CONSTRUCTOR UNIVERSITY

AI Assistant for Project Management Tasks Using Low-Code Solution

by

Hewage Don Lakindu Udeshika Siriwardana

Master Thesis in Computer Science and Software Engineering

Submission: May 19, 2025 Supervisor: Prof. Dr. Manuel Oriol

Statutory Declaration

Family Name, Given/First Name	Siriwardana, Hewage Don Lakindu
Matriculation number	30007206
Kind of thesis submitted	Master Thesis

English: Declaration of Authorship

I hereby declare that the thesis submitted was created and written solely by myself without any external support. Any sources, direct or indirect, are marked as such. I am aware of the fact that the contents of the thesis in digital form may be revised with regard to usage of unauthorized aid as well as whether the whole or parts of it may be identified as plagiarism. I do agree my work to be entered into a database for it to be compared with existing sources, where it will remain in order to enable further comparisons with future theses. This does not grant any rights of reproduction and usage, however.

This document was neither presented to any other examination board nor has it been published.

German: Erklärung der Autorenschaft (Urheberschaft)

Ich erkläre hiermit, dass die vorliegende Arbeit ohne fremde Hilfe ausschließlich von mir erstellt und geschrieben worden ist. Jedwede verwendeten Quellen, direkter oder indirekter Art, in dals solche kenntlich gemacht worden. Mir ist die Tatsache bewusst, dass der Inhalt der Thesis in digitaler Form gepru¨ ft werden kann im Hinblick darauf, ob es sich ganz oder in Teilen um ein Plagiat handelt. Ich bin damit einverstanden, dass meine Arbeit in einer Datenbank eingegeben werden kann, um mit bereits bestehenden Quellen verglichen zu werden und dort auch verbleibt, um mit zuku¨ nftigen Arbeiten verglichen werden zu ko¨ nnen. Dies berechtigt jedoch nicht zur Verwendung oder Vervielfältigung.

Diese Arbeit wurde noch keiner anderen Pru¨ fungsbeho¨ rde vorgelegt noch wurde sie bisher vero¨ffentlicht.

17.05.2025 

Date, Signature

Abstract

In this thesis report describes design, implementation and the validation of an AI Assistant that helps project managers to fast their daily work. This system is being created together with Digital Impacts GmbH, which is a company providing IT governance, business and finance consulting. The system mainly focuses on meeting-related automation, project related automation and company knowledge query related AI automation and expanding to other fields of the company in the future.

The study begins with a deep completion analysis of related research and related systems that use project, business automation and AI to gather effective recommendations and comparison between past topics.

For effective system design, gathering requirements is done by interviewing project managers from the company and conducting a survey including all requirements gathered by each member to prioritize and understand the right initial requirements. The architecture and tech stack chosen by open-source software like N8N, Ollama and PostgreSQL etc. microservice architecture helped a lot to integrate the proposed system easily. The main LLM was customized by developers including more knowledge related to project management and for general purpose queries run by LLAMA3.1 and DeepSeekR1. The main key features achieved include summarizing meeting points, generating follow-up meetings, automated project update to Asana, detailed real-time project dashboard and AI chat focus on company knowledge via user friendly web environment.

Validate the designed system done by various methods includes requirement fulfilment and performance testing. All findings proved the system met most of the requirements and it’s functional prospective to gain benefits for DI employees.

Future work describes new areas that can be improved for other employees not only for project managers, and some use cases will be complete which are not fully met in the requirement list. This study journey covers AI and its use cases for business industries, automated project management works using open-source generative AI and low-code solutions.

Keywords: AI Assistant, Project Automation, Generative AI, N8N, LLM, Low-Code

Table of Contents

Table of Figures

List of Tables

Abbreviations

PM – Project Management
DI – Digital Impacts
LLM – Large Language Model

Acknowledgements

First and foremost, I would like to express my sincere gratitude to Professor Dr. Manuel Oriol, my thesis supervisor at Constructor University. His continuous support, insightful feedback, and invaluable guidance throughout both the practical and written phases of this research have been instrumental in shaping the direction and quality of my work.

I am also deeply thankful to Mr. Habib Naseer, my industry supervisor at Digital Impacts GmbH, for offering me the opportunity to conduct this research within the company. His initial idea, ongoing support, and constructive input were key drivers in the development of this thesis.

Furthermore, I would like to extend my appreciation to Mr. Anh Vo and Mr. Moritz Brochtel from Digital Impacts GmbH for their generous assistance, valuable feedback, and encouragement during the research process. Their involvement greatly contributed to the success of this project.

I am equally grateful to Prof. Julia Kotovich from Constructor University for her helpful support and advice throughout my academic journey.

Finally, I want to thank everyone mentioned above once again for their encouragement and contributions, which were vital in completing this research successfully.

1. Introduction

1.1. Background

DIGITAL IMPACTS is a startup company, guiding customers through the digital age, which provides management and technology consulting [1]. DI, which was founded in Frankfurt, Germany in 2018 as business consulting and service industry, including 10 – 15 well experienced employees [2]. Their mission is to rethink current solutions with a digital mindset and create a spirit of technology-driven simplicity and creating new perspectives for customers.

At DIGITAL IMPACTS, connect customers with industry experts and highly skilled consultants to inspire and guide them through their individual digital journeys, offering consulting services [3],

- **IT Governance:** Take advantage of expertise in managing IT in the digital era and making sure that important stakeholders receive value.
- **Change and Reorganization:** Overseeing reorganization initiatives that involve communication, change management, and organizational transformation.
- **Agile Business Analysis:** Professionals assist clients in managing changes in agile methodologies, understanding business needs, and figuring out solutions to present business difficulties.
- **IT Compliance Management:** By confirming that the necessary IT governance rules, procedures, and standards are efficiently handled, specialists assist in ensuring that IT operations within organizations are conducted in a compliant manner.
- **Enterprise Architecture:** Supporting the proactive management and standardization of IT applications and infrastructure inside your company in accordance with business objectives.
- **Risk-based Control:** Helping customers to build control functions and internal governance structures to control their major business risks.
- **IT Assessments:** Clients get quick IT health checks, IT due diligence and IT readiness assessments to understand their risks, strengths, weaknesses and opportunities in the digital age.
- **Digital Process Excellence:** When feasible, experts provide state-of-the-art process automation, rethink the client's processes, and assist the customer in defining customized best-practice business processes.
- **Agile Project Excellence:** Professionals oversee client projects with cutting-edge project management abilities.

Managing projects in today's dynamic corporate world is a lot tougher than it has ever been. Project managers have to juggle resources, timelines, and procedures to keep

things on schedule. This increasing level of complexity makes the demand to develop more intelligent ways of improvement to streamline processes.

To reduce the time consuming on the daily routine process as project manager, Artificial intelligence is arguably the game-changing solution among these, offering new ways of doing day-to-day activities, actionable insights, and better decision-making.

1.2. Problem Statement

Project Manager doing a critical role in projects including identifying project goals and scope, planning, managing team and communicating with stakeholders etc. When a new project starts in the company, the Project Manager takes care of the result and the project's success from the beginning. This project manager has a role called a Project Manager Assistant to help him/her with the project manager's daily responsibilities such as administrative support, project planning and coordination, process monitoring and reporting etc. But most companies face difficulties with traditional project management assistants. (human or basic digital tools) Including potential delays, lack of communication and poor integration with PM tools.

This research focuses on creating an AI Assistant specifically designed to address the everyday challenges of project management. The AI Assistant aims to take over time-consuming tasks such as summarizing meetings, generating to-do lists, tracking progress, set up follow up meetings and seamless integration with tools such as Asana, the assistant is a worthy partner for project managers and teams.

This enhances the value of the company providing services:

- Increase efficiency by automating respective tasks.
- Seamless tool integration will reduce tool switching and data duplication.
- Provide 24/7 assistance without the recurring costs and limitations.
- Better reporting and transparency.

1.3. Objective of the Thesis

1.3.1. Main Objective

The main objective of this thesis is to develop an AI Assistant for daily project management tasks including automated project assistant tasks with the help of low code solution, allowing DI project managers to fast their daily routine tasks.

1.3.2. Specific Objectives

1. **State of Art:** Investigate and comparison between related research and related existing systems to gather possibilities and difficulties and think about different new ways to design the proposed system.

2. **Design and Implementation:** Design and implement an AI Project Management Assistant including modern and trending digital technologies.

3. **System Deployment:** Deploy the proposed system without any software and hardware limitations.

4. **Validate the designed system:** Address the issues raised in order to assess the suggested system's efficacy. This means asking project managers for their opinions and testing the system under real-world conditions.

1.4. Scope of the Thesis

The following topics are covered in this thesis:

1. **Exploration of Artificial Intelligence:** This thesis will explain the foundational overview of intelligent systems including generative AI, Large Language Models (LLM) and automation framework.

2. **System Development:** Mainly focus on the architecture design and development of the AI assistant that is combined with automation tasks and dynamic user interface including generative communication web interface with modern user experience.

3. **System Deployment:** Deploy the system under cloud platform of Microsoft Azure cloud provider with GPU attached server.

As the first deployment version of this system, it mainly focuses on automation tasks and uses conversational AI for project managers to fast their daily tasks.

1.4.1. Limitations of the Scope

1. **Model Limitations:** Customized LLM model limit for specified tasks only. This system follows two main large language models. A one model follows PM domain specific use cases. And another model supports general knowledge use cases.

2. **External Tool Limitations:** This system does not support Microsoft products to connect internal company Team transcripts, drive folders and Outlook. This will enable future development.

3. **Hardware Limitations:** This system needs a dedicated GPU (graphical processing unit) to generate AI response for user needs. Without GPU server or personal computer time may be various for task completion.

4. **Deployment Limitations:** This thesis does not cover the local deployment procedure. As a first version of deployment process DI request to have a local machine deployment on their company server.

1.5. Methodology

The research methodology is covered in this section. Since there are three primary goals for this thesis explained below,

1.5.1. Methodology for Exploration of Artificial Intelligence

Complete analysis of current applications in the market such as project management assistant software. Discuss commercially available solutions and the research going

on to cover or develop an AI solution for assisting project management tasks. In the stage of art section point out necessary information to carry out this thesis.

1.5.2. Methodology for System Development

At the beginning of this journey DI came up with this idea for use in internal purposes of the company.

As the first step DI had some requirements to develop this system but for better understanding of the problem statement, DI conducted a survey with company project managers to gather requirements and monitor the usefulness of defined requirements.

Based on the gathered requirements, planning to design the architecture and tech stack for the desired system is the second step.

In the third step, the development stage of the system is going on. Use the particular tool sets to automate tasks, generate AI response and connecting external applications will be used as mentioned under tech stack we created already.

1.5.3. Methodology for System Deployment

To improve the scalability of the system, we are planning to deploy this system under the cloud service provider. Finding a GPU server with an affordable price range may provide the best value to the company. The integration section will discuss fully understanding about deployment under Microsoft Azure platform.

2. State of the Art

2.1. Related Research

2.1.1. The Project Management Assistant that Never Sleeps: Using Generative Artificial Intelligence to Support Project Management Activities

This journal article was written by C. Hess and S. Kunz in 2024 [4]. The article provides a case study on project management using generative AI. It demonstrates how a PM's work can be enhanced with GenAI assistants (such as GPT-4 and Copilot) [4]. GenAI can handle tasks including ideation, creating a stakeholder matrix, inviting people to meetings, and sentiment analysis of responses in a comprehensive stakeholder-management scenario. The study highlights trust/control difficulties when employing AI and talks about the new abilities that PMs need (oversight, prompt design). Technology: Generative AI (LLM-based chatbot interfaces). Activities: AI-generated content and summaries assist with stakeholder management activities (concept generation, analysis, document authoring) and associated reporting duties [5].

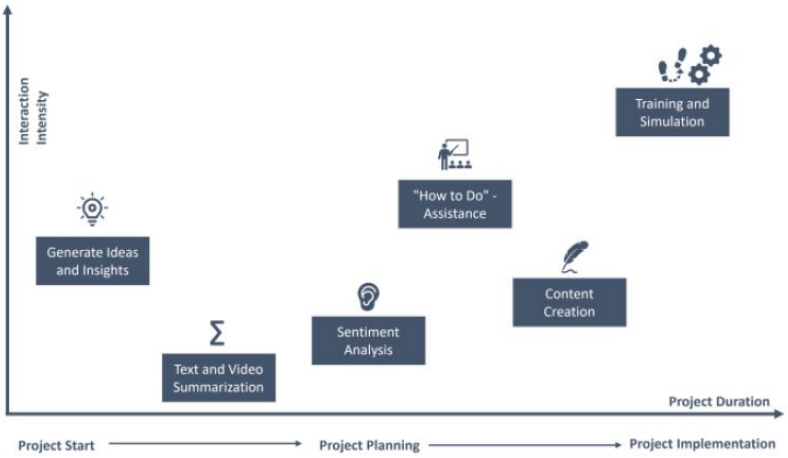


Figure 1: Patterns of AI-Assisted Project Management Tasks [1]

2.1.2. Artificial intelligence and project management: An empirical investigation on the appropriation of generative Chatbots by project managers.

The study by Taboada et al. (2024) titled “Artificial Intelligence and Project Management: An Empirical Investigation on the Appropriation of Generative Chatbots by Project Managers” examines how project managers use ChatGPT and other generative AI tools to improve productivity and creativity [6]. The study explores how generative AI (ChatGPT), the central technology, may help with tasks including idea generation, project communications writing, information summarization, and knowledge management. The study is based on Task-Technology Fit (TTF) theory to evaluate how well ChatGPT’s features match the needs of project management activities and Adaptive Structuration Theory (AST) to comprehend how project managers modify ChatGPT inside their workflows [6]. The study uses Partial Analysis to examine the connections among adoption factors. The study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS4 software to examine the connections between adoption factors [6]. The main conclusions show that ChatGPT efficiently automates a number of repetitive and cognitively demanding project management tasks, such as creating reports, generating ideas, summarizing meeting notes, drafting project documentation, and facilitating internal communication. This allows project managers to concentrate on more strategic and interpersonal duties. Along with highlighting the significance of striking a balance between AI integration and human oversight to ensure successful project outputs, the study also shows that innovation attitude, peer influence, and the fit between technology and tasks are important drivers of innovative and adaptable use of ChatGPT.

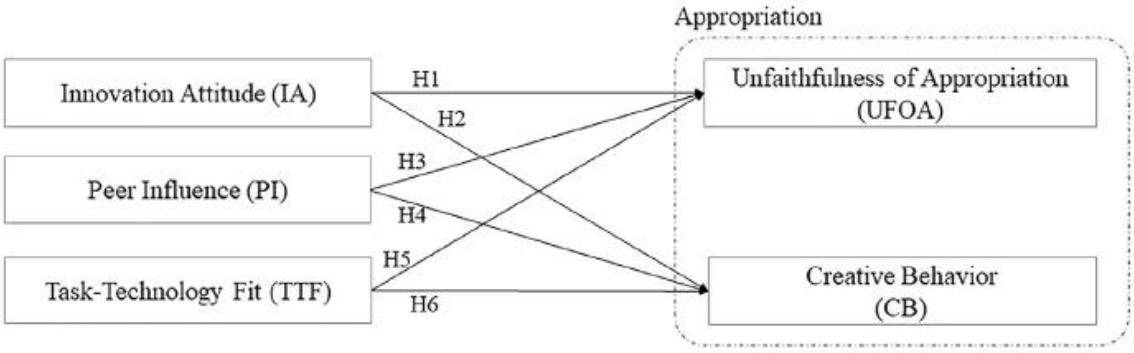


Figure 2: The research model for chatbot [3]

2.1.3. Co-Pilot for Project Managers: Developing a PDF-Driven AI Chatbot for Facilitating Project Management

The study “Co-Pilot for Project Managers: Developing a PDF-Driven AI Chatbot for Facilitating Project Management” describes a chatbot that uses artificial intelligence (AI) to automate project management tasks by deciphering content from PDF documents, such as interview transcripts and Software Requirement Specification

(SRS) reports [7]. Particularly for e-commerce initiatives, the chatbot acts as a virtual project manager, providing ongoing support and help with decision-making. It was constructed with Open Assistant's SFT-1 12B big language model, which was refined on a unique dataset produced by in-depth SRS documentation and interviews with 15 project managers [7]. With a cosine similarity score of 80.80% and a semantic similarity score of 85.21%, the chatbot performs well and shows a strong alignment with PDF information linked to the project [7]. In remote and complex project environments, it facilitates a number of automated tasks, such as extracting, interpreting, and responding to queries from PDF documents; simulating project manager decision-making based on learned patterns; offering round-the-clock project support to international teams; addressing queries asynchronously; and improving communication while lowering manual labor.

