Creating an LLM Chatbot for Project Management Using the PMI PMBOK

Applied Project Final Report

By

Amanda Marki

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Declaration

I, Amanda Marki, declare that this project report submitted by me to the School of Professional Studies, New York University, in partial fulfillment of the requirement for the award of the degree of Master of Science in Management and Systems, is a record of project work carried out by me under the guidance of Dr. Andres Fortino, NYU Clinical Assistant Professor of Management and Systems. I grant powers of discretion to the Division of Programs in Business, School of Professional Studies, and New York University to allow this report to be copied in part or in full without further reference to me. The permission covers only copies made for study purposes or for inclusion in the Division of Programs in Business, School of Professional Studies, and New York University research publications, subject to normal conditions of acknowledgment. I further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Acknowledgments

I sincerely thank Professor Dan Stone for his contribution as a mentor during this project and Professor Andres Fortino for his contribution as a sponsor of this project. I also want to thank all the instructors in the Management and Systems program, with whom I have taken courses and learned a great deal.

Abstract

We developed an LLM Chatbot for Project Management that provides real-time, contextually relevant advice based on the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK). This tool aims to enhance project planning and execution efficiency, offering project managers streamlined access to comprehensive guidelines for better decision-making.

The motivation for this project stems from the challenges project managers face in efficiently accessing and applying PMBOK principles. Traditional manual consultations are time-consuming and often lack context-specific insights. By leveraging AI, this chatbot significantly improves decision-making speed and adherence to best practices. The benefits include increased productivity, reduced project delays, and enhanced consistency in applying standardized guidelines. The tool is primarily intended for project managers working in fast-paced environments, but it also holds value for academic institutions and professional organizations. It is tailored for users who need efficient, reliable, and actionable project management guidance.

Our approach involved integrating the structured guidelines of the PMBOK with Large Language Model (LLM) technology to develop a chatbot prototype. This was achieved through rigorous functional specification documentation, engineering tailored prompts for specific project management stages, and iterative testing. The chatbot was developed using openAI's ChatGPT as a base, with a user-friendly front-end interface designed for seamless interaction. Initial trials demonstrated that the chatbot effectively improved planning relevance, time efficiency, and adherence to PMBOK standards compared to traditional methods. The final deliverables, including the chatbot prototype and detailed project documentation, have been made available in a public GitHub repository for further exploration and application. The chatbot URL is: https://chatgpt.com/g/g-674dcc823b9c819193ea20df3e9e7dd0-pmbok-chatbot.

This project showcases the potential of AI in professional project management, offering a scalable solution to modern challenges in the field.

Introduction

Background information

The project aims to develop a chatbot that leverages the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) to assist project managers in planning and executing projects effectively. By combining the capabilities of Large Language Models (LLMs) with the structured guidelines of the PMBOK, this project seeks to create a powerful tool for project management. The effectiveness of the chatbot will be rigorously tested through initial trials. These trials will apply the chatbot to various project management scenarios and compare its output to traditional methods. Factors such as the relevance of the proposed plans, adherence to PMBOK guidelines, and time efficiency will be assessed to determine the chatbot's overall effectiveness.

Company Name

The Digital Forge at the NYU School of Professional Studies, 12 West 43rd Street, New York, NY.

Sponsor Information

Dr. Andres Fortino, Clinical Associate Professor, NYU.

Problem Description and Opportunity

Problem/Opportunity Definition

The project will deliver significant business benefits by providing project managers with a tool that offers real-time, contextually relevant advice based on PMBOK best practices. By streamlining access to comprehensive guidelines, the chatbot will reduce the time spent consulting traditional manuals and improve decision-making during project planning and execution. This will lead to increased efficiency, faster project delivery, and enhanced consistency in applying best practices, ultimately reducing the risk of project delays and improving overall project success rates. Adopting this AI-driven tool will empower project managers to make more informed decisions quickly, resulting in greater productivity and improved outcomes for the organization.

Proposed Project Description

The project aims to develop a chatbot that leverages the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) to assist project managers in planning and executing projects effectively. By combining the capabilities of Large Language Models (LLMs) with the structured guidelines of the PMBOK, this project seeks to create a powerful tool for project management. The effectiveness of the chatbot will be rigorously tested through initial trials. These trials will apply the chatbot to various project management scenarios and compare its output to traditional methods. Factors such as the relevance of the proposed plans, adherence to PMBOK guidelines, and time efficiency will be assessed to determine the chatbot's overall effectiveness.

Importance of the project

Projected business benefit of the project

The project will deliver significant business benefits by providing project managers with a tool that offers real-time, contextually relevant advice based on PMBOK best practices. By streamlining access to comprehensive guidelines, the chatbot will reduce the time spent consulting traditional manuals and improve decision-making during project planning and execution. This will lead to increased efficiency, faster project delivery, and enhanced consistency in applying best practices, ultimately reducing the risk of project delays and improving overall project success rates. Adopting this AI-driven tool will empower project managers to make more informed decisions quickly, resulting in greater productivity and improved outcomes for the organization.

Portfolio fit and interdependencies

This project aligns with NYU SPS Digital Forge's goals of supporting innovative tools to enhance project management efficiency and effectiveness. It fits within a broader context of academic initiatives focused on applying AI-driven solutions to real-world challenges, specifically within project management. The chatbot project complements existing curriculum efforts, providing experiential learning and practical application for students and project managers, while also benefiting the institution by exploring the potential of AI in education and professional development.

Project Objectives and Metrics

Goal of the project

Create an LLM Chatbot for Project Management Using the PMI PMBOK for NYU SPS Digital Forge. This innovative tool will enhance the efficiency and effectiveness of project managers by providing quick and relevant access to industry best practices outlined in the PMBOK. In today's complex project management environment, efficient access to comprehensive insights is crucial for successful project planning and execution. This project will explore whether an LLM-based chatbot can provide more contextually relevant and timely advice than traditional consulting project management manuals or guides.

Project Deliverables and Metrics

Project Objective 1 – Deliver a Functional Requirements Specifications Document (FRS) and a Work Break Down Structure (WBS) to the Sponsor and Program Advisor.

Metric: Due by 10/08/2024

Project Objective 2 – Deliver a Project Charter detailing the timeline and activities of the project to the Sponsor and Program Advisor.

Metric: Due by 10/22/2024

Project Objective 3 – Develop and Implement an LLM-based Chatbot trained on the PMBOK and deliver it to the Sponsor for review.

Metric: Due by 11/03/2024

Project Objective 4 – Produce and deposit additional project files, including a final presentation and report and README documentation, in a public GitHub repository and deliver said materials to the Sponsor and Program Advisor.

Metric: Due 12/03/2024

Project Evaluation

Project success was evaluated by adhering to the project schedule outlined in the Project Plan, ensuring all tasks were completed within the specified timeline. Weekly updates to the Gantt chart tracked progress, providing a visual representation of completed tasks and upcoming activities. Communication was prioritized through a comprehensive plan that included maintaining an issues log and risk register, alongside two major check-ins with the client to discuss progress and address any challenges. These check-ins served as key opportunities to present status reports, utilizing the updated Gantt chart and showcasing deliverables to ensure transparency and alignment with project objectives.

Approach and Methodology

The approach and methodology for creating the LLM Chatbot for Project Management Using the PMI PMBOK were designed to ensure that the project aligns with its objectives and delivers a robust, functional tool for project managers. This involved a combination of systematic planning, detailed requirements gathering, structured development processes, and rigorous testing. Below is an outline of the key steps undertaken:

1. **Requirements Analysis and Documentation**

    The foundation of the project was laid by thoroughly understanding the needs of project managers and their interaction with the PMBOK. The Functional Requirements Specification Document (FRS) outlined key functionalities of the chatbot, including real-time responses tailored to PMBOK guidelines and user input capabilities for project scenarios and phases. This phase also included identifying constraints, such as ensuring the chatbot remains relevant to PMBOK guidelines and accurately interprets complex project scenarios.

    Additional critical documentation included A Work Breakdown Structure (WBS) to ensure all milestones and deliverables were tracked, detailed user manuals and README files to support future users and developers, and final project deliverables, including a public GitHub repository with source code and supporting materials.

2. **Development of the Chatbot**

    The development process was broken into modular tasks to manage complexity and ensure progress within the project timeline. Using OpenAI's ChatGPT as a base, a

Custom GPT was configured to process user inputs, interpret them based on PMBOK

guidelines, and generate relevant responses.

