**Your Project Name - RoboScale: LLM-Driven Robot Replaceability Assessment Tool**

**Project Charter**

Project Manager: Chongyuan Liu

Sponsor: Dr Andres Fortino

Prepared by: Chongyuan Liu

Name and Location of Client Organization: NYU School of Professional Studies, and the Management and Systems program (MASY), is a New York-based learning institution

1. **Project Goal**

The primary goal of this project is to develop, validate, and document a comprehensive Robot Replaceability Scale Tool utilizing Large Language Models (LLM) to assist business reengineering analysts in evaluating the feasibility and ease of substituting human tasks with robotic alternatives. This tool will leverage the O\*NET dataset from the Bureau of Labor Statistics to derive replaceability scores for various occupations, thereby facilitating the strategic implementation of automation across diverse sectors. The project also aims to compare the tool’s output with predictions from subject matter experts to ensure its accuracy and reliability. Additionally, the process and findings will be meticulously documented and compiled into a research paper, conforming to IEEE conference paper submission standards, with the anticipation of presenting the findings at Princeton University in April 2024. Lastly, all relevant materials and documentation will be delivered and made accessible through a GitHub repository.

1. **Problem/Opportunity Definition**

In an era where technological advancement is rapidly reshaping industries, there is an escalating demand for robust tools that can accurately assess the potential for automating human tasks with robots. The existing scale by Goldman Sachs offers a foundational perspective, but there is an opportunity to extend this work and develop a more comprehensive and accessible tool, leveraging the capabilities of Large Language Models (LLM). The integration of LLM promises enhanced accuracy and adaptability across varied occupations listed in the Bureau of Labor Statistics O\*NET dataset. The opportunity lies in harnessing this technology to create a tool that not only provides a replaceability scale but also sheds light on the implementation feasibility of robotic automation. Addressing this will empower business reengineering analysts with insights that facilitate informed decision-making, optimize resource allocation, and drive organizational efficiency and innovation. By accomplishing this, the project stands to contribute significantly to the field of automation and workforce management, potentially guiding the future trajectory of human-robot collaboration in the professional landscape.

1. **Proposed Project Description**

## In this project, I will be developing a Robot Replaceability Scale Tool utilizing Large Language Models (LLM) to assess the feasibility and ease of replacing human tasks across various occupations with robots, based on the O\*NET dataset from the Bureau of Labor Statistics. The project involves not only building this innovative tool but also meticulously validating its accuracy by comparing its results with the predictions of subject matter experts. Throughout the project, every stage of development, validation, and application will be comprehensively documented. The culmination of this endeavor will be the submission of a detailed research paper, aligning with IEEE conference paper standards, slated for presentation at Princeton University in April 2024. Additionally, all relevant materials, documentation, and the developed tool will be made publicly accessible through a GitHub repository, facilitating further research and development in the field. This sophisticated, validated tool stands to significantly aid business reengineering analysts and contribute to advancements in automation and workforce management.

1. **Project Sponsor**

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

Role within the organization: He is an adjunct faculty member at the NYU School of Professional Studies, where he teaches Business Analytics, Data Mining, Data Visualization, and Innovation.

Role on the project: Project Sponsor

1. **Objectives**

## Objective 1: Build the Robot Replaceability Scale Tool and Document the Whole Process

## Deliverable: A fully functioning Robot Replaceability Scale Tool and comprehensive documentation detailing the development process, methodologies used, and insights gained.

## Metric for Success: Presentation of the developed tool and accompanying documentation to Dr. Andres Fortino and receiving acceptance and approval, ensuring alignment with project requirements.

## Timeframe: By October 15, 2023.

## Objective 2: Prove and Validate the Accuracy of the Tool

## Deliverable: Detailed results of the validation process, comparing the tool’s output with the predictions of subject matter experts, along with any adjustments made to enhance accuracy.

## Metric for Success: Acceptance and approval of the validation results and adjustments by Dr. Andres Fortino, confirming the tool’s accuracy and reliability.

## Timeframe: By October 31, 2023.

## Objective 3: Write the Research Paper

## Deliverable: A comprehensive research paper, conforming to IEEE conference paper submission standards, detailing the development, validation, and application of the Robot Replaceability Scale Tool.

## Metric for Success: Submission of the paper for review and acceptance by Dr. Andres Fortino, ensuring it meets the quality and standards for presentation at the IEEE conference in April 2024 at Princeton University.

