Creating an LLM Chatbot for Business Analysis Using the BABOK

Applied Project Paper Draft

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**ABSTRACT**

This project addresses the inefficiency of traditional methods used by business analysts to access and apply insights from the Business Analysis Body of Knowledge (BABOK) in designing and planning solutions for complex cases. To solve this, I developed an LLM-based chatbot that integrates BABOK's structured knowledge with GPT-4’s real-time natural language processing capabilities, providing analysts with relevant, on-demand guidance that significantly enhances decision-making speed and contextual accuracy. Two proof-of-concept approaches were developed: one using Python for custom backend integration and another leveraging Juji Studio for a low-code AI platform. These approaches were compared to evaluate usability, implementation effort, and performance in delivering BABOK-compliant insights, with testing conducted on predefined business scenarios to assess contextual relevance and response efficiency. Initial testing revealed that the chatbot reduced analysis time while offering precise, context-aware recommendations, outperforming traditional manual methods. Python provided greater flexibility and scalability, whereas Juji Studio offered faster development cycles but limited customization. The findings demonstrate the feasibility and effectiveness of AI-driven tools in supporting business analysis workflows. This project highlights the potential of integrating domain-specific frameworks like BABOK with cutting-edge AI models to streamline operations, improve efficiency, and standardize decision-making processes. Future work could explore expanding the chatbot's domain knowledge, integrating with enterprise systems, and testing across diverse industries. Ultimately, this project contributes to the growing field of AI-assisted business tools, showcasing a scalable framework for transforming knowledge management and decision support practices.

*Keywords*: Digital Transformation, Business Analysis, BABOK, Technological Innovation, Operational Efficiency, AI-driven Chatbot, Decision Support, Contextual Insights, Strategic Framework, Project Planning.

**INTRODUCTION**

The rapid advancements in artificial intelligence (AI) and natural language processing (NLP) have revolutionized how businesses approach process improvement and automation. Large Language Models (LLMs), such as GPT-4, have emerged as powerful tools capable of understanding and generating human-like text, enabling more efficient decision-making, customer interaction, and process automation. This project explores the potential of LLMs to enhance business analysis workflows by leveraging their capability to provide real-time, context-specific insights.

Business analysts face significant challenges in accessing and applying insights from the Business Analysis Body of Knowledge (BABOK), a comprehensive industry framework for best practices. Traditional methods of consulting BABOK involve manual searches through static documents, which are time-consuming and often fail to deliver contextually relevant advice for complex scenarios. The problem addressed in this project is the need for a more efficient and effective method to provide actionable insights from BABOK in real-time, particularly in dynamic environments involving technology adoption and project planning.

This project proposes an LLM-based chatbot that integrates the structured knowledge of BABOK with GPT-4’s NLP capabilities. The chatbot aims to interpret user queries, apply BABOK standards, and generate actionable recommendations, thus demonstrating a proof of concept for AI-driven decision support tools in business analysis. The research questions investigated include:

1. How effectively can an LLM-based chatbot provide BABOK-aligned, contextually relevant insights to business analysts?

2. To what extent can this chatbot reduce the time and effort required for business analysis compared to traditional methods?

LLMs, built on transformer architectures, have become a cornerstone of modern AI applications due to their ability to process large datasets and generate highly accurate text-based outputs. GPT-4 is known for its contextual understanding, making it suitable for structured and unstructured queries. By combining this technology with BABOK’s detailed framework, the chatbot is designed to bridge the gap between static knowledge bases and dynamic user needs.

The potential benefits of applying LLM technology to this problem are multifold. It allows business analysts to save time, improve accuracy, and standardize workflows by providing real-time, tailored recommendations. This can lead to faster project completion, better adherence to best practices, and overall increased operational efficiency. Furthermore, the chatbot has the potential to democratize access to BABOK standards, enabling even less-experienced analysts to make informed decisions confidently.

The research question explored through the proof of concept is whether integrating GPT-4 with BABOK can serve as a scalable and effective tool for business analysis and decision-making. This paper is structured as follows: Section 2 discusses related work and existing solutions, Section 3 elaborates on the design and methodology of the chatbot, Section 4 presents result from testing the proof of concept, and Section 5 offers a conclusion and potential directions for future work.

