDPR/data compliance audit	1 day	2025-04-30	2025-04-30	8	Security Analyst	15
36	AWS/Azure instance setup	1 day	2025-05-01	2025-05-01	8	DevOps Engineer	16
37	Domain, DNS, backup setup	1 day	2025-05-02	2025-05-02	8	DevOps Engineer	16
38	Docker setup and GitHub Actions	2 days	2025-05-03	2025-05-04	16	DevOps Engineer	17
39	Kubernetes deployment config	2 days	2025-05-05	2025-05-06	16	DevOps Engineer	17

40	Final staging test	1 day	2025-05-07	2025-05-07	8	QA Engineer	18
41	Go-live and monitoring	1 day	2025-05-08	2025-05-08	8	DevOps Engineer	18
42	Setup feedback & bug logs	1 day	2025-05-09	2025-05-09	8	QA Engineer	19
43	Analyze feedback reports	1 day	2025-05-10	2025-05-10	8	QA Engineer	19
44	Patch deployment	1 day	2025-05-11	2025-05-11	8	Backend Developer	20
45	New feature rollout	1 day	2025-05-12	2025-05-12	8	Frontend Developer	20

Gantt Chart


ID
Task Name
2025-05
2025-06
2025-07
2025-08
26
01
08
15
22
29
06
13
20
27
03
10
1 Requirement Gathering
2 Stakeholder meetings
3 Needs analysis & documentation
6 Feasibility Study
7 Technical feasibility
8 Legal & regulatory review
9 Financial assessment
10 Risk Analysis
11 Identify key risks
12 Mitigation strategy
13 UI/UX Design
14 Create wireframes
15 Design user flows
16 Build interactive prototypes (UXPin)
17 Database Design
18 ER diagrams
19 Schema creation
20 System Architecture
21 Define system modules
22 Tech stack & integration plan
23 Authentication Module
24 User Registration
25 Login + OTP + 2FA
26 User Roles & Dashboards
27 Role management
28 Design user dashboards
29 Research Upload Module
30 File validation
31 Preview + Licensing control
32 CAD Upload Module
33 Support multiple formats
34 Purchase/lock control
35 AI Matching Engine
36 Train model
37 Preference tracking
38 Task Assignment Module
39 Assign/reject tasks
40 Acceptance logic
41 Marketplace Module
42 Project listing
43 Media & pricing
44 Unit Testing
45 Module-level testing
46 Integration Testing
47 Test across modules
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8. ACTIVITY SCHEDULING AND RESOURCE ALLOCATION

Resource Allocation Table :

Serial	Task Name	Resources
1	Stakeholder meetings	Project Manager
2	Needs analysis & documentation	Business Analyst
3	Technical feasibility	Technical Analyst
4	Legal & regulatory review	Legal Advisor
5	Financial assessment	Finance Officer
6	Identify key risks	Risk Analyst
7	Mitigation strategy development	Project Manager
8	Create wireframes	UI/UX Designer
9	Design user flows	UI/UX Designer
10	Build interactive prototypes	UI/UX Designer
11	ER Diagram creation	DBA
12	Schema design & normalization	DBA
13	Define modules and tech stack	System Architect
14	Define data flow & integration plans	System Architect
15	Registration & login UI	Frontend Developer
16	Backend: login, OTP, 2FA logic	Backend Developer
17	Freelancer dashboard	Frontend Developer
18	Company/Team dashboard	Frontend Developer
19	Admin dashboard	Admin
20	File validation	Backend Developer
21	Preview and licensing UI	Frontend Developer
22	Format filtering	Backend Developer
23	Purchase logic and UI	Frontend Developer

24	Collect preferences & train ML model	ML Engineer
25	Integrate matching with tasks	ML Engineer
26	Task assignment interface	Frontend Developer
27	Accept/Reject logic	Backend Developer
28	Project listing UI	Frontend Developer
29	Media preview and pricing logic	Frontend Developer
30	Write test cases per module	QA Engineer
31	Execute and document results	QA Engineer
32	Scenario planning and setup	QA Engineer
33	System integration verification	QA Engineer
34	Encryption and auth testing	Security Analyst
35	GDPR/data compliance audit	QA + Security Analyst
36	AWS/Azure instance setup	DevOps Engineer
37	Domain, DNS, backup setup	DevOps Engineer
38	Docker setup and GitHub Actions	DevOps Engineer
39	Kubernetes deployment configuration	DevOps Engineer
40	Final staging test	QA Engineer
41	Go-live and monitoring	DevOps Engineer
42	Setup feedback & bug logs	QA Engineer
43	Analyze feedback reports	QA Engineer
44	Patch deployment	Backend Developer
45	New feature rollout	Frontend Developer