## Timeframe: By November 30, 2023.

## Objective 4: Deliver All Necessary Materials in GitHub Repository

## Deliverable: A well-organized GitHub repository containing the developed tool, comprehensive documentation, validation results, and the final research paper.

## Metric for Success: Review and acceptance of the GitHub repository by Dr. Andres Fortino, ensuring all materials are correctly uploaded, organized, and accessible for further research and development.

## Timeframe: By December 14, 2023.

## These objectives, aligned with the SMART criteria, will serve as pivotal milestones in assessing the progress and success of the project, ensuring each phase is accomplished with diligence and precision, leading to the delivery of a valuable and innovative tool in the realm of automation and human-robot collaboration.

1. **Project Selection & Ranking Criteria**

Project benefit category:

|  |  |
| --- | --- |
|  | Compliance/Regulatory |
|  | Efficiency/Cost reduction |
|  | Revenue increase |

Portfolio fit and interdependencies

In the context of all other projects the client is undertaking, my project offers a distinctive approach by emphasizing the potential impact of automation on job roles. This could be especially valuable for businesses looking to understand and plan for the future implications of automation in their sectors. The novelty and relevance of the topic make it an important addition to the client's roster of projects.

Project urgency

The urgency of this project is clearly high. Given that the project's end date is set for December 14th, 2023, there is a limited timeframe to complete the work. This tight deadline is further emphasized by the goal of preparing a research paper for the IEEE STEM conference at Princeton University in April 2024. Having the project completed by the end of the semester not only ensures that the findings and results are fresh and relevant, but it also provides ample time for the necessary revisions, peer reviews, and preparations needed for the conference presentation. Therefore, it is essential to prioritize and expedite the project activities to meet these critical milestones.

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3. **Cost/Benefit Analysis**

Tangible Benefits

Benefit: Development of a Robot Replaceability Scale Tool.

Value & Probability: High value with a high probability (given the project's scope and objectives).

Assumptions Driving Value: There is a significant demand in the business world for tools that can accurately assess the feasibility of automating human tasks.

Intangible Benefits

Benefit: Boosted reputation for NYU School of Professional Studies.

Value & Probability: High value with a medium to high probability (contingent on the success and reception of the research).

Assumptions Driving Value: Successful research outcomes and effective presentations/publications can bolster an institution's reputation.

Cost Categories

Internal Labor hours： This will be the primary cost. The hours dedicated by researchers, faculty, and students to the project. This involves data collection, analysis, tool development, documentation, and paper writing 300 hours

External costs： Accessing proprietary datasets, tools, or platforms – will use free resources

Labor (consultants, contract labor): Myself as project conductor and project manager

Equipment, hardware or software: My own materials

Other costs such as travel & training: NA

Financial Return : While the project will not generate direct commercial profit, the indirect value in terms of reputation, intellectual property, and potential future collaborations or grants is considerable. The tool's development, research publication, and open-source contribution position NYU School of Professional Studies as a leader in the integration of management, systems, and technology, potentially attracting future students, partnerships, and research funding opportunities.

1. **Assumptions**
2. **Skilled Personnel:** It's assumed that the project conductor and other involved personnel have the requisite skills and knowledge to carry out the project. This includes understanding the intricacies of Large Language Models (LLMs), data analysis, and tool development.
3. **Cooperation of Partners:** The success of this project may rely on the cooperation and collaboration of associated partners. Their willingness to provide insights, feedback, or complementary data can enhance the project's outcomes.
4. **Client Availability:** The consistent availability of the client, in this case NYU School of Professional Studies and Dr. Andres Fortino, is essential. Regular meetings, feedback sessions, and alignment discussions are crucial to ensure the project stays on track and meets its objectives.
5. **Data Accessibility:** The project assumes the availability of specific datasets, such as the O\*NET Data Set and the Goldman Sachs scale, the Mckinsey scale and ITIF scale. Access to, and permission to use, these datasets is crucial for the development and validation of the Robot Replaceability Scale Tool.
6. **Technical Infrastructure:** It's assumed that the necessary technical infrastructure, like computing resources, software licenses, and platforms, are available and accessible to the research team. In this case, I will use my own computer and NYU academic resources.
7. **Publication and Presentation Opportunities:** The assumption is that the research, once completed, will be accepted and presented at the "IEEE STEM conference at Princeton University in April 2024". This not only provides a deadline but also a platform for showcasing the research.
8. **Open-Source Contribution:** It's assumed that there are no legal or proprietary barriers preventing the sharing of the tool and its documentation on platforms like GitHub.
9. **Stakeholder Engagement:** The project assumes that key stakeholders, both internal and external to NYU, will be engaged and supportive throughout the project's lifecycle.
10. **Scope**