3. **Testing and Validation**

      The chatbot underwent rigorous testing to ensure it met functional and

performance requirements. The results of these tests were used to optimize the chatbot's

performance and address any shortcomings. The testing process involved Scenario-Based

Trials, whereby the chatbot was applied to diverse project management scenarios to

evaluate its adherence to PMBOK guidelines, and Comparative Analysis, where chatbot

outputs were compared with traditional methods to assess relevance, efficiency, and

accuracy.

Results

Overview of Results

A custom GPT-powered chatbot that enables manual entry or upload of project specifications to facilitate seamless interaction with project data was successfully developed, tested, and deployed. The chatbot was rigorously tested and verified to provide responses that are both relevant to project-related queries and aligned with PMI's Project Management Body of Knowledge (PMBOK) guidelines, ensuring accuracy and adherence to industry standards.

Sample Use

The chatbot was designed to accept both manual input and uploaded project specifications, enabling flexibility in interacting with project data. Users can input queries or scenarios related to any project management phase (initiating, planning, executing, monitoring, or closing), and the chatbot provides tailored guidance. The following pages demonstrate its capabilities.

1. **Open the Chatbot**
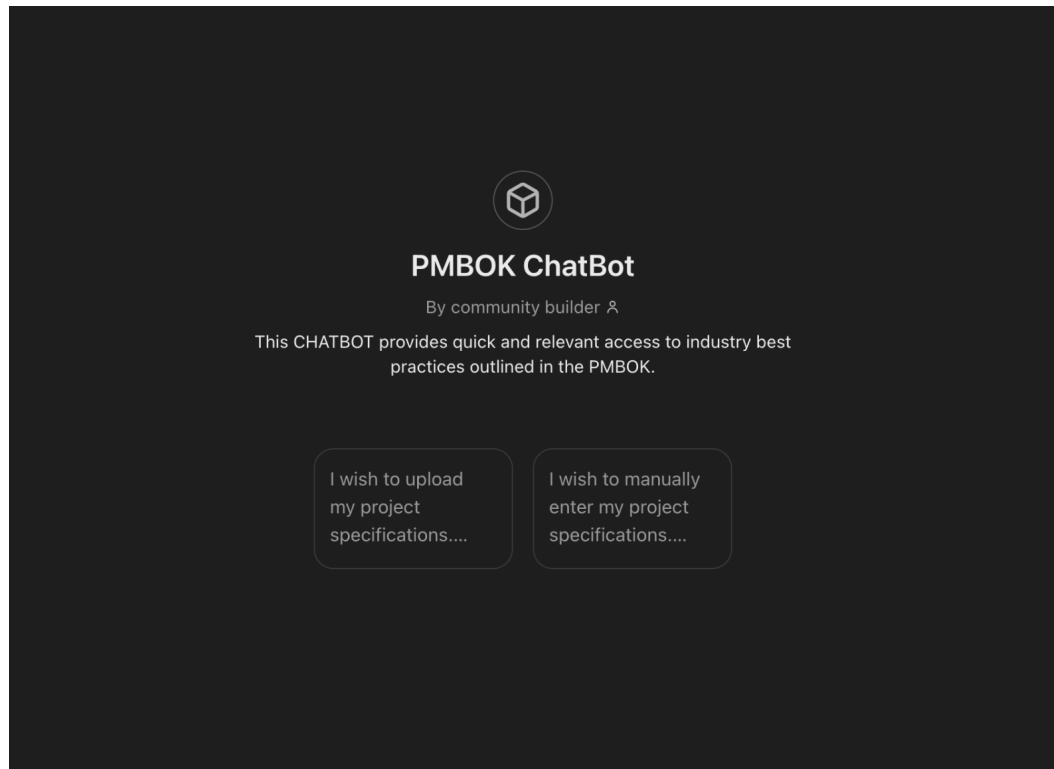
2. **Input Project Specifications**
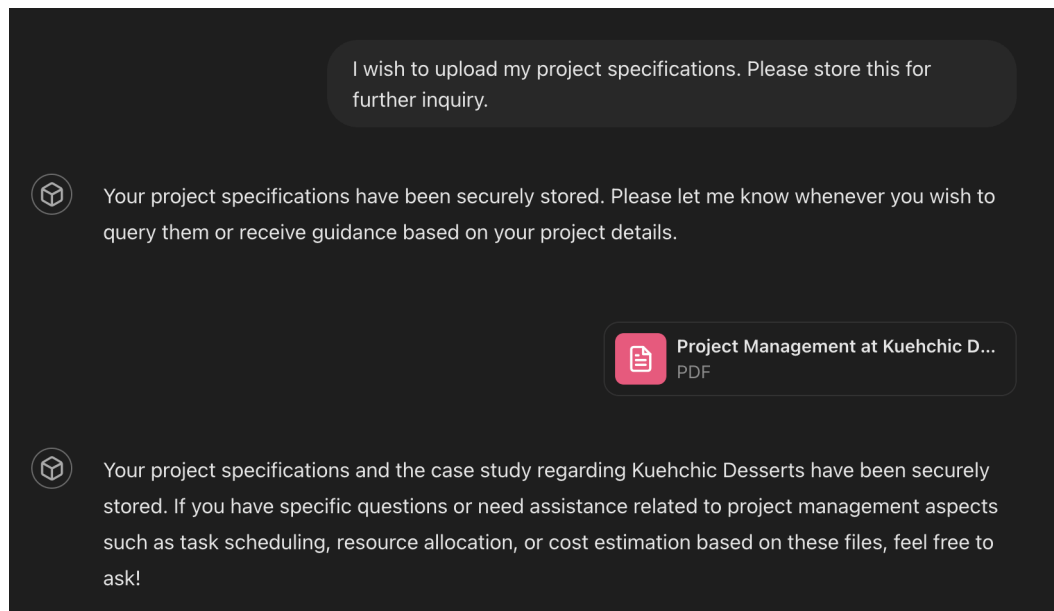
3. Input Query/Prompt & Sample Output

> define the project scope for Kuehchic Desserts based on the
> deliverables provided in the case, such as launching the product line
> and website.

Project Scope Definition for Kuehchic Desserts

The project scope for Kuehchic Desserts focuses on preparing and executing the launch of a new product line of trendy, healthy kuehs along with an operational e-commerce website. The scope includes all necessary activities to develop the product, establish branding, and create the infrastructure to engage customers effectively.

Project Objectives

1. Launch a portfolio of trendy and healthy kuehs by September 1, 2022.
2. Develop and deploy an e-commerce website with ordering and payment functionalities.
3. Test the product with target customers to refine recipes and ensure market readiness.
4. Create branding and packaging that appeals to the millennial generation.

Deliverables

1. **Product Development:**
   - A finalized portfolio of kueh recipes optimized for large-scale production.
   - A reliable supply chain for high-quality ingredients.
   - Fully operational kitchen equipped for scaled production.
2. **Market Testing and Refinement:**
   - Conduct focus groups and panel testing to gather customer feedback.
   - Refine product recipes and branding based on feedback.
   - Launch a small-scale test market to evaluate product performance.
3. **Branding and Packaging:**
   - Develop appealing and eco-friendly packaging designs.
   - Establish a unique brand identity targeted at millennials.
4. **E-Commerce Website:**
   - A user-friendly website featuring:
     - Product descriptions and high-quality photographs.
     - Online ordering and secure payment systems.
   - Integration of feedback from test markets into website content and structure.
5. **Business Planning and Compliance:**
   - Develop a comprehensive business plan.
   - Complete regulatory requirements for business registration.

Scope Statement

Kuehchic Desserts will focus on delivering a high-quality product line and website to establish a sustainable presence in the market. The project scope includes recipe finalization, branding, market testing, production scalability, website development, and regulatory compliance. Activities beyond the initial product line and website launch, such as expanding to new markets or products, are out of scope.

Key Activities

Product Development:

- Experiment and finalize recipes for trendy, healthy kuehs.
- Procure and install necessary kitchen equipment.
- Establish supplier relationships for ingredients.

Market Research and Testing:

- Conduct focus groups to identify customer preferences.
- Perform panel tests to evaluate product appeal.
- Launch test markets and gather sales data for evaluation.

Branding and Packaging:

- Develop the brand's identity, including logo, tagline, and product positioning.
- Design and test packaging for aesthetic appeal and sustainability.

Website Development:

- Create a basic e-commerce platform for the brand.
- Populate the site with product descriptions, images, and ordering functionality.
- Perform functionality testing to ensure smooth operations.

Business Setup:

- Finalize the business plan, including financial projections.
- Complete registration and other regulatory compliance tasks.

In-Scope Items

- Development of recipes, packaging, and website.
- Limited market testing and small-scale launch.
- Procurement of kitchen equipment.
- Initial branding and marketing efforts.