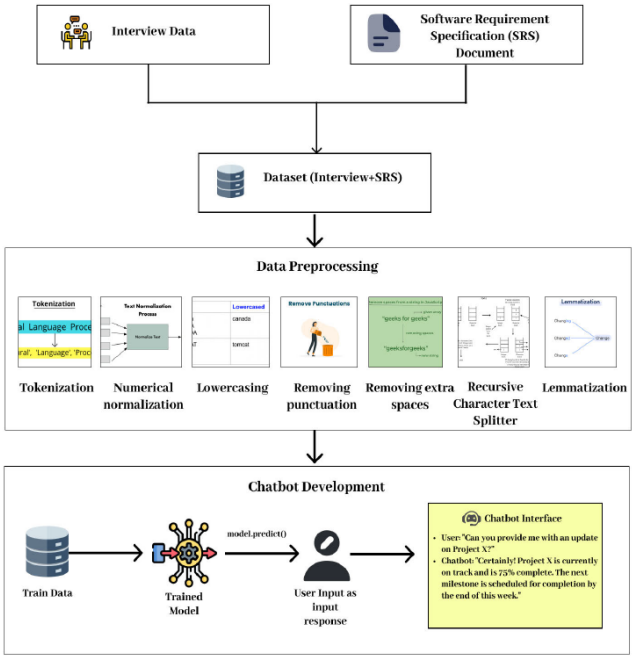


Figure 3: Methodology diagram for PDF-Driven AI Chatbot [4]

2.1.4. Beyond Automation: AI-Driven Project Management with OpenAI and Prompt Engineering

In order to automate and optimize project workflows, the research paper "Beyond Automation: AI-Driven Project Management with OpenAI and Prompt Engineering" offers a comprehensive AI-powered project management system that combines web-based tools with OpenAI's GPT-3.5 Turbo [8]. By enabling natural language interactions for things like assigning roles, collecting information, creating documentation, and tracking progress, the main goal is to help project managers,

especially non-technical users. OpenAI GPT-3.5, Prompt Engineering, Langchain, text-embedding-ada-002, LlamaIndex, MongoDB, ReactJS, NextJS, TailwindCSS, and Django are among the technologies utilized. These were used for long-term memory through vector databases, context-based knowledge retrieval, vector embedding (1536-dimensional vector space), cosine similarity for similarity search, and designed prompts to shape JSON replies from the model [8]. Task assignment, documentation creation, project tracking, intelligent resource allocation, and real-time progress updates are among the automated tasks that are integrated with Slack, Jira, and Microsoft Teams. The system's main advantages include improved decision-making, fewer response hallucinations, and time savings. However, there were drawbacks as well, such as the need to ensure consistent JSON output, computational inefficiencies during long-term memory simulation, and model hallucination in the absence of appropriate vectorized context. The study demonstrates how cutting-edge AI models can significantly enhance project management systems when they are adjusted and contextually grounded.

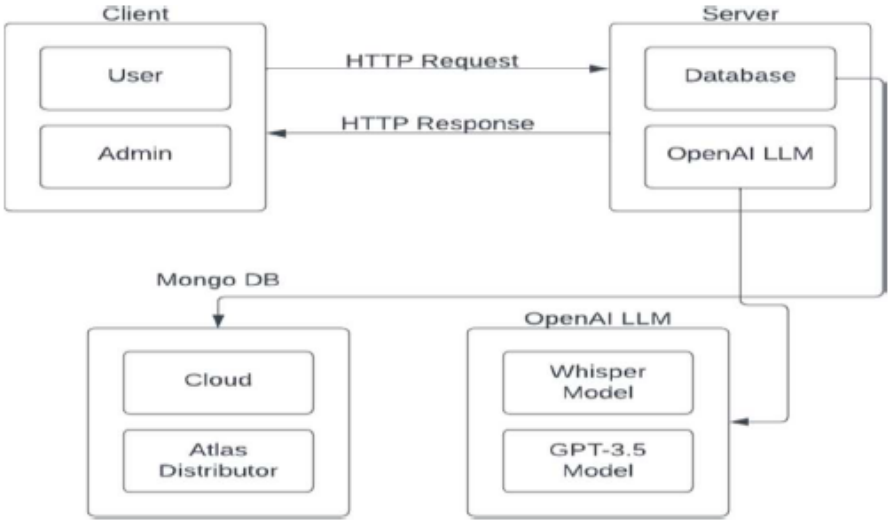


Figure 4: System Architecture of AI-Driven Project Management [5]

2.1.5. Artificial Intelligence Driven Agile Project Management: Enhancing Collaboration, Productivity, and Decision-Making in Virtual Teams

The study "Artificial Intelligence Driven Agile Project Management: Enhancing Collaboration, Productivity, and Decision-Making in Virtual Teams" examines how AI technologies, such as Natural Language Processing (NLP), Machine Learning (ML), Predictive Analytics, Automation Platforms, Generative AI, and AI-powered chatbots, improve communication, productivity, and decision-making in virtual teams [9]. ML and

predictive analytics are used to forecast project outcomes, identify risks, and optimize task prioritization; automation platforms streamline repetitive tasks like scheduling, tracking, and reporting; generative AI helps create project documentation and presentations; chatbots help with routine queries, scheduling, and document retrieval within collaboration tools; and natural language processing (NLP) is used to automate real-time transcription, translation, sentiment analysis, and meeting summarization. Meeting scheduling, progress monitoring, real-time transcription and summarization, project documentation retrieval, risk assessment, and report preparation are among the automated tasks identified in the study [9]. While overcoming obstacles like AI adoption resistance, integration complexity, data quality issues, and ethical concerns, these technologies are integrated at different stages of Agile processes to automate routine tasks, support data-driven decisions, and improve collaboration. In the end, they provide advantages like enhanced communication, efficiency, decision accuracy, and resource management in virtual Agile teams.

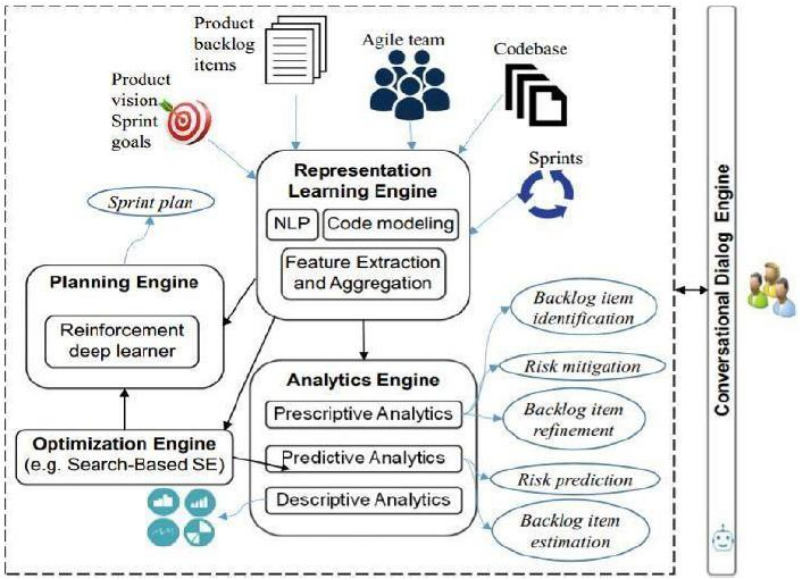


Figure 5: model of AI -enhanced agile project management architecture [6]

2.1.6. Comparison between related research and the proposed system

By incorporating and expanding on important features shown in other studies, the suggested system adds to the expanding corpus of research examining AI's role in project management. The suggested system goes one step further by operationalizing these capabilities into automated workflows via n8n and integrating them directly with project management platforms like Asana, even though previous works (Hess & Kunz, Taboada et al., etc.) highlight the use of generative AI for ideation, document generation, stakeholder management, and chatbot-driven interaction.

However, none of the previous studies provide an integrated workflow that combines AI, workflow automation, private document querying, and real-time project management updates in a unified platform, even though they show how AI can help with certain project management tasks (such as summarization, report generation, and chatbot Q&A). Gaps like automation of post-meeting tasks, end-user control over AI outputs, and close connection with current PM tools are all filled by the suggested system.

Research / System	Set-up follow-up meetings	Generate Agenda	Summarize Meetings	Chat with internal documents	Connect Asana (External Tools)	Detailed Project Dashboard
1. The Project Management Assistant (Hess & Kunz)	✗	✓	✓	✗	✗	✗
2. AI & PM (Taboada et al.)	✗	✓	✓	✗	✗	✗
3. Co-Pilot for PM (PDF-Driven AI Chatbot)	✗	✗	✓	✓	✗	✗
4. Beyond Automation (AI-Driven PM w/ OpenAI)	✗	✓	✓	✓	✓	✗
5. AI-Driven Agile PM	✓	✓	✓	✓	✗	✓
Proposed System	✅	✅	✅	✅	✅	✅

Table 1: Comparison between related researches

2.2. Related Systems

2.2.1. Motion

Motion is a time management and productivity application that prioritizes and schedules work, meetings, and deadlines automatically using artificial intelligence [10]. By lowering the need for human scheduling, it promises to save time. Users include busy professionals, executives, and teams in fast-paced industries such as

ClickUp, Jones Road, Obvi, ZeroTo1 etc. [11] AI-powered scheduling algorithms that work with calendar APIs from Google Calendar, Microsoft Outlook, and others [12].

Figure 6: Services provided by Motion [7]

2.2.2. PMI Infinity

PMI Infinity is an AI-powered project management platform introduced by the Project Management Institute (PMI) [13]. It serves as a virtual project assistant by incorporating generative AI to produce documents, manage project workflows, offer insights, and recommend next steps. Intended for experienced project managers, and it creates the application by combining generative AI and natural language processing methods [14].

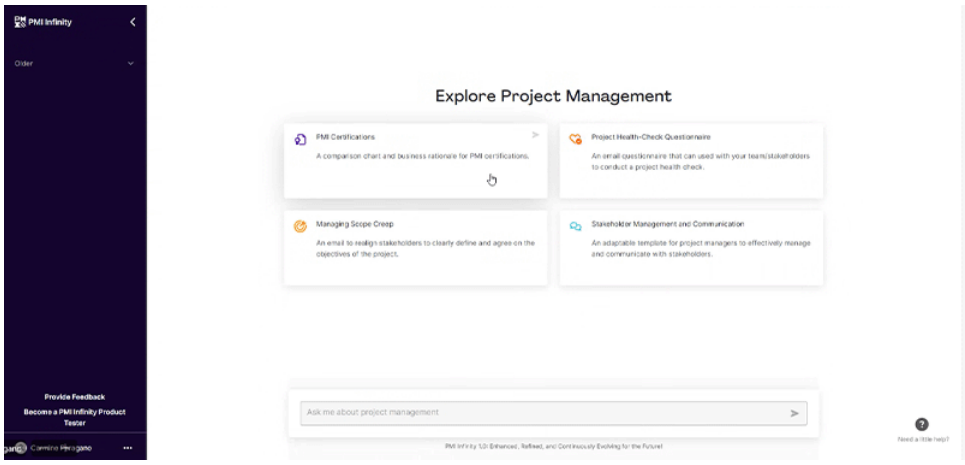


Figure 7: AI Assistant provided by PMI Infinity [10]

2.2.3. Glean

lean is the AI-powered work assistant that connects and understands all your company's knowledge, to bring you the answers you need [15]. Modern enterprise search and RAG technology are used by Glean to find the most pertinent information for LLMs to use. Glean then creates customized responses based on the company's own enterprise knowledge graph. Every response is completely referenceable, private, permission-aware, and safe [15]. With more than 100 interfaces, Glean provides turnkey execution of a sophisticated AI ecosystem without the need for expensive expert services or human fine-tuning. Reputable businesses like Canva, Okta, Confluent, Grammarly, and Duolingo trust it [16]. Built with artificial intelligence (AI), machine learning, and natural language processing, it interfaces with well-known SaaS tools including Google Workspace, Slack, Jira, and Salesforce.

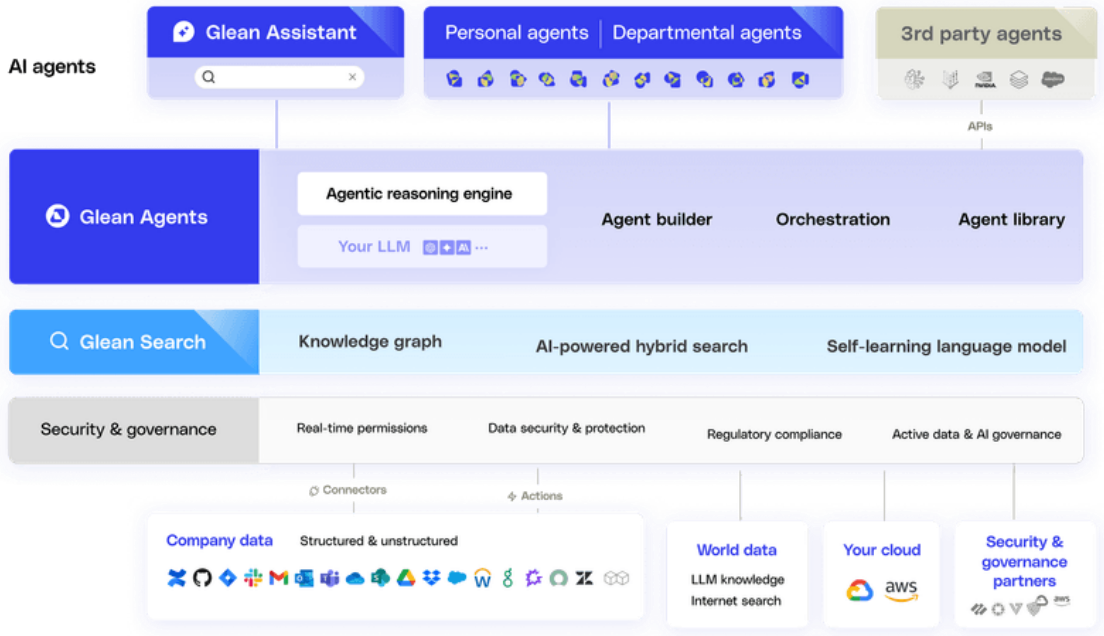


Figure 8: Architecture used by Glean [12]

2.2.4. Comparison Between Related Systems and the Proposed System

While PMI Infinity, Motion, and Glean all use AI to help with productivity and project management, they concentrate on different parts of the workflow (Motion for time management, Glean for information retrieval, and PMI Infinity for project assistant activities, for example).

By combining follow-up meeting automation, agenda creation, summarization, document-based chat, Asana integration (external API integration), dashboard visualization, and report generation into a single platform, the suggested system, on the other hand, offers a comprehensive solution catered to project manager's end-to-end requirements.

Related Systems	**Set-up follow-up meetings**	**Generate Agenda**	**Summarize Meetings**	**Chat with internal documents**	**Connect Asana (External Tools)**	**Detailed Project Dashboard**	**Generate project reports**
1. Motion	✓	✓	✗	✗	✓	✗	✗
2. PMI Infinity	✗	✓	✗	✗	✓	✗	✓
3. Glean	✗	✗	✓	✓	✓	✗	✓
Proposed System	✅	✅	✅	✅	✅	✅	✅

Table 2: Comparison between related systems

3. Architecture

3.1. Initial Requirement

The following requirements were found after conducting a survey with DI internal employees and by the CEO who came up with this idea.

3.1.1. Functional Requirements

1. **Set-up follow-up meetings**

Automate the scheduling of the follow-up meeting process with the help of the last meeting recording or meeting notes.

2. **Generate Agenda**

Create detailed meeting agenda from a meeting held, without any user interaction.

3. **Summarize meetings**

Generate a summary report from the specific meeting according to the user's needs. Also, it can modify the summary and download to the user's machine.

4. **Chat with internal documents**

Users can chat with company related documents without sharing them to the public Internet.

5. **Connect "Asana" software for project automation**

Automated updating and creating tasks, subtasks under existing projects present in Asana with the help of follow-up meetings having in the company.

6. **Detailed project dashboard**

Users need to monitor project timeline, project completeness and important notifications about each project to improve efficiency for their daily work.

7. **Generate project reports**

Users can generate project documents such as Gantt charts, meeting minutes etc. Moreover, users can request a filled company template that is already inserted to the system via company knowledge.

3.1.2. Non – Functional Requirements

- The system must be user-friendly for even non-technical employees.
- Generated answers from the AI should have better overall accuracy.
- The system should support multiple platforms such as laptops and mobile devices.
- For better understanding of the system, users need a well-structured user-guide including all important information.

3.2. Architectural Design

The system follows a "**microservices architecture**", a new approach to software design in which the application is organized as a collection of loosely connected, independently deployable services. Each service uses lightweight protocols, usually message queues or RESTful APIs, to communicate with others and encapsulate a particular business feature.

Utilizing "container technologies" like "Docker" to guarantee consistency across development, test, and production environments improves the architecture even further. Rapid iteration, responsive scalability, and "continuous integration and delivery (CI/CD)" are made possible by microservices when used in conjunction with orchestration tools and cloud platforms.

In this concept, a distributed yet connected ecosystem is created by microservices interacting through well-defined interfaces and frequently integrating with external APIs, automation tools, and AI models.

3.3. System Components

In this section the architecture diagram and key components of the system are discussed in detail.

