



Software Engineering project 2023/2024

Ca' Foscari University of Venice

Project plan
1.0

AgileMasters

17/10/2023



Document Informations

NomeProgetto	Acronimo
Deliverable	Project plan
Delivery date	17/10/2023
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Document History

Version	Issue Date	Stage	Changes	Contributors (reviewer)
0.1	03 /10/2023	Draft	Finish chapter 1	891923, (892539)
0.2	04/10/2023	Draft	Finish chapter 2	892614, (891923)
0.3	07/10/2023	Draft	Finish chapter 3	892539, (892614)
0.4	11/10/2023	Draft	Finish chapter 4	892539, (891923)
0.5	16/10/2023	Draft	Finish chapter 5	892539, (891923)
1.0	16/10/2023	Final	Finish document	(892614, 891923, 892539)



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1. Introduction

1.1. Overview of the project

The proposed project endeavors to develop a sophisticated suite of digital financial tools, designed to empower users with **advanced AI** and real-time **data analytics** capabilities. This suite is conceptualized to be a **multifaceted platform**, offering services such as a **virtual financial advisor**, real-time **arbitrage monitoring**, a user-centric **news** platform, a **portfolio simulation** tool, and an **educational financial chatbot**.

The core aspiration of this project is to **amalgamate technology and finance**, creating a seamless and intuitive user experience. The suite is designed to not only guide users in optimizing their investments but also to enlighten them on market trends, potential risks, and growth opportunities, ensuring they are well-informed and proactive in their financial journey

1.2. Project deliverables

This project is structured around a series of meticulously planned deliverables, each serving as a milestone towards the completion of the comprehensive suite of digital financial tools. These deliverables are designed to ensure the systematic development and refinement of the project, allowing for continuous assessment and alignment with the project's objectives.

1.2.1. Delivery schedule

The delivery schedule is as follows:

Deliverable	Due date
Project Team Setup	26/09/2023
D0: Project Proposal	03/10/2023
D1: Project Plan	17/10/2023
D2: Requirements Document	31/10/2023
D3: Testing Plan	14/11/2023
D4: Design Document	28/11/2023
D5: Source Code v.1.0	15/12/2023
D6: Source Code v.1.1 & Documents Alignment	15/01/2024

Table 1.1: Delivery Schedule



1.2.2. Description of deliverables

- **Project Team Setup (26/09/2023):** Formation and definition of the working groups responsible for the various components of the project.
- **D0: Project Proposal (03/10/2023):** Submission of the initial proposal outlining the project's objectives, scope, and preliminary plan.
- **D1: Project Plan (17/10/2023):** Development and submission of the project plan detailing the project's roadmap, milestones, and timelines.
- **D2: Requirements Document (31/10/2023):** Compilation of the requirements document specifying the project's functional and non-functional requirements.
- **D3: Testing Plan (14/11/2023):** Formulation of the testing plan outlining the testing strategies, methodologies, and criteria for the project.
- **D4: Design Document (28/11/2023):** Creation of the design document detailing the project's architecture, design principles, and components.
- **D5: Source Code v.1.0 (15/12/2023):** Development and submission of Version 1.0 of the source code, incorporating all the planned features and functionalities.
- **D6: Source Code v.1.1 & Documents Alignment (15/01/2023):** Submission of Version 1.1 of the source code along with aligned documentation, reflecting any updates, enhancements, or modifications made to the project.

Each deliverable is crucial, serving as a stepping stone towards the realization of the project's vision to create a comprehensive suite of digital financial tools leveraging advanced AI and real-time data analytics.

1.3. Project evolution

This project, initially conceived as a component of a university project, holds substantial potential for further development and refinement beyond the academic environment. The suite of digital financial tools developed through this project can be evolved and enhanced to meet the dynamic needs of the market, potentially becoming a valuable asset in the financial technology sector.

1.3.1. Post-Academic development

Post the university examination, the team is open to continuing the development of the project, focusing on refining the existing features, addressing any identified shortcomings, and possibly introducing new functionalities to enhance the overall user experience and value proposition of the suite.

- **Enhancements and Optimizations:** The existing features and functionalities can be optimized and enhanced to ensure better performance, reliability, and user satisfaction. This includes refining the AI algorithms, improving the real-time data analytics capabilities, and optimizing the user interface and experience.