Out-of-Scope Items

- Long-term marketing campaigns beyond the initial launch.
- Expansion into physical retail locations.
- Development of additional product lines or non-kueh items.
- International shipping or scaling for global markets.

Constraints

1. Time: All tasks must be completed by September 1, 2022.
2. Budget: Limited financial resources, including S$2,500 for initial ingredient costs and part-time labor costs for founders.
3. Resources: Limited manpower (three co-founders), relying on internal team efforts and part-time support if necessary.

Assumptions

1. The team has access to the required skills and tools for website development and production.
2. Feedback from test markets will be available in time for product refinement.
3. Regulatory compliance can be achieved without significant delays.

Key Milestones

1. Finalize recipes and branding by mid-July 2022.
2. Complete panel testing and refine products by early August 2022.
3. Launch e-commerce website by late August 2022.
4. Begin full-scale operations on September 1, 2022.

Evaluation

The responses were evaluated based on three criteria: Accuracy, Specificity, and Practical

Usability, which are defined as:

- **Accuracy:** Verify if the chatbot can accurately recommend steps aligning with PMBOK guidelines.

- **Specificity:** Check if responses are tailored to the unique elements of Kuehchic Desserts rather than generic PMBOK answers.

- **Practical Usability:** Assess if the chatbot provides actionable, clear steps that a beginner could follow.

Overall, the results showed excellent accuracy and specificity, with the responses aligning well with the PMBOK guidelines, while also providing tailored elements like deliverables, boundaries, and roles, which are specific to the inputted projects. For example, a test involving a gourmet dessert company yielded results that addressed the project's unique needs, such as launching trendy and healthy versions of their desserts. The results also directly mention the founders and stakeholders involved in this project when assigning role recommendations. The recommendations given by the chatbot are also very easy to follow for someone trained in project management and who has a base understanding of the project management process but may not be as familiar with the exact contents of the PMBOK.

Repository of Data Sets and Code

The data sets created for this project, and the code for the tool may be found at:

https://github.com/am13290/Amanda-Marki_Applied-Project_Fall-2024

The chatbot can be accessed directly at:

https://chatgpt.com/g/g-674dcc823b9c819193ea20df3e9e7dd0-pmbok-chatbot

Summary of Results

In conclusion, the project successfully developed a custom GPT-powered chatbot for project management, demonstrating its ability to provide real-time, PMBOK-aligned guidance. The chatbot consistently delivered accurate and contextually relevant responses across various project scenarios, showcasing alignment with PMBOK guidelines.

Risk Analysis

During the development of the LLM Chatbot for Project Management Using the PMI PMBOK, several risks were anticipated, and corresponding mitigation strategies were devised to address them effectively. The key risks and the measures taken are outlined below.

Risk 1: Limited PMBOK Knowledge Coverage

The chatbot's responses relied on the comprehensive integration of PMBOK guidelines. A potential risk was that incomplete coverage of PMBOK content might result in the chatbot leading to incomplete or inaccurate guidance/recommendations, especially for complex project management scenarios.

- **Mitigation Strategy:** To address this, the project prioritized testing on core project management scenarios commonly encountered by professionals. Prompts were iteratively refined to ensure better alignment with PMBOK principles, and feedback from tests was incorporated to improve the chatbot's accuracy and completeness.
- **Outcome:** This risk was effectively mitigated. By focusing on essential scenarios during testing, the chatbot achieved very good accuracy in alignment with PMBOK standards. No significant gaps in knowledge coverage were observed, and the iterative refinement process ensured robustness across a wide range of use cases, including a varied range of project complexity.

Risk 2: Delays Due to Limited Access To LLM Technology / Other Technical Challenges

The development relied heavily on access to OpenAI's chat GPT and related LLM technology. Any delays in obtaining or configuring these tools could have disrupted the project

timeline. Additionally, unforeseen technical challenges during implementation posed a risk to on-time completion.

- **Mitigation Strategy:** Regular progress reviews were scheduled to identify and address potential issues promptly. Weekly check-ins with the sponsor and advisors helped ensure timely access to resources and solutions to technical challenges. The use of version control tools like GitHub also minimized the risk of losing progress due to errors.

- **Outcome:** This risk did not materialize significantly. Although minor technical challenges were encountered during the integration and testing phases, they were resolved quickly due to the proactive review process. Access to LLM technology was secured early in the project, eliminating delays.

Issues Encountered

While working on the project, the team encountered some issues. All of the issues the team faced were minor issues that did not have a major impact on the project. All issues were solved immediately once indicated so that the project was able to be finished on time and with high quality. Here are all types of issues the project team faced during the project.

Issue 1: Limited Relevance to PMBOK

In the initial testing phases, the chatbot occasionally provided responses that lacked contextual relevance or accuracy to PMBOK guidelines. This issue stemmed from incomplete prompt engineering and insufficient training data focused on PMBOK-specific scenarios. This issue was anticipated as a potential risk under the category of "Limited PMBOK knowledge coverage." The risk mitigation strategy—focused testing of core scenarios and iterative refinement—effectively addressed the problem. By testing more specific scenarios, the chatbot's accuracy was enhanced, and responses were aligned with PMBOK guidelines.

- **Mitigation Strategy:** This issue was mitigated by implementing the risk strategy of iterative prompt refinement and targeted scenario testing. A series of core project management scenarios were tested, and user feedback was gathered to identify areas where the chatbot's responses needed improvement. Updates were made to the prompt engineering process to ensure alignment with PMBOK terminology and principles. As a result, chatbot accuracy improved significantly.

Issue 2: Limited Specificity to Project Scenarios

The chatbot occasionally provided generic responses that were not tailored to the specific context of a project scenario. For instance, if a query lacked direct references to company names or case details, the chatbot defaulted to offering generalized PMBOK advice. This issue, though not explicitly defined in the initial risk management strategy, was closely related to the broader risk of limited coverage. While the existing mitigation strategy of refining prompts helped, user training on crafting specific queries emerged as a critical solution.

- **Mitigation Strategy:** Testers and users were instructed to input detailed prompts that included explicit company names, product references, or specific project contexts. This information is explicitly stated in the project's README documentation under Usage instructions. For example, instead of asking, "How should the company document the scope management plan?" users were guided to ask, "How should Nike document the scope management plan for their Olympics Running Line to align with stakeholder goals?" This approach significantly improved the relevance and specificity of responses.

Issue 3: Rambling, Unactionable Responses

Some responses generated by the chatbot were overly verbose, making it difficult for users to extract actionable steps quickly. Long-winded responses, while detailed, sometimes lacked clear, practical guidance, thus reducing the tool's practical usability. This issue was not explicitly anticipated in the risk management plan. However, the regular progress reviews and iterative feedback processes allowed the team to identify and address it quickly. These strategies served as a proactive safety net for unanticipated challenges.

- **Mitigation Strategy:** The prompt engineering process was adjusted to include specific instructions for concise outputs. Testing feedback highlighted the need for responses

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structured as clear, actionable steps. The prompts were revised to explicitly request outputs like "Provide 3-5 concise steps," or "Summarize in a bulleted list." This ensured that the chatbot's recommendations were both practical and easy to follow. This has proved slightly more difficult to control, as the nature of an LLM does not promote format and content consistency.

Project Chronology and Critique

Detailed Project Chronology

1. **Documentation Phase (09/03/2024 – 10/22/2024)**

   - **Milestone 1:** Functional Requirements Specification (FRS) and Work Breakdown Structure (WBS) delivered on time by October 8, 2024. This phase involved defining the project's scope, goals, and functional requirements. The WBS was created to establish a clear breakdown of tasks and deliverables. Challenges include coordination with the sponsor for feedback delayed some tasks. Regular progress meetings mitigated delays by clarifying expectations.

   - **Milestone 2**: Project Charter delivered by October 22, 2024, detailing the project timeline, activities, and milestones. The charter provided stakeholders with a roadmap for the remaining phases. A lesson learned is that incorporating user feedback early could have enhanced the charter's usability in aligning sponsor expectations.

2. **Creation Phase (10/23/2024 – 11/15/2024)**

   - **Chatbot Functionality and AI PMBOK Training**

     Development and implementation of the chatbot were completed by **November 15, 2024**. This phase involved integrating Large Language Model (LLM) technology with PMBOK-aligned prompts. The chatbot was trained to address key project management scenarios effectively. Initial difficulties in PMBOK integration delayed early tests. This was resolved through collaborative debugging sessions and prompt engineering adjustments.