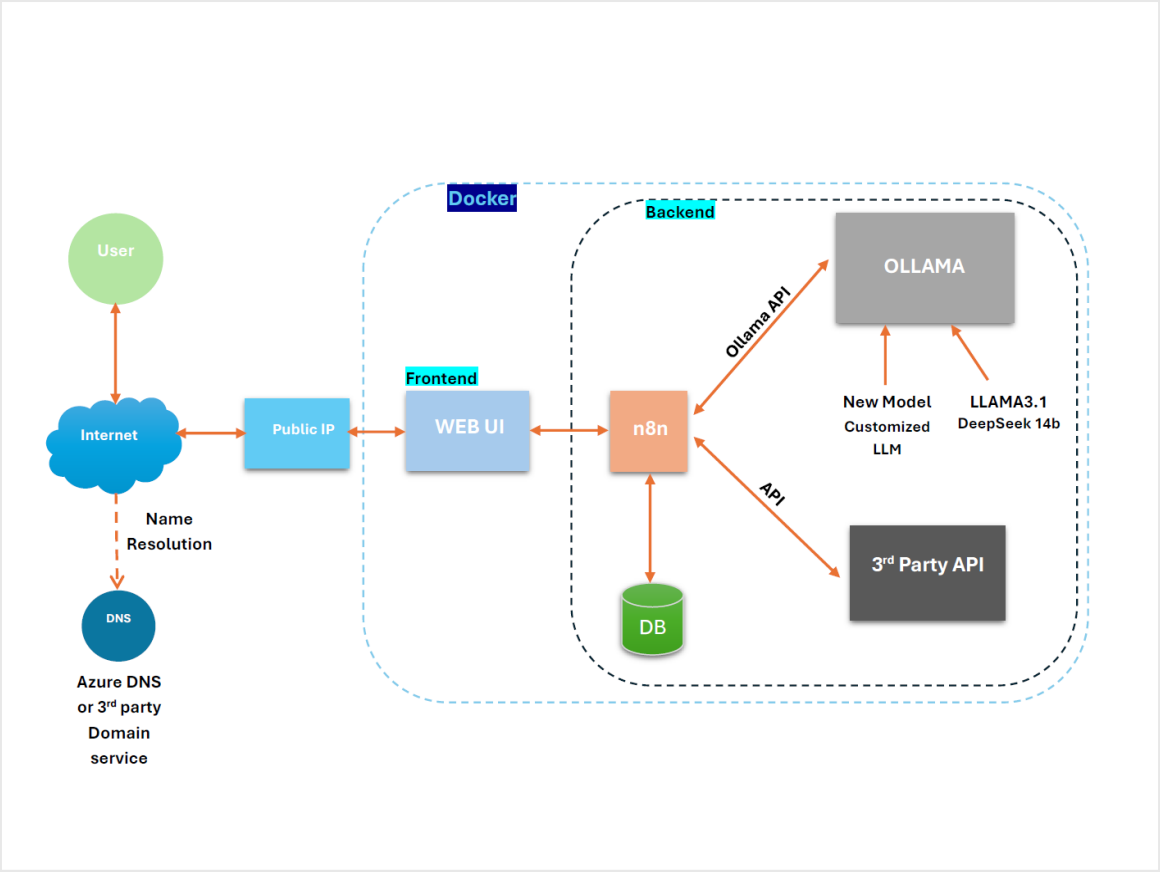


Figure 9: Proposed Architecture for DI AI Assistant

Users connect with the client side with the help of web URL through the internet. The server side of the system is running on Microsoft Azure cloud. According to the architecture diagram the proposed system runs under Docker containers. To run all these services together, Docker has three main containers on active.

Users can navigate the tasks from the home page of the WebUI. For each task the system followed by n8n framework and for all AI tasks link through OLLAMA engine to Large Language Models.

Especially users need to fetch data as input or push the result as output for an external tool such as Asana, the n8n offer external API calls under user needs.

At the completion of the workflow, the user can see the results from the WebUI and interact with AI for further modifications of their results.

3.4. Example of Interaction

This section discussed an example of the identification of the flow of interaction between client side and server side of the system.

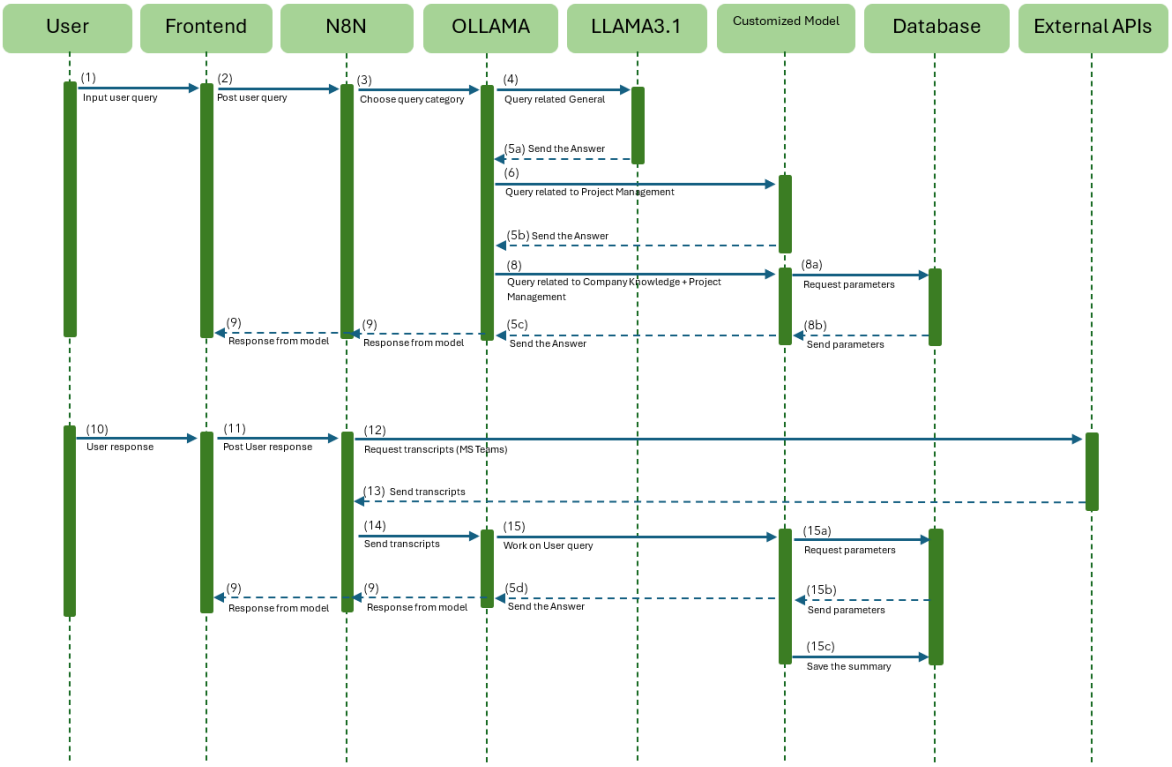


Figure 10: Sequence Diagram of Interaction

Figure 10 is a UML sequence diagram showing a scenario how AI has understood user query and flow of the system.

3.4.1. Entities in the Diagram

1. **User:** Initiates interaction
2. **Frontend:** Interface between backend and the user.
3. **N8N:** Connect system components such as Ollama, database and third-party APIs and communicate among them.
4. **LLAMA / Customized Model:** Process queries using large language models.
5. **Database:** Store data and retrieve necessary information.
6. **External APIs:** Integrate 3rd party applications to share information.

3.4.2. Interaction Between Entities

(1) Input user query: A query is issued by the user through the front end.
(2) Post user query: The front end sends the query to the N8N for processing.
(3) Choose query category: Determined whether the query is related to General knowledge/project management/company knowledge.
(4) Query-related general: Processes queries from LLAMA3.1 with general LLM knowledge.
(5) (5a)/(5b)/(5c)/(5d) Send the Answer: The answer sent from specific model to N8N through the Ollama.
(6) Query-related PM: If the query is related to Project Management staff, it passes to our customized model for generating the answers.

(8) Query-related to Company knowledge + Project Management: If the query is related to company knowledge, it is getting access with database and communicating with customized model to generate accurate answer.

(8a) Request Parameters: request database knowledge and their related parameters from the database.
(8b) Send Parameters: The database sends the parameters and knowledge from the database to LLM to generate better answers.

(9) Response from the model: The system returns the answer to the user.

(10) User response: Key outputs are saved to the database, such as a summary, chat memory.

(11) Post user question: The front end sends the questions to the N8N for processing.

(12) Fetch transcripts request Teams: API fetches meeting transcripts from Microsoft Teams or Google Drive folder.

(13) Respond with transcript: Teams API or Google Drive returns the requested transcript.

(14) User Query Processing: System processes the query comprehensively using available resources.

(15a-15c) Updated Interactions:

(15a) Request the parameters: Request data from the database.
(15b) Send the parameters: Return refined responses.
(15c) Save the summary: Save the summary under database

3.5. Tech Stack

N8N

The main technology platform used for developing this system was “N8N” workflow automation platform [17]. The main reason of using n8n is its unique AI capabilities can interact large language models by using API endpoints. Moreover, the n8n can be self-hosted without being subject to any pricing schema [18]. Especially n8n was an open-source framework to some extent, as a developer you can self-host the n8n framework for developing purposes but when you planning to deploy that system for industrial use, you should go ahead with their pricing plans.

However, the n8n supports more than 400+ integrations including Asana API, Google services APIs and Ollama APIs specially for proposed system [19].

Another important aspect of this proposed system is its flexibility. Because it is possible to modify and change the flow of a task very easily. The main reason for this is the low code and drag and drop concept in n8n framework.

OLLAMA

To connect the large language models, the proposed system needs another digital technology called “OLLAMA”. Ollama is open-source software to download and use large language models on local machines [20]. Apart from that Ollama offer various kinds of LLM models including LLAMA, DeepSeek and many more famous models up to date [21]. Ollama have different kinds of LLMs for particular tasks. If you need vision related AI, you can use vision models, for reasoning models it offers tool AIs and embedding models support for large data embedding purposes.

Downloading Ollama can be done by two separate ways, with the dedicated GPU downloading, Ollama may run 80% - 90% with the help of GPU. Compared to the second method (CPU downloading) AI can run smooth and efficiently by using GPU because the GPU has billions of CUDA processors that can run model parameters parallel at the same time. Using CPU download method can limit the number of LLM models that can be used in the system.

In proposed system used Ollama GPU version for better accuracy of generating results and more efficient task automation for user’s convenience.

POSTGRES SQL & SUPABASE VS

For data storing purposes the system used two main services such as, “Postgres SQL” database for store the memory of the chat and AI responses [22]. And for vector storage “SupaBase Vector Store” to store company knowledge database [23].

DOCKER

Docker is an open-source platform that makes software development and deployment more effective and uniform across many environments by automating the deployment of apps within containers [24]. It enables developers to swiftly deploy and execute their code in any environment without worrying about compatibility by combining apps with all of their dependencies into a single container.

The main reason is the use of Docker engine, which acts as a client-server application that allows developers to build, manage, and run containers after final deployment (for future works and system updates).

MICROSOFT AZURE

Microsoft Azure is a cloud solution service platform developed by Microsoft [25]. For the deployment process of the system Azure provides various kinds of cloud servers. After successful research specification of collected servers, we choose dedicated GPU server for deploy our system located in Netherland.

As a part of the deployment process, under dedicated server establish a virtual machine embedded with Linux operating system to ignore the errors that came from when downloading dependencies.

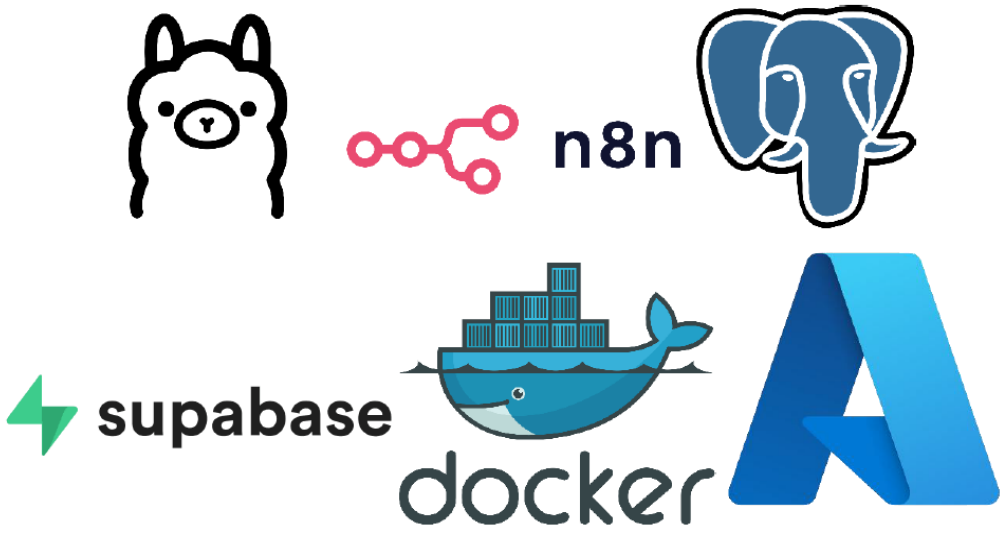


Figure 11: Technology stack used for development

4. Implementation

4.1. Environment Setup

Beginning with the system implementation, download and install all dependencies from scratch. As discussed in the above section, n8n is our main framework that should connect all other applications explained under tech stack.

Before setting up the n8n, as a developer for development stuff a Windows PC was used including 32GB RAM and 12GB dedicated GPU from Nvidia.

As the first step, Docker Desktop was downloaded and installed to the PC to create containers for other applications. (docker version: 27.4.0) Next Ollama was pulled through a GitHub repository as docker container. Now inside docker have our first container ‘Ollama’ for work with Large Language Models. (Ollama version: 0.6.5)

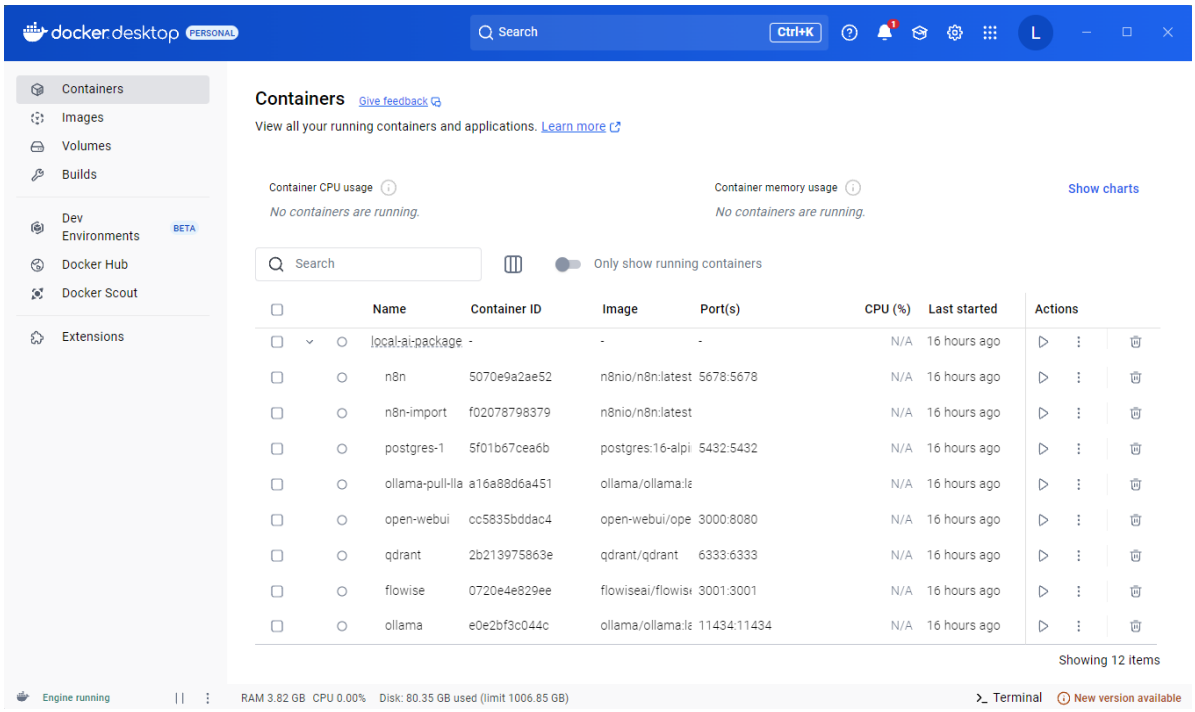


Figure 12: Docker Desktop with Containers

Next step was to pull ‘N8N’ our main framework through the GitHub repository as docker container. After successful installation, n8n pops-up a login screen to add credentials for start the application. (this login was not very important) Using ‘create workflow’, new workflow can be started.

Apart from that, other dependent applications were installed as docker containers such as Supabase vector storage and PostgreSQL database.

As the final step of environmental setup, each tool needs to connect with the credentials to use those services. If n8n needs external tools from the internet, such as Google Drive, Asana needs to get API key endpoint to connect with n8n tool.

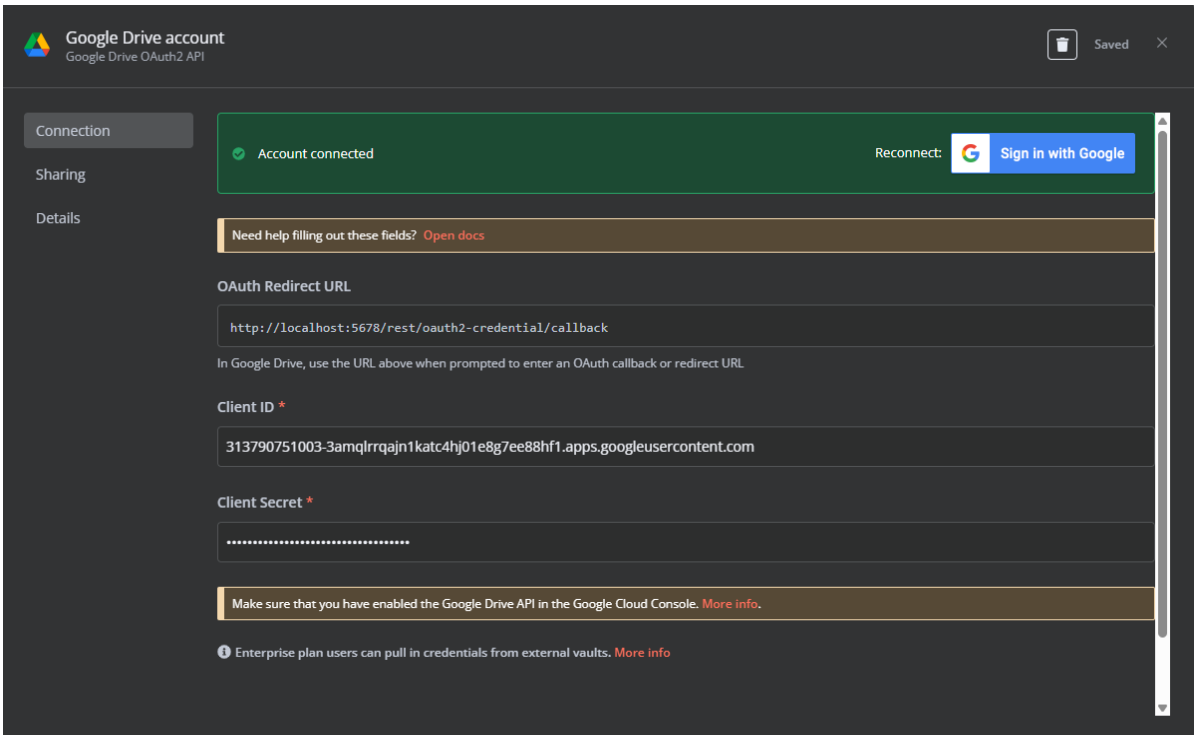


Figure 13: Add credentials to Google Drive

4.2. Implementation of Key Tasks

The system is done with the final product as a WebUI. Key components are developed on top of the n8n framework as workflows. This system has five main key tasks (workflows) such as,

1. Follow-up Meetings
2. Summarize Meetings
3. Asana Connect
4. Chat with Internal Documents
5. Project Dashboard

The system interconnects all these key tasks from *'index.html'* page. The Index page has links to other workflows, mainly after clicking the specific AI task from the index page it will directly load the specific task's html page as new web page. At the meantime, workflow's first webhook activates the trigger to start the process of the workflow.