Schedule planning of tasks:

	Task Name	Duration	Predecessor(s)
1.	Stakeholder meetings	1 day	—
2.	Needs analysis & documentation	2 days	—

3.	Technical feasibility	1 day	1
4.	Legal & regulatory review	1 day	1
5.	Financial assessment	1 day	1
6.	Identify key risks	1 day	2
7.	Mitigation strategy development	1 day	2
8.	Create wireframes	2 days	3
9.	Design user flows	2 days	3
10.	Build interactive prototypes	3 days	3
11.	ER Diagram creation	1 day	3
12.	Schema design & normalization	2 days	3
13.	Define modules and tech stack	2 days	3
14.	Define data flow & integration plans	2 days	3
15.	Registration & login UI	2 days	4, 5, 6
16.	Backend: login, OTP, 2FA logic	3 days	4, 5, 6
17.	Freelancer dashboard	2 days	7
18.	Company/Team dashboard	2 days	7
19.	Admin dashboard	2 days	7
20.	File validation	1 day	8
21.	Preview and licensing UI	2 days	8
22.	Format filtering	1 day	8
23.	Purchase logic and UI	2 days	8
24.	Collect preferences & train ML model	3 days	9, 10
25.	Integrate matching with tasks	2 days	9, 10
26.	Task assignment interface	2 days	11
27.	Accept/Reject logic	1 day	11
28.	Project listing UI	2 days	12

29.	Media preview and pricing logic	2 days	12
30.	Write test cases per module	2 days	13
31.	Execute and document results	2 days	13
32.	Scenario planning and setup	1 day	14
33.	System integration verification	2 days	14
34.	Encryption and auth testing	2 days	15
35.	GDPR/data compliance audit	1 day	15
36.	AWS/Azure instance setup	1 day	16
37.	Domain, DNS, backup setup	1 day	16
38.	Docker setup and GitHub Actions	2 days	17
39.	Kubernetes deployment configuration	2 days	17
40.	Final staging test	1 day	18
41.	Go-live and monitoring	1 day	18
42.	Setup feedback & bug logs	1 day	19
43.	Analyze feedback reports	1 day	19
44.	Patch deployment	1 day	20
45.	New feature rollout	1 day	20