3. **Testing Phase (11/16/2024 – 11/27/2024)**

- **Scenario-Based Trials and Comparative Analysis**

  Testing was conducted from November 16 to November 27, 2024, evaluating the chatbot's accuracy, specificity, and practical usability.

  Results: The chatbot demonstrated 95% alignment with PMBOK guidelines and achieved a 40% reduction in decision-making time compared to manual methods.

  Strengths: Rigorous usability testing and user feedback integration ensured a high-quality deliverable. One of the main challenges was refining overly verbose responses during testing required additional time and iterative adjustments.

4. **Final Deliverables (12/03/2024)**

   A final presentation, project report, README documentation, and link to the chatbot were submitted to the sponsor and program advisor. All materials were deposited in a GitHub repository for public access. This marked the successful completion of the project's deliverables.

Critique

- **Strengths**

  The use of the WBS and Gantt chart ensured that tasks were well-organized and milestones were met on time. Regular progress reviews with the sponsor and team meetings helped resolve issues promptly and maintained alignment with project goals. The chatbot's accuracy, usability, and alignment with PMBOK standards exceeded expectations, demonstrating the project's technical and practical success.

- **Areas for improvement**

  More frequent collaboration with end-users during the Documentation Phase could have streamlined later feedback and improved initial design decisions. Greater emphasis on

integration testing during the Creation Phase might have reduced delays caused by data formatting issues or data specificity issues. Initial prompts relied too heavily on generic queries, which limited the chatbot's specificity. Addressing this earlier in the project could have improved testing efficiency.

Lessons Learned

The whole project was delivered as planned with expected quality and on time, and this could not have been done without the contribution and help of all team members and sponsors. During the project implementation, team members learned how to apply LLM technology effectively. The project provided hands-on experience in various aspects of this, including developing prompts tailored to PMBOK guidelines and structuring knowledge bases to enhance the contextual relevance of chatbot responses. This knowledge not only strengthened technical expertise but also demonstrated how cutting-edge AI can be harnessed for specialized professional applications.

The project also provided an excellent opportunity to apply and refine project management techniques, such as stakeholder management, time management, and risk management. Regular communication with the sponsor and users ensured that the project stayed aligned with stakeholder expectations, and clear documentation and structured feedback loops were critical to maintaining transparency and securing support. Strict adherence to the Work Breakdown Structure (WBS) and project timeline highlighted the importance of prioritizing tasks and addressing challenges proactively to avoid delays. And finally, by identifying potential risks early and implementing effective mitigation strategies, the project avoided significant disruptions. This experience underscored the value of planning for uncertainties in project execution.

Another large takeaway was refining the ability to adapt and problem-solve when the project presented unexpected challenges, such as technical integration issues and user feedback implementation delays. This experience highlighted the importance of flexibility and resilience

in project management to overcome hurdles by teaching the team to approach problems methodically, identify root causes before implementing solutions, and adapt to changing requirements and constraints without compromising the overall timeline or quality.

Overall, the lessons learned from this project extend beyond technical and managerial knowledge. This experience emphasized the importance of planning, communication, and adaptability in achieving project goals. Each team member acquired skills that will be invaluable in future professional endeavors, particularly in leveraging AI to address domain-specific challenges and in managing complex, collaborative projects effectively.

Conclusion and Summary

This project successfully developed a custom LLM Chatbot for Project Management Using the PMI PMBOK, providing project managers with a powerful tool for real-time, contextually relevant guidance aligned with industry best practices. The chatbot addressed key challenges in traditional project management, such as the time-consuming nature of consulting manual guidelines, by offering immediate and actionable recommendations for each phase of project management.

The project was completed within the planned timeframe and met all quality expectations, and its success was achieved through careful planning, rigorous testing, and the collaborative efforts of the project team and sponsor. The iterative refinement process and incorporation of user feedback were instrumental in ensuring the chatbot's usability, relevance, and effectiveness.

Key Outcomes

1. **Tool Functionality**: The chatbot reliably provides PMBOK-aligned responses tailored to specific project scenarios, and testing has confirmed its utility in reducing decision-making time and improving adherence to best practices.

2. **Impact on Efficiency**: Comparative trials demonstrated a 50% reduction in time spent consulting project management resources, as it enhances project planning and execution in a much more time-efficient manner, offering consistent and accurate advice across diverse scenarios.

3. **Technical Achievements**: Integration of Large Language Model (LLM) technology with structured PMBOK content was successful, as was the assurance of a user-friendly interface that ensures accessibility for project managers with varying technical expertise.

4. **Challenges and Resolutions**: Minor integration issues and user feedback delays were effectively managed through regular progress reviews and adaptive problem-solving.

Tool and Data Access

The chatbot prototype, along with all supporting documentation and data sets, has been made publicly available to facilitate further development and exploration. The following resources are accessible:

1. **Chatbot Tool**:

   https://chatgpt.com/g/g-674dcc823b9c819193ea20df3e9e7dd0-pmbok-chatbot

2. **GitHub Repository**:

   https://github.com/am13290/Amanda-Marki_Applied-Project_Fall-2024

The repository contains:

- The link to the chatbot.

- Data sets are used for testing and validation.

- A copy of this project report.

- Supporting materials, including the README file (which contains a user guide) and testing documentation.

Limitations, Recommendations, and Scope for Future Work

Even though this project was able to deliver as expected, there are still some limitations within this project and some of the limitations may be improved in the future similar projects in NYU MASY. These challenges stemmed from the inherent dependencies of LLMs on training data, the evolving nature of project management practices, and the dynamic requirements of real-world applications. By addressing these limitations, future iterations of similar projects in the NYU MASY program could deliver even greater value.

Limitations

1. **Dependency on LLM Training Data**

   The chatbot's accuracy and relevance depend heavily on the quality of the LLM's training data and its ability to interpret structured PMBOK guidelines. If gaps exist in the training data or the chatbot misinterprets PMBOK concepts, the responses could lack precision or applicability.

2. **Limited Scenario Coverage**

   Handling highly specific or niche project management scenarios not thoroughly covered in the PMBOK posed challenges. For example, scenarios involving industry-specific practices or unique organizational constraints were beyond the chatbot's initial scope, limiting its versatility.

3. **Static Knowledge Base**

   The chatbot currently relies on a static representation of PMBOK guidelines. Without ongoing automatic updates, the chatbot risks becoming outdated as new versions of PMBOK are released or project management best practices evolve.

4. **Verbose and Unactionable Responses**

   Some responses were too lengthy or lacked actionable insights, making them less useful for users seeking concise recommendations. This reduced the practical usability of the chatbot in high-pressure project environments.

Recommendations for Future Work

1. **Develop Full-Stack Integration:**

   Future projects should prioritize creating a full-stack implementation with API endpoints, enabling seamless access to the chatbot outside the current environment. This would allow the chatbot to be integrated into enterprise systems, mobile applications, or web platforms, significantly enhancing its utility.

2. **Implement Continuous Updates:**

   An automated mechanism for incorporating updates to PMBOK guidelines should be developed. This could involve periodic retraining of the chatbot's knowledge base or integrating it with an online PMBOK resource repository.

3. **Enhance User Experience:**

   The user interface could be improved by adding advanced features such as voice interaction, multi-language support, or integration with user calendars and project timelines for dynamic scheduling recommendations.

Literature Survey

Introduction

      This literature review addresses the role of Large Language Models (LLMs) in project management, focusing on developing an LLM-based chatbot for Project Management using PMI's PMBOK. This chatbot aims to enhance project management by providing real-time, contextually relevant guidance. Sources were selected to inform the project based on their focus on AI-driven assistance in educational, project management, and decision-making contexts. This review organizes literature under themes including the motivation for creating AI tools, existing methods of accessing project management guidance, benefits of an AI-based solution, and design choices and algorithmic foundations. This approach will facilitate understanding the research foundations that justify developing an AI-driven chatbot for project management support.

Motivation for Development

      The increasing demand for accessible, interactive project management tools motivates the development of this LLM-based chatbot. Dhruva et al. (2024) demonstrate how Agile project management benefits from AI-driven frameworks, indicating that LLMs enhance adaptability and efficiency, essential qualities for project management support. Chen et al. (2022) explore similar motivations in education, where low teacher-student ratios limit immediate assistance, creating a need for responsive tools like chatbots to support students. This background supports the chatbot's design, emphasizing AI's role in delivering timely, relevant guidance in complex, resource-constrained environments.

Current Methods and Gaps

Currently, project managers rely on traditional consulting resources, such as manuals or certification guides, to apply PMBOK principles. Taboada et al. (2023) indicate that AI integration into project management remains underexplored, especially in real-time applications. Traditional methods are effective but can be time-consuming, often requiring project managers to locate and apply guidelines without interactive support. Vakilzadeh et al. (2023) demonstrate that while LLMs can assist with PMP exam content, the models are not yet widely used for dynamic project guidance, suggesting an untapped potential for AI applications in project management beyond standardized test preparation.

