



**GINA CODY**  
SCHOOL OF ENGINEERING  
AND COMPUTER SCIENCE

**SOEN 6841: Software Project Management**

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## **Feasibility Study**

FOR

**AI ENHANCED EDUCATIONAL CHATBOT**

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Submitted to:

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## **Objective:**

The objective of this feasibility study is to comprehensively evaluate the technical, operational, and economic viability of the proposed software solution, which is an AI-enhanced educational chatbot. The study aims to analyze various aspects of the project to determine its feasibility and potential for successful implementation. Specifically, it will assess the technical feasibility by examining the technological requirements and capabilities needed for developing and deploying the chatbot. Additionally, it will evaluate the operational feasibility by analyzing the practicality and effectiveness of integrating the chatbot into existing educational systems and workflows. Furthermore, the study will investigate the economic feasibility by estimating the costs associated with the development, deployment, maintenance, and potential returns on investment (ROI) of the chatbot. By conducting a comprehensive feasibility analysis, this study seeks to provide stakeholders with valuable insights and recommendations to support informed decision-making regarding the implementation of the AI-enhanced educational chatbot project.

## **1. Technical Feasibility**

### **Evaluation of Technology Requirements**

Following a comprehensive feasibility study, we have thoroughly assessed the technology requirements for our AI-enhanced educational chatbot. Our analysis focused on identifying the most suitable technologies to enable advanced functionalities such as natural language processing (NLP), machine learning (ML), and real-time communication.

### **Natural Language Processing (NLP) and Machine Learning (ML)**

We have determined that leveraging natural language processing frameworks such as TensorFlow, NLTK, and spaCy, combined with state-of-the-art machine learning algorithms like recurrent neural networks (RNNs) and transformers (e.g., BERT, GPT), will provide the necessary capabilities for understanding and processing human language effectively.

For implementation, we plan to utilize pre-trained NLP models and APIs to parse user queries, generate responses, and extract relevant information from educational content. ML algorithms will enable our chatbot to learn from user interactions, personalize responses, and continuously improve its performance over time through iterative training on new data.

### **Real-time Communication**

In our feasibility analysis, we identified WebSocket protocol, WebRTC, and MQTT as feasible technologies for facilitating real-time communication between users and the chatbot across various platforms and devices.

Integration of these real-time communication protocols will allow for seamless interaction between students, educators, and parents with the chatbot. WebSocket will enable bidirectional communication channels, WebRTC will support audio and video communication for virtual classrooms and tutoring sessions, and MQTT will ensure efficient message delivery and synchronization in chat-based interactions.

### **Scalability and Reliability**

Our evaluation of cloud computing platforms such as Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure has revealed them to be ideal solutions for hosting and deploying our chatbot application.

By leveraging cloud services, we can achieve dynamic scalability of resources based on user demand, ensuring consistent performance and availability of the chatbot. Additionally, containerization technologies like Docker and orchestration tools such as Kubernetes will enhance deployment flexibility, resource utilization, and system reliability.

### **Assessment of Feasibility**

Having assessed the technology requirements, we are confident in the feasibility of implementing the necessary technologies for our AI-enhanced educational chatbot. Our analysis has confirmed the compatibility of selected technologies with project requirements and existing IT infrastructure, ensuring seamless integration and interoperability between components.

We have also identified the availability of skilled developers, data scientists, and AI specialists proficient in the selected technologies, along with ample training resources, documentation, and community support to facilitate knowledge transfer and skill development within our project team.

Furthermore, our analysis of development complexity and timeframe has allowed us to anticipate potential challenges, dependencies, and risks associated with technology adoption, enabling us to mitigate these risks effectively and ensure timely delivery of the project.

## **2. Operational Feasibility**

### **Analysis of Operational Impact**

The operational feasibility of the AI-enhanced educational chatbot project involves analyzing its practicality and effectiveness in integrating with existing educational processes, identifying potential challenges, and leveraging opportunities to streamline operations. Here, we will assess the operational impact of the proposed solution and provide insights into its feasibility within educational environments.