Quality

* The quality of the final deliverable will be determined by its accuracy, comprehensiveness, and relevance. The Robot Replaceability Scale Tool should be able to accurately assess the feasibility of automating human tasks using the specified datasets.
* The quality will also be gauged by the acceptance and feedback from the academic community, especially during the "IEEE STEM conference at Princeton University in April 2024".
* Peer reviews, testing, and validation of the tool against known benchmarks or case studies can also serve as quality indicators.

Time

* The project has a clear end date: December 14th, 2023. This is the deadline by which the research and tool development should be completed.
* The time allocated for the project is the duration of the semester, which is typically around 3 months.

Resource Allocation

* The project will primarily utilize the infrastructure provided by myself and NYU School of Professional Studies. This includes computer equipment for analysis and research.

Out of scope activities

* Development of commercial applications or extensions of the tool for specific industry use-cases.
* Broadening the tool's capabilities beyond the datasets specified (O\*NET Data Set and the Goldman Sachs scale).
* Exploratory research outside the domain of robot replaceability and business reengineering.

Constraints

* **Programmer Expertise:** The project assumes a certain level of expertise on the project conductor, especially in the domains of Large Language Models (LLMs), data analytics, and tool development.
* **Technology:** The tools for analysis have not been specified but will be chosen based on the project's requirements and the team's expertise. However, given the mention of GitHub, it's safe to assume familiarity with languages like Python.
* **Client Availability:** Dr. Andres Fortino and other stakeholders from NYU School of Professional Studies must be available for regular meetings, feedback sessions, and updates. The exact frequency and duration of these interactions would need to be defined.
* **Analytical Techniques:** Specific techniques would be determined based on the project's progress and the challenges encountered.

1. **Risks and Mitigation Strategies**

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1. **Communications Plan**

1. Frequency

2. Method

3. Content

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1. **Schedule Overview**

Project Start Date: September 13, 2023

Estimated Project Completion Date: December 14, 2023

Major Milestones:

1. **Development of the Tool (100 Hours)**
   * Design and implement the Robot Replaceability Scale Tool using LLM.
   * Refine the tool based on initial testing and feedback.
   * Document the development process comprehensively.
2. **Validation and Refinement (60 Hours)**
   * Compare tool results with predictions of subject matter experts.
   * Analyze discrepancies and refine the tool for enhanced accuracy.
   * Document the validation process and the adjustments made.
3. **Writing the Research Paper (50 Hours)**
   * Compile findings, insights, and methodologies into a comprehensive paper.
   * Ensure the paper aligns with IEEE conference paper submission standards.
   * Review and revise the paper to ensure quality and coherence.
4. **Repository Management and Finalization (30 Hours)**
   * Organize and upload all materials to the GitHub repository.
   * Ensure accessibility and proper documentation within the repository.
   * Finalize all deliverables and prepare for project closure.
5. **Contingency Time (10 Hours)**
   * Address unforeseen challenges or issues.
   * Make any last-minute adjustments or enhancements to the tool or paper.

External Milestones Affecting the Project

**IEEE Conference Submission Deadlines:** There will be specific deadlines for paper submissions to the IEEE STEM conference, which could affect the project's timeline.