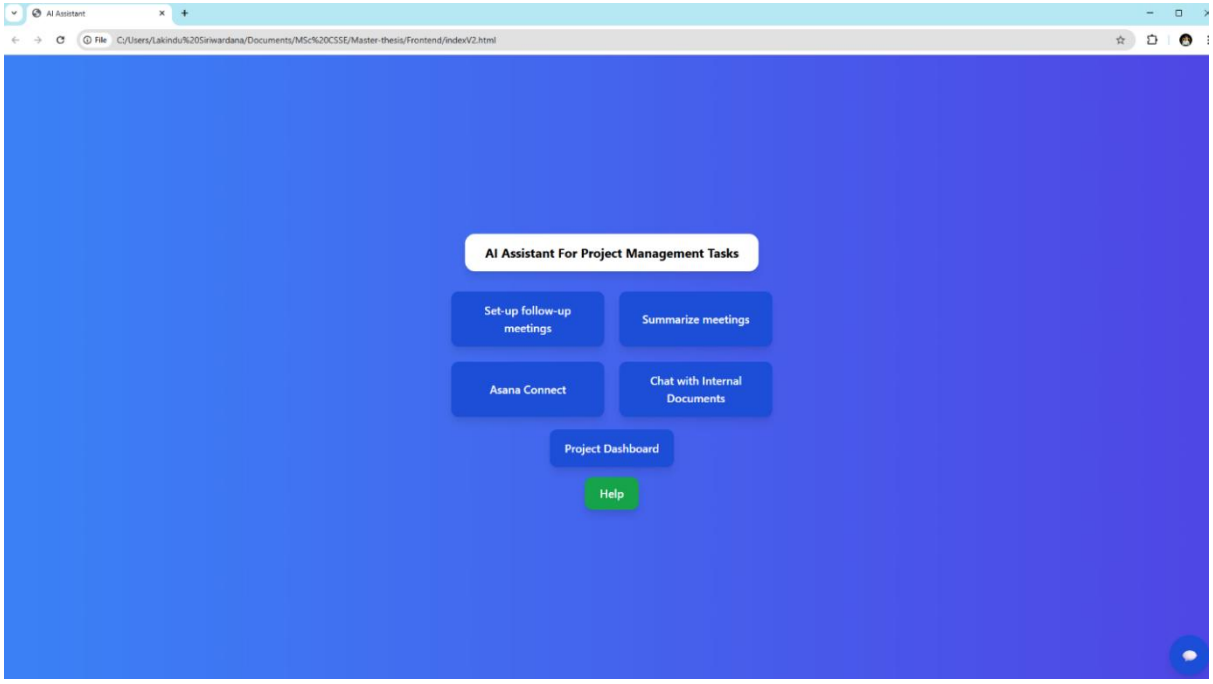


Figure 14: Index Web page of Designed System

4.2.1. Follow-up Meetings

Figure 15 below explains the fully understandable flow of follow-up meeting workflow. The main idea behind this workflow is that basically the user needs to set up a follow-up meeting using the information from the last meeting transcript. The traditional method to schedule a follow up meeting was manually by the user. Using the proposed method, the AI suggests the possibilities for having the meeting, important information (meeting agenda) and the participants by analyzing the given meeting transcript.

The workflow contains three main sections to complete the task with one click signal from the user. The workflow developed under n8n framework and minimum usage of the code prospective.

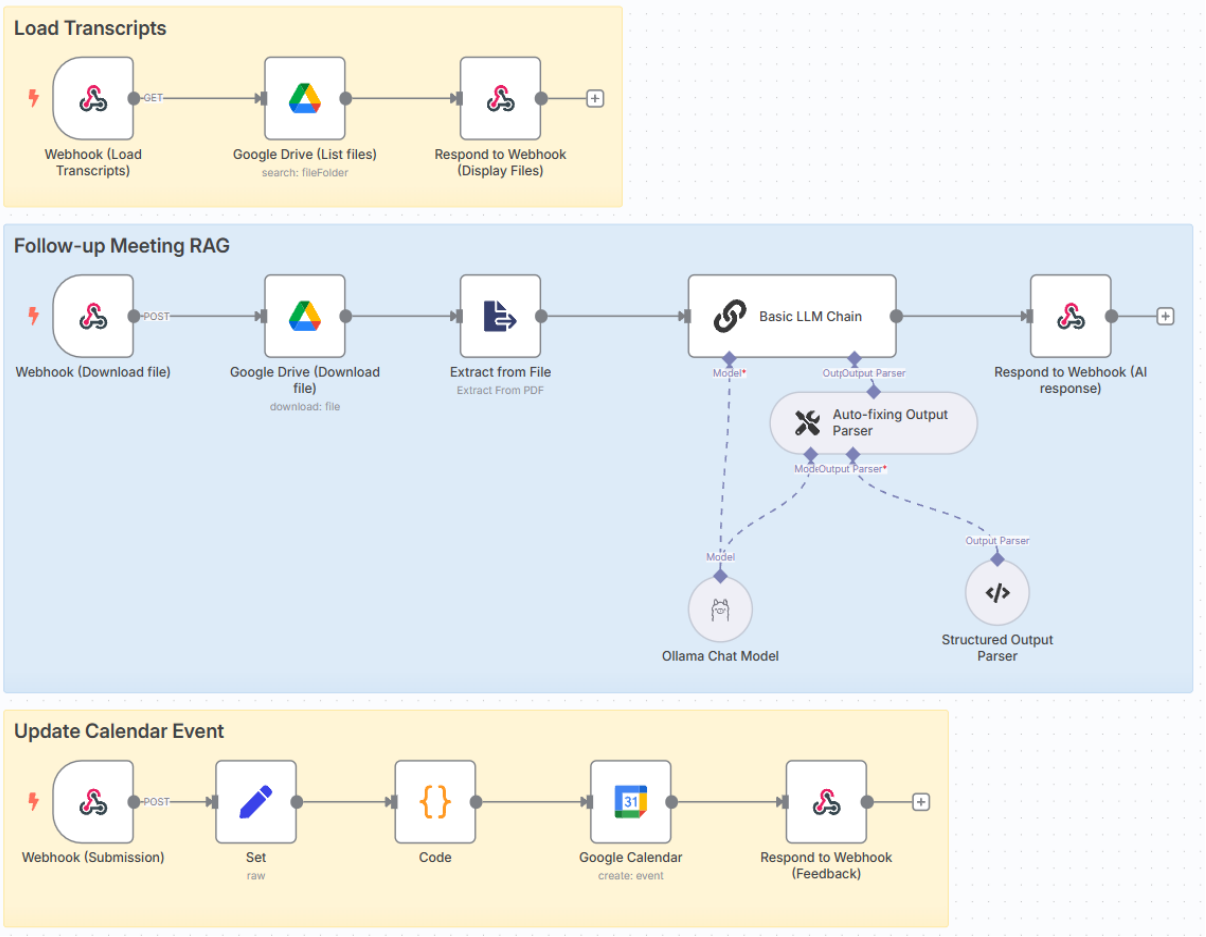


Figure 15: N8N workflow of Follow-up meetings

Load Transcript

After clicking the ‘follow-up meeting’ button from the ‘index.html’ page, webhook (Load Transcripts) trigger activate and fetch the files from ‘meeting-transcript’ folder present within the Google drive folder. After successful file search, the list of files should display on the same webhook as the respond to the webhook.

Access to the certain folder, developer need to connect the specific google drive and n8n using OAuth2 verification method. For this authentication method all you need, client id and client secret from google console and add OAuth redirect URL under google console. To give access to n8n for file search, download and modification.

Follow-up meeting RAG

The second section discussed the AI part of our key task. In the first step, the webpage shows the list of all meeting transcript fetch from section one. Users can click the download button to choose a specific transcript that wants to go through AI.

Clicking the download button of the specific file triggers the start of section two to put the file into AI. As first step is to download the specific binary file from the google drive and extract the binary file to actual data that can be possible to read by the AI.

8n8 offer different kinds of AI nodes for particular tasks. For this workflow ‘Basic LLM Chain’ was used to generate AI response. Basic LLM chain has two main branchers called, model and output parser to provide accurate results. In this system LLAMA3.1 model was used as our LLM, and the temperature of the model was set to 0.1 to ignore the randomness when generating the results. Control the LLM for specific tasks, set user prompt much as needed and very understandable way to generate the AI response very usable way to use a specific output format given by the developer under ‘Structured Output Parser’ as Json schema. The reason for using these output parsers is to avoid unwanted AI text and pass the response to next step with the well-structured Json.

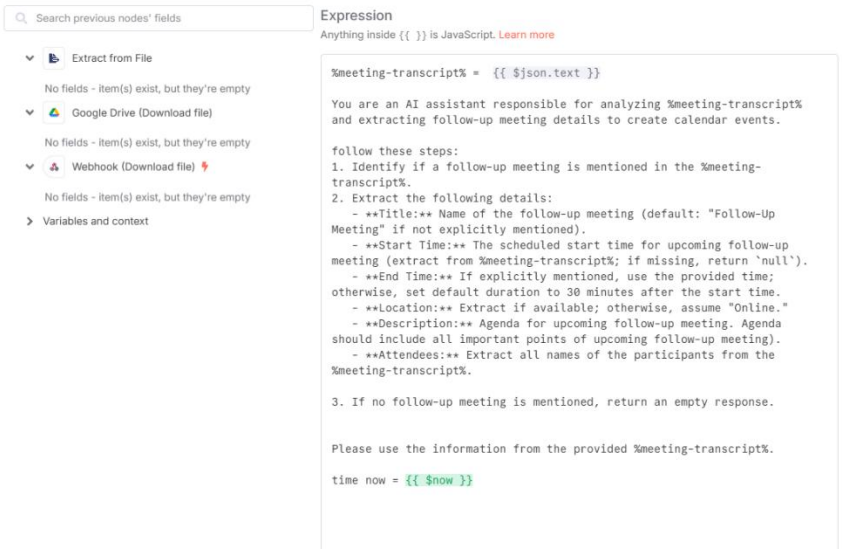


Figure 16: User Prompt for Follow-up meeting's AI Agent

Users can see a pre-filled follow-up meeting schedule form including AI response that can be edited or changed by the user.

Update Calendar Event

Now users can see the pre-filled form after completion of follow-up meeting rag. In this step the user can check and confirm the calendar event by pressing the ‘Send Update’ button. The ‘set email’ node will handle the emails of the participants that are already in the company database. If a user needs to add a new member (external participant) to a coming up meeting, simply the user needs to add his/her email under attendance field as coma separate value. The ‘code’ node takes care of the new emails that are provided by the user.

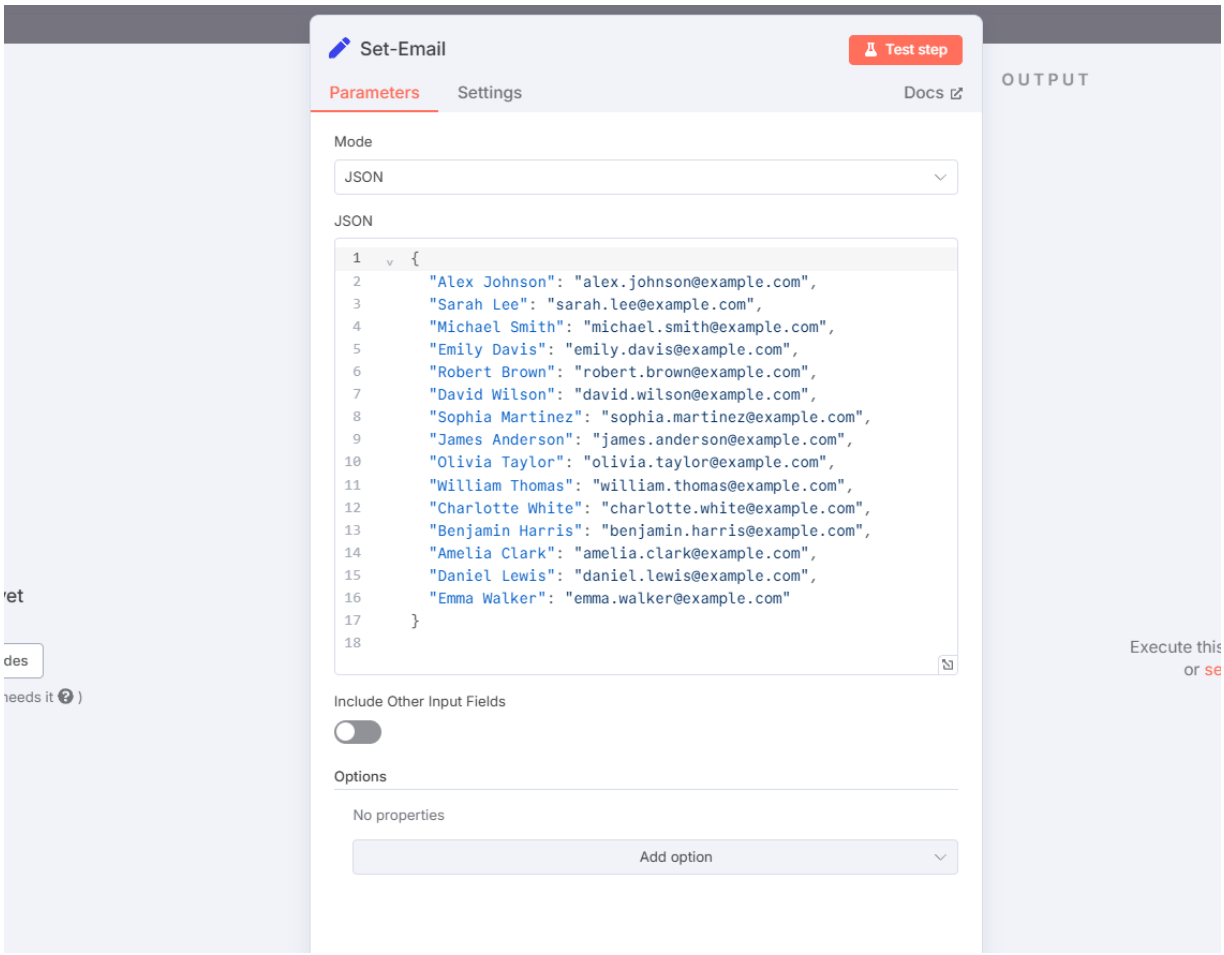


Figure 17: Stored Company emails

After careful filtering process of data coming from the AI should place within the ‘Google Calendar’ to share the meeting schedule among all other participants. Google Calendar node can send the update including all essential information such as, Title, Description of the meeting, Location, start time and the duration of the meeting. All attendees will notify us of this essential information.

Finally, the summary of the meeting schedule report will be displayed on the webpage as the reference of the command.