- **New Functionalities:** Based on user feedback and market demands, new functionalities and features can be introduced to the suite, expanding its capabilities and addressing a wider range of user needs and preferences
- **Market Alignment:** Continuous market analysis will be conducted to align the suite with the latest trends, technologies, and demands in the financial technology sector, ensuring its relevance and competitiveness in the market

The team envisions the possibility of making the product available to the market, subject to extensive testing, validation, and refinement to ensure its reliability, security, and compliance with industry standards and regulations. The suite can be offered as a comprehensive solution to individuals seeking advanced, personalized, and reliable digital financial tools, thereby contributing to the democratization of financial knowledge and empowerment.

1.3.2. Sustainability and Scalability

The project will be developed with sustainability and scalability in mind, ensuring its **adaptability** to changing market conditions, user needs, and technological advancements. This involves adopting best practices in software development, maintaining a modular and extensible architecture, and ensuring the continuous improvement and upgradation of the suite.

The evolution of this project can have a significant impact on the financial technology sector, providing users with advanced tools and resources to make informed financial decisions, optimize their investments, and enhance their financial literacy. By combining AI and real-time data analytics, the suite can revolutionize the way individuals interact with financial information, fostering a more informed and financially empowered society.

1.4. Reference materials

The materials used to draft the project plan are listed below:

- Slides provided by the professor during the course to give guidance on the content of each paragraph;
- Projects from previous years provided on the Moodle platform;
- Online documents and data to calculate average budget and resources;
- Project Libre, a free software for designing the Gantt chart and activity graph;
- Edrawmax, software with some free features for creating diagrams, used for the WBS."

1.5. Definitions and abbreviations

Agile: An approach to project management and product development that focuses on iterative development cycles, collaboration among cross-functional teams, and rapid response to changes.

Backend: The part of an application or system that handles the logic, databases, and server operations. It is not directly accessible to end users.

Codebase: The entire collection of source code used to build a specific application or software.

Continuous: In a software development context, it often refers to practices like Continuous Integration (CI) and Continuous Delivery (CD) aimed at improving the quality and speed of development.

Deliverable: Any tangible or intangible output produced as a result of a project.

Frontend: The part of an application or website with which the end user directly interacts.



Scrum: An Agile framework for product management and development.

API (Application Programming Interface): A set of definitions and protocols that allows different software entities to communicate with each other. It provides standard methods and tools for building software applications.

Discord: A communication platform that combines features of text chat, voice chat, and video chat. It is widely used for communication among gaming groups, communities, and work teams.

Backup: A copy of data stored in a location separate from the original. It's used to restore the original in the event of data loss or damage.

2. Project organization

2.1. Process Model

For the development of the **FinancialFlow** project, we opted for a combination of models to ensure efficiency, flexibility and quality of the final product. Given the client's specifications and expectations, the **waterfall model** will be our backbone. With a clear cadence for document delivery and a low degree of variability in requirements, this model allows for systematic planning and execution, delivering predictable results at every stage.

However, taking into account the remote nature of the team and the variety of skills among members, we will incorporate elements of the **evolutionary model**. This will ensure that we can adapt and refine the application iteratively, leveraging regular reviews to improve and refine the product, while ensuring that every team member is involved and valued in the process.

Even if the client prefers a traditional approach, the flexibility introduced by the evolutionary model will allow us to balance the rigid structure of the waterfall with a degree of adaptability, ensuring that we are equipped to deal with any unexpected challenges and opportunities that might arise during development.

Our combination of methodologies aims to combine the best of both worlds: the predictability and structure of the waterfall model, with the flexibility and adaptability of the evolutionary model. This blended approach is designed to maximize product quality, team efficiency, and customer satisfaction, while ensuring timely delivery of the financial application that conforms to the highest standards of quality and performance.

2.2. Organizational Structure

The organizational structure of our project is lean and **flexible**, consisting of a team of four highly skilled members working remotely. The team adopts an **Agile** methodology, effectively facilitated by an experienced **Scrum Master**, who is dedicated to organizing and optimizing the team's workflow. Tasks are created and assigned to developers through **clear and concise processes**, ensuring that each project phase is executed efficiently and accurately.

Communication is a key pillar in our structure. We use **Discord** as our main communication platform, ensuring timely and effective information flow between all team members. Despite the remote nature of



our work, we are committed to maintaining open and **constant communication**, simulating the collaboration and interaction of a traditional work environment.

Every important decision is made through **joint team agreement**. We value the skills and opinions of each member and believe that collaborative decisions lead to more innovative and robust results. The roles are distinct but integrated: the developer is in charge of developing the application, turning ideas into concrete, functional solutions, while the Scrum Master ensures that the team is synchronized, motivated and goal-oriented.