1. **Impact of Late Delivery**
2. **Reputation Impact:** A delay in the delivery of the project could potentially harm the reputation of both the NYU School of Professional Studies and the research team. In the academic world, meeting deadlines for conferences and publications is paramount. Missing the deadline for the "IEEE STEM conference at Princeton University in April 2024" could result in missed opportunities to showcase the research, diminishing the institution's standing as a thought leader.
3. **Financial Impact:** While the project itself might not have direct commercial profit, delays can lead to increased costs. Extended project timelines might require additional resources, both in terms of labor and other associated costs.
4. **Resource Allocation Disruption:** Resources (personnel, equipment, software licenses) allocated for this project might have been scheduled for other projects or responsibilities post-completion. Delays could disrupt these schedules, potentially affecting other projects or operational tasks.
5. **Missed Opportunities for Further Research:** The findings from this project could be foundational for subsequent research or projects. Delays might hinder the progress of these subsequent initiatives, potentially leading to missed opportunities or further delays in other projects.
6. **Stakeholder Engagement:** Continuous delays might result in waning interest or trust from stakeholders, which could affect future collaborations or engagements. The continuous engagement of stakeholders is predicated on trust and reliability, which could be eroded with delays.
7. **Operational Impact:** If other projects or initiatives are contingent on the results or tools developed in this project, their timelines and operations might be adversely affected.
8. **Emotional and Morale Impact:** Continuous delays and extended working hours to catch up can have a toll on the research team's morale and well-being, potentially affecting the quality of work and team dynamics.
9. **Resources Required**

Personnel:

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Facilities, Software, Hardware and other Resources

* **Facilities:** Access to NYU's academic resources, including libraries, databases, and research labs if necessary.
* **Software:**
  + LLMs such as ChatGPT 4, Claude 2, etc.
  + Document writing software like Microsoft Word for drafting the research paper. PowerPoint for the preparation of the presentation.
  + Version control and collaboration tools like GitHub for managing the project repository.
* **Hardware:** Personal computer with sufficient processing power and storage to handle data analysis, tool development, and other tasks.
* **Other Resources:** Access to the O\*NET Data Set, the Goldman Sachs scale, Mckinsey scale and ITIF scale, and any other academic resources or datasets available through NYU.

Procedures/ Methodology

The project will likely follow a structured research methodology, which may involve:

* **Data Collection:** Procuring and organizing the necessary datasets.
* **Exploratory Data Analysis:** Understanding the datasets, identifying patterns, and drawing preliminary insights.
* **Tool Development:** Iterative design, development, and refinement of the Robot Replaceability Scale Tool.
* **Validation:** Testing the tool against known benchmarks or real-world scenarios.
* **Documentation & Publication:** Writing the research paper, documenting the tool's development, and preparing for the conference.

1. **Project Plan, Gantt**

*Attach a Gantt chart as an MS Project .mpp file or an Excel Gantt chart in an .xlxs file to show the baseline planning for your project. Once you have done so, you should save the baseline so that subsequent updates can be compared to the baseline plan.*

It’s attached with this document in Assignment 5 section.

1. **Project Evaluation** (How the project will be evaluated)
2. **Project Schedule:**
   * The progress of the project will be continually compared against the baseline Gantt chart. Tasks and milestones laid out in the Gantt chart will serve as indicators. If tasks are being completed as per their scheduled end dates without any significant delays, the project can be considered on track. Any deviation from the Gantt chart will be addressed immediately, and corrective measures will be taken to bring the project back on schedule.
3. **Project Weekly Status Report and Dashboard:**
   * A weekly status report will be generated to communicate the current status of the project. This report will highlight completed tasks, upcoming milestones, potential risks or challenges faced, and any significant achievements. Alongside the status report, an updated version of the Gantt chart will serve as a visual dashboard, showcasing the progress against the planned timeline. This approach ensures that all stakeholders, including the client, are consistently informed about the project's standing.
4. **Project Communication Plan, Issues Log, Risk Register:**
   * The communication plan involves weekly virtual meetings to discuss progress, challenges, and next steps. In addition, an "Issues Log" will be maintained, documenting any challenges or roadblocks encountered. Each entry will detail the issue, its potential impact, and the proposed resolution. Similarly, a "Risk Register" will be maintained to identify potential risks, their likelihood, and proposed mitigation strategies. Both the Issues Log and Risk Register will be shared with the client during the weekly meetings to ensure transparency and collaborative problem-solving.
5. **Project Status Reports:**
   * Apart from the weekly status report, a more comprehensive monthly status report will be generated. This report will delve deeper into the project's progress, providing a detailed analysis of the work done, insights gained, and the overall health of the project. The monthly report will be shared with the client and other stakeholders, offering a granular view of the project's trajectory. This ensures that all involved parties are well-informed and can make decisions based on up-to-date information.

By adhering to these evaluation metrics and communication strategies, the project aims to maintain transparency, ensure timely delivery, and address challenges collaboratively.

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