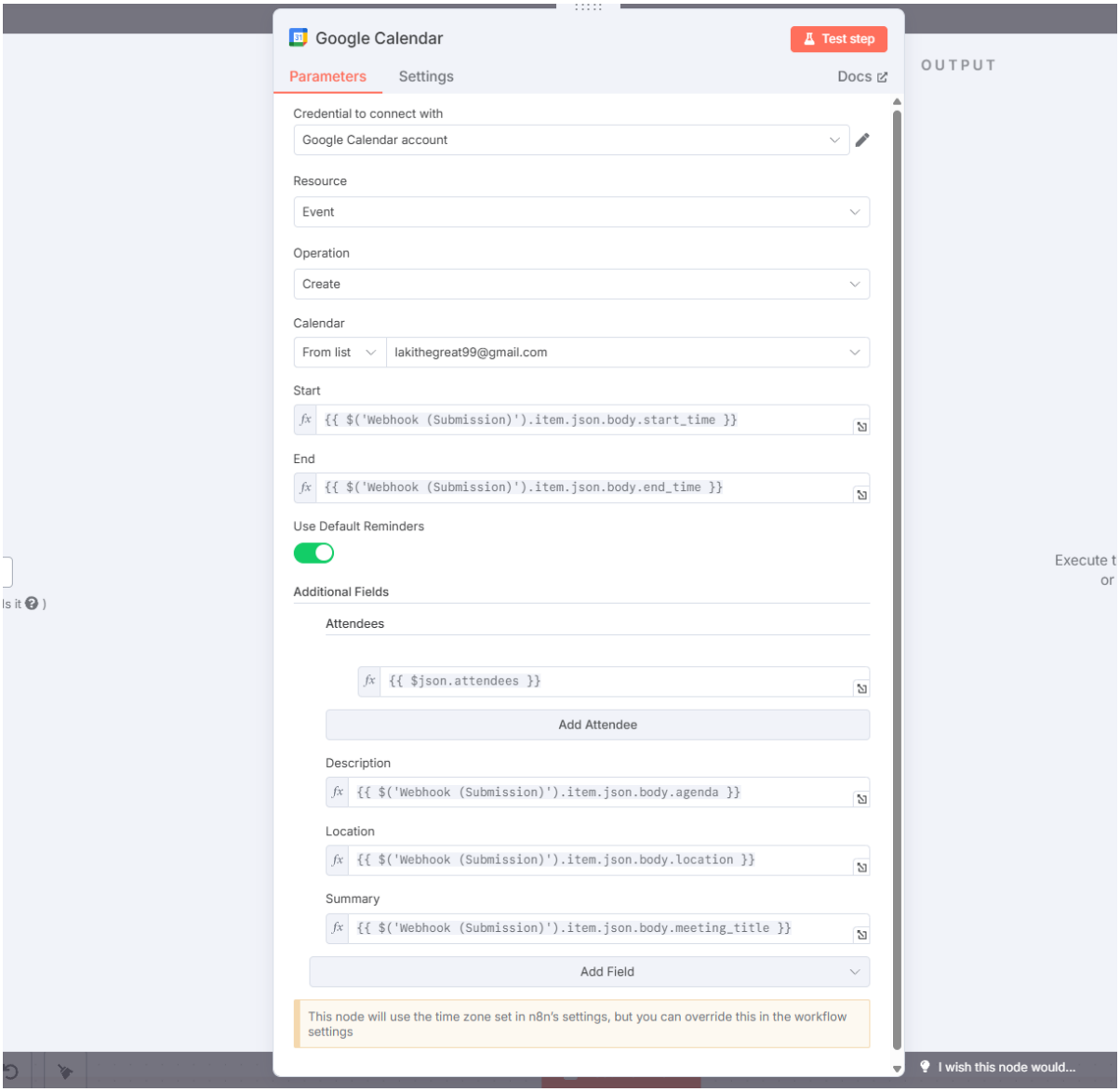


Figure 18: N8N calendar node

4.2.2. Summarize Meetings

This automation workflow discussed summarization of the meeting transcript to generate an understandable response without going manually through the meeting recording or transcript file. In the present world most companies use a meeting bot to summarize meetings and ChatGPT to summarize meetings. But using these methods of company data privacy has an impact on these. Using the proposed method, users can share the meeting transcripts to their own server and local LLM to produce high quality output.

This workflow contains two main sections to summarize the provided meeting transcript and having a conversational prompt to retrieve and modify specific areas of the generated summary by having a chat with AI.

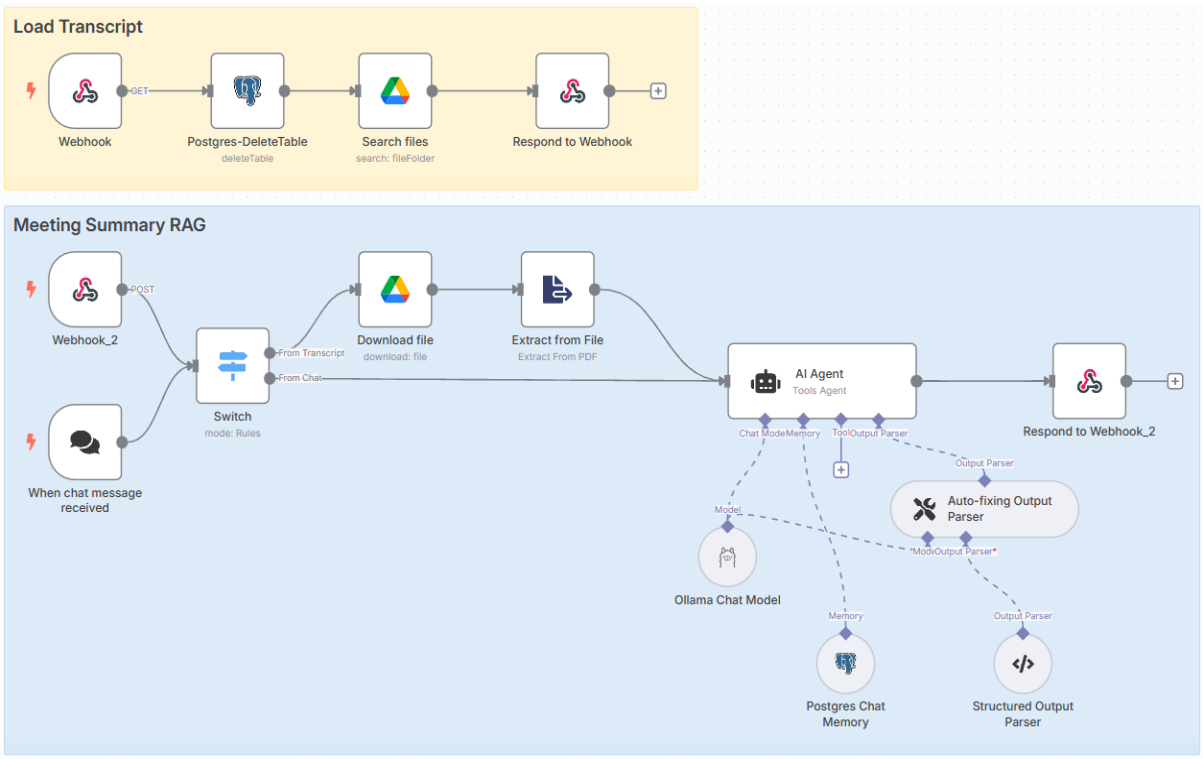


Figure 19: N8N workflow of Summarize meetings

Load Transcript

As same as previous workflow, system need to fetch all meeting transcript from specific Google folder. Compared to the previous workflow, this workflow has an additional node call ‘Postgres-DeleteTable’ that can delete (Truncate) specific table before running the second section.

Before using the PostgreSQL service, it needs to connect with Database, user, password and specific port given under docker desktop.

Meeting Summary RAG

The second section has two main triggers to start the workflow, the first trigger (webhook_2) activates when the user selects a meeting transcript and the second trigger (when the chat message received) activates when the chat message received from the user.

As the second step the node switch checked the right flow where the trigger activates from. If a user goes ahead with the meeting transcript, simply download the specific file as binary file and extract the specific binary file to readable data format.

In this time the AI Agent use for generating AI response instead of using ‘Basic LLM chain’ because in this workflow we need to store the summary and chat memory to conduct a conversational interface with the AI and the user. But each new session, the AI doesn’t need previous memory backup to continue the new session. For that reason, in the first session the table was deleted (truncate) for fresh start. As previously, under AI Agent LLAMA3.1 used as LLM and for chat memory Postgres and structured output parser were used.

For user prompts, customized prompts will be used including a new parameter ‘update_summary’ to check the status of the AI response. Basically, when the user needs to summarize the meeting transcript simply, return the output under summary box as,

update_summary: false
output: summary of the meeting

When a user needs to ask general questions from the AI chat simply return the output under chat window as,

update_summary: false
output: response to the user message

When a user needs to edit the summary as a new version of the summary, the user can chat with AI to have a specific new version of summary. Simply use example chat as “update the summary only including assignees and their tasks for upcoming week.” Will return the output under summary box as,

update_summary: true
output: new updated summary

In this AI, the update_summary parameter is decided by the AI from analyzing the user input by using the AI knowledge.

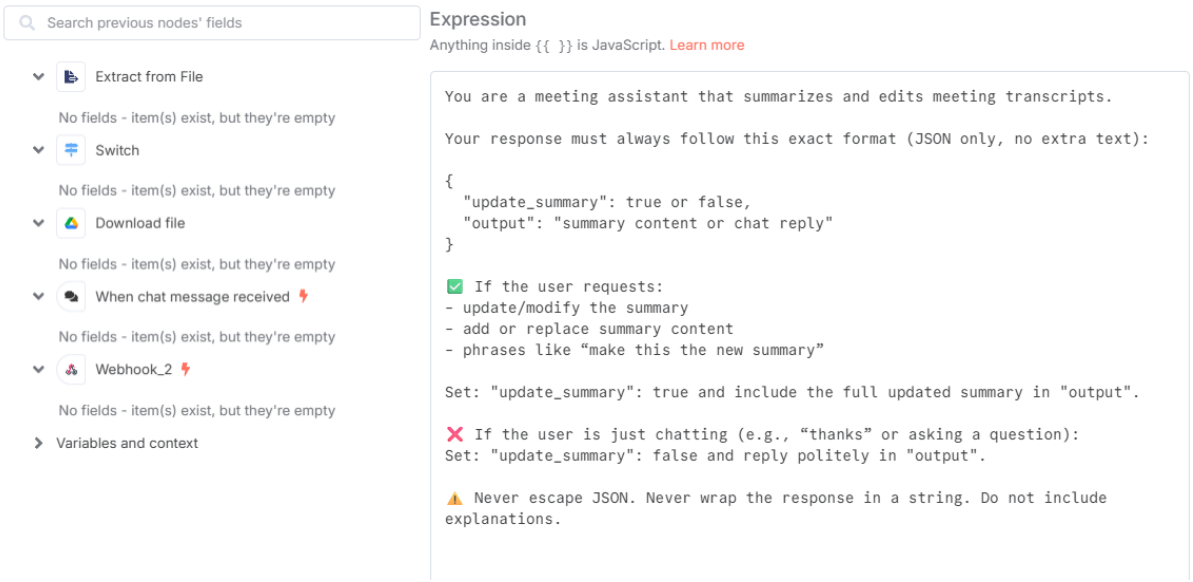


Figure 20: User Prompt for Summarize meeting's AI Agent

4.2.3. Chat with Internal Documents

In this automation workflow offer user to chat with internal documents such as company knowledge, project management base documentation, project management standards and company reports etc. The main important benefit of this chat was being able to fetch all uploaded document knowledge and response within provided knowledge. Also, the stored knowledge private to company server or deployed cloud server.

The workflow contains three main sections to provide an accurate result from the provided context only. As main workflow suggest to begging to explanation from ‘Tool to Add a Google Drive file to Vector DB’.

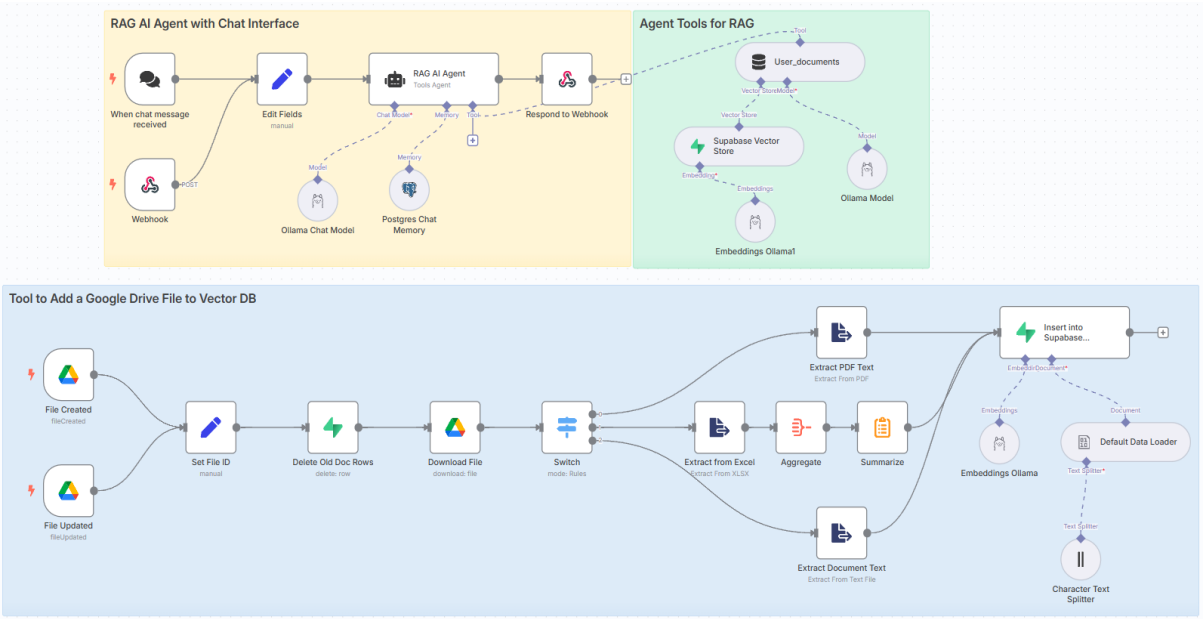


Figure 21: N8N workflow of Chat with Internal Documents

Tool to Add a Google Drive File to Vector DB

This section has two main triggers called ‘File Created’ and ‘File Updated’. The File Created trigger will start when a new file is added/uploaded under connected folder. Also File updated trigger will start when a file modified under connected folder. In this time this section does not trigger with the link from index page. In means, this section works on real time of updating the google drive. As next step ‘Set File id’ node fetch the file id and file type from each file present in the google folder.

The database (documents) will be increased day by day. To gather correct information for user queries, it needs to be very fast. As a solution for that vector databases were used to store all knowledge as vector to control easily. In here Supabase vector databases service used under Docker container. The file coming from the drive folder was downloaded as a binary file. From the switch node, check the file type and put it in the right flow to extract the data to AI understandable format. The first flow extracts the PDF files to data, and the second flow extracts the excel sheets to data with the help of aggregate that convert all rows into a single list and summarize node concatenate by adding comma separate value. The last flow extracts the text and ppt file into data format.

All the flows insert into the Supabase vector storage as embedded text (nomic-embed-text) with the size of 1000 as a chunk size and no overlaps. If file was updated on the drive folder, the old vector rows will be deleted of particular file to insert new version of the vector to avoid the overwritten of the data.

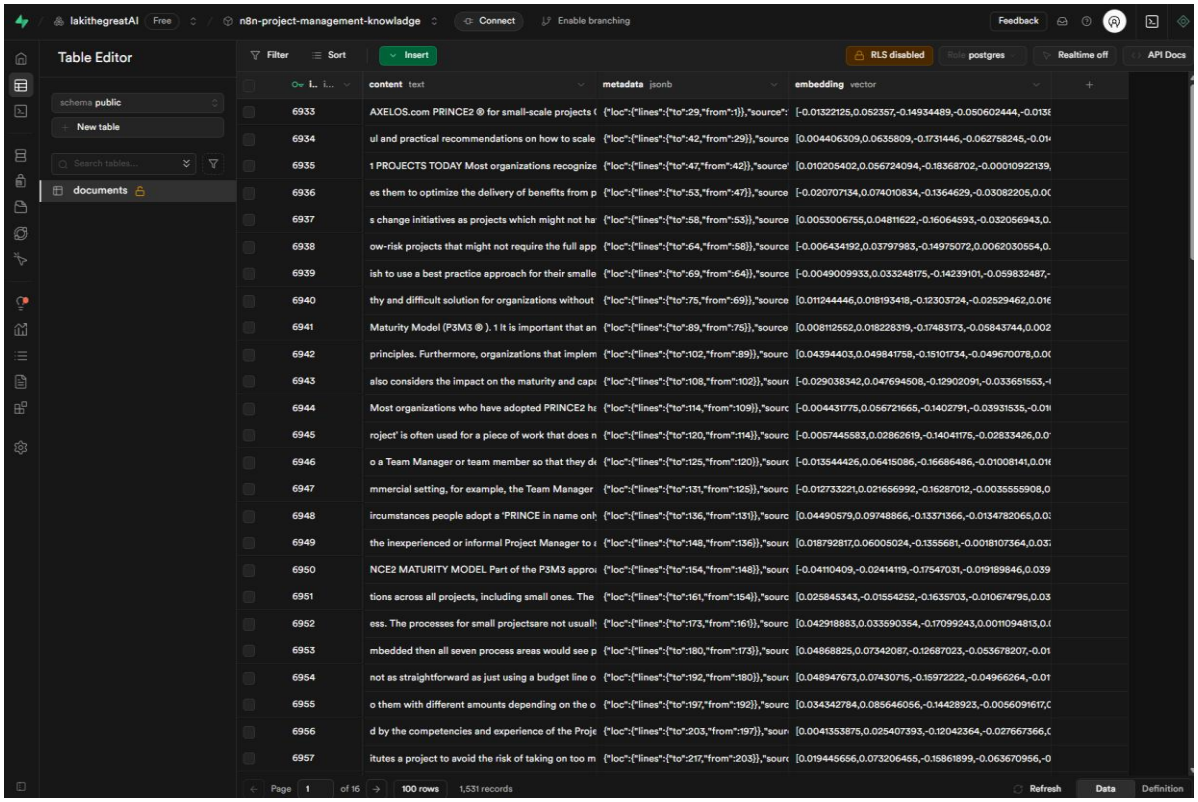


Figure 22: Supabase Vector Store (Database)

RAG AI Agent with Chat Interface

As discussed in the summarization of the meeting points RAG the same RAG will be used in this workflow. But the difference between these workflows carried out is a tool that will be connected to another section. Users can have a conversational session between AI to get the information related to the knowledge provided in google drive. When a user asks a question and the answer to that question is stored under PostgreSQL means, the user asks that question on a previous session. Then AI can directly fetch from the SQL database. The whole chat history will be stored under PostgreSQL. If a user asks a question that is not present in the SQL database, they will call tool to get the answer.

Agent tool for RAG

When AI needs to call the tool agent to fetch the answer, this section will start. As the first step the question from the user comes to the ‘user_document’ node to find the answer. The Ollama model node retrieves the answers from the Supabase vector store. In the meantime, embedding models work as decoder to decode the embedded texts coming from the vector database. Each iteration ‘user_document’ node takes four related answers and retrieves the better answer to the user.

4.2.4. Project Dashboard

The workflow displayed detailed information about the projects present in the Asana tool. Asana is a project management tool found in 2008, developed by an American company to organize team, track and manage company works [26]. The n8n provides the integration between Asana via API endpoint. Before using this service, the company needs to create an API key from the Asana account and from the n8n side, connect both services using OAuth2 authentication method instead of using access token method to get the full access between Asana.