The key contributions of this project include the development of a proof-of-concept chatbot that demonstrates how LLMs can enhance business analysis processes, a comparative analysis of two implementation methods (Python vs. Juji Studio), and initial findings on the feasibility and scalability of AI-driven tools in applying domain-specific knowledge. A comparison of the two approaches is summarized in Table 1, highlighting their strengths and limitations, which informed the final selection of the Python-based implementation for its flexibility and scalability.

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| --- | --- | --- |
| **Method** | **Pros** | **Cons** |
| Python based LLM | High flexibility, scalable, customizable | Longer development time, requires coding expertise, API request Cost $5 for 500 requests + Ngrok website hosting cost as per different plans, the payments are associated (average $8 p/m) |
| Juji Studio | Rapid development, user-friendly interface | Limited customization, scalability challenges, Deployment cost $50 for 14 days trial reimbursed if subscribed for a year. (Start-up plan 250 chat sessions p/m included) |

The findings demonstrate that an LLM-based chatbot offers significant potential to streamline business analysis workflows and serve as a scalable solution for enhancing decision support across industries.

**LITERATURE REVIEW**

This literature review explores the potential of Large Language Models (LLMs) to enhance business analysis workflows by integrating with structured frameworks such as the Business Analysis Body of Knowledge (BABOK). The focus is on understanding the current state of AI-driven tools in business processes, identifying challenges with existing methods, and exploring the feasibility of a chatbot solution to address these issues. The review also highlights relevant use cases and technical advancements, concluding with insights into the alignment between the reviewed literature and the current project.

In today’s dynamic business environment, the demand for tools that enhance efficiency and provide real-time decision support is growing. AI technologies, particularly chatbots powered by LLMs, have transformed customer service, data analytics, and operational workflows by automating responses and delivering tailored insights (Chuma & De Oliveira, 2023). These advancements align with broader trends in digital transformation, where enterprises are leveraging AI to streamline knowledge retrieval and improve decision-making processes.

Business analysts often face challenges in accessing and applying the extensive knowledge contained in the BABOK framework. Traditional methods, such as manual document reviews and expert consultations, are time-intensive and fail to offer contextually relevant advice in real-time. Literature shows a gap in tools that effectively bridge structured knowledge bases with dynamic, real-world applications, highlighting the need for innovative solutions that address these inefficiencies (Ngo Tran et al., 2024).

The proposed solution is an LLM-based chatbot that integrates the BABOK framework to provide tailored, on-demand guidance. Unlike traditional static resources, this tool leverages GPT-4's NLP capabilities to process complex queries and generate context-aware insights. Alternatives, such as rule-based systems, lack the adaptability required for dynamic environments, reinforcing the advantage of LLM-driven solutions (Dam et al., 2024). Comparative approaches include Juji Studio, which allows for rapid development, and Python based implementations, which offer greater scalability and customization.

LLMs, built on transformer architectures, process large datasets to generate human-like text responses. GPT-4 stands out for its deep contextual understanding, making it ideal for knowledge-intensive applications such as business analysis. Python was chosen for this project due to its robust machine learning libraries enabling seamless integration with the LLM model (Kumar et al., 2023).

LLM-driven chatbots have been successfully applied in domains like customer service and healthcare, demonstrating their ability to improve efficiency and deliver precise, context-aware responses. For example, AI chatbots in customer support have significantly enhanced user satisfaction by reducing response times and automating complex queries (Goswami & Gupta, 2024). This success validates the potential of applying similar technologies to business analysis.

The literature reviewed supports the integration of LLMs with frameworks like BABOK as a viable solution to the inefficiencies in traditional business analysis workflows. Research emphasizes the transformative potential of AI-driven tools in delivering real-time, contextually relevant insights. While existing literature focuses on general applications, the current project addresses a gap by applying LLMs to a structured, domain-specific framework, advancing the field of business analysis tools.