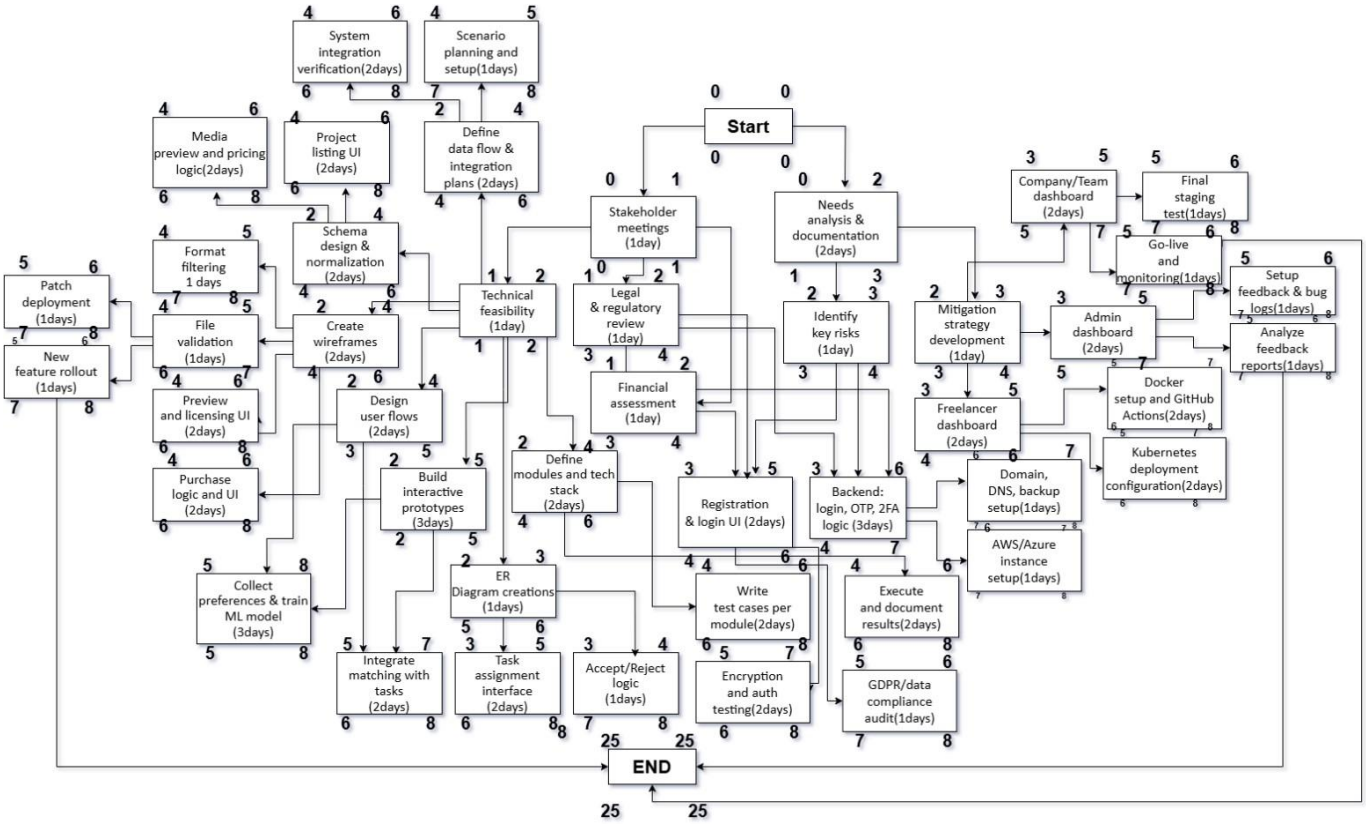

Figure: Activity Scheduling in Network Diagram

9. EVA ANALYSIS AND RISK MANAGEMENT

Effort Table:

No.	Project Tasks	Planned Effort (hrs)	Actual Effort (hrs)
1	Stakeholder Identification	2	2
2	Initial Requirement Gathering	3	3
3	Competitive Analysis	2	2
4	Feature Brainstorming & Categorization	3	3
5	Technical Feasibility Study	2	2
6	Legal and GDPR Feasibility Review	2	2
7	Financial Viability Study	2	2
8	Risk Identification Workshop	2	2
9	Risk Mitigation Planning	2	2
10	Project Charter Finalization	1	1
11	User Role Matrix Design	2	2
12	Functional Requirement Specification	3	3
13	Non-Functional Requirement Spec	2	2
14	Use Case Modeling (All roles)	4	4
15	Flowchart Creation (Process-level)	2	2
16	UI Wireframes (Freelancer side)	2	2
17	UI Wireframes (Company/Team)	2	2
18	UI Wireframes (Admin)	2	2
19	User Journey Mapping	2	2
20	Prototyping (Low-Fidelity)	3	3
21	Prototyping (High-Fidelity)	3	3
22	Feedback Collection (Prototype)	2	2
23	Adjustments from UI feedback	2	2

24	Entity Relationship Diagram (ERD)	2	2
25	Database Schema Design	3	3
26	DB Normalization	2	2
27	Table Indexing & Optimization	2	2
28	Tech Stack Finalization	1	1
29	Backend Framework Setup	2	2
30	Frontend Framework Setup	2	2
31	Version Control (GitHub Repository)	1	1
32	Registration Module – UI	2	2
33	Registration Module – Logic	2	2
34	Email/OTP Verification Logic	2	2
35	Login, Logout, Session Handling	3	3
36	Forgot Password, 2FA Logic	2	2
37	Freelancer Dashboard – UI	2	2
38	Freelancer Dashboard – Backend	2	2
39	Company Dashboard – UI	2	2
40	Company Dashboard – Backend	2	2
41	Admin Dashboard (All Controls)	3	3
42	Research Upload UI	2	2
43	Research Upload Validation	2	2
44	Research Licensing and Pricing	2	2
45	CAD Upload UI	2	2
46	CAD Upload Validation & Parsing	2	2
47	CAD Purchase & Preview Logic	3	3
48	Task Posting by Companies	2	2
49	Task Matching Logic (AI Input)	3	3