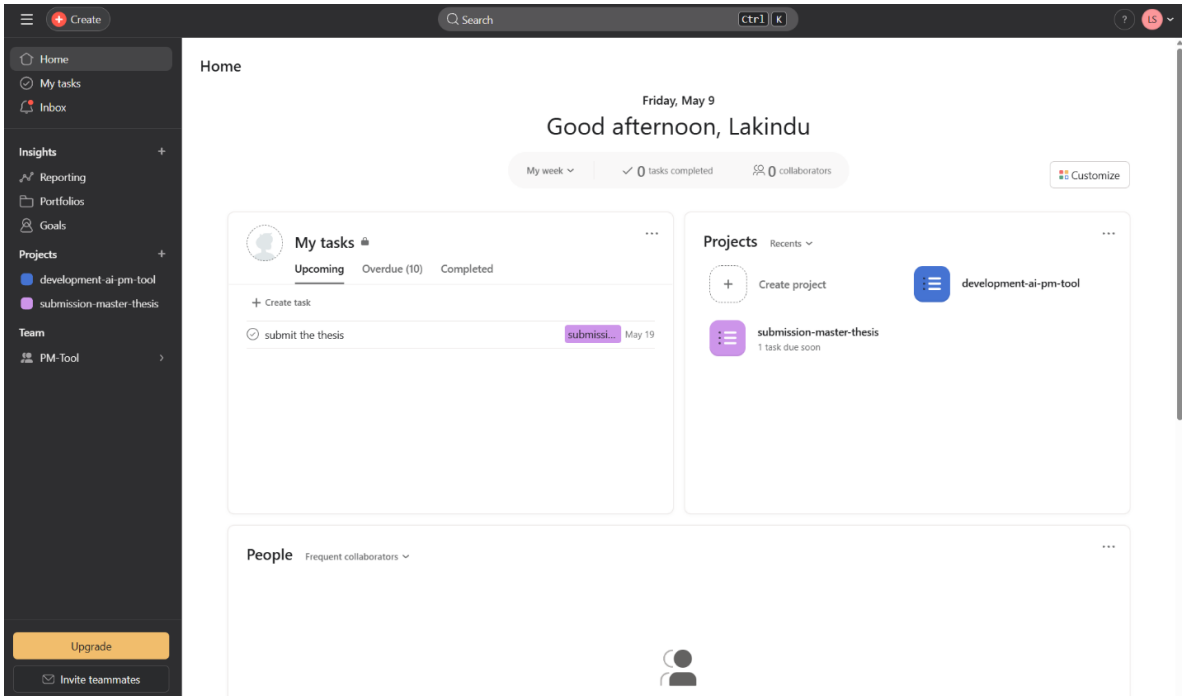


Figure 23: Overview of the Asana Tool

Basically, this workflow used a technique to fetch all projects from Asana and analyze all details of each project and provide an overview of the details about each project and provide an overview of the projects such as completion percentage, task percentage and important notification where user need to take care of next 4 to 5 days.

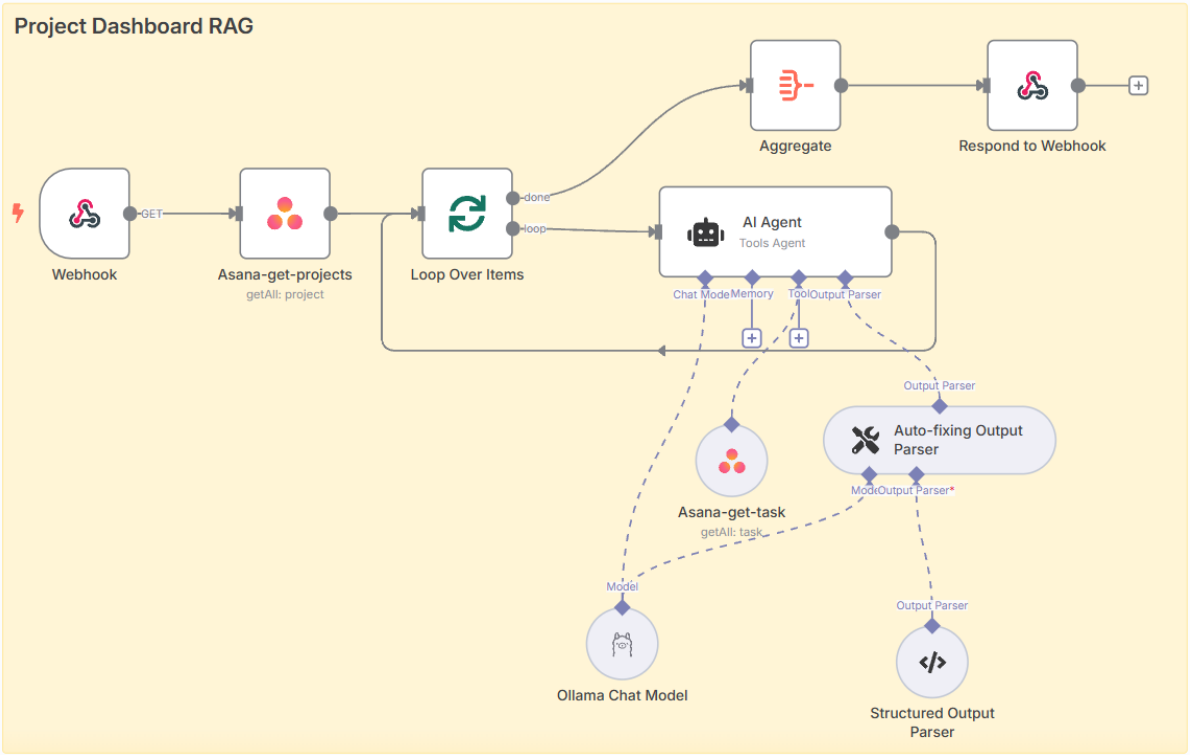


Figure 24: N8N workflow of Project Dashboard

Project Dashboard RAG

After activating the webhook trigger coming from the index page, the system fetches the all-Asana projects that are presented in the PM-Tool workspace. As the output from the 'Asana-get-projects' node, Json file passed with project id and project name. To analyze each project, 'Loop Over items' node take care as batch size equal to one. In this time the system used an AI Agent tool to get the tasks and their details having under the specific project. Using 'Asana-get-task' node, the AI fetch task id, task name, status of the completed and due date of each task to analyze the project details.

As the output AI, used a specific Json format to get a proper accurate result at the end of the workflow. The result contained project name, completeness, project due date and percentages of the tasks showing with the user-friendly interactive web interface.

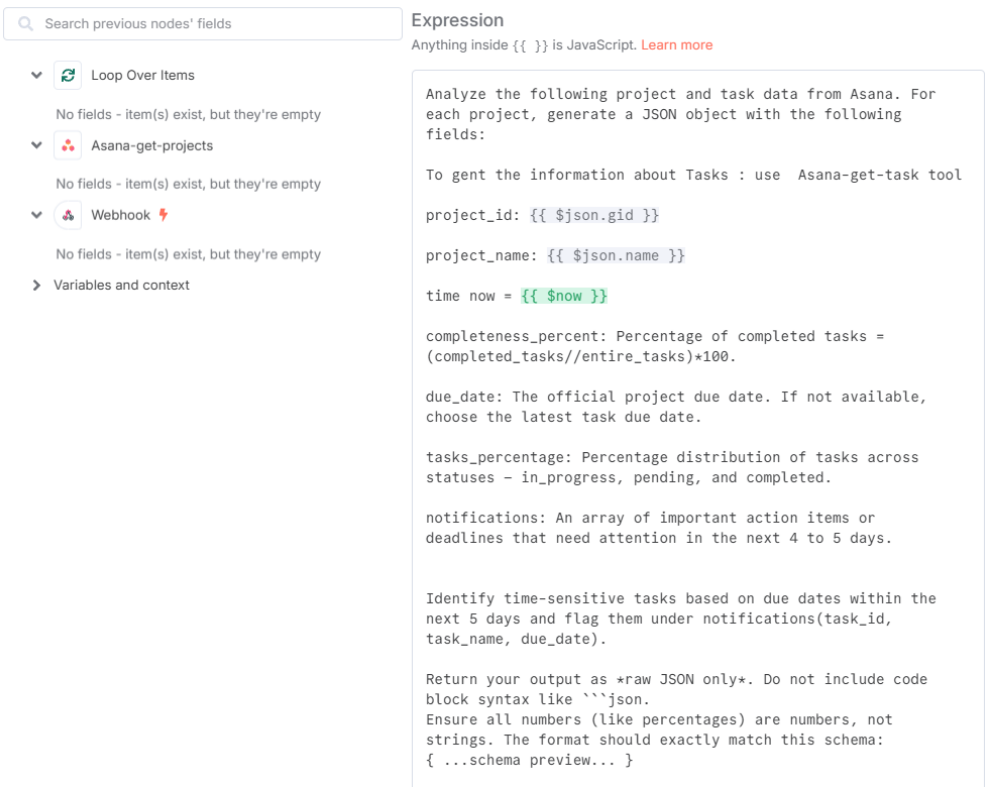


Figure 25: User Prompt for Project Dashboard's AI Agent

4.3. Integration

The system has five main workflows, and each workflow is linked through the index page. Using Docker, all dependencies have been connected. Microsoft Azure server runs on cloud with Linux GUI environment. ‘xrdp’ giving benefits to access the Linux server as a graphical desktop from any machine using remote desktop access feature [27]. GitHub repository has been created to push resources package from development machines to push to cloud server. In n8n has a button to activate each workflow for live demonstration. Acter enabling, the system is open for any triggers and API calls to run the workflow. Developers need to add credentials for services what we are using in the designed system before he/she runs the system as its first time. Credentials include Ollama, PostgreSQL, Asana, Google Drive and Supabase VDB credentials. The front end runs under webserver that has a port from Docker. The developer connects that port with the DNS server and creates a domain name to access the system through the internet easily.

4.4. Testing

Testing the implemented system has been done by various methods to build a quality product. To gather the right requirements the company conducted sprint meetings to discuss what I have done and adjustments of the requirements. Furthermore, I performed input validation and performance testing to polish the product. Company employees engaged to conduct an acceptance test to check the fulfilment of the requirement. The next chapter will discuss detailed information about all validation steps that are performed.

5. Validation

5.1. Requirement Validation

The initial idea to create this automated system for project manager's daily work came from DI's CEO (my supervisor). At the first stage I conducted individual interviews with each project manager, explaining basic ideas of the proposed system to gather requirements. In the 2nd stage, a structured survey was published under MS Forms to prioritize and rank the requirements.

After selecting the initial requirement to the system, the Implementation process took place. In stage 4, initial development of each selected requirement presented to stakeholders (company project managers) to get feedback. In the final review, conducted a final showcase and collected end-user feedback to confirm the acceptance of validated requirements.

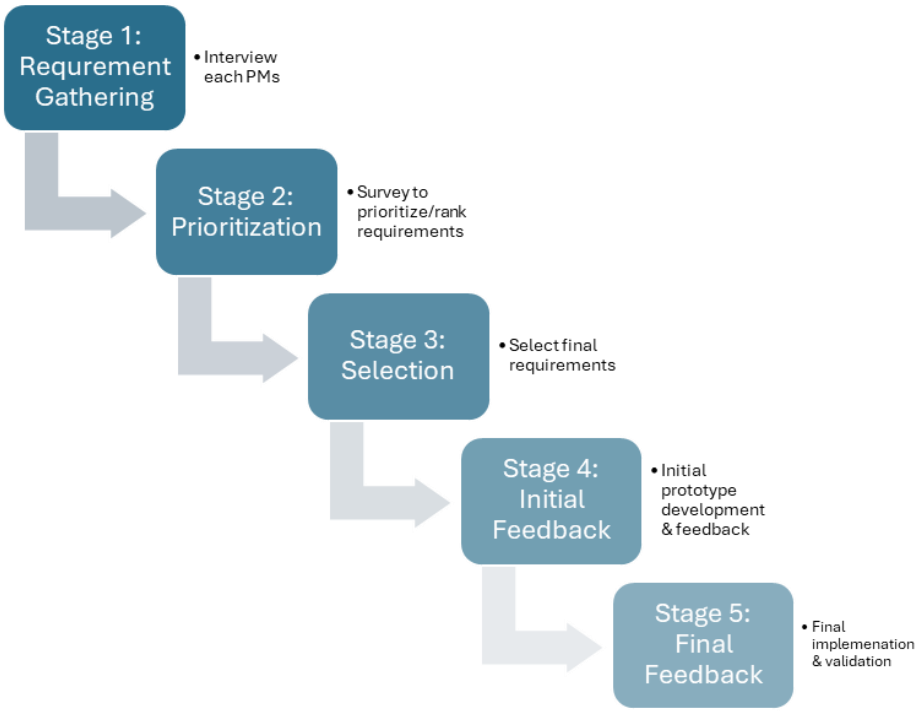


Figure 26: Diagram shows each step of the requirement validation

ID	Description	Stage 1	Stage 2 Scale (1-5)	Stage 3	Stage 4	Stage 5
1	Conversational interface	Mr. Anh	4.33	✅	-	Finalized
2	Meeting summarization	Mr. Anh, Moritz	3.33	✅	Users can edit and regenerate	Finalized
3	Generate agenda	Mr. Arslan	4.67	✅	-	Finalized
4	Follow-up meetings	Mr. Firas	3.67	✅	Add company employee emails	Finalized
5	Email template	Mr. Moritz	4.00	❌	-	Discarded
6	Outlook integration	Mr. Moritz	3.33	❌	-	Discarded
7	Chat with company knowledge (Database)	Mr. Anh, Firas	4.00	✅	Save chat memory	Finalized
8	Customized LLM	Mr. Manuel, Habib	3.67	✅	Add company knowledge to train	Accepted
9	Generate project documents	Mr. Habib	3.00	❌	-	Discarded
10	Asana integration	Mr. Manuel, Habib, Faruk	4.00	✅	Create task from meeting transcript	Partially met - Accepted
11	Generate graphics, diagrams	Mr. Arslan	3.00	❌	-	Discarded
12	Project dashboard	Mr. Habib	3.33	✅	Add completeness and important notification alert	Finalized

Table 3: Requirement validation table

5.2. Fulfilment of Functional Requirements

In this section covers how much of each functional requirement fulfilled at the end of the MVP application.

Each functional requirement starts after clicking respective button for each task on index page.

1. **Setup follow-up meetings**

As a result, this workflow properly worked. After the user downloads the specific meeting transcript, the AI fetches the relevant information for set-up a follow-up meeting, from the frontend user can edit and submit the pre-filled form. So, this requirement is fully met.

2. **Generate agenda**

As a part of ‘setup follow-up meetings’ workflow, this requirement mainly creates an agenda for follow-up meetings. The agenda includes all the information to take care of the coming meeting as bullet points. So, this requirement is fully met.

3. **Summarize meetings**

As a result, this workflow generates meeting summary as a text file that user can download to their personal computer. Addition to that, user can chat with summary and edit, modify the summary. So, this requirement is fully met.

4. **Connect Asana tool for project update**

Basically, this workflow fetches the information from the selected meeting transcript and selected project present in Asana. After analyzing the AI, the system pointed out updated fields like existing tasks and new tasks that the user can edit and submit the form to update on Asana tool. As a result, successfully fetch and analyze the output from the AI but couldn’t connect to the frontend to edit pre-filled form and submitting automation. So, this requirement is partially met.

5. **Chat with internal documents**

As a result, this workflow stored company documents and reports as a vector in the database. Users can chat with internal documents. So, this requirement is fully met.

6. **Project dashboard**

As a result, this workflow fetches the all-project details from Asana and displays as fully detailed dashboard including notification alert. So, this requirement is fully met.

7. **Generate project reports**

From this requirement, users can generate project related reports such as Gannt chart, meeting minutes etc. Simply user can chat with the AI and all information about projects can be found in Asana. Unfortunately, this workflow couldn’t be completed with the time limitation. So, this requirement is not met.

Requirements	Fully met	Partially met	Not met
1. Set-up follow-up meetings	x		
2. Generate meeting agenda	x		
3. Summarize meetings	x		
4. Chat with internal documents	x		
5. Connect "Asana" software for project automation		x	
6. Detailed project dashboard	x		
7. Generate Project reports			x

Table 4: Functional requirement fulfilment

5.3. Acceptance Testing

The system was designed for DI's internal purposes, as so far from this study I had a user acceptance test with end-users that are going to use this system. With the time limitation I couldn't complete the acceptance test with all of the project managers that are present in the company. For the acceptance test my supervisor (CEO of DI) tested his powerful laptop locally and provided positive feedback for the overall designed system.

5.4. Performance Testing

In this section the system was tested by using several tools to check the benchmark and performance of the designed system. For that, these tests check through two main areas such as system hardware performance and each workflow's performance.

To check the hardware performance, 'Process Monitor' software was used. Resource monitor is a tool developed by Microsoft capable of Windows Vista and later versions that show real-time details about hardware used [28]. To use this facility simply go task manager > performance > resource monitor. Using this software CPU and memory usage (RAM) was checked [29].

The main hardware device for AI capabilities was graphic cards (GPU). To check the usage and other parameters I chose the software called ‘Nvidia Management Interface’ (Nvidia-Smi) is a command line tool built on top of the Nvidia Management Library that helps control and keep an eye on GPU measurements [30].

Monitoring the workflow’s benchmark is also a main part of this evaluation process. Using another workflow created by Xavi [31], we can generate each workflow’s execution report. Examine how n8n workflow is being executed and produce a comprehensive report including AI expenses, node performance and optimization recommendations.