Our approach to remote collaboration is systematic and well-coordinated, ensuring that geographic distance does not compromise the quality of our work or the efficiency of our operations. Each member is committed to contributing expertise and dedication, ensuring the success of our project.

2.3. Organizational Interfaces

In the context of developing our **FinanceFlow** project, organizational interfaces play a crucial role in ensuring smooth communication and effective transfer of information between our development team and external entities. The team consists of four dedicated developers, with one of them also serving as Scrum Master, thus facilitating not only internal cohesion but also external interactions.

The main external interface is established between the Scrum Master and the **teacher**. In this dynamic, the Scrum Master assumes a position of **communicative leadership**, acting as a bridge between the internal world of the development process and the external expectations and requirements set by the teacher. This relationship is vitally important in aligning project deliverables with academic expectations and standards.

The Scrum Master is responsible for **collecting**, **processing**, and **presenting** relevant information to the teacher. This includes, but is not limited to, periodic project status updates, milestone deliverables, problem resolution, and feedback. This organizational structure is designed to ensure that communication is timely, accurate, and efficient.

It is paramount to ensure that this organizational interface is robust and reliable. Therefore, specific **procedures** and **protocols** have been implemented to ensure that communication is structured and systematic. These include standardized reports and dedicated communication channels to ensure that all parties are constantly aligned on the status and direction of the project. **Clarity**, **transparency** and **efficiency** are the pillars that support this organizational interface, ensuring the continued success of our financial application development project.

2.4. Responsibilities and Main Activities

Potentially every member of the group can contribute equally in the development of the project. However, it was decided to indicatively adopt the following division of tasks, so as to foster collaboration and improve interactions among the members.

Role	Description	Members
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Application Development	Writing source code	Andrè Ramolivaz, Alberto Tomasin, Simone Dinato, Mirco De Zorzi
Code review	Code quality assurance	Alberto Tomasin, Mirco De Zorzi
Drafting documentation	Drafting the various documents to be delivered described in section 1.2 of the current document.	Andrè Ramolivaz, Alberto Tomasin, Simone Dinato
Documentation review	Documentation review	Alberto Tomasin, Andrè Ramolivaz, Simone Dinato
Graphic UI Design	Prototyping UI and UX	Andrè Ramolivaz, Simone Dinato

3. Management Process

3.1. Objectives and Priorities

The **FinanceFlow project** aims to create a comprehensive suite of digital financial tools that leverage **advanced AI** and **real-time data analytics** to empower individuals to make informed financial decisions. This suite includes a **virtual financial advisor**, **real-time arbitrage monitoring**, a **user-centric news platform**, a **portfolio simulation tool**, and an **educational financial chatbot**.

To successfully conclude the FinanceFlow project and complete the application according to the predetermined premises, the following aspects are relevant.

3.1.1. Objectives

The project seeks to achieve the following goals:

- **Personalized Financial Guidance:** Create an AI-powered virtual financial advisor capable of analyzing public financial data and delivering tailored investment recommendations based on real-time news insights.
- **Customized News Experience:** Develop a platform that curates news content according to individual user preferences and portfolio holdings, ensuring users stay well-informed about pertinent financial developments.
- **Portfolio Simulation and Analysis:** Enable users to simulate their portfolio's performance using historical data and future projections, empowering them to make informed strategic decisions.
- **Enhanced Financial Literacy:** Implement an interactive chatbot that addresses user queries and offers educational resources on financial topics, fostering a deeper understanding of financial markets and investment strategies.



3.1.2. Priorities

The priorities of the project are as follows:

- **Timeliness:** Meeting project milestones on schedule is crucial.
- **Engagement:** Ensuring the application meets user needs is a primary focus.
- **Collaboration:** Effective team communication and collaboration are vital to avoid operational disruptions.
- **Excellence:** Implementing a select set of high-quality features is preferred over quantity

By focusing on these objectives and priorities, the FinanceFlow project aims to provide a comprehensive suite of digital financial tools that will empower individuals to make **informed financial decisions** and navigate the complex financial landscape with confidence.