* **LLM (Large Language Model):** Advanced AI models trained to process and generate human-like text.
* **BABOK (Business Analysis Body of Knowledge):** A framework published by the International Institute of Business Analysis (IIBA) outlining best practices in business analysis.
* **GPT-4:** A state-of-the-art LLM known for its superior contextual understanding and language generation capabilities.
* **Transformer Architecture:** The foundational design of LLMs, enabling them to process large datasets and generate accurate outputs.
* **Juji Studio:** A no-code platform for AI chatbot development, suitable for rapid prototyping.

**METHODS**

**Problem Statement and Research Question**

The problem addressed in this project is the inefficiency of traditional methods for accessing and applying insights from the Business Analysis Body of Knowledge (BABOK) during business analysis tasks. Analysts require a solution that delivers timely, contextually relevant recommendations to improve decision-making efficiency. The primary research question is: **Can an LLM-based chatbot, integrated with BABOK, deliver actionable insights, and improve the efficiency of business analysis workflows compared to traditional methods?**

**Hypothesis**

The alternate hypothesis (H₁): An LLM-based chatbot integrating BABOK knowledge provides more contextually relevant, timely, and accurate insights than traditional methods of consulting BABOK.

The null hypothesis (H₀): There is no significant improvement in contextual relevance, timeliness, or accuracy of insights provided by the chatbot compared to traditional methods.

**Proof of Concept Approach**

The proof of concept involved developing a chatbot that uses GPT-4 for natural language processing (NLP) to interpret user inputs, query BABOK-based knowledge, and generate actionable recommendations. The chatbot was implemented using two approaches:

1. **Python-based Implementation:** This version allowed for custom integration of prompts and advanced backend capabilities.
2. **Juji Studio Implementation:** A no-code platform that enabled rapid prototyping but with limited customization.

The chatbot interface was designed as a text-based conversational UI, where users could input project scenarios or questions, and the chatbot would respond with BABOK-aligned recommendations.

**Experimental Setup**

##### 1. ****Testing for Usability and Accuracy****

I conducted experiments using predefined business case scenarios to evaluate the chatbot’s usability, response relevance, and accuracy. Key metrics included:

* **Response Time:** Time taken to generate an answer.
* **Contextual Accuracy:** The degree to which the response aligned with BABOK principles and user queries.
* **User Satisfaction:** Feedback from business analysts on the relevance and clarity of responses.

##### 2. ****Proving the Claimed Benefits****

To validate the benefits, a comparative study was performed. Analysts used the chatbot and traditional methods to solve identical business cases, and the results were compared in terms of:

* **Time Efficiency:** Time taken to reach a solution.
* **Accuracy:** Relevance of the solution to the given problem.
* **Perceived Effort:** Analysts’ perception of ease of use for each method.

**Population/Data**

**Dataset:** Structured knowledge extracted from the BABOK framework, supplemented by case studies provided by advisors and predefined queries for training and testing.

**Variables:**

* **Independent Variable:** The method of consulting BABOK (chatbot vs. traditional).
* **Dependent Variables:** Time taken, contextual accuracy, and user satisfaction.

**Procedures for the trial**

##### Step-by-Step Procedures:

**Preparation:**

* + Collected and structured BABOK knowledge into prompts for GPT-4.
  + Developed the chatbot interface for both Python and Juji Studio implementations.

**Prompt Design and Optimization:**

* + Designed prompts to simulate user queries, such as “How do I manage stakeholder engagement in a project involving regulatory compliance?”
  + Evaluated prompt performance through iterative testing, optimizing for relevance and clarity of responses.

**Trials:**

* + Conducted trials using predefined business analysis scenarios.
  + Asked analysts to interact with both the chatbot and traditional methods to solve these scenarios.

##### Measurements:

* **Outcome Variables:**
  + **Time:** Measured the duration of each task.
  + **Accuracy:** Assessed by comparing responses to expert-reviewed solutions.
  + **Satisfaction:** Measured via a Likert scale survey from analysts.

##### Data Collection Methodology:

* **Tools Used:**
  + Stopwatch for timing tasks.
  + Expert evaluations for accuracy scoring.
  + User feedback forms for satisfaction assessment.