CPU

Testing computer uses AMD Ryzen 7 7800x3d processor includes 8 cores 16 threads maximum boost to 5GHz clock speed [32]. When a workflow was running, the CPU usage of the system increased from 7% to 14%. ‘vmmemWSL’ was the Linux environment used under Docker for running this program. Average CPU usage around 2.16 means the program performs well over CPU without any overload and pressure.

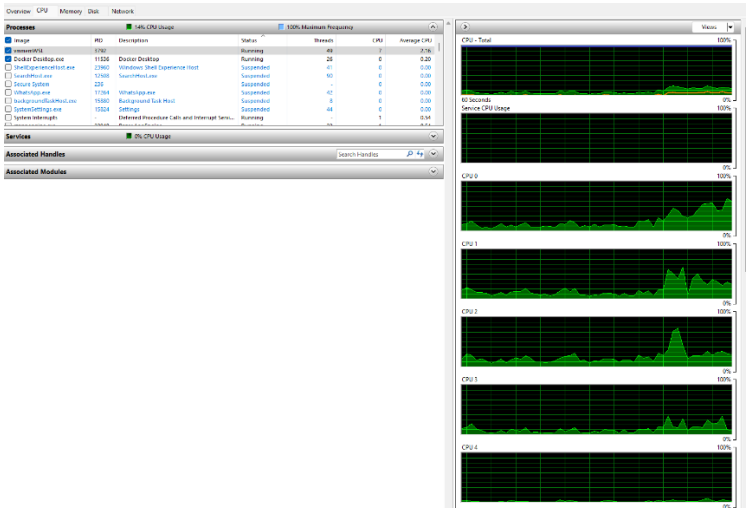


Figure 27: CPU Usage when running the workflow

RAM

The computer has 32GB total memory installed and when the running instance of this screenshot shows how much memory is used. Around 62% of physical memory is used (~20GB). In here ~15% of memory usage increased when workflow running under Docker. The process ‘vmmemWSL’ reserved ~18GB virtual memory and ~7.3GB actual physical memory in use. As so far ‘Zero hard faults/sec’ nearly zero means system is not frequently accessing the page file due to insufficient RAM. The system used more memory to run the workflows, but it was not badly affected by the computer’s other operations.

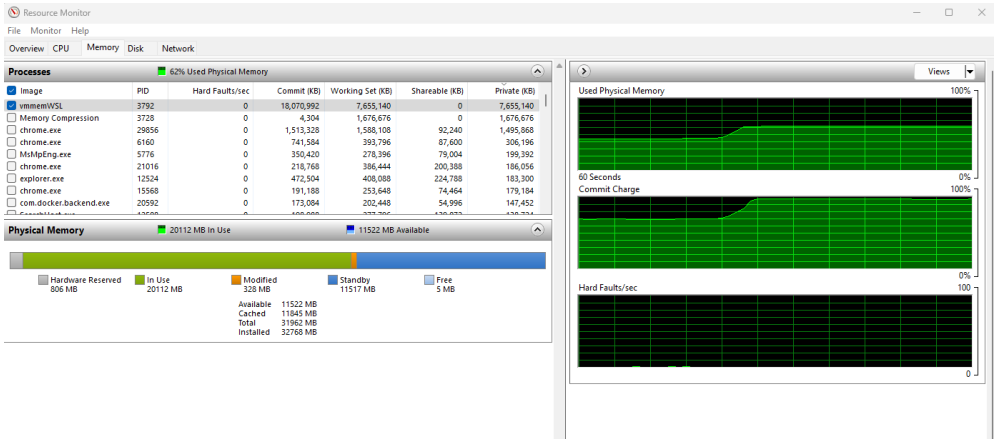


Figure 28: RAM Usage when running the workflow

GPU

The computer has a Nvidia GPU (RTX 4070 Super) with 12GB graphical memory. GPU driver and CUDA version are up to date to get better performance. Basically, CUDA is a parallel computing platform and programming model developed by NVIDIA for general computing on graphical processing units (GPUs). By utilizing the capabilities of GPUs, developers may significantly accelerate computing applications with CUDA [33]. Cuda can run LLM's parameters parallelly at the same time to generate AI response. In the below example, the figure shows how GPU works before and at the running stage of the workflow. Before the workflow starts, the GPU utilization is approximately 4% and memory usage is nearly 1GB. When the workflow in the running stage and AI node was started, the GPU increased to ~90% and memory ~7GB to produce an answer.

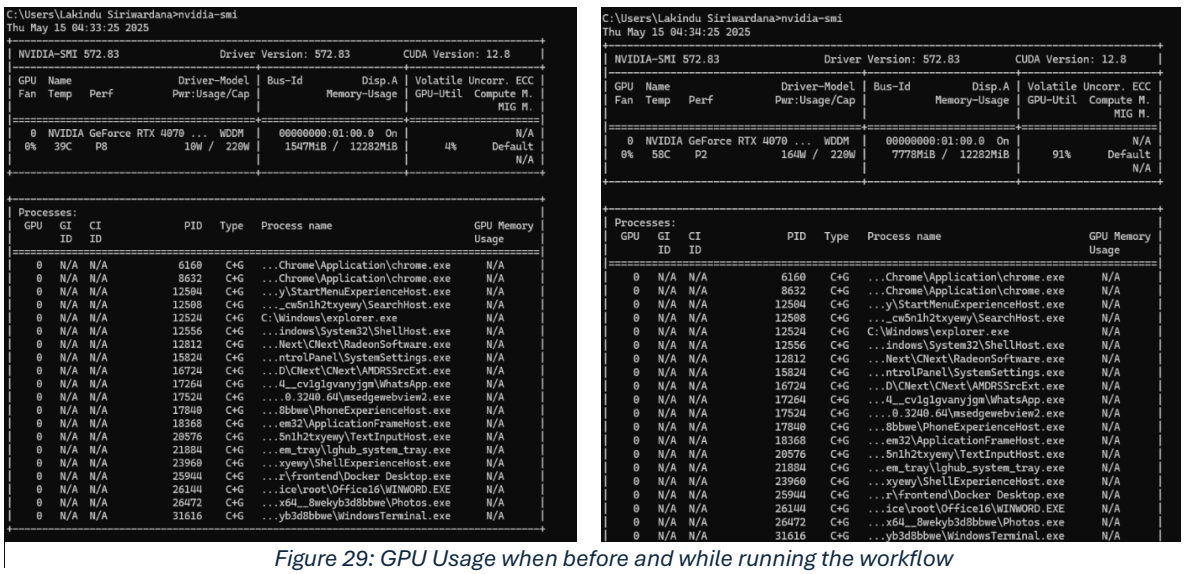


Figure 29: GPU Usage when before and while running the workflow

Workflow Testing

Each workflow test contains the status, duration of the process and times spent in each node and if that token related to an AI, especially Model used, and tokens used. At the end most execution node (bottleneck) summary will be available.

Execution Report

Workflow: index-page-chat

Execution ID: 1076
Status: success
Date: 05/05/2025 - 13:04:59
Duration: 0.635s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	llama3.1:latest	99 + 31	616	Price not available
AI Agent	llama3.1:latest	0 + 0	632	N/A

Non-AI Nodes

Node	Type	Time (ms)
Webhook	webhook	0
Edit Fields	set	0
Postgres Chat Memory	memoryPostgresChat	8
Respond to Webhook	respondToWebhook	0

Report Analysis

Slowest node: AI Agent 632ms

Bottleneck nodes

- Ollama Chat Model | 616 ms | **49.04%** of total execution time
- AI Agent | 632 ms | **50.32%** of total execution time

Execution Report

Workflow: follow_up_meetings

Execution ID: 1081
Status: success
Date: 05/05/2025 - 17:40:36
Duration: 25.62s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	deepseek-r1:14b	1059 + 453	23343	Price not available

Non-AI Nodes

Node	Type	Time (ms)
Webhook	webhook	0
Google Drive	googleDrive	1397
Extract from File	extractFromFile	183
Auto-fixing Output Parser	outputParserAutofixing	1
Structured Output Parser	outputParserStructured	1
Basic LLM Chain	chainLlm	24035
Respond to Webhook	respondToWebhook	1

Report Analysis

Slowest node: Basic LLM Chain 24035ms

Bottleneck nodes

- Ollama Chat Model | 23343 ms | **47.68%** of total execution time
- Basic LLM Chain | 24035 ms | **49.09%** of total execution time

Workflow: summarize_meeting

Execution ID: 1053
Status: success
Date: 05/05/2025 - 09:32:47
Duration: 10.319s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	llama3.1:latest	860 + 203	8259	Price not available
AI Agent			8965	N/A

Non-AI Nodes

Node	Type	Time (ms)
Webhook1	webhook	0
Switch	switch	11
Google Drive1	googleDrive	1153
Extract from File	extractFromFile	186
Postgres Chat Memory	memoryPostgresChat	8
Auto-fixing Output Parser	outputParserAutofixing	1
Structured Output Parser	outputParserStructured	1
Respond to Webhook1	respondToWebhook	1

Report Analysis

Slowest node: AI Agent 8965ms

Bottleneck nodes

- Ollama Chat Model | 8259 ms | **44.44%** of total execution time
- AI Agent | 8965 ms | **48.24%** of total execution time

Execution Report

Workflow: summarize_meeting

Execution ID: 1056
Status: success
Date: 05/05/2025 - 09:34:05
Duration: 3.22s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	llama3.1:latest	1173 + 91	1759	Price not available
AI Agent	llama3.1:latest	0 + 0	3216	N/A

Non-AI Nodes

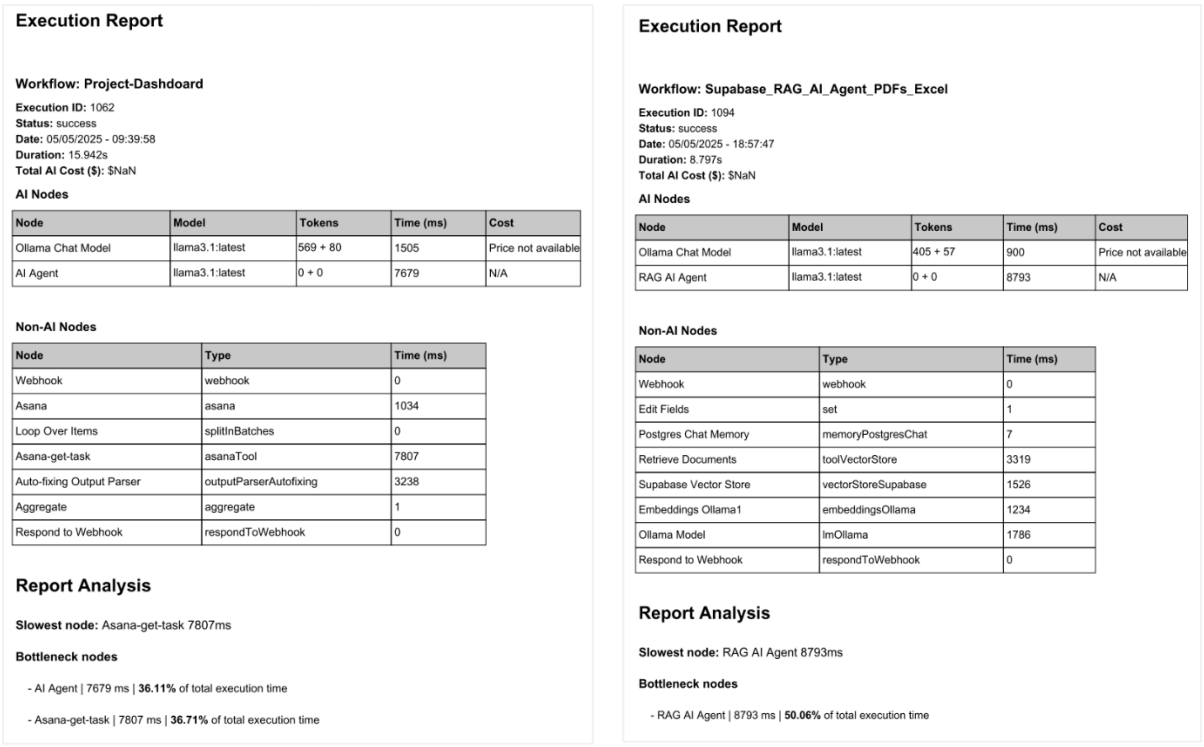
Node	Type	Time (ms)
When chat message received	chatTrigger	0
Switch	switch	1
Postgres Chat Memory	memoryPostgresChat	8
Auto-fixing Output Parser	outputParserAutofixing	1436
Respond to Webhook1	respondToWebhook	0

Report Analysis

Slowest node: AI Agent 3216ms

Bottleneck nodes

- AI Agent | 3216 ms | **50.09%** of total execution time



Execution Report

Workflow: Project-Dashboard

Execution ID: 1062
Status: success
Date: 05/05/2025 - 09:39:58
Duration: 15.942s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	llama3.1:latest	569 + 80	1505	Price not available
AI Agent	llama3.1:latest	0 + 0	7679	N/A

Non-AI Nodes

Node	Type	Time (ms)
Webhook	webhook	0
Asana	asana	1034
Loop Over Items	splitInBatches	0
Asana-get-task	asanaTool	7807
Auto-fixing Output Parser	outputParserAutofixing	3238
Aggregate	aggregate	1
Respond to Webhook	respondToWebhook	0

Report Analysis

Slowest node: Asana-get-task 7807ms

Bottleneck nodes

- AI Agent | 7679 ms | **36.11%** of total execution time
- Asana-get-task | 7807 ms | **36.71%** of total execution time

Execution Report

Workflow: Supabase_RAG_AI_Agent_PDFs_Excel

Execution ID: 1094
Status: success
Date: 05/05/2025 - 18:57:47
Duration: 8.797s
Total AI Cost ($): $NaN

AI Nodes

Node	Model	Tokens	Time (ms)	Cost
Ollama Chat Model	llama3.1:latest	405 + 57	900	Price not available
RAG AI Agent	llama3.1:latest	0 + 0	8793	N/A

Non-AI Nodes

Node	Type	Time (ms)
Webhook	webhook	0
Edit Fields	set	1
Postgres Chat Memory	memoryPostgresChat	7
Retrieve Documents	toolVectorStore	3319
Supabase Vector Store	vectorStoreSupabase	1526
Embeddings Ollama1	embeddingsOllama	1234
Ollama Model	lmOllama	1786
Respond to Webhook	respondToWebhook	0

Report Analysis

Slowest node: RAG AI Agent 8793ms

Bottleneck nodes

- RAG AI Agent | 8793 ms | **50.06%** of total execution time

Figure 30: Performance Testing of each workflow

5.5. Input Validation (error handle)

Error handle testing done under two main areas. The basic error handling scripts were used in the front-end code as JavaScript code. And other areas to use error handling through AI. When AI had an error while running the code, it raised an error and provide an output as empty Json with error code and the frontend catch the empty response and error code to identify and pops up message.

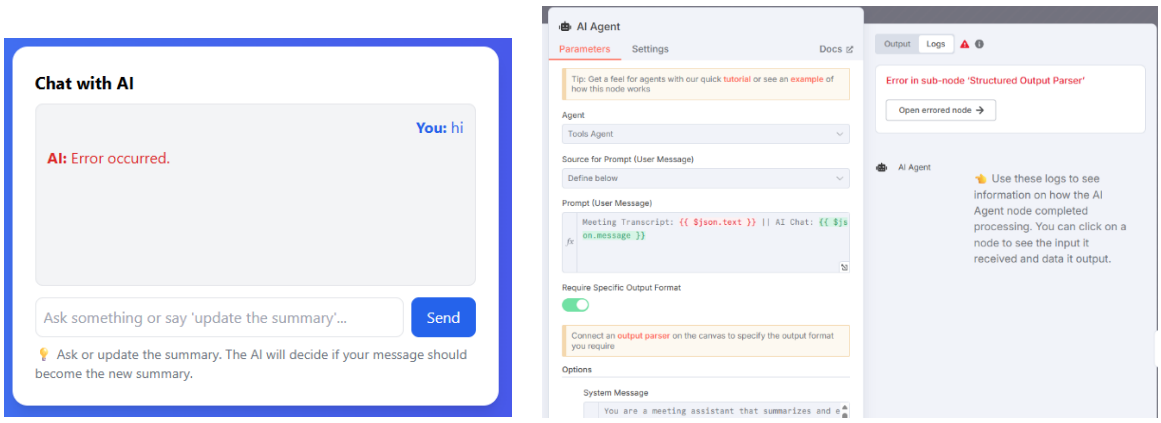


Figure 31: Error handling in AI Agent

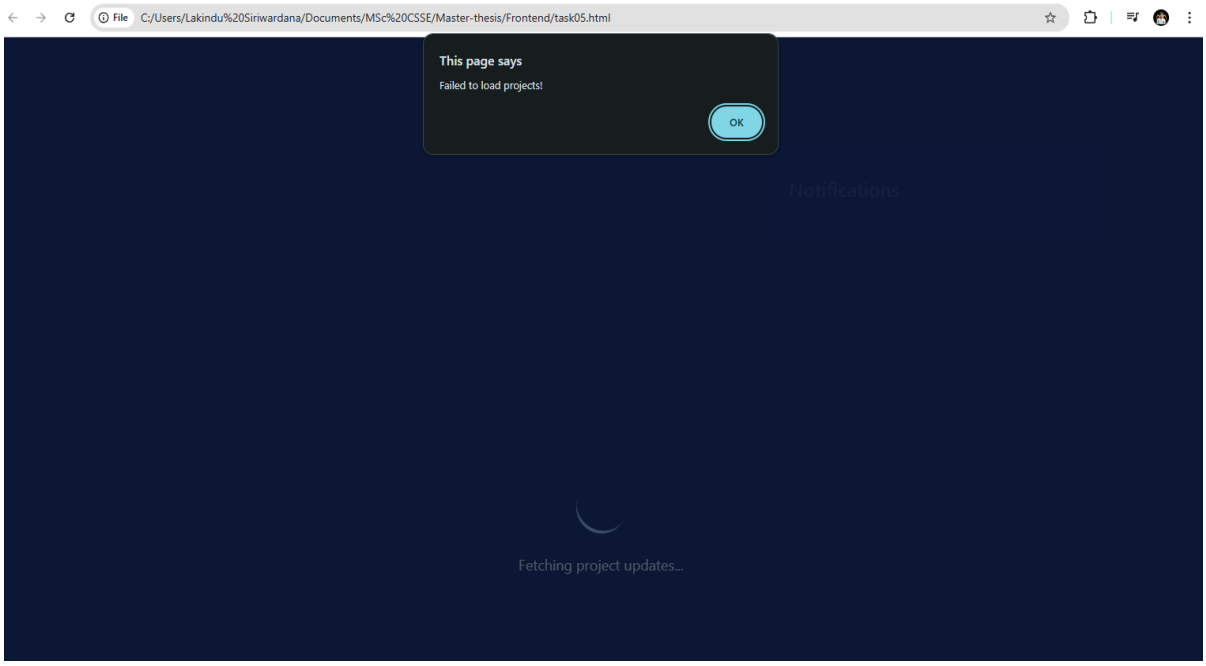


Figure 32: Error handling in the System

5.6. Effort-Based Validation

Using an adjusted COCOMO model calibrated for AI-enhanced low-code prototyping [34], each traditional coding task is estimated to take 17–38 developer days, compared to the actual 7–15 days spent using n8n and Ollama. This reflects a 2× – 4× reduction in effort through low-code automation.