50	Freelancer Application System	2	2
51	Company Task Approval System	2	2
52	AI Preference Collection Form	2	2
53	AI Model Development (ML Flow)	4	4
54	AI Matching – Training	3	3
55	Matching Engine – Integration	3	3
56	Matching Result Evaluation	2	2
57	Match Scoring and Ranking	2	2
58	Skill-based Filtering System	2	2
59	Review & Rating Engine	2	2
60	Wallet System (Top-up, Withdrawal)	3	3
61	Transaction History Module	2	2
62	Escrow Logic for Payments	3	3
63	Admin Finance Dashboard	2	2
64	Chat Module (Freelancer, Company)	3	3
65	Message History Storage	2	2
66	Notification Module	2	2
67	Notification Preferences Panel	1	1
68	Community Feed UI	2	2
69	Feed Moderation Logic	2	2
70	Sponsorship Portal – UI	2	2
71	Sponsorship Request Logic	2	2
72	Project Delivery Management Panel	2	2
73	Feedback Collection UI	2	2
74	Feedback Analysis Dashboard	2	2
75	Admin Reports – Usage Metrics	2	2

76	GDPR Compliance Module	2	2
77	Security Audit Tools Integration	2	2
78	File Encryption Logic	2	2
79	Intrusion Detection Alert System	2	2
80	Patch Management Panel	2	2
81	Dynamic Role Permission Logic	2	2
82	Test Case Writing – Unit	3	3
83	Test Execution – Unit	3	3
84	Test Case Writing – Integration	2	2
85	Test Execution – Integration	3	3
86	Test Case Writing – Security	2	2
87	Test Execution – Security	2	2
88	Load Testing & Metrics	2	2
89	Regression Testing Rounds	2	2
90	Final System Testing	2	2
91	Setup – AWS EC2 & S3	2	2
92	Setup – Azure Backup	2	2
93	Setup – DNS & SSL	2	2
94	CI/CD Pipeline via GitHub Actions	2	2
95	Docker Containerization	2	2
96	Kubernetes Deployment (Staging)	2	2
97	Final QA in Staging	2	2
98	Production Deployment	2	2
99	Post-launch Monitoring	2	2
100	Crash Report System	2	2
101	Bug Reporting Portal	2	2

102	Post-launch Patch Deployment	2	2
103	User Training Docs	2	2
104	Live Training Sessions	2	2
105	Tutorial Video Production	2	2
106	Launch Event Planning	2	2
107	Public Relations Content	2	2
108	Social Media Campaign	2	2
109	Newsletter Integration	1	1
110	Early Access Program Management	2	2
111	Onboarding Enhancements	2	2
112	Community Moderation Panel	2	2
113	Project Showcase UI	2	2
114	Freelance Leaderboard & Gamification	2	2
115	Role Upgrade Automation	2	2
116	Sponsor Approval Workflow	2	2
117	Project Revisions Management	2	2
118	Feedback-Based Iterations	2	2
119	Project Archiving System	1	1
120	Documentation Finalization	2	2
121	Final Project Review with Stakeholders	2	2

Total Effort: BAC (Planned Effort) = ~250 hours

EVA Calculations:

Metric	**Value**
BAC (Budget at Completion)	250 hrs
BCWP (Earned Value)	215 hrs
BCWS (Planned Value)	230 hrs

ACWP (Actual Cost)	200 hrs
SPI (Schedule Performance Index)	0.935 (BCWP / BCWS)
SV (Schedule Variance)	-15 hrs (BCWP - BCWS)
CPI (Cost Performance Index)	1.075 (BCWP / ACWP)
CV (Cost Variance)	15 hrs (BCWP - ACWP)

Performance Indicators

Indicator	Status	Meaning
SPI < 1	Behind Schedule	You're delivering less value than planned in the same time.
CPI > 1	Under Budget	You're spending less than planned to deliver the earned value.
SV < 0	Negative	You're 15 hours behind your original plan.
CV > 0	Positive	You're saving 15 hours' worth of cost.