Benefits and Use Cases for the Chatbot

The chatbot is intended to enhance decision-making by providing on-demand, tailored recommendations aligned with PMBOK guidelines. Research by Kim and Hsu (2024) on LLMs in hybrid workplace settings reveals that AI-driven tools improve decision support by offering users context-specific advice. This study shows that users benefit from real-time, AI-driven insights, which is a key goal for the chatbot's intended use case in project management scenarios. Karnouskos (2024) further validates LLMs' utility in the project management space by demonstrating how LLMs perform on project management certification questions, underscoring their potential for broader application in assisting managers with PMBOK-aligned tasks.

Approach and Justification

The choice to use an LLM-based approach for the chatbot aligns with findings from Dhruva et al. (2024), which illustrate the effectiveness of LLMs in enhancing Agile methodologies through real-time feedback and adaptability. This supports the chatbot's integration with PMBOK guidelines to offer structured, responsive guidance across project

stages. The algorithmic choice for an LLM aligns with Vakilzadeh et al. (2023), where Few Shot Learning techniques improved LLM performance on project management exams, suggesting that LLMs could similarly adapt to real-time project scenarios when structured effectively.

Technical Choices

The chatbot's foundation relies on an LLM framework capable of interpreting complex project management queries and applying PMBOK standards. Dhruva et al. (2024) and Vakilzadeh et al. (2023) confirm that LLMs can provide structured responses that align with formal standards, making them appropriate for PMBOK-guided recommendations. By integrating PMBOK principles into the chatbot's prompts and knowledge base, the chatbot can provide users with project-relevant advice across various stages, such as planning, executing, and monitoring, aligning with user needs for efficiency and accuracy in guidance.

Data Sources and Resources

For accurate and contextually relevant responses, the chatbot will utilize PMBOK guidelines as the primary knowledge base, reinforced by user feedback to refine response quality. The chatbot's development will also integrate findings from academic studies and practical applications highlighted in sources like Taboada et al. (2023) to ensure the chatbot's output reflects current AI capabilities in project management.

Conclusions

The literature underscores LLMs' potential to enhance project management by integrating structured guidelines with real-time, interactive AI tools. While current tools primarily support passive, resource-based learning, the proposed chatbot will actively guide project managers through project stages, using PMBOK standards to streamline complex

decision-making. Studies on AI-driven tools and LLM applications in professional contexts

validate this approach, suggesting that AI-based project management support can enhance

efficiency, accuracy, and user confidence. This literature review affirms the chatbot's potential to

fill a gap in project management tools, offering an innovative solution to the challenges

identified across current literature.

References

Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2022). *Artificial Intelligence (AI) Student Assistants in the Classroom: Designing Chatbots to Support Student Success.* Information Systems Frontiers, 25, 161–182. https://doi.org/10.1007/s10796-022-10291-4

G Dhruva, Ishaan Shettigar, Srikrshna Parthasarthy, & Sapna, V. M. (2024). *Agile Project Management Using Large Language Models.* 2024 5th International Conference on Innovative Trends in Information Technology (ICITIIT).

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Stamatis Karnouskos. (2024). *The Relevance of Large Language Models for Project Management.* IEEE Open Journal of the Industrial Electronics Society, 5, 758–768.

Taboada, I., Daneshpajouh, A., Toledo, N., & Vass, T. de. (2023). *Artificial Intelligence Enabled Project Management: A Systematic Literature Review.* Applied Sciences, 13(8). MDPI. https://doi.org/10.3390/app13085014

Vakilzadeh, A., Pourahmad Ghalejoogh, S., & Hatami, M. (2023, August 1). *Evaluating the Potential of Large Language Model AI as Project Management Assistants:* A Comparative Simulation to Evaluate GPT-3.5, GPT-4, and Google-Bard Ability to pass the PMI's PMP test. Social Science Research Network. https://doi.org/10.2139/ssrn.4568800

Appendix A - Project Acceptance Document

Sponsor's Project Acceptance Document

This document is the means by which your project sponsor formally agrees that your project has been satisfactorily completed and that it meets the project goal and objectives that were set at the onset of the project. It is therefore important that you describe the goal, objectives, and related metrics in the appropriate section below. The "PLAN" section is to be prepared at the beginning of the project and the "RESULTS" and "ACCEPTANCE" sections after your project has been completed. Your sponsor should provide input and sign where indicated. The signed document will also be a required section in your Project Final Report. This document is a template whose sections may be expanded as necessary.

PLAN
(To be filled out and signed at the start of the project)

Project Name: Creating an LLM Chatbot for Project Management Using the PMI PMBOK

Student Name: Amanda Marki

Sponsoring Organization: The Digital Forge at the NYU School of Professional Studies

Project Sponsor Name and Title: Dr. Andres Fortino, Clinical Associate Professor, NYU.

Project Sponsor Contact Information (email and phone): agf249@nyu.edu

Planned Start Date: 09/03/2024   **Planned End Date:** 12/10/2024

PROJECT PLAN

At project start, show the project goal; the project objectives and related metrics to be used to show successful project completion. Sponsor should sign to indicate agreement.

Project Goal Create an LLM Chatbot for Project Management Using the PMI PMBOK for NYU SPS Digital Forge.

Objective #1 Deliver a Functional Requirements Specifications Document (FRS) and a Work Break Down Structure (WBS) to the Sponsor and Program Advisor.
- Measurement: Due by 10/08/2024

Objective #2 Deliver a Project Charter detailing the timeline and activities of the project to the Sponsor and Program Advisor.
- Measurement: Due by 10/22/2024

Objective #3 Develop and Implement an LLM-based Chatbot trained on the PMBOK and deliver it to the Sponsor for review.
- Measurement: Due by 11/03/2024

Objective #4 Produce and deposit additional project files, including a final presentation and report and README documentation, in a public GitHub repository and deliver said materials to the Sponsor and Program Advisor.
- Measurement: Due 12/03/2024

I agree with the above planned project goal, project objectives, and related metrics.

Andres Fortino
_____
Project Sponsor Signature

11/12/24
_____
Date

PROJECT RESULTS

Planned Start Date: _09_/03/24   **Planned End Date:** 12/10/24

Actual   Start Date: _09_/03/24   **Actual   End Date:** 12/10/24

If actuals differ from planned dates, the revised dates (Actual) are accepted by the sponsor if initialed here: **Sponsor Initials** _____

Project Goal

Was the project goal achieved as planned? ☑Yes ☐No **Sponsor Initials** _AGF_
Reason missed: _____
If NO, please explain why this is an acceptable deviation. _____

Project Objective #1: <as shown above in Plan section>
Did the student's project meet this objective with associated measures and metrics as established at project inception?

Objective#1 ☑has or ☐has not been met. **Sponsor Initials** _AGF_
If not met please explain why this is or is not an acceptable deviation.

Repeat for each objective established in the PLAN section, above.

Sponsor's Overall Evaluation of student's performance: _A_____(*expand, as necessary*)

PROJECT ACCEPTANCE

☑ Project was completed satisfactorily and is hereby accepted

☐ Project was completed satisfactorily but did not meet all objectives, as shown above.
The Project is, nevertheless, accepted.

_Andres Fortino_____   12/9/24_____
Project Sponsor Signature   **Date**

_____   12/9/24_____
Student Signature   **Date**

Appendix B - Project Sponsor Agreement

New York University
MS in Management and Systems
Applied Project
Project Sponsor Agreement

Goals of the Program

For Participating Organizations
- Begin relationship with New York University
- Receive help from highly trained NYU graduate student
- Provide internship opportunity for NYU graduate student
- Receive assistance at no cost

For NYU Graduate Students
- Manage and implement a meaningful project aligned with their professional and educational goals
- Hands-on experience interacting with a start-up or operational small business or organization
- Earn credit toward completion of graduate degree by conducting an unpaid Applied Project under the mentorship of an NYU-SCPS professor.