3.2. Assumptions and Dependencies

To ensure the successful completion of the FinanceFlow project, several key assumptions and dependencies have been considered:

3.2.1. Assumptions

- **Team Autonomy and Competence:** We assume that all team members possess the necessary skills and technical knowledge required to perform their tasks effectively. They are expected to work autonomously, contributing to the project's progress without hindrance.
- **Collaborative Teamwork:** We anticipate a harmonious team dynamic, with members collaborating effectively to avoid any disruptive situations. Team members are expected to manage their workloads responsibly to ensure the project progresses smoothly.

3.2.2. Dependencies

- **Data Security and Compliance:** The FinanceFlow project places paramount importance on safeguarding user data and complying with stringent data protection and regulatory standards. Adherence to these principles are integral to the project's success.
- **Project Feasibility:** Acknowledging the ambitious nature of the FinanceFlow project, we recognize the challenges it presents. Nevertheless, our commitment to delivering tailored solutions and innovative features forms the foundation of our determination to overcome these challenges

By acknowledging these considerations, we aim to ensure the smooth and successful execution of the FinanceFlow project. Our ultimate goal is to provide individuals with a comprehensive suite of digital financial tools that empower them to make well-informed financial decisions.

3.3. Risk Management

To ensure the successful completion of the FinanceFlow project, we have identified and assessed various risks, along with their estimated probabilities:

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Risk	Probability (%)
Platform Competition	45%
Data Security	35%
Technical	25%
Financial	25%
Market	25%
Regulatory	15%

Table 3.1: Risk probabilities (ordered by risk level)

Risk	Mitigation	Impact
Platform Competition	Continuously monitor the market for similar platforms, improve features, and enhance user engagement strategies.	Medium
Data Security	Implement strong encryption, access controls, and conduct regular security audits.	High
Technical	Conduct thorough code reviews, testing, and ongoing bug fixes to ensure a smooth user experience.	Medium
Financial	Develop a detailed budget, closely monitor expenses, and implement financial contingencies.	Medium
Market	Enhance market research capabilities and user education to adapt to changing market conditions.	High
Regulatory	Stay up-to-date with relevant regulations, work with legal experts, and ensure compliance.	Low

Table 3.2: Classified risk, migration and impact

By summarizing the identified risks, estimating their probabilities, and presenting corresponding mitigation strategies in the tables above, we establish a framework for proactive risk management throughout the project, essential for ensuring its successful execution.

3.4. Monitoring and Control

In our University project, we prioritize adherence to a **standardized document format** specified by our instructor, which includes incorporating **Ca' Foscari University's logo** in the header.



Version control of both **documentation** and **codebase** will commence at 1.0 and progress to 1.1 as needed. Our project's versioning will be managed seamlessly through **GitHub**, and version increments will be considered only when specifically requested by the course professor.

As for **risk management**, we emphasize **proactive communication** and **collaboration** among team members to identify, assess, and address potential risks promptly. This approach ensures the project's successful execution and aligns with our commitment to **academic excellence**.

3.5. Staffing Strategies

Our project encompasses a range of **technical requirements**, including **Android application development**. While our team members may have varying levels of expertise, we are committed to a **collective learning approach**. We will pool our resources and proactively seek knowledge from various avenues, such as classroom lectures, online forums, and other educational resources. This **collaborative learning strategy** ensures that we assemble the required skills and expertise needed to accomplish the project successfully.

Additionally, a **solid foundation in programming** and **adept problem-solving** skills are integral to the project's success. If any team member identifies areas requiring further development, they will be encouraged to independently enhance their skills using available resources. This approach promotes both **individual growth** and the **seamless progress** of our project.

4. Technical Process

4.1. Approaches, Instruments and Procedures

Our project employs a carefully chosen set of tools and approaches to ensure efficient development and effective project management. These instruments and procedures are pivotal to our project's success:

4.1.1. Version control and collaboration

- **GitHub**: We utilize GitHub as our version control system, enabling us to maintain code versions and ensure a decentralized backup.
- **Jira**: For task assignment and project management, we employ Jira to plan and track our project's workflow.
- **Discord**: Discord serves as our primary platform for team meetings and real-time communication.

4.1.2. Documentation and collaboration tools

- **GDocs**: We use Google Documents for collaborative document creation and to streamline the documentation process.
- **Confluence**: To store workflow documents efficiently, we rely on Confluence, which facilitates easy access and retrieval.

4.1.3. Development environments

- **Android Studio**: Android Studio is our preferred integrated development environment (IDE) for Android application development.
- **Visual Studio Code**: for backend development.