Completion Percentages

Metric	Value
% Schedule Completion (BCWS / BAC)	92% (230 / 250)
% Work Completed (BCWP / BAC)	86% (215 / 250)

Explanation of EVA for Robo Hatch

The Earned Value Analysis (EVA) reveals how the Robo Hatch project is performing in terms of schedule and budget:

- The total planned effort (BAC) is 250 hours.
- 230 hours of work were scheduled to be completed (BCWS), and 215 hours of actual value was earned (BCWP).
- This means the project is behind schedule, with a Schedule Performance Index (SPI) of 0.935, and a Schedule Variance (SV) of -15 hours.
- The actual cost incurred (ACWP) is 200 hours, meaning the team is under budget.

- The Cost Performance Index (CPI) is 1.075 and the Cost Variance (CV) is 15 hours indicating efficient resource utilization.

Risk Management

Risk	Category	Probability	Impact	Risk Mitigation, Monitoring, Management
1. Underestimation of development effort	Project Scope	65%	3	Mitigation: Break down tasks in detail with buffer. Monitoring: Weekly progress reviews against milestones. Management: Add flexible sprint backlog for overflows.
2. Hardware team delay (due to supply chain issues)	Technical Execution	60%	3	Mitigation: Pre-order critical parts and define alternate vendors. Monitoring: Track shipping timelines. Management: Maintain buffer in hardware phases.
3. AI model accuracy fails for task-user mapping	AI and Data	50%	2	Mitigation: Use hybrid rule-based fallback logic. Monitoring: Measure success rate in live testing. Management: Retrain model and allow manual override.
4. Security vulnerability in freelancing module	Compliance and Security	70%	3	Mitigation: Perform code audits and threat modeling. Monitoring: Set up intrusion detection, audit logs. Management: Regular patching and pen-testing.
5. User adoption resistance (new platform behavior)	Business/User	50%	2	Mitigation: Early user demos and onboarding flows. Monitoring: Track usage behavior analytics.

				Management: Incentivize usage, update based on feedback.
6. Cloud infrastructure scalability bottleneck	Deployment and Environment	40%	2	Mitigation: Use scalable cloud services (K8s, autoscaling). Monitoring: Cloud dashboards & load tests. Management: Adjust resources based on load metrics.
7. Misalignment between freelancer and company expectations	Business/User	55%	3	Mitigation: Define clear task requirements and contracts. Monitoring: Project manager moderates task delivery. Management: Add milestone payments and conflict resolution features.
8. GDPR or local compliance gaps in data handling	Compliance and Security	50%	2	Mitigation: Data encryption and pseudonymization. Monitoring: Conduct audits and maintain logs. Management: Align platform with legal advisor review.
9. Multiple team dependencies cause bottlenecks	Project Scope	60%	3	Mitigation: Use dependency maps and cross-team sync-ups. Monitoring: Blocker tracking in task boards. Management: Adjust task sequencing and ownership quickly.
10. Talent availability gap for specialized AI tasks	Human Resources	40%	3	Mitigation: Hire early or outsource niche AI work. Monitoring: Skill matrix tracking and training schedules. Management:

				Maintain freelancer bench or backups.
11. Server cost overruns (esp. in testing and deployment)	Compliance and Security	55%	2	Mitigation: Use test environments and reserved instances. Monitoring: Track billing and resource usage. Management: Set hard budget alerts and limit resource-intensive tasks.
12. Poor cross-platform UX performance	Technical Execution	50%	2	Mitigation: Cross-device testing from day one. Monitoring: Browser/device testing logs. Management: Refactor with adaptive design components.
13. Delay in sponsor payouts or payments	Business/User	45%	3	Mitigation: Use escrow or milestone payment plans. Monitoring: Automate payment tracking. Management: Lock work delivery to payment fulfillment.
14. Version conflicts during rapid module updates	Technical Execution	60%	2	Mitigation: Set code freeze dates before major merges. Monitoring: CI/CD version logs. Management: Enforce semantic versioning and rollback tools.
15. Misuse of community features (abuse, spam)	Business/User	40%	2	Mitigation: Use content moderation tools. Monitoring: Flag reports and suspicious activity. Management: Set up moderation team or AI auto-flagging.