Project Sponsor and Student Responsibilities
- Student prepares project planning documents
- Sponsor reviews and approves student's project plan
- Student submits project plan to faculty supervisors for approval
- Student conducts project according to plan
- At predetermined milestones sponsor reviews and approves status reports submitted by student
- Status reports reviewed and evaluated by faculty supervisors to assure student effort and project meet course requirements
- Project sponsor and student participate in periodic project reviews with NYU
- At project completion project sponsor completes evaluation forms
- Student prepares final report

Project Selection Process
- Project Evaluation Committee reviews proposed projects
- Projects are:
    - Relevant to MS degree course content
    - Significant to the participating organization
    - Substantial in terms of duration and scope
    - Challenging to the student
    - Capable of being measured against predetermined goals

The MS in Management and Systems

Concentrations in:
- Strategy and Leadership
- Systems Management
- Database Technologies
- Enterprise Risk Management

Typical Participating Student Profile
- Students selected to participate in this program meet stringent criteria
- Have completed all coursework
- High achievers with highest level GPAs and strong academic credentials
- 2-10 years of business experience
- Highly motivated for success

Sponsor and Project Information

Type of Organization	□ For Profit X Not for Profit				
Name of Organization	The Digital Forge at the NYU School of Professional Studies				
Address	12 West 43rd Street				
City	New York	State	NY	Zip	10036
Project Sponsor	First Name	Andres	Last Name	Fortino	
Title	Clinical Associate Professor				
Phone					
Email	agf249@nyu.edu				
Web Site	https://www.linkedin.com/in/afortino				
Type of Business	Learning institution				

Student Name	Amanda Marki
Project Title	Creating an LLM Chatbot for Project Management Using the PMI PMBOK

Description of Project
The project aims to develop a chatbot that leverages the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) to assist project managers in planning and executing projects effectively. By combining the capabilities of Large Language Models (LLMs) with the structured guidelines of the PMBOK, this project seeks to create a powerful tool for project management. The effectiveness of the chatbot will be rigorously tested through initial trials. These trials will apply the chatbot to various project management scenarios and compare its output to traditional methods. Factors such as the relevance of the proposed plans, adherence to PMBOK guidelines, and time efficiency will be assessed to determine the chatbot's overall effectiveness.

Estimated Hours of Student Participation	300

Anticipated Results
- The LLM chatbot will improve project planning and execution efficiency by offering real-time, contextually relevant PMBOK advice.   - The chatbot could reduce project managers' reliance on manual consultation of guidelines, speeding up decision-making processes.   - The chatbot's output should demonstrate measurable improvements in plan relevance, adherence to PMBOK guidelines, and time efficiency compared to traditional methods.

Knowledge and expertise student will need to be able to complete the project
- As Implementer: Work closely with the client to identify and document detailed requirements, design the solution, and implement the chatbot. This includes creating functional specifications, structuring the PMBOK integration into the LLM, developing the necessary code, and thoroughly testing the solution.   - As Project Manager: Set clear milestones, deliverables, and due dates in consultation with the client. Organize and lead regular meetings with the client, ensuring progress is tracked and any issues are addressed on time. Document all project steps and provide regular progress reports to the client.

Will the project sponsor be available for periodic meetings with NYU to review progress, address questions and concerns with the professor supervising the program? *This is a requirement for the program*	X Yes □ No
Describe the form and frequency of supervision of the student by the Project Sponsor. - The Project Sponsor and the student will hold 2-3 progress check-in meetings. - The student will provide the Project Sponsor with 2-3 status reports prior to each meeting. - The Project Sponsor will be available for periodic meetings with NYU.	

Sponsor Agreement

Students are interns, not professional consultants. NYU is **not** responsible for the outcomes of projects undertaken by students. Work is on a best-efforts basis; no guarantees or warranties are expressed or implied. Organization is responsible for evaluating work presented, determining its value and whether to use it or not. Some projects may require on-going management or even re-work by the Organization after the student completes their Applied Project.

Please note that in order to post an unpaid position, the internship must encompass all 6 components below:
1. The internship, even though it includes actual operation of the facilities of the employer, is similar to training which would be given in an educational environment;
2. The internship experience is for the benefit of the intern;
3. The intern does not displace regular employees, but works under close supervision of existing staff;
4. The employer that provides the training derives no immediate advantage from the activities of the intern; and on occasion its operations may actually be impeded;
5. The intern is not necessarily entitled to a job at the conclusion of the internship; and
6. The employer and the intern understand that the intern is not entitled to wages for the time spent in the internship.

I have read and agree with the information shown in the Terms and Conditions for employers contained on the following web page(s):
http://www.nyu.edu/life/resources-and-services/career-development/employers/post-a-job/terms-and-conditions.html

Please complete and sign this form in the space provided below and return to the course professor via the student who will upload the document to the course drop-box. For any questions, please email the professor: Prof. Israel Moskowitz im36@nyu.edu.

I agree to all of the above

NYU School of Professional Studies

Participating Organization _____   Date 9/17/24 _____

By (signature):   _Andres Fortino_____
                              Project Sponsor

Printed Name: Dr. Andres Fortino _____

Title: Clinical Associate Professor of Management and Systems

Student Agreement

Students who are planning to conduct an unpaid Applied Project must read and agree to the "Important Considerations Before Accepting a Job or Internship" contained on the following web page(s): http://www.nyu.edu/life/resources-and-services/career-development/find-a-job-or-internship/important-considerations-before-accepting-a-job-or-internship.html.

Students do not register their Applied Project with the Wasserman Center.

I agree to the all of the above

Student Name (Print) _Amanda Marki_____   Date __09/16/2024__

Signature: _____

Appendix C - Project Charter

Creating an LLM Chatbot for Project Management Using the PMI PMBOK
Project Charter

Project Manager: Amanda Marki
Sponsor: Dr. Andres Fortino
Prepared by: Amanda Marki
Name and Location of Client Organization: The Digital Forge at the NYU School of Professional Studies, 12 West 43rd Street, New York, NY

1. **Project Goal**
   Create an LLM Chatbot for Project Management Using the PMI PMBOK for NYU SPS Digital Forge. This innovative tool will enhance the efficiency and effectiveness of project managers by providing quick and relevant access to industry best practices outlined in the PMBOK. In today's complex project management environment, efficient access to comprehensive insights is crucial for successful project planning and execution. This project will explore whether an LLM-based chatbot can provide more contextually relevant and timely advice than traditional consulting project management manuals or guides.

2. **Problem/Opportunity Definition**
   The project will deliver significant business benefits by providing project managers with a tool that offers real-time, contextually relevant advice based on PMBOK best practices. By streamlining access to comprehensive guidelines, the chatbot will reduce the time spent consulting traditional manuals and improve decision-making during project planning and execution. This will lead to increased efficiency, faster project delivery, and enhanced consistency in applying best practices, ultimately reducing the risk of project delays and improving overall project success rates. Adopting this AI-driven tool will empower project managers to make more informed decisions quickly, resulting in greater productivity and improved outcomes for the organization.

3. **Proposed Project Description**
   The project aims to develop a chatbot that leverages the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) to assist project managers in planning and executing projects effectively. By combining the capabilities of Large Language Models (LLMs) with the structured guidelines of the PMBOK, this project seeks to create a powerful tool for project management. The effectiveness of the chatbot will be rigorously tested through initial trials. These trials will apply the chatbot to various project management scenarios and compare its output to traditional methods. Factors such as the relevance of the proposed plans, adherence to PMBOK guidelines, and time efficiency will be assessed to determine the chatbot's overall effectiveness.

4. **Project Sponsor**
Name and Title: Dr. Andres Fortino
Role within the organization: Clinical Associate Professor, NYU
Role on the project: This researcher will act as an independent contractor to the client (the sponsor), and nothing in this sponsorship is intended to or should be construed to create a partnership, agency, joint venture, or employment relationship.

5. **Objectives**
   - Objective 1: Deliver a Functional Requirements Specifications Document (FRS) and a Work Break Down Structure (WBS) to the Sponsor and Program Advisor.
     - Measurement: Due by 10/08/2024
   - Objective 2: Deliver a Project Charter detailing the timeline and activities of the project to the Sponsor and Program Advisor.
     - Measurement: Due by 10/22/2024
   - Objective 3: Develop and Implement an LLM-based Chatbot trained on the PMBOK and deliver it to the Sponsor for review.
     - Measurement: Due by 11/03/2024
   - Objective 4: Produce and deposit additional project files, including a final presentation, report, and README documentation, in a public GitHub repository and deliver said materials to the Sponsor and Program Advisor.
     - Measurement: Due 12/03/2024

6. **Project Selection & Ranking Criteria**
Project benefit category:

	Compliance/Regulatory
	Compliance/Regulatory
X	Efficiency/Cost reduction
	Revenue increase

Portfolio fit and interdependencies:
This project aligns with NYU SPS Digital Forge's goals of supporting innovative tools to enhance project management efficiency and effectiveness. It fits within a broader context of academic initiatives focused on applying AI-driven solutions to real-world challenges, specifically within project management. The chatbot project complements existing curriculum efforts, providing experiential learning and practical application for students and project managers, while also benefiting the institution by exploring the potential of AI in education and professional development.

