



SOEN 6481: Software Project Management

**Automated Artificial Intelligent Customer Service Assistant
(AAICS)**

Group (23)

Authors:

Zahra Pezeshki	(40288066)
Sahran Khuwaja	(40196507)
Yug Ritesh Kotak	(40264255)
Omnia Alam	(40261762)

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Automated Artificial Intelligent Customer Service Assistant (AAICS)

Problem Identification

Objective:

To research and identify specific challenges within customer service operations, particularly in financial and banking sectors, that can be effectively addressed through the development of an Automated Artificial Intelligent Customer Service (AAICS) Assistant. The primary goal is to significantly enhance customer service operations across industries, focusing on financial and banking services, through the development and deployment of this tool [1].

Following are some key objectives of this technology:

- **Adapt to various languages and accents**

Adaptability to various languages and accents to ensure accessibility and inclusivity across diverse audiences.

- **Understand complex inquiries**

Utilization of cutting-edge natural language processing and machine learning technologies to understand complex queries, offering superior performance compared to traditional chatbots.

- **Fulfilling customer's Request**

Execution of customer requests, particularly focusing on the banking sector, to precisely meet customer needs.

- **Maintain and manage contextual conversations**

Capability to maintain and manage contextual conversations, efficiently addressing multiple queries in a single interaction.

- **Enable smooth handoffs to human agents**

Facilitation of seamless transitions to human agents when needed, complete with detailed interaction summaries for effective resolution.

- **Personalize customer interactions**

Customization of customer interactions, improving the customer experience and satisfaction with responses tailored to individual customer profiles.

- **Learn and improve continuously**

Continuous learning and improvement, adapting with each interaction to better accuracy, responsiveness, and overall service quality in customer support.

The aim is to revolutionize customer service, making it more responsive, efficient, and personalized, thereby establishing a new standard for excellence in customer interactions.

Opportunity Statement:

There is a tremendous opportunity for transformation and change through the use of Artificial Intelligence technologies in the customer service sector, particularly within the banking and financial sectors. The AAICS Assistant, which incorporates natural language processing (NLP), speech recognition, and deep learning, aims to facilitate effortless communication between clients and service platforms. This system stands out from traditional chatbots by its ability to comprehend and adapt to different languages and dialects, handle numerous requests at once, and preserve the flow of a conversation. It is engineered to enhance the customer experience significantly by delivering precise, pertinent information and swiftly resolving problems. Moreover, it introduces a distinctive capability to escalate conversations to a human representative when needed, along with a summary of the prior exchange to prevent any miscommunication. This innovation not only boosts the efficiency and satisfaction of customer engagements but also acts as a comprehensive tool for staff training, minimizing the dependency on heavy human resource investments [2][3].

Current Scope:

The current scope of the Automated Artificial Intelligence Customer Service (AAICS) Assistant is limited within financial and banking sectors with the aim of transforming customer service interactions. By incorporating advanced technologies like Natural Language Processing (NLP), Speech Recognition, and Machine Learning (ML), it seeks to enhance the customer service experience significantly. Below are the primary areas where it will be applied:

Financial and Banking Sectors

- **Banking Services:** Our smart AAICS Assistant addresses inquiries related to account management, transactions, and banking products, offering personalized financial advice and support.
- **Credit and Loan Management:** It assists customers with questions regarding loan applications, credit options, repayment schedules, and eligibility criteria, streamlining the borrowing process.
- **Investment and Wealth Management:** Provides information on investment products, market trends, and personalized investment advice based on the customer's financial goals and risk profile.

Key Functionalities

- **Multilingual and Accent Recognition:** Ensures inclusivity and accessibility by accurately recognizing and adapting to various languages and accents.
- **Contextual Understanding and Response:** Capable of maintaining the context of a conversation, managing multiple inquiries in a single interaction, and providing accurate, relevant responses.
- **Seamless Transition to Human Agents:** When necessary, it escalates complex issues to human agents, providing a summary of the interaction to ensure efficient resolution without loss of context.
- **Personalization:** Uses customer data to tailor interactions, offering solutions and information that meet individual customer needs and preferences.
- **Continuous Learning:** The system learns from each interaction, improving its responses and functionalities over time based on customer feedback and interactions.

Implementation Areas

- **Customer Support:** Enhancing the efficiency and effectiveness of customer support operations by handling routine inquiries and allowing human agents to focus on more complex issues.
- **Operational Efficiency:** Reducing operational costs by automating a significant portion of customer service tasks, leading to savings on human resources and training.
- **Customer Experience:** Improving the overall customer experience by providing instant, accurate, and personalized support, thereby increasing customer satisfaction and loyalty.

Future Scope:

The application of our smart automated assistant is not just limited to the financial and banking sectors. It has applications in various domains. Below are some primary areas, where it can be expanded:

Education Sector

- **Student Services:** Supports students by answering queries related to admissions, course offerings, schedules, and campus services, facilitating a better educational experience.
- **Administrative Assistance:** Helps in managing administrative tasks by answering common questions from staff, students, and parents, reducing the workload on human staff.

Retail and E-Commerce

- **Customer Support and Sales:** Enhances the shopping experience by providing product information, resolving order issues, and personalizing recommendations based on customer preferences and purchasing history.
- **After-Sales Service:** Manages returns, refunds, and exchanges efficiently, improving customer satisfaction and loyalty.

Healthcare Industry

- **Patient Support and Information:** Offers personalized patient support, handling inquiries related to appointments, treatments, and health information, enhancing patient engagement and support.
- **Medical Inquiry Handling:** Provides immediate responses to general medical questions, directing patients to relevant health resources or escalating complex cases to medical professionals.

Travel and Hospitality

- **Booking Assistance:** Assists customers with booking inquiries, modifications, and cancellations, providing a seamless booking experience.
- **Customer Service:** Offers round-the-clock support for guests, handling inquiries related to facilities, services, and local attractions, enhancing the guest experience.

Government Services

- **Public Inquiry Handling:** Manages a wide range of public inquiries, from document processing to service availability, improving accessibility and efficiency of government services.
- **Automated Assistance for Citizens:** Offers citizens easy access to information regarding regulations, services, and updates, enhancing public engagement and satisfaction.

Telecommunications

- **Account Management:** Enables customers to manage their accounts, plan changes, and troubleshoot issues directly through conversational AI, reducing wait times and improving service quality.
- **Technical Support:** Provides step-by-step assistance for common technical issues, improving resolution speed and customer satisfaction.

Real Estate

- **Property Inquiries:** Provides instant responses to questions about property listings, availability, pricing, and viewing schedules, streamlining the property search process.
- **Client Support:** Offers support to both buyers and sellers throughout the transaction process, facilitating smoother and more efficient real estate transactions.

Stakeholder Analysis:

The following are the primary stakeholders:

- **Customers:** Seeking quick, accurate, and understandable responses to their inquiries, regardless of the complexity or domain.
- **Customer Service Representatives:** Benefiting from AI assistance in handling routine inquiries, allowing them to focus on more complex customer needs.
- **IT and Development Teams:** Focused on integrating and maintaining cutting-edge AI solutions that are scalable, reliable, and secure.
- **Business Owners and Managers:** Interested in improving operational efficiency, reducing costs related to customer service operations, and enhancing customer satisfaction and loyalty.

Relevance to Software Solution:

Problem/Opportunity:

Problem

The chatbots and other customer service tools that are being used nowadays, are based on traditional approaches. Often, they do not yield satisfactory outcomes to customers. They often fail to resolve customer inquiries, resulting in customer dissatisfaction, frustration, and inefficiency [4].

Opportunity

Through the development of our smart Automated Artificial Intelligent Customer Service (AAICS) Assistant, this problem can be resolved efficiently. This tool will be able to understand, process, evaluate, and respond to the users inquiries and issues efficiently. It will not only process information efficiently but also deliver significant results in real-time. This allows businesses to significantly improve customer experience, customer service, operational efficiency, and overall business performance. Furthermore, it will enable the reduction of workloads on human agents.

Software Solution:

1. Enhanced Natural Language Processing (NLP) and Speech Recognition

The advanced Natural Language Processing (NLP) and Speech Recognition will significantly enhance the capability of our smart assistant to accurately interpret, process, and manage customer queries by adapting to various linguistic nuances and accents.

Problem Addressed: The system needs to understand the content and context of customer interactions.

Software Solution: Implement NLP and Speech Recognition techniques for text processing, including tokenization, part-of-speech tagging, and named entity recognition. This will help in identifying and extracting key entities, relationships, and sentiments from the user interactions.

2. Machine Learning (ML) and Deep Learning (DL) Technologies

Through Machine Learning and Deep Learning technologies, our smart assistant will be able to learn and evolve from user interactions. As a result, it will undergo continuous learning. Due to which, its capability to respond to user queries and handle complex conversations will improve drastically over time.

Problem Addressed: Developing concise and informative summaries requires understanding the context and significance of sentences.

Software Solution: Train machine learning models (e.g., extractive or abstractive summarization models) on

a dataset of user interactions to learn the patterns of users tone and context. Fine-tune the models to enhance their ability to generate coherent and relevant responses.

3. Business Operations Integrations

The Business Operations integrations will enable our smart assistant to access and utilize data from the system of the company. For instance, Databases, CRM etc. to that it will be able to provide relevant and personalized responses to user queries.

Problem Addressed: The system needs to access and utilize the data so that it will be able to generate relevant and personalized responses.