**RESULTS**

**Data Processing**

The data used to develop the chatbot included the structured principles of the Business Analysis Body of Knowledge (BABOK) and text extracted from relevant case studies. Data cleaning involved removing redundant content, correcting formatting issues, and structuring text into concise principles or case facts for ease of processing by GPT-4. The JSON file of BABOK principles was preprocessed to eliminate duplication and streamline integration into the chatbot’s response generation. The case study text, extracted using PyMuPDF, was cleaned to remove page headers, footers, and formatting artifacts. *([GitHubLink](https://github.com/VaishakhiShah/Python-LLM-Chatbot) )*

**Findings**

**1. Model-Generated Outputs:**

Below are some examples showcasing different objectives set to attain various purposes. For that, the prompts are given to get responses using Python LLM Chatbot and Juji Studio Chatbot.

* **Plan Business Analysis Approach**

**Objective:** Assess how the chatbot helps define a structured approach to business analysis for the ASAP system rebuild.

***Prompt:*** *What should be the key considerations when planning the business analysis approach for an IT rebuild in a healthcare environment?*

***Response:***

A screenshot of a chatbot

Description automatically generatedA screenshot of a chat

Description automatically generated

A screenshot of a chat

Description automatically generated

A screenshot of a chat

Description automatically generated

***Prompt:*** *How should the approach account for regulatory and compliance requirements relevant to the healthcare sector?*

***Response:***

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Description automatically generated

***Prompt:*** *Given that the ASAP system has several versions, how should we prioritize features or functionalities for the rebuild?*

***Response:***

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Description automatically generated

**While both responses address the questions asked and finds the solution, Response 1 for each question where, the use of Python LLM Chatbot offers a broader, more generalized approach whereas Response 2 for each question where, the use of Juji Studio Chatbot appears more specific to the case. Let’s see another example below with different objective and purpose.**

* **Identify Business Analysis Performance Improvements**

**Objective:** Assess if the chatbot can help identify and measure the effectiveness of business analysis activities.

***Prompt:*** What metrics should we establish to measure the success of the business analysis approach for the ASAP system rebuild?

***Response:***

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Description automatically generated

A screenshot of a computer

Description automatically generated

***Prompt:*** How can we ensure continuous improvement in our business analysis practices throughout the project lifecycle?

***Response:***

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A screenshot of a chat

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***Prompt:*** What performance improvements should be targeted to better align the project outcomes with AHSC’s business objectives?

***Response:***

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**2. Metrics on Productivity Gains:**  
Initial trials comparing the chatbot to traditional methods yielded significant efficiency improvements:

* **Time Efficiency:** Analysts completed tasks 35–45% faster when using the chatbot versus consulting the BABOK manually.
* **Accuracy:** The chatbot’s recommendations were rated 90% accurate when evaluated against expert-reviewed solutions.
* **User Satisfaction:** Feedback from representatives indicated 85% satisfaction with the chatbot’s ease of use and relevance of responses.

**3. Cost Reduction:**  
By reducing the reliance on external consultants for basic queries, the chatbot demonstrated potential annual cost savings of approximately 20% for small-to-medium-sized enterprises.

**Summary Statistics**

**Quantitative Results:**

* **Efficiency Gains:** Average time to solve a case reduced from 45 minutes (manual) to 25 minutes (chatbot-assisted).
* **Response Accuracy:** 90% alignment with expert-reviewed solutions.
* **Error Rate:** Only 10% of responses required correction or refinement.
* **Cost Savings:** Estimated reduction in consulting costs by 20%.

**Qualitative Observations:**

* Analysts reported the chatbot was particularly effective for routine, well-defined queries.
* Users noted occasional challenges with nuanced scenarios requiring broader context, which can be addressed with future refinements.

**Outcomes**

The chatbot achieved its intended objectives of streamlining business analysis workflows and enhancing decision-making efficiency. Its ability to provide real-time, context-specific insights demonstrated the feasibility of using LLM-based tools for structured knowledge applications. The Python-based implementation offered greater scalability, while the Juji Studio prototype enabled faster initial development. The findings validate the hypothesis that an LLM-based chatbot can significantly improve task efficiency and reduce costs compared to traditional methods.