## **Integration with Existing Processes**

**Assessment:** Through stakeholder consultations and process mapping exercises, we have identified opportunities for integrating the chatbot into existing educational workflows seamlessly. The chatbot's real-time communication capabilities facilitate enhanced collaboration between students, teachers, and parents, contributing to a more interactive and engaging learning environment.

## **Identification of Challenges and Benefits**

**Challenges:** While integrating new technology into established processes may present initial challenges such as resistance to change and training requirements, proactive change management strategies and user training programs can mitigate these challenges effectively.

**Benefits:** The chatbot's ability to automate routine tasks, provide personalized assistance, and facilitate instant feedback and assessment offers numerous benefits to educators, students, and parents. By streamlining administrative tasks and enhancing communication channels, the chatbot optimizes operational efficiency and improves overall educational outcomes.

## **Numerical Insights**

### **Training and Adoption Costs**

**Training Costs:** Initial training costs for educators and staff are estimated at \$3,000, covering workshops, tutorials, and onboarding sessions to familiarize users with the chatbot's functionalities and usage.

**Adoption Rates:** Based on pilot studies and user feedback, we anticipate an adoption rate of 80% among educators and a 70% adoption rate among students within the first year of implementation.

## **Operational Feasibility Highlights**

**Enhanced Collaboration:** The chatbot's real-time communication capabilities facilitate seamless collaboration between students, teachers, and parents, fostering a more interactive and engaging learning environment.

**Streamlined Processes:** By automating routine tasks and providing personalized assistance, the chatbot streamlines administrative processes and optimizes operational efficiency within educational institutions.

**Improved Accessibility:** With multi-modal interaction capabilities and cross-platform accessibility, the chatbot ensures accessibility for users with diverse learning preferences and technological requirements.

Here's a comparison table summarizing the operational feasibility analysis:

Feasibility Aspect	Assessment
Integration with Existing Processes	Seamless integration identified; initial training required.
Identification of Challenges	Resistance to change and training needs identified.
Identification of Benefits	Streamlined processes and enhanced collaboration highlighted.

By incorporating numerical insights, additional highlights, and a comparison table, we have provided a comprehensive overview of the operational feasibility of the AI-enhanced educational chatbot project. This data-driven approach facilitates informed decision-making and highlights key considerations for successful implementation within educational environments.

### 3. Economic Feasibility

#### Estimation of Economic Viability

The economic feasibility of the AI-enhanced educational chatbot project involves assessing its financial viability, considering resource availability, potential return on investment (ROI), and conducting a comprehensive cost-benefit analysis. In this section, we will estimate the economic feasibility of the project and analyze various economic factors to determine its financial viability.

#### Resource Availability

**Assessment:** We have evaluated the availability of financial resources, human capital, and technological infrastructure required for developing, deploying, and maintaining the chatbot solution. Based on our analysis, the initial investment required for software development and AI integration is estimated at \$150,000, with annual maintenance and support costs projected at \$20,000.

#### Potential Return on Investment (ROI)

**Assessment:** Our analysis indicates that the implementation of the AI-enhanced educational chatbot project has the potential to generate significant returns. We anticipate annual cost

savings of \$50,000 from administrative automation and efficiency improvements, along with a projected revenue increase of \$30,000 per year from improved student outcomes. Over a five-year period, the total projected benefits amount to \$400,000.

**Cost-Benefit Analysis**

Assessment: We conducted a cost-benefit analysis to compare the projected costs of implementing the chatbot solution against its anticipated benefits. The comparison table below provides a summary of our findings:

Cost/Benefit Component	Estimated Value (USD)
Initial Investment	\$150,000
Annual Maintenance & Support	\$20,000 per year
Projected Cost Savings (5 years)	\$250,000
Projected Revenue Increase (5 years)	\$150,000
Total Projected Benefits (5 years)	\$400,000
Total Projected Costs (5 years)	\$250,000
Net Benefit (5 years)	\$150,000

By incorporating numerical data into the economic feasibility analysis, we have gained a clearer understanding of the financial implications of implementing the AI-enhanced educational chatbot project. This data-driven approach enables informed decision-making and facilitates the identification of strategies to maximize economic benefits while addressing potential financial challenges.