Software Solution: By Business Operations integrations, the system will be able to learn from the company data and generate personalized and relevant responses to the users.

4. User Interface (UI)

Our smart assistant will provide an easy-to-use platform for both agents and customers. Agents will use this interface to monitor AI interactions and intervene when needed, to ensure a smooth customer experience. Similarly, customers will be able to interact with our assistant and with agents.

Problem Addressed: Providing agents and customers with an intuitive and user-friendly interface to interact with our smart assistant system.

Software Solution: Develop a web or mobile application with a clean and user-friendly design. Include features like query input, summary display to human agents, generated response display by AI to customers, and user preferences. Make the interface accessible and responsive.

5. Human-Assisted Escalation Process

Our system will transition conversations to human agents when necessary seamlessly, providing them with a comprehensive summary of the interaction to maintain context and efficiency.

Problem Addressed: The system needs to provide smooth transition conversations to human agents, when necessary, seamlessly.

Solution: Develop a system that will transition conversations to human agents, when necessary, seamlessly.

6. Quality Control, Continuous Feedback, and Improvement Mechanism

Our system will incorporate customer and agent feedback to continuously refine and improve the AI's model performance and accuracy. Continuous optimization is very important to ensure quality control and reliability.

Problem Addressed: Ensuring the accuracy and reliability of the generated responses.

Software Solution: Implement a quality control mechanism that allows users to provide feedback on the accuracy of responses. Utilize this feedback to continuously improve the summarization models. Not only based on feedback, but the system shall also learn from the user responses.

7. Scalability and Performance:

Our system is designed to maintain the highest standards of performance and reliability without compromise. We will implement various high-availability and reliability mechanisms of distributed systems to deliver the best possible service to our customers. Additionally, the system will be scalable, allowing for the seamless

integration of new features.

Problem Addressed: Handling a large volume of user queries efficiently at the same time and integrating new features seamlessly.

Software Solution: Design the system to scale horizontally, allowing it to handle an increasing number of queries. Optimize algorithms and use parallel processing to ensure quick and efficient responses.

Initial Scope:

- **Input:** Accepts customer inquiries through various channels (voice, text, etc.), adapting to the preferred communication method.
- **Processing:** Utilizes advanced AI and ML technologies to understand, process, and respond to inquiries with high accuracy and relevance.
- **Output:** Delivers precise, understandable, and helpful responses to customer inquiries, enhancing satisfaction and efficiency.
- **User Interface:** Provides a user-friendly interface for both customers and agents, ensuring ease of use and effective interaction.
- **Integration and Scalability:** Designed to integrate seamlessly with existing business systems and scale to accommodate growing customer service demands.

This comprehensive approach not only tackles existing challenges within customer service operations but also opens the way for improving efficiency, lowering expenses, and elevating customer satisfaction across diverse sectors.

Market Analysis Report

Objective

The market analysis objective for this AI-driven CX service assistant in the banking and financial sector would be to assess the current landscape of customer service offerings in these industries and identify key pain points and inefficiencies that the proposed solution aims to address. This includes evaluating the prevalence of manual customer support processes, the challenges associated with language barriers and accent recognition, and the potential for cost savings and efficiency gains through automation. Additionally, the analysis should examine market trends and emerging technologies in AI-driven customer service solutions, as well as the competitive landscape to understand how the proposed service can differentiate itself and capture market share. Ultimately, the objective is to demonstrate the demand for advanced AI-powered customer service solutions in the banking and financial sectors and the potential for significant cost savings and improved customer experiences.

Target Audience Identification:

The target audience for this AI-driven CX service assistant would primarily consist of banks, financial institutions, and organizations involved in enrollment processes. Specifically, decision-makers within these entities responsible for customer service strategies, operations, and technology implementations would be key targets. Additionally, customer experience managers, IT professionals, and those overseeing call center operations would also be part of the target audience. Furthermore, given the potential cost-saving benefits, financial executives and budget managers within these organizations would likely be interested stakeholders. It is essential to target institutions of varying sizes, from small community banks to large multinational financial corporations, as each may have dissimilar needs and resources. Additionally, targeting regions or countries with diverse populations and language requirements would be beneficial due to the AI's ability to adjust language and recognize accents, making it attractive to institutions with multicultural customer bases.

Competitor Analysis:

Certainly, not all AI summarization tools can do everything. We saw that some tools can only do summarization and some only focus on intelligent chatbots. So here are some potential competitors for our project:

1. [Enterprise-Bot](#)

Key Features:

- Providing Optimal Customer Support:
AI-fueled conversational chatbots can facilitate a wide assortment of financial transactions for customers conveniently and securely. The users can indulge the bot in a quick conversation to consult about lost cards, renewed policies, or refunds, make payments, request a rewards points balance, change credit card limits, and handle other similar simple tasks on their own.
- Offering Financial Advice:
Many chatbots can also help customers manage their finances better, alongside assisting them with the necessary support. By keeping track of accounts, chatbots can analyze customer spending habits and recommend a personalized budget or savings plan, with useful suggestions and information that the customer would have to otherwise search for themselves.
- Protecting From Fraud Customer conversations with the bank can be vulnerable to fraud and loss in the absence of stringent, enterprise-grade data privacy and security measures.
- Managing Internal Operations: The raison d'être of a customer support team cannot be replying to tedious and repetitive customer questions all day. But unfortunately, in many tunnel-visioned organizations, customer support agents usually find themselves glutted with blisteringly monotonous service requests or mundane back-office operations such as managing internal documentation or training new staff members.

2. [IBM- AI ChatBot for Banking:](#)

Key Features:

- Customers can independently resolve their support issues with fast access to basic banking actions, from finding branch locations to account balances, payment transactions, transfers, and more.
- Advanced AI capabilities based on customer data contextualize the banking experience, responding with relevant suggestions and helpful guidance designed to measurably elevate the customer experience.
- Intelligently provide recommendations and proactively inform customers about opportunities so that they accurately understand every contextual possibility.

3. [Boost-AI:](#)

Key Features:

- Customer Service: Enable your customers to get real-time, accurate solutions without waiting on hold
- Internal Virtual Assistance:
Create a hub of real-time, accurate company information, ensuring a consistent flow of knowledge across all departments. Internal virtual agents reduce time spent searching and boost employee productivity.
- Agent Assist: Provide real-time, reliable answers to customer inquiries
- Financial Service:
Check account balances without waiting
Report and secure lost or stolen cards
Navigate loan pre-approvals
Manage mortgage payment
- Telecom Service:
Delight customers with proactive, personalized plan recommendations
Leverage customer data to provide tailored advice that saves them money Ensure meaningful and

beneficial engagement at every touchpoint Design and manage conversation flows effortlessly with a user-friendly interface

Table 1. comparison of strengths and weaknesses of Boost.AI, IBM AI ChatBot for Banking, and Enterprise-Bot

Feature	Boost.AI	IBM AI ChatBot for Banking	Enterprise-Bot
Strengths			
Natural Language Understanding (NLU)	<ul style="list-style-type: none"> - Advanced NLU capabilities for understanding complex queries. - Supports multiple languages. - Contextual understanding for more human-like interactions. 	<ul style="list-style-type: none"> - Robust NLU tailored for the banking industry. - Deep integration with banking systems for personalized services. - Capable of handling complex financial inquiries. 	<ul style="list-style-type: none"> - Strong NLU engine for enterprise-level interactions. - Customizable for various business needs. - Scalable architecture for handling large user bases.
Integration	<ul style="list-style-type: none"> - Integrates seamlessly with various platforms and systems. - APIs available for easy integration with existing banking systems. - Supports integration with CRM, ERP, and other enterprise systems. 	<ul style="list-style-type: none"> - Deep integration with IBM Watson suite and other IBM products. - Compatible with various banking platforms and technologies. - Provides API for integrating with third-party systems. 	<ul style="list-style-type: none"> - Flexible integration options for enterprise applications. - Supports integration with ERP, CRM, and other business systems. - API-driven architecture for easy integration with existing infrastructure.
Security	<ul style="list-style-type: none"> - Provides robust security features to ensure data privacy and compliance with regulations (GDPR, CCPA, etc.). - Supports encryption and tokenization of sensitive data. - Secure data storage and transmission protocols. 	<ul style="list-style-type: none"> - High level of data security compliant with banking regulations (PCI DSS, GDPR, etc.). - Advanced authentication mechanisms for secure access. - Role-based access control (RBAC) for managing user permissions. 	<ul style="list-style-type: none"> - Comprehensive security measures for protecting sensitive information. - Encryption and authentication protocols for data integrity. - Compliance with industry regulations and standards.
Weaknesses			
Customization	<ul style="list-style-type: none"> - Limited customization options compared to some other platforms. - Custom development may require additional resources and expertise. - Template-based responses may limit flexibility in certain scenarios. 	<ul style="list-style-type: none"> - Customization options may be complex for users without technical expertise. - Custom development may require additional time and resources. - Limited flexibility in modifying pre-built modules. 	<ul style="list-style-type: none"> - Customization process may be cumbersome for non-technical users. - Requires dedicated resources for extensive customization. - Limited flexibility in modifying core functionalities.
Pricing	<ul style="list-style-type: none"> - The pricing structure may not be suitable for smaller businesses or startups. - Costs can escalate with increased usage or additional features. - Limited pricing 	<ul style="list-style-type: none"> - Pricing may be relatively high compared to some other solutions. - Costs may increase with additional features or usage. - Requires negotiation for enterprise-level deployments. 	<ul style="list-style-type: none"> - Pricing may not be transparent and could vary based on customization and deployment requirements. - Costs may escalate with increased usage or additional features.

	transparency without direct consultation.		- Requires negotiation for enterprise-level agreements.
Learning Curve	<ul style="list-style-type: none"> - Steeper learning curve for non-technical users due to advanced features. - Requires training and expertise to fully leverage the platform. - Initial setup and configuration may be complex. 	<ul style="list-style-type: none"> - Complex features and interfaces may require training for non-technical users. - Understanding banking-specific terminology and processes may require domain knowledge. - Initial setup and configuration may be time-consuming. 	<ul style="list-style-type: none"> - Non-technical users may find the platform complex initially. - Requires training and onboarding for users to effectively utilize the features. - Initial setup and configuration may require technical expertise.