4.1.4. Backend and front end technologies

- **Flask & MongoDB:** Our backend is powered by Flask and MongoDB, enabling secure data handling, and efficient API development. User data is stored in a **PostgreSQL** database for enhanced security.
- **Flutter:** we leverage Flutter for frontend development, ensuring a dynamic and responsive user interface.

Our workflow follows a structured pattern:

- **Task assignment and workflow design:** In Jira, we assign tasks and design the project's workflow.
- **Document creation:** Using Google Documents, we create documentation related to each assignment.
- **Development:** We develop the application in Android Studio (frontend) and VSCode (backend).
- **Version control:** We maintain version control by pushing code and documents to GitHub.
- **Documentation storage:** Documents are stored in Confluence for easy access
- **Project updates:** We regularly meet on Discord to update the project status and address any challenges.

These approaches, instruments, and procedures collectively form the foundation of our project, ensuring seamless development, effective documentation, and efficient collaboration.

4.2. Software Documentation

Our project places a strong emphasis on **user-friendliness** and **accessibility**. While comprehensive documentation depends on available time, our commitment is to deliver an **intuitive interface** that enables easy exploration and learning. Our application is designed to empower users in the fields of **finance**, **stocks**, and **cryptocurrencies**, guiding them through a **seamless** and enriching experience.

4.3. Project Support

Our project relies on a robust support framework and a commitment to exceptional software quality. We align with the ISO/IEC 25010 standard, emphasizing **functional suitability**, **performance efficiency**, **compatibility**, **usability**, **reliability**, **security**, **maintainability**, and **portability** as key attributes of software quality.

For support, we integrate various mechanisms:

- Technical support through developer communities, forums, and documentation.
- Task management via Jira for seamless assignment and issue resolution.
- Document collaboration on platforms like Google Documents and Confluence.
- Codebase management using GitHub for version control, code review, and issue tracking.

Our unwavering commitment to quality ensures that our project operates efficiently, exceeding both industry norms and user expectations.



5. Planning

5.1. Work Breakdown Structure

In our project's work breakdown structure, we illustrate the **timeline** of the project, the days taken to complete tasks and the size of the bubbles representing its efficiency.