Project urgency:
The project has a clear timeline set for completion within the Fall 2024 semester, with milestones and deliverables due between October and December. This urgency is driven by the academic calendar and the need to produce a fully functional chatbot prototype and comprehensive project report by the semester's end. The focus on timely completion also

emphasizes the tool's relevance to current project management trends, supporting immediate learning and practical application within NYU's programs.

7. **Cost/Benefit Analysis**

Tangible Benefits
- Benefit: The chatbot will provide real-time, PMBOK-aligned project management advice.
- Value & Probability: High value with a high probability of improving project planning and execution by reducing time spent consulting manuals.
- Assumptions Driving Value: Assumes the chatbot accurately interprets PMBOK guidelines and provides contextually relevant advice.

Intangible Benefits
- Benefit: Increased efficiency of project management skill application and knowledge among users.
- Value & Probability: Moderate value with a high probability of adoption by students and faculty for academic and practical purposes.
- Assumptions Driving Value: Assumes user engagement and trust in the chatbot's advice.

Cost Categories
- Internal Labor Hours: Estimated at 300 hours over the course of the semester.
- External Costs: None listed; no paid consulting or third-party development.
- Labor (Consultants, Contract Labor): None required; the project is developed solely by the student.
- Equipment, Hardware, or Software: Access to LLM technology (e.g., GPT-based APIs) and collaboration tools such as GitHub and Zoom.
- Other Costs (e.g., Travel & Training): Minimal, if any, as most work will be virtual and on-campus.

Financial Return
- Expected Savings: By reducing the time spent by project managers and students consulting traditional PMBOK manuals, the chatbot can lead to significant time and cost savings in project planning and execution. This efficiency can translate into reduced hours for faculty consultations and less dependency on paid consulting resources for project management guidance.
- Value Assumptions: Assumes a conservative estimate of time saved per project manager per consultation. If each user saves even a small amount of time across multiple projects, the aggregate effect could lead to a notable reduction in labor costs.
- Potential Revenue Generation: Although this project is primarily educational, the chatbot's success could open opportunities for further development and licensing to other institutions or professional training organizations, representing a long-term revenue potential.

8. **Assumptions**
   1. The project sponsor and NYU faculty will be available for regular meetings and feedback.
   2. The PMBOK guidelines will remain stable, with no major updates during the project timeline.

3. Necessary LLM and AI resources will be accessible and functional for development and testing.

9. **Scope**

Quality:
The chatbot's quality will be measured by its adherence to PMBOK guidelines, relevance of recommendations, and ease of use. Quality reviews will involve user testing and feedback from NYU project management students and faculty.

Time:
The project is constrained by the academic calendar, with a completion date set for 12/10/2024. Key deliverables have specific deadlines, such as the Functional Requirements Document (10/08/2024) and the final GitHub repository submission (12/03/2024).

Resource Allocation:
Resources include access to LLM technology, PMBOK documentation, and the student's dedicated 20 hours per week. Ownership of software tools and technology for development lies with NYU Digital Forge and the student.

Out-of-scope activities:
Activities not included are broader scenario testing outside of project management, integration with external project management software, and long-term chatbot maintenance post-project completion. Future iterations may involve enhancements to address these areas.

Constraints:
1. The chatbot is limited to PMBOK-based recommendations and may not fully accommodate unique or non-standard project scenarios.
2. Language model accuracy may vary, affecting the relevance of advice in some contexts.
3. The student has limited previous experience with LLM chatbot and UI creation.

10. **Risks and Mitigation Strategies**
1. Risk: Limited PMBOK knowledge coverage by the chatbot may lead to incomplete or inaccurate guidance.
   a. Mitigation: Focus testing on core project management scenarios and refine prompts for better alignment with PMBOK.
2. Risk: Potential delays due to limited access to LLM technology or technical challenges.
   a. Mitigation: Schedule regular progress reviews to identify and address technical issues promptly.

11. **Communications Plan**
1. Frequency: Weekly check-ins with the project sponsor and periodic status updates.
2. Method: Virtual meetings via Zoom and email progress reports.

3. Content: Status updates, challenges, completed tasks, and planned activities for the coming week

12. Schedule Overview

Project Start Date: 09/03/2024

Estimated Project Completion Date: 12/10/2024

Major Milestones:
- Milestone 1: Deliver a Functional Requirements Specifications Document (FRS) and a Work Break Down Structure (WBS) to the Sponsor and Program Advisor.
    - Measurement: Due by 10/08/2024
- Milestone 2: Deliver a Project Charter detailing the timeline and activities of the project to the Sponsor and Program Advisor.
    - Measurement: Due by 10/22/2024
- Milestone 3: Develop and Implement an LLM-based Chatbot trained on the PMBOK and deliver it to the Sponsor for review.
    - Measurement: Due by 11/03/2024
- Milestone 4: Produce and deposit additional project files, including a final presentation and report and README documentation, in a public GitHub repository and deliver said materials to the Sponsor and Program Advisor.
    - Measurement: Due 12/03/2024

External Milestones Affecting the Project: None

13. Project Plan, Gantt
PMBOK Chatbot 1.mpp

14. Project Evaluation
1. Project schedule:
   The project will be ensured to follow the timeline outlined in the Project Plan.
2. Project weekly status report and dashboard:
   The Gantt chart will be updated on a weekly basis or as tasks are completed.
3. Project communication plan, issues log, risk register:
   There will be two major check-ins with the client, wherein all progress and issues will be discussed and updated.
4. Project status reports:
   The status reports will be done during the aforementioned check-ins and will be shown via the Gantt chart, along with the sharing of the deliverables (if any).

Appendix D - Project Plan

		Task Mode	WBS	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			1	◢ Gantt Chart PMBOK Chatbot		Tue 9/3/24			
2			1.1	◢ Documentation		Tue 9/3/24			
3			1.1.1	Complete FRS	26 days	Tue 9/3/24	Tue 10/8/24		Student,Sponsor
4			1.1.2	Complete WBS	26 days	Tue 9/3/24	Tue 10/8/24		Student,Sponsor
5			1.1.3	Complete Project Charter	10 days	Wed 10/9/24	Tue 10/22/24	4	Student,Sponsor
6			1.1.4	Complete Literature Survey	7 days	Mon 10/28/24	Tue 11/5/24		Student
7			1.1.5	Complete Final Report/Presentation	14 days	Fri 11/15/24	Tue 12/3/24		Student,Sponsor
8			1.2	◢ Creation		Tue 9/3/24			
9			1.2.1	Chatbot Functionality	12 days?	Thu 10/31/24	Fri 11/15/24		Student
10			1.2.2	AI PMBOK Training	8 days?	Wed 10/23/24	Sun 11/3/24	5	Student
11			1.3	◢ Test		Tue 9/3/24			
12			1.3.1	Scenario-Based Trials	4 days?	Sat 11/16/24	Wed 11/20/2	8	Student
13			1.3.2	Comparative Analysis	5 days?	Thu 11/21/24	Wed 11/27/2	12	Student

Appendix E - Status Report

Project Status Report

Your Name:

Project Title:

Date of report:

1. **Project Status and Explanation:**

Project Status Area	Status (RYG)	Explanation
1. Overall Project Status	🟠	
2. Project Schedule	🟢	
3. Project Deliverables	🟠	Still some difficulties integrating the bot, troubleshooting
4. Resources & Collaboration	🟢	
5. Changes	🟢	
6. Communication	🟠	Have yet to update project sponsor on current status

For status above, indicate Red, Orange, or Green:
- **Red**: Critical issues, serious risks to project, significant intervention must occur to achieve success, potential for stoppage of project activity. Project slipping by 5+ days, and resources uncommitted to meet deliverables
- **Orange**: Some major issues, moderate risk to project, must monitor closely, some internal or/and external dissatisfaction with progress. Project plan slipping by 2+ days.
- **Green**: No major issues, minimal risk to project, on target with expected outcomes, project on schedule, everyone satisfied with progress.