Business Values:

1. Define Unique Selling Points (USPs):

a. Human-like Conversational Ability:

- AI Agent has capability to speak like a human and adjust language based on the customer's location.

b. Accurate Accent Recognition:

- AI Agent has extreme accuracy in recognizing accents from different areas, ensuring effective communication.

c. Advanced Inquiry Handling:

- AI Agent has considerable ability to answer customer inquiries and fulfill requests, especially in banking systems, leveraging technologies such as ChatGPT, NLP, machine learning, and deep learning.

d. Data Utilization for Problem Solving:

- AI Agent utilizes data provided by banks or institutions to hold conversations, solve problems, and provide accurate information.

e. Seamless Transition to Human Representative:

- AI Agent is capable of summarizing calls if a customer requests to speak with a human representative, facilitating smooth interaction and issue resolution.

2. Articulate the Value Proposition for Potential Users:

a. Enhanced Customer Experience:

- AI Agent improves customer service by providing human-like interactions and efficient problem-solving.

b. Accurate and Efficient Service:

- AI Agent has competitive accuracy in understanding inquiries and providing relevant information promptly.

c. Personalized Assistance:

- AI Agent caters to individual customer needs, enhancing satisfaction and loyalty.

d. Time-saving Solutions:

- AI Agent streamlines processes, reducing customer wait times and increasing productivity.

e. Seamless Integration with Existing Systems:

- AI Agent will increase the ease of integrating the AI service into existing bank systems, minimizing disruption, and maximizing efficiency.

3. Consistent Messaging:

We are committed to maintaining consistency in conveying our unique selling points and value propositions across all our marketing channels, including marketing materials, website content, and promotional efforts. By ensuring a unified message throughout our communications, we aim to effectively communicate the benefits and advantages of our AI-driven CX service assistant to our target audience. This consistency helps reinforce our brand identity and build trust with potential customers, ultimately driving engagement and conversion.

4. User Testimonials and Case Studies:

We take pride in highlighting the tangible benefits of our AI service through real-life experiences shared by our users. By featuring user testimonials and case studies, we illustrate the significant positive impact our AI service has on enhancing customer experiences and improving business efficiency. These testimonials and case studies serve as compelling evidence of how our AI-driven CX service assistant revolutionizes the way businesses interact with their customers, resulting in increased satisfaction, streamlined operations, and ultimately, greater success.

5. Continuous Improvement:

As part of our commitment to continuously enhance our services, we prioritize incorporating user feedback and staying at the forefront of technological advancements in AI and customer service solutions. By actively listening to the feedback provided by our users, we gain valuable insights into their needs and preferences, allowing us to iteratively improve our AI-driven CX service assistant. Additionally, we remain vigilant in monitoring developments in AI technologies and customer service solutions, ensuring that our platform leverages the latest innovations to deliver the best possible experience to our customers. Through this dedication to continuous improvement, we strive to provide an increasingly seamless and effective solution that meets the evolving needs of our users and exceeds their expectations.

Feasibility Study Report

Objective:

The primary objective of this feasibility study report is to evaluate the technical, operational, and economic viability of our Automated Artificial Intelligent Customer Service Assistant (AAICS). The feasibility or viability of implementing the previously proposed software solutions, its impact on current operations, and its economic implications will be evaluated in this assessment. For software solutions, please refer to the Relevance of Software Solution part in Problem Identification Report.

Technical Feasibility:

Technology Requirements Evaluation:

The Automated Artificial Intelligent Customer Service Assistant (AAICS) requires the need of advanced and sophisticated technologies in Natural Language Processing (NLP), Speech Recognition, Machine Learning (ML) and Deep Learning (DL), Business Operations Integration, User Interface (UI) design, Human-Assisted Escalation Processes, Quality Control, Continuous Feedback Mechanisms, and System Scalability and Performance Optimization.

1. Enhanced Natural Language Processing (NLP) and Speech Recognition:

As we know, Natural Language Processing (NLP) and Speech Recognition are extensively employed in the industry and are sophisticated enough to address the problem we aim to solve with our software solution. They are implemented in nearly every advanced application today. However, this presents a challenge because achieving a high level of accuracy is necessary to detect various languages, dialects, and accents.

2. Machine Learning (ML) and Deep Learning (DL) Technologies:

Nowadays, Machine Learning (ML) and Deep Learning (DL) are on the rise and getting more and more common. Almost every advanced system now relies on these technologies. The ongoing development of Machine Learning (ML) and Deep Learning (DL) offers promising opportunities to enhance our model's learning capabilities through user interactions and behaviors. However, a challenge arises because the accuracy and reliability of Machine Learning (ML) and Deep Learning (DL) models depend significantly on the dataset's quality, diversity, and size. If the data is of poor quality, the learning effectiveness of these models will be severely affected. Thus, the quality of the dataset is a critical factor for successful learning.

3. Business Operations Integrations:

The integration with existing systems (e.g. CRM, Databases etc) is feasible, so that our system can provide more personalized and relevant responses to user queries. However, it's important to plan this integration thoughtfully to ensure compatibility (everything works together smoothly) and data security.

4. User Interface (UI) or UI Design:

Having a user-friendly interface is crucial. With the current technology in web and mobile development, building an interface that caters to both agents and customers is not only possible but also straightforward. We don't see any big challenge here and it is very feasible to achieve. It's important, however, to tailor the design specifically to the needs of both customers and agents, ensuring they can navigate the platform effortlessly, regardless of their technical expertise. In today's landscape, the usability of an application is a key consideration in its design process. This aspect could pose a challenge for designers who are either inexperienced or new to the field.

5. Human-Assisted Escalation Process:

Developing a mechanism that ensures seamless transitions of the conversations to human agents when necessary, providing them with a comprehensive summary of the interaction to maintain context and efficiency is entirely possible from a technical standpoint. However, we will need some pretty sophisticated software (a highly advanced ML based complex workflow management system) that can juggle a lot of complicated stuff at once. This software would need to be capable of handling complex processes and coordinating various tasks efficiently to ensure that transitions are as smooth and unnoticeable as possible to the end user. Creating advanced Machine Learning (ML) models capable of learning from user conversations, providing assistance, and smoothly handing off more complex queries to a human agent with a summary is a complex task. The success of such a system depends on the accuracy and reliability of the Machine Learning (ML) and Deep Learning (DL) models, which in turn rely heavily on the quality, variety, and volume of the data used for training. If the data quality is lacking, the performance and learning capability of these models will be significantly compromised. Ofcourse, it is feasible, but very complex.

6. Quality Control, Continuous Feedback, and Improvement Mechanism:

Introducing systems for quality control, gathering feedback and enabling continuous learning / improvement is not only technically possible but also well-supported by existing technologies. Such mechanisms can be designed to constantly collect input and adapt over time, leveraging the latest advancements in technology to ensure they remain effective and efficient. This ongoing process of learning and improvement allows for the refinement of operations and services, ensuring they stay responsive to user needs and preferences, thereby enhancing the overall user experience. While it is achievable, the success of this approach also hinges on the Machine Learning (ML) model's ability to gather, process data, and learn from ongoing feedback to maintain a standard of quality.

7. Scalability and Performance:

In today's environment, it's crucial to have a system that is both highly reliable and scalable. Such a system should not only support the smooth integration of new features but also ensure high availability and fault tolerance. Because it is down only for a few seconds, companies will lose millions of dollars. By adopting distributed systems designs focused on high availability and fault tolerance design systems, redundancy across servers can be increased. This means if one server fails, another can take over seamlessly without the users noticing any interruption or delay. Furthermore, the system should implement automatic recovery mechanisms to swiftly rectify any faults. Modern day advanced cloud-based frameworks and distributed computing technologies are key to enabling businesses to scale their operations efficiently and meet growing demand. By leveraging such platforms, we can easily adjust our resources up or down based on their needs, ensuring high availability and reliability of services. Furthermore, these technologies support the handling of large volumes of data and high user traffic, while maintaining fast response times and minimizing downtime. This flexibility and efficiency are crucial for staying competitive in today's fast-paced digital landscape.