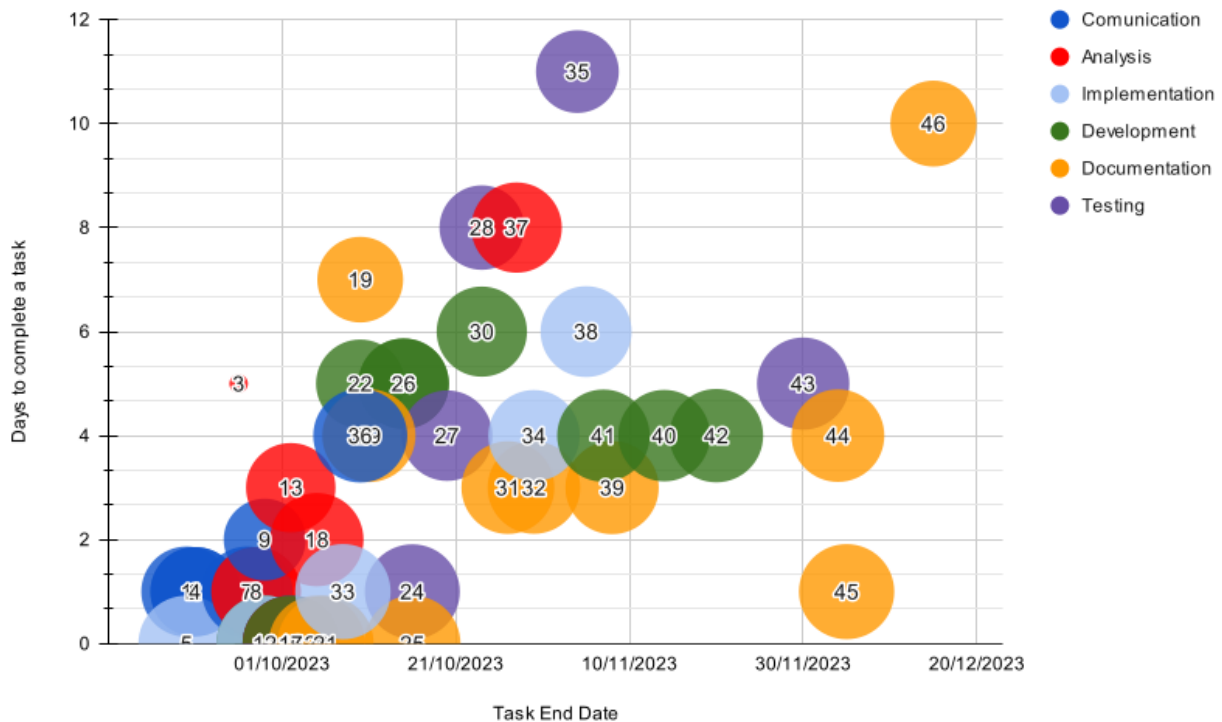


Figure 5.1: Work Breakdown Structure task chart

In Figure 5.1, we depict the tasks end dates along the x-axis, representing the project timeline from start to finish. The y-axis shows the days taken to complete each task within the respective phase. Each bubble in the chart represents a specific task, with its size reflecting the efficiency measured by the days remaining from the end of the task to the actual end of that task's period.

The task chart provides a visual representation of task duration, their dependencies, and their relative impact on the overall project timeline. This aids in understanding critical path tasks and helps in effective project management.

5.2. Dependencies and Constraints

In our pursuit of a comprehensive project overview, we recognize the significance of understanding the dependencies and constraints that shape the FinanceFlow project's timeline and execution. To provide a more comprehensive and visual representation of these crucial aspects, we have transformed the previously mentioned bubble chart into a Gantt chart.

This Gantt chart serves as a dynamic visualization tool, allowing us to meticulously plot and analyze the project's timeline, inter-dependencies between tasks, and key constraints that influence our project's



progression.

By examining this chart, we gain valuable insights into how various project elements align and impact each other, enabling us to make informed decisions and navigate potential challenges effectively.