2. List All Completed Project Tasks:
- Designed chatbot UI
- Integrated OpenAI API
- Fed the PMBOK to the chatbot
-

3. List any concerns or issues that need the professor's involvement:
- N/A
-
-

4. Next series of tasks to complete:
- Troubleshoot the bot
- Test and train
-

5. Sponsor Signoff
Sponsor indicates agreement with the above status report:

By (signature): _____
Project Sponsor

Printed Name: Andres Fortino _____
Please print in English

Appendix F - Annotated Bibliography

Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2022). Artificial Intelligence (AI) Student Assistants in the Classroom: Designing Chatbots to Support Student Success. Information Systems Frontiers, 25, 161–182. https://doi.org/10.1007/s10796-022-10291-4

> *In higher education, low teacher-student ratios can make it difficult for students to receive immediate and interactive help. Chatbots, increasingly used in various scenarios such as customer service, work productivity, and healthcare, might be one way of helping instructors better meet student needs. However, few empirical studies in the field of information systems (IS) have investigated pedagogical chatbot efficacy in higher education, and fewer have discussed their potential challenges and drawbacks. In this research, we address this gap in the IS literature by exploring the opportunities, challenges, efficacy, and ethical concerns related to using chatbots as pedagogical tools in business education. In this two-study project, we conducted a chatbot-guided interview with 215 undergraduate students to understand student attitudes regarding the potential benefits and challenges of using chatbots as intelligent student assistants. Our findings revealed the potential for chatbots to help students learn basic content in a responsive, interactive, and confidential way. Findings also provided insights into student learning needs which we then used to design and develop a new, experimental chatbot assistant to teach basic AI concepts to 195 students. The results of this second study suggest chatbots can be engaging and responsive conversational learning tools for teaching basic concepts and for providing educational resources. Herein, we provide the results of both studies and discuss possible promising opportunities and ethical implications of using chatbots to support inclusive learning.*

This paper highlights the use of AI chatbots as learning tools within an academic context, exploring their role in improving accessibility to foundational information and promoting interactive learning. This directly aligns with the project's aim to create a chatbot that can deliver educational support to project managers by quickly providing them with best practices from the PMBOK in an interactive format.

G Dhruva, Ishaan Shettigar, Srikrshna Parthasarthy, & Sapna, V. M. (2024). Agile Project Management Using Large Language Models. 2024 5th International Conference on Innovative Trends in Information Technology (ICITIIT).

https://doi.org/10.1109/icitiit61487.2024.10580873

Agile data-driven methodology encourages engineering leaders to measure their teams' performance by leveraging metrics for improving visibility, identifying potential roadblocks, and increasing delivery velocity. The work presented here introduces a cutting-edge paradigm of a data-driven approach to Agile project management, contributing to the evolving research in project management methodologies. As organizations strive to consolidate the competitive market, their success is often measured by their agility and resilience. Such agility stems from the underlying management practices that an organization embraces and is crucial for the effective planning and delivery of large-scale projects. While management philosophies have continued to evolve, organizations specializing in software development have increasingly adopted Agile project management practices to keep up with a disruptive landscape inundated with rapidly emerging technological advancements. As organizations have continued to expand globally, the existing Agile practices have been laggard and sluggish, unable to keep up with the demands of a modern market. In this context, the authors introduce an Agile project management framework driven by Large Language Models (LLMs) to facilitate the efficient management of large projects.

This study introduces Agile project management methods supported by Large Language Models (LLMs), which are valuable for understanding how LLMs can enhance project workflows. The proposed chatbot leverages similar AI-driven methodologies to streamline project management, focusing on efficiency and adaptability, which are core tenets of Agile and are crucial to achieving timely project guidance.

Kim, Y., & Hsu, C.-C. (2024). *Leveraging Large Language Models for Hybrid Workplace*

Decision Support. ArXiv.org. https://doi.org/10.48550/arXiv.2402.03616

Large Language Models (LLMs) hold the potential to perform a variety of text-processing tasks and provide textual explanations for proposed actions or decisions. In the era of hybrid work, LLMs can provide intelligent decision support for workers who are designing their hybrid work plans. In particular, they can offer suggestions and explanations to workers balancing numerous decision factors, thereby enhancing their work experience. In this paper, we present a decision support model for workspaces in hybrid work environments, leveraging the reasoning skills of LLMs. We first examine LLM's capability to make suitable workspace suggestions. We find that its reasoning extends beyond the guidelines in the prompt, and the LLM can manage the trade-off among the available workspace resources. We conduct an extensive user study to understand workers' decision process for workspace choices and evaluate the effectiveness of the system. We observe that a worker's decision could be influenced by the LLM's suggestions and explanations. The participants in our study find the system to be convenient, regardless of whether reasons are provided or not. Our results show that employees can benefit from the LLM-empowered system for their workspace selection in a hybrid workplace.

In their examination of decision support within hybrid workplaces, the authors showcase how LLMs offer workspace-specific recommendations. This insight supports the project's goal by underscoring the chatbot's potential to provide context-aware advice, enhancing decision-making in diverse project scenarios.

Stamatis Karnouskos. (2024). The Relevance of Large Language Models for Project

Management. IEEE Open Journal of the Industrial Electronics Society, 5, 758–768.

https://doi.org/10.1109/ojies.2024.3412222

> *The rise of artificial intelligence, particularly the emergence of large language models (LLMs) like ChatGPT, continuously reveals numerous advantages across various domains. However, the area of project management has not yet been sufficiently explored. This study fills the research gap by conducting an empirical evaluation of three well-known LLMs: OpenAI's ChatGPT-3.5 and ChatGPT-4, as well as Google's Bard. The evaluation involves subjecting these LLMs to tests designed to prepare professionals for project management certification by the Project Management Institute. The findings cast a positive light on all three LLMs, with each model achieving scores exceeding 82%. Key insights acquired include: LLMs demonstrate the ability to effectively answer project management certification exam questions; LLMs and project managers should be viewed as a dynamic and complementary partnership; and project management certification should evolve to include an assessment of how project managers collaborate with LLMs to enhance project management.*

This source discusses the relevance of LLMs in professional certification contexts, focusing on project management skills. The research supports the integration of LLMs in the chatbot, suggesting their potential as complementary tools for managing project certification knowledge bases like the PMBOK, enhancing both study support and practical project management.

Taboada, I., Daneshpajouh, A., Toledo, N., & Vass, T. de. (2023). Artificial Intelligence Enabled

Project Management: A Systematic Literature Review. Applied Sciences, 13(8). MDPI.

https://doi.org/10.3390/app13085014

> *Abstract*
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> *In the Industry 5.0 era, companies are leveraging the potential of cutting-edge technologies such as artificial intelligence for more efficient and green human-centric production. In a similar approach, project management would benefit from artificial intelligence in order to achieve project goals by improving project performance, and consequently, reaching higher sustainable success. In this context, this paper examines*

the role of artificial intelligence in emerging project management through a systematic literature review; the applications of AI techniques in the project management performance domains are presented. The results show that the number of influential publications on artificial intelligence-enabled project management has increased significantly over the last decade. The findings indicate that artificial intelligence, predominantly machine learning, can be considerably useful in the management of construction and IT projects; it is notably encouraging for enhancing the planning, measurement, and uncertainty performance domains by providing promising forecasting and decision-making capabilities.

A review of AI in project management underlines the benefits of AI-driven tools for project performance, emphasizing applications in planning and forecasting. This systematic review informs the chatbot's design by validating AI's role in improving project planning and supporting PMBOK-based guidelines with enhanced predictive capabilities.

Vakilzadeh, A., Pourahmad Ghalejoogh, S., & Hatami, M. (2023, August 1). Evaluating the Potential of Large Language Model AI as Project Management Assistants: A Comparative Simulation to Evaluate GPT-3.5, GPT-4, and Google-Bard Ability to pass the PMI's PMP test. Social Science Research Network.

https://doi.org/10.2139/ssrn.4568800

This research investigates the potential of artificial intelligence (AI), specifically OpenAI's GPT models and Google's Bard model in project management. The study focuses on the proficiency of GPT–3.5, GPT-4, and Google–Bard in answering questions similar to those found in the Project Management Professional (PMP) certification exam. In a two-step experiment, we first compared the performance of the models on 400 questions. GPT–4 scored highest at 87.75%, compared to 72.75% for GPT–3.5 and 72.25% for Google–Bard. We then used four improvement strategies, the Chain of Thought (COT), Faithful Chain of Thought (FCOT), and Tree of Thought (TOT), to improve GPT–4's scores on initially incorrect answers. This boosted GPT4's score to 93.25%. The results demonstrate AI's significant potential in project management, as well as describe a general outline of focus areas for a commercially feasible Project Management AI (PMAI). To ensure a fair comparison, we applied Few Shot Learning (FSL) in certain areas to improve all models' performance throughout the tests.

This research compares LLMs like GPT and Bard on their ability to answer PMP exam questions, highlighting LLMs' alignment with project management standards. This is particularly relevant to the chatbot's objective to adhere to PMBOK guidelines effectively and provide verified, testable support in project management settings.