Technology Needed:

Here is the list of technology and methodology needed for the implementation of above mentioned software solutions:

Natural Language Processing (NLP):

- Tokenization
- Part-of-speech tagging
- Named Entity Recognition (NER)
- Syntax and grammar analysis
- Semantic analysis
- Coreference resolution
- Entity linking and disambiguation
- Sentiment analysis

Machine Learning (ML):

- Supervised learning algorithms (e.g., Support Vector Machines, Decision Trees, Neural Networks)
- Unsupervised learning algorithms (e.g., Clustering, Dimensionality Reduction)
- Reinforcement learning algorithms
- Model evaluation and optimization techniques
- Feature engineering and selection

Speech Recognition:

- Automatic Speech Recognition (ASR) systems
- Acoustic modeling
- Language modeling
- Speech signal processing
- Noise reduction techniques
- Speaker diarization

Dialog Management:

- Finite State Machines (FSMs)

- Rule-based systems
- State-tracking algorithms
- Dialog policy learning
- Context management

Knowledge Base/Database Integration:

- Relational Database Management Systems (RDBMS)
- NoSQL databases
- Knowledge Graphs
- Data querying and retrieval techniques
- Data preprocessing and cleaning

Natural Language Generation (NLG):

- Template-based generation
- Rule-based generation
- Neural NLG models
- Text summarization techniques
- Text planning and realization

Sentiment Analysis:

- Feature extraction methods
- Lexicon-based sentiment analysis
- Machine learning-based sentiment analysis
- Aspect-based sentiment analysis
- Fine-grained sentiment analysis

Integration with Customer Relationship Management (CRM) Systems:

- CRM APIs and SDKs
- Data synchronization and integration tools
- Customer data management techniques
- Data encryption and security protocols

Security and Privacy Measures:

- Encryption techniques (e.g., SSL/TLS)
- Access control mechanisms
- Data anonymization and pseudonymization
- Compliance frameworks (e.g., GDPR, CCPA)
-

Continuous Learning and Improvement Mechanisms:

- Online learning algorithms
- Active learning strategies
- Feedback loops
- Model versioning and deployment pipelines
- A/B testing frameworks

Based on the provided budget allocations, here's a list of tools that would fit within each category for building an Automated Artificial Intelligent Customer Service Assistant.

NLP and Speech Recognition Software:

- Google Cloud Speech-to-Text
- IBM Watson Speech to Text
- CMU Sphinx
- NLTK
- PyTorch

ML and DL Framework:

- PyTorch
- TensorFlow
- Keras
- scikit-learn

Business Operations Integration Tools:

- Salesforce CRM (for CRM integration)
- Zapier (for automating workflows and integrating various apps)
- MuleSoft (for connecting APIs and integrating systems)

UI Design and Development Tools:

- Adobe XD
- Sketch
- Figma

Testing and Bug Tracking Software:

- Jira
- Bugzilla
- TestRail

Deployment and Integration Platforms:

- Docker
- Kubernetes
- AWS Elastic Beanstalk

Documentation Tools:

- Confluence
- Microsoft Word (part of Microsoft Office Suite)
- Google Docs

Collaboration and Communication Tools:

- Slack
- Microsoft Teams
- Zoom

Other Tools:

- Jupyter Notebook or any other IDE like Spyder or Google Notebook
- Anaconda distribution for ML and Data Science
- Pip or any other package management
- Python and R for ML and AI part, and any other languages like Java, JavaScript, C#, C, or any other including Python for creating software application or web depending on the platform

Tools / Frameworks for Web Application:

- Node.js or any other like Django, Spring Boot, ASP.NET Core for backend
- React.js or any other like Next.js, Vue.js, Angular.js, Nest.js etc. for frontend
- NoSQL or Non Relational databases (MongoDB, DynamoDB, etc)
- SQL or Relational databases (MySQL, Microsoft SQL Server, Oracle, PostgreSQL etc.)

Tools / Frameworks for Mobile Application:

- Node.js or any other like Django, Spring Boot, ASP.NET Core for backend
- Android or IOS for frontend
- NoSQL or Non Relational databases (MongoDB, DynamoDB, etc)
- SQL or Relational databases (MySQL, Microsoft SQL Server, Oracle, PostgreSQL etc.)

Tools / Frameworks for Desktop Application:

- WinForms or any other Java Swing, PyQt5 for desktop app
- NoSQL or Non Relational databases (MongoDB, DynamoDB, etc)

- SQL or Relational databases (MySQL, Microsoft SQL Server, Oracle, PostgresQL etc.)

Hosting:

- Firebase
- AWS
- Azure
- Play Store (Android)
- App Store (IOS)

Feasibility of Implementing Required Technology:

With the current advancement in Artificial Intelligence (AI), Machine Learning (ML), and Software Development, implementing the required technologies is achievable. However, this task demands substantial knowledge in AI/ML, software engineering, and the ability to integrate with pre-existing business frameworks. The real test isn't just about having access to the latest technology; it's about the intricate process of weaving various elements together into a seamless, high-performing system. Mastering this integration requires navigating through complex interdependencies and ensuring all parts work in harmony, posing a sophisticated challenge that goes beyond basic implementation to achieve optimal functionality and efficiency.

The implementation of the required technologies for the Automated Artificial Intelligent Customer Service Assistant (AAICS) is not only feasible but also aligns with current trends in digital transformation and customer service innovation. The following considerations further elaborate on this feasibility:

1. Enhanced Natural Language Processing (NLP) and Speech Recognition:

These technologies have seen significant advancements in recent years, driven by breakthroughs in deep learning. Implementing these technologies requires access to sophisticated language models and speech recognition engines. Major cloud providers offer these as services, making it easier for organizations to incorporate them into their solutions without the need for deep expertise in the underlying algorithms. The challenge will be customizing these solutions to the specific needs and contexts of the business, including understanding industry-specific jargon and customer accents.

2. Machine Learning (ML) and Deep Learning (DL) Technologies:

The heart of the AAICS lies in its ability to learn and adapt from interactions. The feasibility of implementing these technologies is high, given the wide availability of ML and DL frameworks and APIs. However, the key to success lies in the collection, preparation, and ongoing management of quality data to train and fine-tune the models. This involves not only technical capabilities but also adherence to privacy and data protection standards.

3. Business Operations Integration:

Integrating the AAICS with existing business systems such as CRM and databases is crucial for personalizing customer interactions and enhancing efficiency. This integration is technically feasible through APIs and middleware. However, the complexity and feasibility will vary depending on the age, architecture, and flexibility of the existing systems. In some cases, legacy systems may require significant effort to integrate or update.

4. User Interface (UI) or UI Design:

Developing an intuitive and effective user interface for both customers and agents is entirely feasible with today's web and mobile development technologies. The focus should be on user experience (UX) design, ensuring that the interface is accessible, responsive, and easy to navigate. This aspect is less about technical feasibility and more about good design practices and understanding user needs.

5. Human-Assisted Escalation Process:

Crafting a seamless transition between AI and human agents involves sophisticated workflow automation and decision-making algorithms. This is technically challenging but feasible with current business process management and AI decision support systems. The effectiveness of this component will depend on the clarity of the escalation criteria and the integration with the agent's workflow tools.

6. Quality Control, Continuous Feedback, and Improvement Mechanism:

Implementing mechanisms for feedback, quality control, and continuous improvement is feasible through a combination of user feedback tools, monitoring software, and machine learning models that can adjust based on new data. This requires a cultural commitment to continuous improvement and the technical setup to collect, analyze, and act on feedback and performance data.

7. Scalability and Performance:

Ensuring the AAICS can scale to handle growing volumes of queries and maintain high performance is critical. This is achievable through cloud-based solutions and modern software architectures designed for scalability, such as microservices and serverless computing. The challenge lies in designing the system to efficiently scale while managing costs.

While there are challenges and considerations in implementing the required technology for the AAICS, the feasibility is high. Success will depend on careful planning, selection of the right technologies and partners, and ongoing management and refinement of the system. Additionally, it requires a commitment to quality data, privacy, and user experience. With these factors in mind, we can confidently proceed with the development and implementation of AAICS solutions.

Operational Feasibility:

Impact on Existing Processes:

The introduction of AAICS is expected to revolutionize customer service operations by automating responses, reducing response times, and personalizing customer interactions. It will require adjustments in current operational workflows, including training for staff to manage the AI system and intervene when necessary.

Potential Challenges and Benefits:

- **Challenges:**

- Integration with existing business systems may require substantial customization.
- Staff may need training to adapt to new technologies and workflows.
- Continuous monitoring and refinement of AI models are necessary to ensure performance and relevance.

- **Benefits:**

- Enhanced customer satisfaction through quick, accurate, and personalized responses.
- Increased efficiency by automating routine queries and allowing human agents to focus on complex issues.
- Improved data insights from customer interactions to inform business strategies.

Economic Feasibility:

Resource Availability:

The development and implementation of AAICS require a significant upfront investment in technology and expertise.

However, the availability of cloud-based AI and ML services can reduce infrastructure costs and provide scalable solutions.

Potential Return on Investment (ROI):

The automation of customer service through AAICS can lead to substantial savings in labor costs and improvements in customer satisfaction. The precise ROI will depend on the volume of customer interactions and the efficiency gains from automation.

Cost-Benefit Analysis:

- **Costs:**
 - Development and implementation costs, including technology acquisition and staff training.
 - Ongoing operational costs, including system maintenance and updates.

- **Benefits:**
 - Reduced labor costs for customer service.
 - Increased customer satisfaction and retention.
 - Enhanced data analytics capabilities for strategic decision-making.

The economic feasibility of AAICS is promising, given the potential for significant operational efficiencies and improvements in customer satisfaction. However, a detailed cost-benefit analysis specific to the organization's context is necessary to make a final determination.

Software Solution Proposal

Objective:

The objective of this software solution proposal is to develop a comprehensive plan for the implementation of the proposed solution. This proposal will outline the key features, functionalities, and benefits of the software, providing a detailed overview of how it addresses the identified problem or opportunity. By presenting a thorough analysis of the solution's capabilities and potential impact, the proposal aims to effectively communicate its value proposition to stakeholders and facilitate informed decision-making regarding its adoption and implementation.