Effort (PM) = 3.0 × (KLoC)^1.12 [35]
Assume a semi-detached team (a = 3.0, b = 1.12)
a: A productivity coefficient — how much effort (in person-months) is needed per unit of code.
b: An exponential factor — reflects project complexity (how effort grows with more code).

Workflow	KLoC (Realistic)	Effort (PM)	Hours	Days	Actual Days (n8n)
Set-up follow-up meetings	0.3	0.89	135	17	10
Generate Agenda	0.4	1.14	173	22	5

Workflow	KLoC (Realistic)	Effort (PM)	Hours	Days	Actual Days (n8n)
Summarize meetings	0.5	1.41	215	27	15
Chat with internal documents	0.6	1.70	260	33	18
Connect Asana for project automation	0.4	1.14	173	22	15
Detailed project dashboard	0.8	2.00	304	38	8

Table 5: Effort base validation

6. Conclusions

6.1. Summary of the Key Findings

The main objective of this thesis is to develop an AI Assistant for Project Management tasks that can be helpful for DI project manager's daily routine. To achieve this main objective, I divided the whole process into four specific objects such as,

- State of Art
- Design and Implementation
- System deployment
- Validate the designed system

The chapter state of art looking for related scientific research has been done in the past few years. Also, commercial tools that are trending on the present market. As a result, I conducted good research comparison between both related research and systems that should help to implement the proposed system. As I noticed, the project manager has a huge area to cover with AI. Most of the available products covered only a few specific areas.

The chapter design and implementation mainly focus on system architecture and project implementation setup step by step. For better scalability, the system used

microservices architecture and ran the main services such as webserver, n8n, Ollama and database under docker container for rapid integration and continuous delivery (CI/CD).

The implementation process includes various types of key tasks and their step-by-step development phase. The proposed system states seven major key tasks that should be achieved as their first version of the application (MVP). As the developer I build most of the use cases under n8n as automated workflows. One of the scopes of this thesis is to use low code solutions to develop that product for maintainability and future works.

After successful implementation of major tasks, the system must deploy under Microsoft Azure cloud as mentioned in the thesis. For testing purposes, I used a GitHub repository as a one package including all dependencies to smooth run under company server or a powerful employee laptop. After careful acceptance test with the employee, the system should deploy under cloud provider for better hardware requirement and scalability of the project.

The last chapter called validation of the designed system evaluated the product quality of the system using various kinds of activities such as requirement validation, fulfilment of functional requirements, performance testing and input validation techniques. As a result of each validation method comes up with unique areas for testing phase. Requirements are chosen by the interviewers and with the help of the survey results, most of the selected requirements are fulfilled at the end of this thesis. The performance testing and input validation test was done by using various tools and had better results at the end of the validation test cases.

6.2. Reflection & Implications

Considering this research experience, developing an AI assistant for project managers becomes a potential benefit to DIGITAL IMPACTS and other business world. This application shows how AI adapted for our day-to-day activities and benefits from AI works. This technology will be a useful product for all project managers because the workload can be divided and split into minor tasks with the help of this summarization and project dashboard. Automating repetitive tasks like meeting scheduling, agenda creation, and summary generation saves time for teams, allowing them to focus on strategic work.

Furthermore, the data privacy related queries can be decreased without using external AI software such as ChatGPT and DeepSeek. The main LLMs could be run under local server and all other dependent tools running with the help of Docker.

The system can be improved in various areas to attract more users (not only for the PM) and for client assistants. The topic below ‘Future work’ will be discussed for more opportunities.

6.3. Future Works

The several areas that can be improved after the first version of the system (MVP). In the below mentioned, a few areas have already caught the eye that could be worked on in the future.

User Authentications: While the system showed good performance on each validation method, the next step is to deploy the system under cloud as I mentioned in the thesis. When the system was running in the cloud, more than one user needed to connect at the same time to access the system. As a result, I am working with the JWT Auth0 service to generate access tokens for each user.

Project Management Standards: Add project management standards such as PRINCE2, PMBOK etc. to leveraging phases, processes, artifacts, roles and responsibilities which can help to generate new use cases and insights. (The present project can handle knowledge about PM standards but in the future system, need to have specific structure to work with more use cases)

Visual Aids: Generate visual diagrams such as project timelines, project diagrams and project related visuals using AI to enhance user experience.

Voice commands over AI chat and meeting bot: To enhance user experience, enable voice over AI that user can insert voice commands to execute workflows and communication in between system. Addition to that, planning to connect meeting bot to get the real update of the meetings instead of using meeting transcript after each meeting.

Risk Management via AI: Train the AI (build a new fine-tune model) to analyze more risk management use cases and improve decision-making knowledge.

Bibliography

[1] "DIGITAL IMPACTS – We guide our customers through the digital age." Accessed: May 18, 2025. [Online]. Available: https://digitalimpacts.net/de/startseite/

[2] "(5) DIGITAL IMPACTS GmbH: About | LinkedIn." Accessed: May 18, 2025. [Online]. Available: https://www.linkedin.com/company/digitalimpacts/about/

[3] "Consulting – DIGITAL IMPACTS." Accessed: May 18, 2025. [Online]. Available: https://digitalimpacts.net/de/consulting-de/

[4] C. Hess and S. Kunz, "The Project Management Assistant that Never Sleeps - Using Generative Artificial Intelligence to Support Project Management Activities," *International Journal On Advances in Software*, vol. 17, no. 1 and 2, pp. 44–58, Jun. 2024, Accessed: May 17, 2025. [Online]. Available: http://www.iariajournals.org/software/2024,

[5] C. Hess and S. Kunz, "The Project Management Assistant that Never Sleeps," *personales.upv.esC Hess, S Kunzpersonales.upv.es*, vol. 17, Accessed: May 17, 2025. [Online]. Available: https://personales.upv.es/thinkmind/dl/journals/soft/soft_v17_n12_2024/soft_v17_n12_2024_5.pdf

[6] A. M. Felicetti, A. Cimino, A. Mazzoleni, and S. Ammirato, "Artificial intelligence and project management: An empirical investigation on the appropriation of generative Chatbots by project managers," *Journal of Innovation & Knowledge*, vol. 9, no. 3, p. 100545, Jul. 2024, doi: 10.1016/J.JIK.2024.100545.

[7] K. Alam, M. H. Bhuiyan, M. S. Islam, A. H. Chowdhury, Z. A. Bhuiyan, and S. Ahmmed, "Co-Pilot for Project Managers: Developing a PDF-Driven AI Chatbot for Facilitating Project Management," *IEEE Access*, 2025, doi: 10.1109/ACCESS.2025.3548519.

[8] M. Jayaram, Y. Bhutkar, I. L. Kumar Bojjanapalli, G. Yeshwanth, and B. Y. Reddy, "Beyond Automation: AI-Driven Project Management with OpenAI and Prompt Engineering," *International Conference on Electrical, Computer, and Energy Technologies, ICECET 2024*, 2024, doi: 10.1109/ICECET61485.2024.10698333.

[9] S. S.-N. P. (ISSN: 1660-6795) and undefined 2023, "Artificial Intelligence Driven Agile Project Management: Enhancing Collaboration, Productivity, and Decision-Making in Virtual Teams," *researchgate.netS SomanathanNanotechnology Perceptions (ISSN: 1660-6795), 2023•researchgate.net*, Accessed: May 17, 2025. [Online]. Available: https://www.researchgate.net/profile/Sureshkumar-

Somanathan/publication/391201861_Artificial_Intelligence_Driven_Agile_Project_Management_Enhancing_Collaboration_Productivity_and_Decision-Making_in_Virtual_Teams/links/680d38e7bfbe974b23bc2ae6/Artificial-Intelligence-Driven-Agile-Project-Management-Enhancing-Collaboration-Productivity-and-Decision-Making-in-Virtual-Teams.pdf

[10] “The AI Powered Super App for Work | Motion (Try for free).” Accessed: May 18, 2025. [Online]. Available: https://www.usemotion.com/

[11] “Customer Stories | Motion.” Accessed: May 18, 2025. [Online]. Available: https://motionapp.com/resources/customer-stories

[12] “AI Task Manager: I Tested 20+ Task Managers. Here’s My Top 7.” Accessed: May 18, 2025. [Online]. Available: https://www.usemotion.com/blog/ai-task-manager

[13] “AI Personal Assistant for Project Professionals | PMI Infinity.” Accessed: May 18, 2025. [Online]. Available: https://www.pmi.org/infinity

[14] “PMI Infinity – a revolutionizing GenAI tool for Project Management | NTT DATA Group.” Accessed: May 18, 2025. [Online]. Available: https://www.nttdata.com/global/en/insights/focus/2024/pmi-infinity

[15] “Message from Glean.” Accessed: May 18, 2025. [Online]. Available: https://www.glean.com/product/overview

[16] “Work AI for all - AI platform for agents, assistant, search.” Accessed: May 18, 2025. [Online]. Available: https://www.glean.com/?r=0&utm_source=google&utm_medium=paid-search&utm_campaign=non-branded-emea-sc&utm_term=ai%20productivity%20assistant&gad_source=1&gad_campaignid=22329607194&gbraid=0AAAAAoJ_vzGugUc9-3-GXBaTGnYD_1tq5&gclid=CjwKCAjwz_bABhAGEiwAm-P8YfuuAyAJtVuEJPO4_P82RfZrGJgpodhpHAY6XfPFqywbrykYwbQZ0hoCLicQAvD_BwE

[17] “Powerful Workflow Automation Software & Tools - n8n.” Accessed: May 18, 2025. [Online]. Available: https://n8n.io/

[18] “GitHub - n8n-io/n8n: Fair-code workflow automation platform with native AI capabilities. Combine visual building with custom code, self-host or cloud, 400+ integrations.” Accessed: May 18, 2025. [Online]. Available: https://github.com/n8n-io/n8n

[19] “Best apps & software integrations | n8n.” Accessed: May 18, 2025. [Online]. Available: https://n8n.io/integrations/

[20] “Ollama.” Accessed: May 18, 2025. [Online]. Available: https://ollama.com/

[21] “Ollama Search.” Accessed: May 18, 2025. [Online]. Available: https://ollama.com/search

[22] “PostgreSQL: The world’s most advanced open source database.” Accessed: May 18, 2025. [Online]. Available: https://www.postgresql.org/

[23] “Database | Open source SQL Database.” Accessed: May 18, 2025. [Online]. Available: https://supabase.com/database

[24] “Docker: Accelerated Container Application Development.” Accessed: May 18, 2025. [Online]. Available: https://www.docker.com/

[25] “Cloud Computing Services | Microsoft Azure.” Accessed: May 18, 2025. [Online]. Available: https://azure.microsoft.com/en-us/

[26] “Manage your team’s work, projects, & tasks online • Asana.” Accessed: May 18, 2025. [Online]. Available: https://asana.com/

[27] “How to Remote Access Linux Desktop GUI from Windows over the Internet.” Accessed: May 18, 2025. [Online]. Available: https://www.socketxp.com/iot/remote-connect-linux-desktop-gui-rdp-from-windows-over-internet/

[28] “Open Resource Monitor in Windows 11 | Windows 11 Forum.” Accessed: May 18, 2025. [Online]. Available: https://www.elevenforum.com/t/open-resource-monitor-in-windows-11.13898/

[29] “How to Open Resource Monitor using Task Manager on Windows 11 | Microsoft Community Hub.” Accessed: May 18, 2025. [Online]. Available: https://techcommunity.microsoft.com/discussions/windows11/how-to-open-resource-monitor-using-task-manager-on-windows-11/3333480

[30] “System Management Interface SMI | NVIDIA Developer.” Accessed: May 18, 2025. [Online]. Available: https://developer.nvidia.com/system-management-interface

[31] “GitHub - Xavi1995/n8n_execution_report: Analyze your n8n workflow executions and generate detailed reports in PDF format, including AI costs, node performance, and optimization suggestions.” Accessed: May 18, 2025. [Online]. Available: https://github.com/Xavi1995/n8n_execution_report

[32] “AMD Ryzen™ 7 7800X3D gaming processor.” Accessed: May 18, 2025. [Online]. Available: https://www.amd.com/de/products/processors/desktops/ryzen/7000-series/amd-ryzen-7-7800x3d.html

[33] “CUDA Zone - Library of Resources | NVIDIA Developer.” Accessed: May 18, 2025. [Online]. Available: https://developer.nvidia.com/cuda-zone

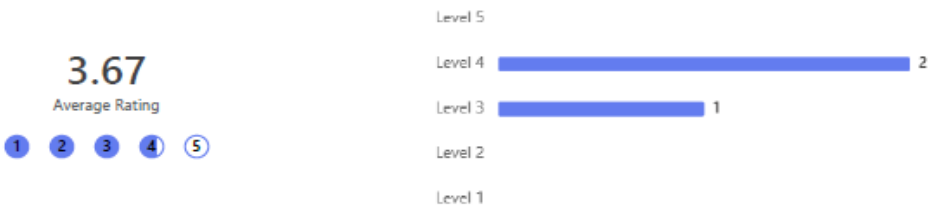
[34] “COCOMO II - Constructive Cost Model.” Accessed: May 18, 2025. [Online]. Available: https://softwarecost.org/tools/COCOMO/

[35] B. W. Boehm, “Software Engineering Economics”.

Appendix

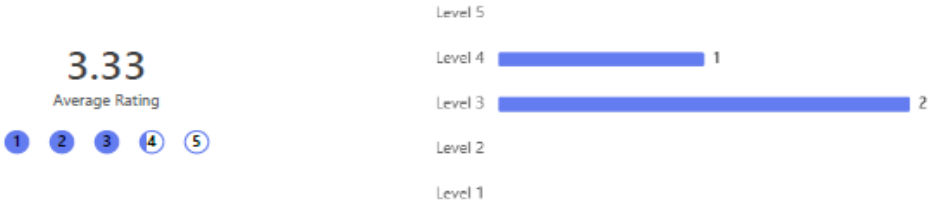
Summary of the Survey

4. **Share Meeting Summaries:**
Easily share meeting summaries with all participants.



5. **Email Template Creation:**
Generates email drafts using your company's branding and tone.

6. **Outlook Integration:**
Connects to Outlook to send invitations and updates automatically to team members.

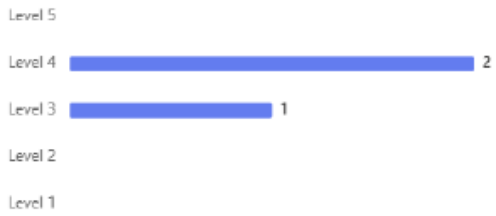


7. **Database Connection:**
Links AI to a company database for accessing reports and knowledge.

8. **Custom Trained Models (LLM):**
Develops AI models trained on specific project management domains.

3.67
Average Rating

1 2 3 4 5



9. **Standardized Document Generation:**
Creates documents that align with project management standards (e.g., PMBOK, PRINCE2).

3.00
Average Rating

1 2 3 4 5

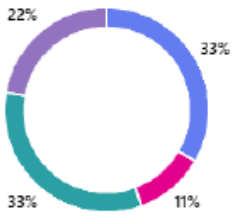
10. **Dynamic Form Creation:**
Generates forms to collect relevant project information efficiently.

4.00
Average Rating

1 2 3 4 5

11. Select all features you think should be included in future expansions of the AI assistant.

Generate timelines, diagrams, and graphics based on user input related to project management.	3
Provides the first steps of a workflow, accessible in PM tools or reports.	1
Monitors project progress, identifies delays, and suggests corrective actions.	3
Tracks project budget, timeline, and resource allocation.	2
Other	0



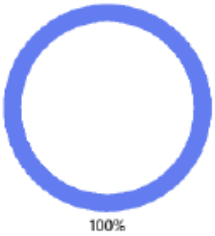
12. Your role (e.g. Project Manager)

3
Responses

Latest Responses
"Project Manager"
"IT Governance"
"Projekt Manager at ING"

13. Gender

Male	3
Female	0
Prefer not to say	0



14. Age

Below 25	0
25 - 34	2
35 - 44	1
45 - 54	0
55 - 64	0
65 and above	0

15. If you are interested in receiving the result of the survey, please leave your Email address:

1
Responses

Latest Responses
"[redacted]"

16. How would you rate the overall clarity and ease of this survey?

4.33
Average Rating