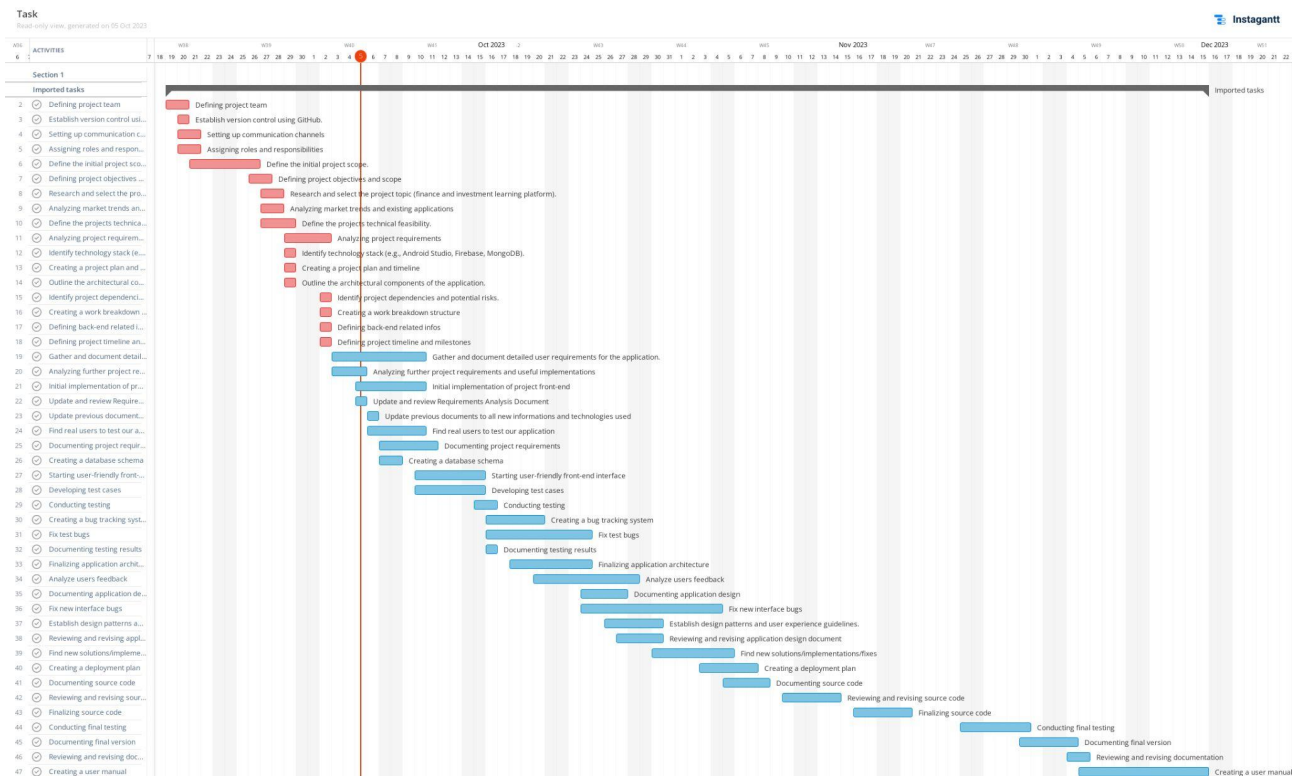


Image 5.2: Project Gantt chart

In Figure 5.2, the Gantt chart displays tasks on the y-axis, grouped by their respective phases or workstreams. The x-axis represents the project's timeline, indicating the start and end dates of each task. Dependencies between tasks are shown through the positioning of tasks in relation to one another. Tasks that depend on the completion of others are scheduled accordingly.

This Gantt chart helps us identify critical paths, where delays in certain tasks could impact the overall project timeline. Additionally, it highlights any resource constraints or potential bottlenecks in task completion. By visualizing dependencies and constraints, we can proactively manage project risks and ensure a smooth project flow.

5.3. Resource Allocation

Efficient resource allocation is crucial for the successful completion of the FinanceFlow project. We carefully distribute resources to meet project objectives, adhere to timelines, and ensure high-quality deliverables.

5.3.1. Human Resources

Our project team consists of four dedicated members, each with a specific role and set of responsibilities:

- **Simone Dinato:** GUI design, front-end development, documentation, and peer review.



- **André Ramolivaz:** Front-end development, documentation, and peer review.
- **Alberto Tomasin:** Project Manager, task assignment, documentation review, and back-end development.
- **Mirco De Zorzi:** Back-end development, code versioning, and feedback on application logic.

Team members work collaboratively, leveraging their skills and knowledge to fulfill their respective roles. Effective communication and task allocation are key to resource optimization.

5.3.2. Technology Resources

The project utilizes a range of technology resources to support development and collaboration:

- **GitHub:** Version control and code repository.
- **Jira:** Task management and project workflow tracking.
- **Discord:** Real-time communication and team meetings.
- **Google Documents:** Collaborative document creation and management.
- **Confluence:** Document storage and workflow documentation.
- **VSCode:** Integrated development environment for back-end development.
- **Flask, MongoDB, PostgreSQL:** Backend development technologies.
- **Flutter:** Frontend development framework.

These technology resources facilitate efficient development, documentation, and communication, ensuring that the project progresses smoothly.

5.3.3. Financial Resources

Financial resources for the project are primarily allocated for essential expenses, such as **software licenses**, **server hosting**, and potential **external services**. A detailed budget and financial plan have been established to manage these resources effectively. In the interest of **sustainability** and prudent **financial management**, we have chosen a cost-effective approach to resource allocation, ensuring that our project remains financially efficient while delivering exceptional value.

5.3.4. Time Allocation

We have allocated time strategically, with a strong emphasis on initial **organization** and **planning**. By investing in meticulous project **preparation**, **defining roles**, and establishing efficient **workflows**, we aim to boost productivity in subsequent phases. This approach ensures that we can efficiently meet project goals while maintaining top-notch quality.

Efficient resource allocation is crucial for the successful completion of the **FinanceFlow** project. We carefully distribute resources to meet project objectives, adhere to timelines, and ensure high-quality deliverables. Our structured approach, encompassing human, technology, financial, and time resources, ensures that we



optimize our capabilities for project success. By proactively addressing risks and strategically utilizing available resources, we are well-equipped to navigate the challenges and complexities of the project while delivering exceptional value.

5.4. Budgeting

In this section, we outline the **budget** for our project, which includes estimating the cost of labor and categorizing expenses into three main groups: General, Documents, and Coding. Our internal team's hourly rate is set at **€14** per hour, while external test users are compensated at **€10** per hour. Notably, the expenses account for various project-related activities, including **weekly meetings**, **document creation** and **review**, coding tasks (back-end, front-end, testing, bug fixing), external **testing**, and code **documentation**.

Despite the comprehensive scope of our project, we have managed to keep our overall costs at a moderate level. It's worth mentioning that some services, such as APIs, work management dashboards, and other tools, were freely accessible due to their inherently cost-free nature.