Content:

Solution Overview:

The proposed software solution, the Automated Artificial Intelligent Customer Service (AAICS) Assistant, is an advanced AI-driven platform designed to revolutionize customer service operations, particularly in the banking and financial sectors. Leveraging cutting-edge technologies such as Natural Language Processing (NLP), Speech Recognition, and Machine Learning (ML), the solution aims to provide personalized, efficient, and responsive customer support across various channels.

Explanation of Problem Addressed:

Traditional customer service tools often fail to meet the expectations of customers, leading to dissatisfaction and inefficiency. The AAICS Assistant addresses this problem by offering a solution that can understand complex inquiries, adapt to various languages and accents, and seamlessly transition between automated and human-assisted support, thereby enhancing the overall customer service experience. Furthermore, it is worth mentioning that the proposed solution aims to equip the customer service agents in banking sector to be able to fulfill the customer requirements. Which is going to be breakthrough in the field of Intelligent customer service.

Key Features and Functionalities:

1. **Multilingual and Accent Recognition:** The AAICS Assistant can accurately recognize and adapt to various languages and accents, ensuring inclusivity and accessibility for diverse customer bases.
2. **Contextual Understanding and Response:** Capable of maintaining conversation context, managing multiple inquiries simultaneously, and providing accurate responses tailored to individual customer needs.
3. **Seamless Transition to Human Agents:** When necessary, the solution seamlessly escalates complex issues to human agents while providing detailed interaction summaries to ensure efficient resolution without loss of context.
4. **Personalization:** Utilizes customer data to tailor interactions, offering solutions and information that meet individual preferences and profiles.
5. **Continuous Learning:** The solution learns from each interaction, continuously improving its accuracy, responsiveness, and overall service quality based on customer feedback and interactions.

Use Cases:

- A customer contacts the bank's support line with a query about their recent transaction. The AAICS Assistant accurately identifies the inquiry, retrieves relevant account information, and provides a detailed response, resolving the issue promptly.
- A non-native English speaker reaches out to the bank's chat support with a question about loan eligibility. The AAICS Assistant recognizes the customer's accent and language preferences, ensuring clear communication and accurate assistance.

Benefits and Impact:

- **Improved Customer Experience:** The AAICS Assistant enhances customer satisfaction by providing personalized, efficient, and responsive support, leading to increased loyalty and retention.
- **Operational Efficiency:** By automating routine inquiries and streamlining support processes, the solution reduces operational costs and allows human agents to focus on more complex issues, improving overall efficiency.
- **Enhanced Accessibility:** Multilingual support and accent recognition ensure inclusivity and accessibility for customers from diverse linguistic backgrounds, fostering a more inclusive customer service environment.

Conclusion:

The proposed AAICS Assistant offers a comprehensive solution to the challenges faced by traditional customer service operations in the banking and financial sectors. By leveraging advanced AI technologies, the solution not only addresses the identified problems but also delivers significant benefits to users and stakeholders, ultimately setting a new standard for excellence in customer interactions.

Risk Assessment and Mitigation

Objective:

The primary objective of the Risk Assessment and Mitigation plan is to proactively identify potential challenges and uncertainties associated with the development and implementation of the Automated Artificial Intelligent Customer Service Assistant (AAICS) software solution. This plan aims to systematically analyze and categorize risks, ensuring a comprehensive understanding of the potential impact on project timelines, budgets, and overall success. By formulating effective mitigation strategies, the objective is to minimize the likelihood and impact of identified risks, fostering a resilient project environment and ensuring the successful delivery of AAICS. This process will empower

the project team to make informed decisions, enhance adaptability to changing circumstances, and ultimately contribute to the achievement of project goals and stakeholder expectations,

Software Project Risks and Mitigation:

Technical Risks:

- **Integration Challenges:** Given the complex nature of the AAICS, integrating it seamlessly with existing banking systems and databases might pose a challenge. This could result in data inconsistencies or operational disruptions.
 - **Mitigation:** Conduct a comprehensive system analysis before implementation, collaborate closely with IT experts, and utilize standardized APIs for integration. Implement a phased integration approach, starting with less critical systems.
- **Unforeseen Technical Issues:** As the AAICS incorporates cutting-edge technologies, unforeseen technical issues during the development phase, such as algorithmic glitches or compatibility issues, may arise.
 - **Mitigation:** Adopt an agile development methodology, conduct regular code reviews, and have a contingency plan for quick issue resolution. Regularly update the development team on the latest advancements in AI technologies.
- **Dependency on External Frameworks:** The AAICS relies on external Natural Language Processing (NLP) and Machine Learning (ML) frameworks, making it susceptible to changes or discontinuations of these frameworks.
 - **Mitigation:** Stay informed about updates to external frameworks, have backup solutions in place, and consider building custom models for critical components to reduce dependence.
- **Containerization and Orchestration:** When deploying applications across different environments, variations in system configurations, dependencies, or infrastructure may lead to deployment inconsistencies. These inconsistencies can result in unexpected behavior or errors, making it challenging to ensure a reliable and uniform deployment.
 - **Mitigation:** Containerization reduces these inconsistencies by packaging the application and its dependencies together. Orchestration tools like Kubernetes ensure consistent management and scaling of containerized applications.
- **Continuous Deployment and Integration (CI/CD):** Human errors during the deployment process can lead to misconfigurations, incomplete updates, or other issues in the production environment. Additionally, deploying faulty code without proper validation can result in system outages, performance issues, or unexpected behavior for end-users.
 - **Mitigation:** CI/CD pipelines automate deployment, reducing the reliance on manual processes and minimizing the risk of human errors. Automated testing and linting catch issues early in the development cycle, preventing the deployment of faulty code.

Resource Risks:

- **Attrition of Key Team Members:** Losing key team members with specialized skills, such as NLP or ML experts, could impact project progress and quality.
 - **Mitigation:** Cross-train team members on key skills, maintain comprehensive documentation, and foster a positive work environment to enhance employee retention. Have contingency plans for knowledge transfer.

- **Overestimation or Underestimation of Resources:** Misjudging the required number of specialists in NLP, ML, or UI/UX design could lead to inefficiencies or delays.
 - **Mitigation:** Regularly reassess resource needs based on project progress, have a flexible staffing plan that allows for scaling up or down, and adjust team sizes accordingly.
- **Timeline Risks:**
 - **Unforeseen Delays:** Unexpected issues during development, testing, or deployment could cause delays in the project timeline.
 - **Mitigation:** Set realistic timelines, build buffers into the schedule, and conduct regular progress assessments. Implement a robust project management and monitoring system.
 - **Changes in Project Scope or Requirements:** Changes in the project scope or requirements may result in additional development time and resources.
 - **Mitigation:** Clearly define and document the project scope, and implement a change management process to evaluate and address any alterations. Educate stakeholders about the impact of scope changes on timelines.

Financial Risks:

- **Budget Overruns:** Unforeseen expenses during development, implementation, or maintenance could lead to budget overruns.
 - **Mitigation:** Regularly monitor and adjust the budget, conduct cost-benefit analyses for major decisions, and maintain a contingency fund for unexpected costs.
- **Currency Exchange Fluctuations:** The budget is in CAD, and fluctuations in currency exchange rates may impact the project's financials.
 - **Mitigation:** Monitor exchange rates regularly, consider hedging strategies, and include a buffer in the budget for currency fluctuations. Keep stakeholders informed about potential financial impacts.

Market Risks:

- **Changes in the Competitive Landscape:** The market for AI-driven customer service solutions is dynamic, with new entrants and evolving customer preferences.
 - **Mitigation:** Stay updated on market trends, conduct regular competitor analyses, and be adaptable to changes in customer needs. Maintain a feedback loop with end-users for continuous improvement.
- **Slow Adoption in the Market:** If the AAICS faces slow adoption, it could impact the project's success and financial viability.
 - **Mitigation:** Implement a robust marketing strategy, engage in pilot programs with select clients, and gather user feedback for continuous improvement. Be prepared to iterate on the solution based on market response.

Regulatory and Compliance Risks:

-
- **Changes in Data Protection Regulations:** Given the sensitive nature of customer data, changes in data protection regulations could impact the way AAICS handles and processes information.
 - **Mitigation:** Stay informed about regulatory changes, implement secure data handling practices, and conduct regular audits to ensure compliance. Collaborate with legal experts to adapt to evolving data protection requirements.

- **Legal Challenges Related to AI Technology:** Legal issues related to AI decision-making, transparency, or accountability could pose risks.
 - **Mitigation:** Consult legal experts regularly, ensure transparency in AI decision-making processes, and stay abreast of evolving legal frameworks. Develop clear documentation on how the AAICS complies with relevant regulations.