**Implications**

**Theoretical Impacts:**

The project demonstrates how domain-specific knowledge frameworks like BABOK can be effectively integrated with LLMs to create specialized AI tools. This expands the application of LLMs into niche professional domains, setting a precedent for future AI-driven innovations in knowledge management.

**Practical Impacts:**

Organizations adopting this tool can expect faster project turnarounds, improved adherence to best practices, and reduced costs. It democratizes access to expert-level guidance, benefiting less-experienced analysts and enhancing team consistency.

**Summary**

The development and testing of the LLM-based chatbot highlighted its potential to revolutionize business analysis workflows. Key findings include a 35–45% improvement in task efficiency, high user satisfaction, and measurable cost savings. These results demonstrate the chatbot’s value as a scalable, efficient, and practical tool for enhancing decision-making processes in professional settings. Future iterations could focus on refining outputs for complex scenarios and expanding the knowledge base to include additional industry frameworks.

**CONCLUSIONS AND FURTHER WORK**

**Conclusions**

The development and evaluation of the LLM-based chatbot integrating the BABOK framework successfully addressed the primary research question: Can such a tool provide actionable insights and improve business analysis efficiency? The chatbot demonstrated significant time efficiency improvements, enhanced accuracy, and high user satisfaction, validating the feasibility and value of AI-driven tools for business analysis. Key findings include a 35–45% reduction in task completion time, 90% alignment with expert-reviewed solutions, and a substantial potential for cost savings in professional settings. The proof of concept effectively showcased the viability of using LLMs for structured knowledge applications, highlighting its potential as a transformative tool for business process re-engineering.

**Implications**

**Theoretical Implications:**

This project expands the application of generative AI into niche professional domains, demonstrating that LLMs can be adapted to specialized knowledge frameworks like BABOK. It provides evidence that integrating domain-specific standards with LLM capabilities can enhance knowledge management and decision support systems, contributing to the broader field of AI applications in business process automation.

**Practical Implications:**

In real-world contexts, the chatbot offers a scalable and accessible solution for organizations seeking to streamline business analysis workflows. It reduces the reliance on manual methods and external expertise, democratizing access to high-quality, standardized insights. This has implications for improving project timelines, ensuring compliance with best practices, and enabling less-experienced analysts to make informed decisions confidently.

**Limitations**

**Constraints:**

The chatbot’s effectiveness is limited by the quality and scope of the data it relies on. BABOK principles and case study examples provide a solid foundation, but the tool may struggle with scenarios outside these predefined contexts. Additionally, its reliance on GPT-4 introduces potential issues with robustness in edge cases or highly nuanced queries.

**Validity:**

The chatbot may exhibit biases inherent to the LLM model, including tendencies to overgeneralize or misinterpret ambiguous inputs. These biases could affect the reliability of recommendations in complex scenarios requiring broader context or deeper industry-specific knowledge.

**Further Work**

**Next Steps:**

Future iterations of the chatbot should focus on:

* Expanding its knowledge base to include additional frameworks and industry-specific guidelines.
* Incorporating user feedback loops to refine response accuracy and contextual relevance.
* Enhancing robustness by integrating domain-specific fine-tuning of the underlying LLM model.

**Long-term Directions:**

Long-term advancements could involve integrating the chatbot with enterprise resource planning (ERP) systems to offer real-time decision support across broader organizational processes. Additionally, exploring multimodal capabilities (e.g., text and visual data inputs) could enhance the chatbot's adaptability to more complex business scenarios. Developing offline versions of the tool could also address data privacy concerns for sensitive industries.

**Closing Summary:**

This project successfully demonstrated the potential of integrating LLMs with structured knowledge frameworks like BABOK to transform business analysis workflows. By improving task efficiency, ensuring compliance with best practices, and offering a scalable solution, the chatbot represents a significant step forward in AI-driven business process automation. The outcomes and findings of this proof of concept lay a strong foundation for future innovations in generative AI applications within professional domains.

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