	Activity	Members occupied	Hours (mean)	Total per activities	Total
Main	Weekly meeting	4	4	17	€ 3.808,00
Documents	Document drafting	2	10	8	€ 2.240,00
	Documents review	2	3	8	€ 672,00
Coding	Back-end	1,5	8	5	€ 840,00
	Front-end	1,5	6	5	€ 630,00
	Testing and Bug Fixing	2	6	5	€ 840,00
	External Testers	3	3	5	€ 450,00
	Finalizing Code	1	2	5	€ 140,00
Total estimated					€ 9.620,00

Image 5.3: Budget table

5.5. Scheduling

Efficient scheduling is a critical aspect of project management, and in the context of the **FinanceFlow** project, it played a pivotal role in **optimizing our workflow**. We meticulously planned and executed tasks to ensure that the project proceeded smoothly and efficiently. To visualize the effectiveness of our scheduling, we present the following bar graph:

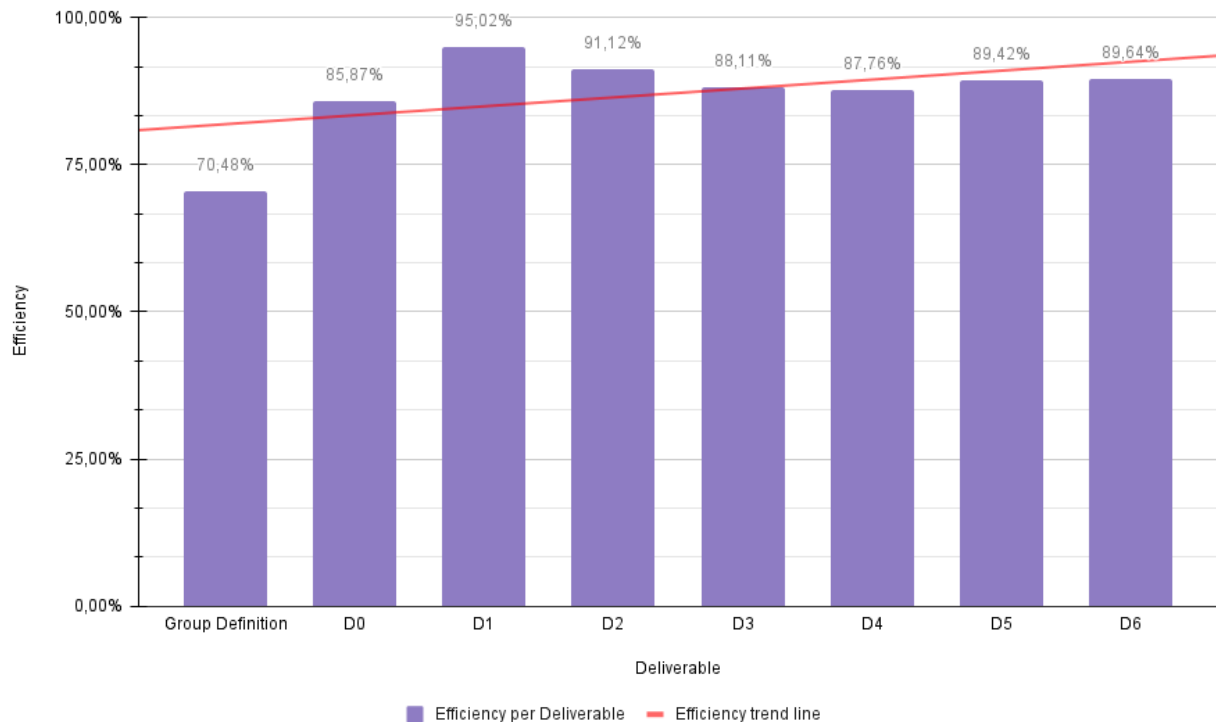


Image 5.4: Efficiency table

The graph provides a comprehensive overview of the project **timeline**, extending from the initial commencement to the final completion. Each bar within the graph corresponds to a distinct period within the project's life cycle. The y-axis measures the percentage of time gained during each period, signifying the efficiency improvements achieved over time. These improvements were a direct result of our adept project management, which enabled us to complete tasks more expeditiously as we advanced through the project phases. The line on the graph represents a trend in the percentage of efficiency gain throughout the entire project duration. It showcases how the project's efficiency has evolved over time.

What stands out significantly from the graph is the consistent trend of time gained. On average, we achieved a time gain of over **87.63%** throughout the project's duration. This remarkable time optimization is a testament to our rigorous project organization and execution, reaffirming the success of our scheduling and management strategies.