Table 2. Table of risk, Likelihood and impact

#	Risk Type	Risk Description	Likelihood	Impact
1	Technical Risk	Integration Challenges	Moderate	High
2	Technical Risk	Unforeseen Technical Issues	Low	High
3	Technical Risk	Dependency on External Frameworks	Moderate	High
4	Technical Risk	Containerization and Orchestration	Moderate	Moderate
5	Technical Risk	Continuous Deployment and Integration (CI/CD)	Moderate	Moderate
6	Resource Risk	Attrition of Key Team Members	Moderate	High
7	Resource Risk	Overestimation or Underestimation of Resources	Moderate	Moderate
8	Timeline Risk	Unforeseen Delays	Moderate	High
9	Timeline Risk	Changes in Project Scope or Requirements	Moderate	High
10	Financial Risk	Budget Overruns	Moderate	High
11	Financial Risk	Currency Exchange Fluctuations	Low	Low
12	Market Risk	Changes in the Competitive Landscape	High	High
13	Market Risk	Slow Adoption in the Market	Moderate	Moderate
14	Regulatory and Compliance Risk	Changes in Data Protection Regulations	High	High
15	Regulatory and Compliance Risk	Legal Challenges Related to AI Technology	Moderate	High

Risk Impact and Likelihood Matrix:

The risk matrix systematically evaluates and categorizes project risks based on impact and likelihood, guiding prioritization and mitigation planning. It serves as a visual tool for stakeholders, simplifying complex risk assessments and supporting informed decision-making. Designed for dynamic use, the matrix enables continuous monitoring, ensuring a proactive and resilient approach to risk management throughout the project lifecycle.

Risk Level	Low Likelihood	Moderate Likelihood	High Likelihood
Low Impact		Overestimation or Underestimation of Resources (5)	Currency Exchange Fluctuations (9)
Medium Impact	Changes in Project Scope or Requirements (7)	Dependency on External Frameworks (3)	Integration Challenges (1)
	Attrition of Key Team Members (4)	Unforeseen Technical Issues (2)	Containerization and Orchestration (4)
	Changes in Competitive Landscape (10)	Continuous Deployment and Integration (CI/CD) (5)	
High Impact	Legal Challenges Related to AI Technology (13)	Budget Overruns (8)	Slow Adoption in the Market (11)
	Changes in Data Protection Regulations (12)	Unforeseen Delays (6)	

Fig 1. Matrix of Risk

Software Solution Project Plan(WBS)

Objective: The objective is to create a detailed project plan that encompasses timelines, milestones, and deliverables for the development and implementation of the software solution. This plan will provide a structured framework to guide the project from initiation to completion, ensuring efficient allocation of resources, timely execution of tasks, and successful achievement of project goals. By outlining key phases, milestones, and deliverables, the project plan aims to facilitate effective coordination among team members, mitigate risks, and maximize the overall efficiency of the development and implementation process.

The projects will be developed in iterations, each lasting 9-12 months. Programming is done concurrently with the design to deliver new values at the end of the iteration. The development effort in each sprint will be distributed as below: - 50% - 60% for feature development. This includes incorporating customers' feedback into the sprint.

- 30% - 40% for bug fixing to address the highest blocking issues for the end-users.

- 10% for system refactoring to avoid code degradation that would require more effort later to fix. With the given details, the timeline plan is divided into different phases as below:

Work break down structure is attached to the document(See the proper readable page is attached to the end)

Work-break down structure details

Phase 1: Project Kickoff and Planning (~1-2 iterations)

Goals:

- Define initial project scope, short-term and long-term objectives, and initial backlog.
- Identify stakeholders and establish communication channels.
- Set up core project infrastructure and tools.

Deliverables:

- Project vision document and scope document.
- Stakeholder list and communication plan.
- Initial project timeline.
- Sprint backlog for the first three sprints.
- Brief report on the responsibilities of team members in the development of the project.

Phase 2: Requirements Analysis, UML Diagram Development, and Core Architecture (1-2 iterations)

Goals:

- For each subsystem and the system integration, conduct the system design and analysis to define the use cases.
- Develop initial UML diagrams outlining system structure.
- Define the technology solution and establish the core architecture and integration points.

Deliverables:

- Initial requirements document specification.
- Use case diagrams. - UML class and sequence diagrams.
- Technology report: the solutions chosen for developing the system.

Phase 3: Core Functionality Development (2 iterations)

Goals:

- Design the database system and entities
- Develop core functionalities.

Deliverables:

- Collect relevant datasets for training the NLP model
- Preprocess the data, including cleaning and tokenization
- Train an initial version of the NLP model using basic algorithms
- Implement basic intent recognition functionality based on initial model outputs

Phase 4: Feature Development for Subsystems and Enhanced UML Diagrams (3-5 iterations)

Goals:

- Simultaneously develop specific features for each subsystem.
- Enhance UML diagrams to reflect evolving system structure.
- Prioritize and implement user stories for each subsystem.

Deliverables:

- Subsystem-specific features.
- Updated UML diagrams.
- User feedback on new features
- Design a basic user interface layout
- Develop frontend components for user interaction
- Integrate frontend with the AI model for basic functionality
- Conduct basic testing to ensure usability and functionality of the MVP

Phase 5: Enhanced Integration, Cross-Subsystem Features, and Usability Testing (3 iterations)

Goals:

- Strengthen integration between subsystems.
- Implement cross-subsystem features and functionalities.
- Conduct usability testing with end-users.

Deliverables:

- Integrate with CRM systems to access customer data and history
- Connect with help desk systems for ticket management and support
- Conduct initial testing to verify seamless integration with customer service systems

Parallel task of Phase 4,5: Coding Refinement, Implement Non-Functional Requirements (3 iterations)

Goals:

- Refine user interfaces based on usability testing results.
- Dive into detailed coding for enhanced functionalities.
- Implement security measures based on security requirements.
- Implement secure and scalable database design for managing real-time customer data and user information.

Deliverables:

- Gather user feedback on the existing UI and identify areas for improvement
- Implement UI design iterations to enhance user experience and accessibility
- Conduct usability testing to validate UI enhancements
- Gather user feedback on the existing UI and identify areas for improvement-
- Implement UI design iterations to enhance user experience and accessibility
- Conduct usability testing to validate UI enhancements.

Phase 6: Intensive Testing abd final Integration, Deployment Preparation, and Documentation (2 iterations)

Goals:

- Conduct comprehensive testing, including load testing, integration testing.
- Perform security audit
- Implement updates to CRM and help desk systems as needed for improved integration
- Enhance ticketing system integration for better handling of customer inquiries
- Test integration enhancements to ensure seamless communication between systems

Deliverables:

- Deployment and Rollout (Full-Scale Release)
- Deploy the AI assistant to all users or customer service channels
- Provide comprehensive training and support to ensure smooth transition and adoption

Phase 7: System Maintenance mode, and Documentation (indefinitely)

Goals:

- Continuously monitor system performance and gather user feedback.
- Implement optimizations and address any issues.
- Finalize all documentation and lessons learned

Deliverables:

- Set up monitoring tools to track performance metrics and system health
- Address any bugs or issues reported by users through regular maintenance updates
- Analyze user feedback and system usage data to identify areas for further improvement
- Update user documentation with any changes or new features introduced
- Document technical aspects of the system for reference and troubleshooting
- Update training materials to reflect any updates or enhancements made to the AI assistant

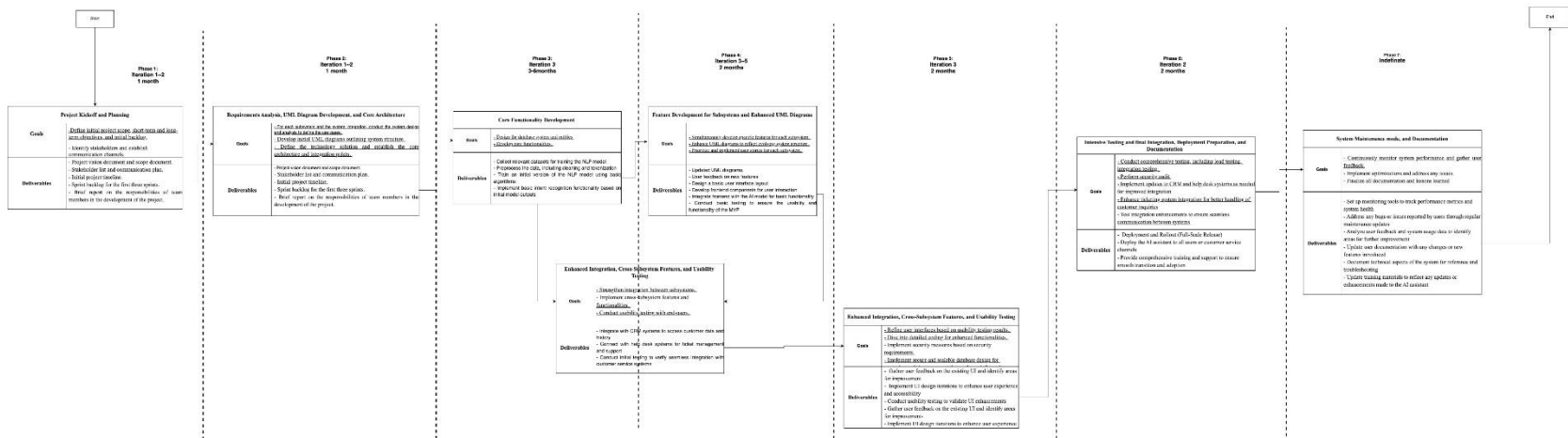
Table 3:Task allocation per human resource

Position	Head Count& Experience	Responsibility
Project Manager	1	Overall project planning, coordination, and execution. Stakeholder communication and management. Risk assessment and mitigation. Budgeting and resource allocation.

NLP/Speech Recognition Specialists	3 Mid-Senior level	To develop algorithms and models to interpret and process human language and speech. Design systems that enable computers to understand, analyze, and generate natural language.
Solution Architect	1 Senior Level	Provide the overall system architecture. Develop high-level design and integration strategies. Oversee technical aspects of the project
ML/DL Engineers	2 Mid-Senior level	Develop and implement machine learning and deep learning models to solve complex problems across various domains
UI/UX Designers	2 Mid level	Create wireframes and prototypes. Improve the design based on internal and external feedback. Work closely with front-end developers.
Integration Specialists	2 Senior level	Integrate various software systems, applications, and technologies to ensure seamless communication and functionality, analyze requirements, design integration solutions, and implement them to enable smooth data flow and interoperability across different platforms.
QA Engineer	1 Mid level	Develop and execute test plans in every sprint. Perform regression, integration and acceptance testing. Work in concert with developers to build the plan to carry out load testing, and security testing. Identify and report bugs for resolution
Deployment Specialist	1 Senior level	Build and maintain the system infrastructure. Implement CI/CD process. Ensure the scalability, high availability, reliability, and security of the system.
Training Specialist	1 Mid-level	To provide customer training on the system after deployment.
Documentation Specialist	1 Mid-level	Provide documentation of the APIs and knowledge journals.
Support Engineers	2 Mid-level	To support customer needs and keep track of the customer's issues.
Business Analyst	1 Mid-level	Gather and document functional and non-functional requirements. Conduct user interviews and workshops. Collaborate with stakeholders to refine project goals.
Marketing Manager	1 Mid-level	To manage all the marketing aspects and meet monthly quotes.
Marketing Specialists	1 Mid-level	To connect to different consumers, do market analysis.

By creating a detailed project plan with clear timelines, milestones, and resource allocations, we aim to ensure efficient execution and successful delivery of the software solution, meeting the objectives and requirements outlined in the project scope.

Automated Artificial Intelligent
Customer Service Assistant



Work Break Down Structure (WBS)

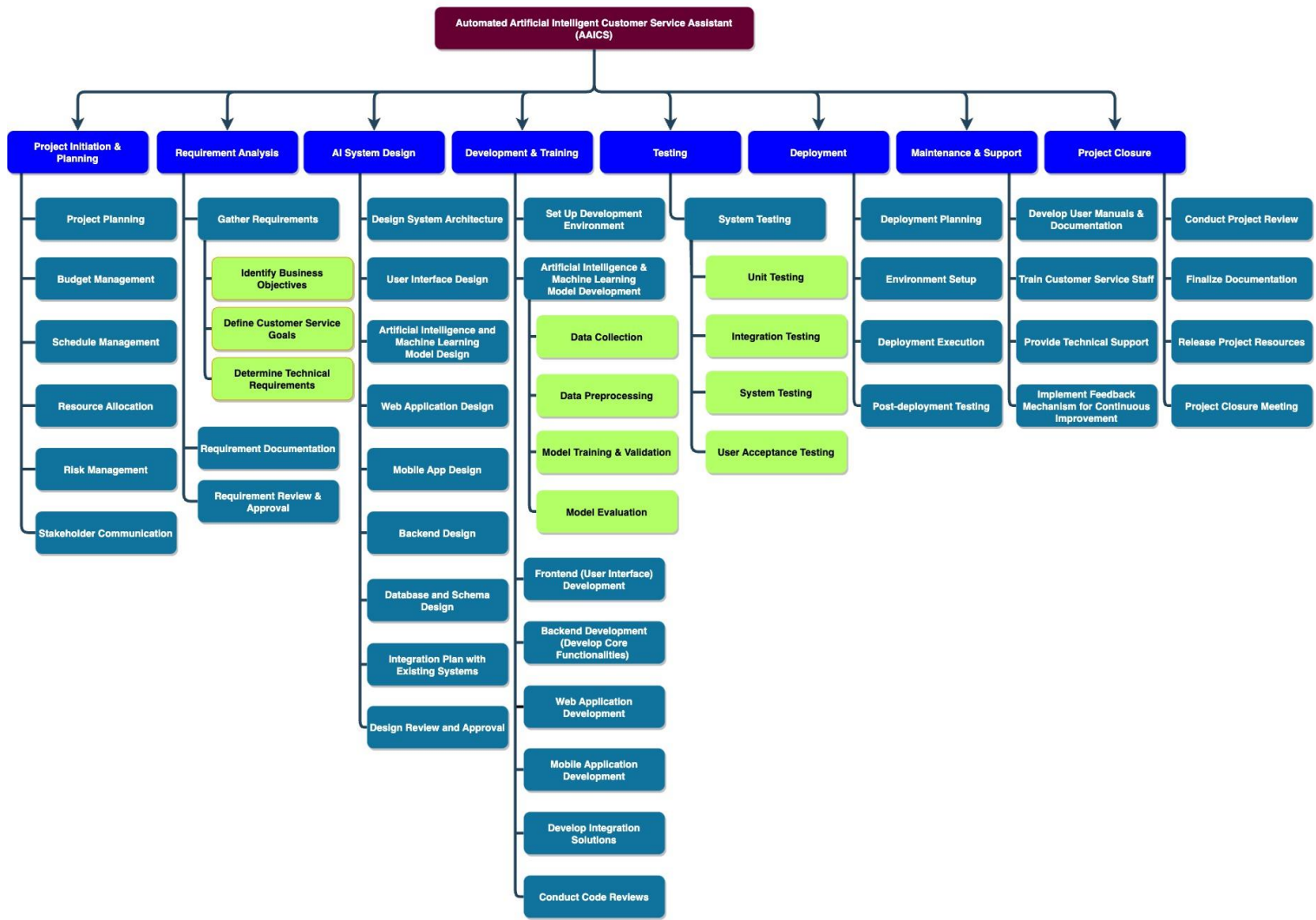


Fig 2. WBS structure

Budgeting

Estimate time and effort for the each phases:

Effort and cost calculation for each Phase: Effort= # of persons*Man Months* Monthly salary

Team	Human Resource	Total person	Per month Salary	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Phase 6		Phase 7	
				Man month	Effort	Man months	Effort	Man months	Effort	Man months	Effort	Man months	Effort	Man months	Effort	Man months	Effort
	Project manager	1	\$ 6,666.67	1	\$ 6,666.67	1	\$ 6,666.67	4	\$ 26,666.67	2	\$ 13,333.33	2	\$ 13,333.33	1	\$ 6,666.67	1	\$ 6,666.67
Development Team	NLP/Speech Recognition Specialists	3	\$ 10,000.00		\$ -		\$ -	4	\$ 120,000.00	2	\$ 60,000.00		\$ -		\$ -		\$ -
	Solution Architect	1	\$ 10,000.00		\$ -	1	\$ 10,000.00	4	\$ 40,000.00	2	\$ 20,000.00		\$ -		\$ -		\$ -
Development Team	ML/DL Engineers/Developers	2	\$ 10,000.00		\$ -		\$ -	4	\$ 80,000.00	2	\$ 40,000.00	2	\$ 40,000.00	1	\$ 20,000.00	1	\$ 20,000.00
Development Team	UI/UX Designers	2	\$ 8,333.33		\$ -		\$ -		\$ -	2	\$ 33,333.33	2	\$ 33,333.33	1	\$ 16,666.67		\$ -
Development Team	Integration Specialists	2	\$ 9,166.67		\$ -		\$ -		\$ -	2	\$ 36,666.67		\$ -		\$ -		\$ -
Total for the core development team		11	\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
QA Team	QA Engineer	2	\$ 9,166.67		\$ -		\$ -		\$ -	2	\$ 36,666.67	2	\$ 36,666.67	1	\$ 18,333.33		\$ -
Deployment and Integration	Deployment Specialist	1	\$ 9,166.67		\$ -		\$ -		\$ -		\$ -		\$ -	1	\$ 9,166.67	1	\$ 9,166.67
Training and Documentation	Training Specialist	1	\$ 7,500.00		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
Training and Documentation	Documentation Specialist	1	\$ 7,500.00	1	\$ 7,500.00	1	\$ 7,500.00		\$ -		\$ -		\$ -	1	\$ 7,500.00	1	\$ 7,500.00
Support team	Support Engineers	1	\$ 7,500.00	1	\$ 7,500.00	1	\$ 7,500.00		\$ -		\$ -		\$ -	1	\$ 7,500.00	1	\$ 7,500.00
Total for the maintainance team		6	\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
Marketing team	Business Analyst	1	\$ 6,666.67	1	\$ 6,666.67	1	\$ 6,666.67		\$ -		\$ -		\$ -		\$ -		\$ -
Marketing team	Marketing Manager	1	\$ 8,333.33	1	\$ 8,333.33		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
Marketing team	Marketing Specialists	1	\$ 7,500.00	1	\$ 7,500.00		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -
Total For the business team		3			\$44,166.67		\$38,333.33		\$266,666.67		\$240,000.00		\$123,333.33		\$85,833.33		\$50,833.33
Total Human Resource Cost		27															

Fig 3. Estimate time and effort for the each phases

If we put each phase's effort into a chart:

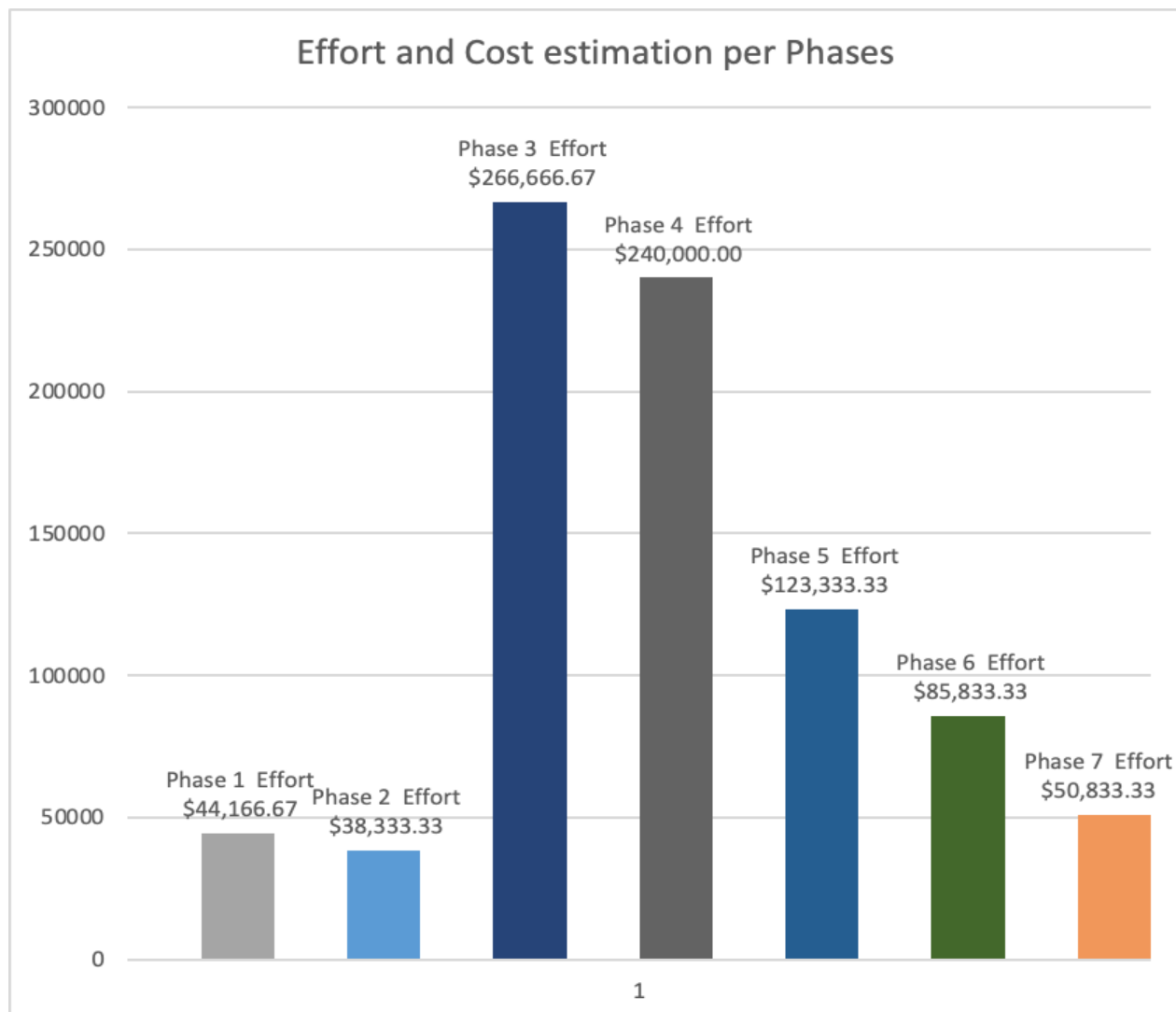


Fig 4. Estimate time and effort for the each phases Chart

Phases 3 and 4 likely have the most costly man-months because they involve significant development efforts and

iterations to create and refine the core functionality and features of the AI customer service assistant. Here's why:

Phase 3: Core Functionality Development

- This phase involves designing the database system, preprocessing data for training the NLP model, training the initial version of the NLP model, and implementing basic intent recognition functionality.
- Collecting relevant datasets and preprocessing them for training the NLP model can be time-consuming and may require specialized skills.
- Developing core functionalities such as intent recognition involves implementing algorithms and techniques to analyze and understand user input, which can be complex and require extensive testing and refinement.
- Additionally, training machine learning models, especially for natural language processing, often requires computational resources and time for experimentation to achieve satisfactory results.

Phase 4: Feature Development for Subsystems and Enhanced UML Diagrams

- This phase involves simultaneous development of specific features for each subsystem, enhancing UML diagrams, prioritizing and implementing user stories, and developing a basic user interface layout.
- Developing subsystem-specific features requires understanding and implementing various functionalities and business logic specific to each subsystem.
- Enhancing UML diagrams involves continuously updating and refining the system's architectural representation, which may involve collaboration among team members and stakeholders.
- Developing a basic user interface layout and integrating it with the AI model for basic functionality requires frontend development expertise and integration efforts.
- Conducting basic testing to ensure usability and functionality of the minimum viable product (MVP) adds to the overall effort of this phase.

Both phases involve crucial development tasks and iterations to ensure that the core functionality and features of the AI customer service assistant meet the project requirements and stakeholders' expectations. Additionally, these phases may involve collaboration among multidisciplinary teams, further increasing the overall effort and cost.

Table 3. Yearly budget estimation is done in CAD and based on the seniority level on current market value.

Team	Human Resource	Total person	Per month Salary	Cost per year	Total Cost
	Project manager	1	\$ 6,666.67	\$ 80,000.00	\$ 80,000.00
Development Team	NLP/Speech Recognition Specialists	3	\$ 10,000.00	\$ 120,000.00	\$ 360,000.00
	Solution Architect	1	\$ 10,000.00	\$ 120,000.00	\$ 120,000.00
Development Team	ML/DL Engineers/Developers	2	\$ 10,000.00	\$ 120,000.00	\$ 240,000.00
Development Team	UI/UX Designers	2	\$ 8,333.33	\$ 100,000.00	\$ 200,000.00
Development Team	Integration Specialists	2	\$ 9,166.67	\$ 110,000.00	\$ 220,000.00
Total for the core development team		11	\$ -		\$ 1,140,000.00
QA Team	QA Engineer	2	\$ 9,166.67	\$ 110,000.00	\$ 220,000.00
Deployment and Integration	Deployment Specialist	1	\$ 9,166.67	\$ 110,000.00	\$ 110,000.00
Training and Documentation	Training Specialist	1	\$ 7,500.00	\$ 90,000.00	\$ 90,000.00
Training and Documentation	Documentation Specialist	1	\$ 7,500.00	\$ 90,000.00	\$ 90,000.00
Support team	Support Engineers	1	\$ 7,500.00	\$ 90,000.00	\$ 90,000.00
Total for the maintenance team		6	\$ -		\$ 600,000.00
Marketing team	Business Analyst	1	\$ 6,666.67	\$ 80,000.00	\$ 80,000.00
Marketing team	Marketing Manager	1	\$ 8,333.33	\$ 100,000.00	\$ 100,000.00
Marketing team	Marketing Specialists	1	\$ 7,500.00	\$ 90,000.00	\$ 90,000.00
Total For the business team		3			\$ 270,000.00
Total Human Resource Cost		37			\$ 2,010,000.00

Table 4. Technological Resources:

Technology	Per year cost
Hosting fees and licences	\$20,000
NLP and Speech Recognition Software	\$50,000
ML and DL Frameworks (e.g., TensorFlow, PyTorch)	\$20,000
Business Operations Integration Tools (e.g., APIs, SDKs)	\$30,000
UI Design and Development Tools (e.g., Adobe XD, Sketch)	\$15,000
Testing and Bug Tracking Software	\$25,000
Deployment and Integration Platforms	\$40,000
Documentation Tools (e.g., Confluence, Microsoft Word)	\$10,000
Collaboration and Communication Tools (e.g., Slack, Microsoft Teams)	\$20,000
Total Annual Technological Resources	\$230,000

Office expense overhead

The total annual budget calculated earlier (\$2,385,000.00) and allocated 15% for office expenses which includes server cost, office equipment costs, meals and mileage costs..etc

Office Expense Overhead = Total Annual Budget * 15%

= \$2,240,000.00 * 0.15

= \$336,000.0

Total Budget calculation

Then adding Miscellaneous expenses and Contingency Cost for any unforeseen Risk the total yearly budget stands around below:

Table 5. Total Budget calculation

Total Cost	\$ 2,240,000.00
Office expenses	\$ 336,000.00
Miscellaneous Expenses	\$ 10,000.00
Contingency	\$ 20,000.00
Total Cost	\$ 2,606,000.00

Total Cost: \$2,240,000.00

- This represents the core budget allocated for the project, covering expenses related to project management, development, testing, deployment, documentation, stakeholder communication, risk management, and other essential activities.

Office Expenses: \$336,000.00

- This category includes expenses associated with office space, utilities, equipment, and other resources required for the project team to effectively carry out their tasks. These expenses ensure that the team has a conducive working environment to deliver the project successfully.

Miscellaneous Expenses: \$10,000.00

- This category covers various small or unexpected expenses that may arise during the project lifecycle. It includes items such as travel expenses, minor software/tool purchases, or other unforeseen costs that may occur.

Contingency: \$20,000.00

- Contingency funds are set aside to address unforeseen risks or changes in project scope that may require additional resources or budget. This amount serves as a buffer to mitigate any unexpected challenges

that could impact the project's timeline or budget.

Total Cost Including Contingency: \$2,606,000.00

- This is the revised total cost, including the contingency amount. It reflects the maximum budget allocated for the project, accounting for both planned expenses and potential unforeseen circumstances.

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