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ChatBot Flight Booking System
Project Proposal

PREPARED FOR:

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COVER LETTER

Subject: Response to RFP: ChatBot Flight Booking System Proposal

Dear Mr. Effati,

We were delighted to receive the Request for Proposal (RFP) from Capstone Technologies. In response, we, at MetaMorph Solutions, would like to express our keen interest in partnering with you to bring this project to life.

Our team comprises of postgraduate students specializing in Big Data Analytics. With diverse IT backgrounds spanning Business Administration, Mathematics, Software Development, Quality Assurance and Project Management, we are uniquely positioned to handle complex challenges. Our combined expertise provides confidence in our ability to deliver the project with the utmost quality, on schedule and within budget.

Below is our project proposal for a state-of-the-art flight booking system tailored to meet the evolving demands of today's tech-savvy travelers, which includes an array of innovative features that ensure not only a seamless user experience but also provide actionable insights for better decision-making.

Key Features

- **Chatbot**: Round-the-clock assistance for general queries
- **Booking System**: Seamless bookings, cancellations and history views via ChatBot
- **Real-time Flight Tracking**: Instant notifications to keep travelers updated
- **Passport Reader**: An ML[1]-driven tool for swift updates and reduced manual effort
- **Review Sentiment Analysis**: ML-powered feedback analysis for targeted improvement
- **Data Analytics and Visualization**: Graphical representation of user sentiments and flight booking trends and patterns

Expected Outcomes

- **Enhanced User Experience:** With real-time updates, an intuitive user interface and round the clock assistance, users will find the platform both reliable and user-friendly
- **Operational Efficiency:** Machine Learning integrations like the passport reader and sentiment analysis will streamline operations and offer strategic insights
- **Informed Decision Making:** Through data analytics and visualization, stakeholders will have a clearer understanding of market trends, user behavior and areas of improvement

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[1] Machine Learning (ML) is a field of artificial intelligence (AI) that focuses on the development of algorithms and models that enable computers to learn and make predictions or decisions

We are convinced that the implementation of these features will produce a solution that stands out in the market, addressing both the needs of travelers and the objectives of the airline industry. A budget of CAD 100,000 is sufficient for all research, development, integration, testing, deployment activities and tools to complete the project and deliver it with the highest quality. Nevertheless, we remain open to discussions and negotiations to align with your financial expectations and constraints.

We would be pleased to discuss this proposal further, demonstrate prototypes, and collaborate on refining the system based on your feedback and needs. Kindly inform us of a convenient time for discussion.

Sincerely,

MetaMorph Solutions
partnership@metamorphsolution.ca

I. PROJECT OVERVIEW

Background

Introduction to the Problem

In an era of technological advancements and increasing expectations from users, the aviation industry lags in terms of delivering an integrated, seamless, and user-friendly booking experience. Many users find the existing flight booking systems exhausting, unsecured, and not up-to-date with real-time flight changes. Moreover, these platforms often lack the insights needed for airlines and stakeholders to improve their services and optimize operations.

Relevance of the Problem

Every year, millions of travelers worldwide rely on online platforms to book, edit, or cancel their flight tickets, with the majority using web or mobile platforms. Their experiences and the efficiency of these systems play a significant role in customer satisfaction and loyalty. A complicated booking process can not only deter potential customers but can also lead to revenue losses for airlines. Furthermore, the aviation industry not only faces challenges in providing a seamless user experience but also misses out on leveraging the rich data they collect. Many entities in the aviation sector often don't have dedicated data analytics teams, leaving them without insights that could reveal valuable trends and refine service offerings.
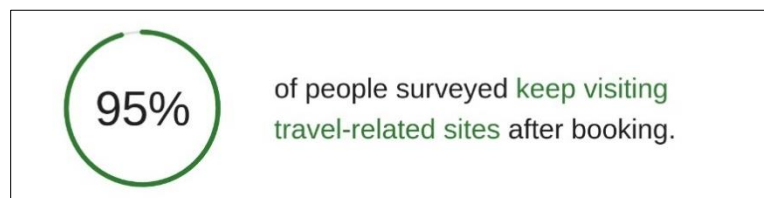

Figure 1: Based on insights taken from 'Think with Google' [1]

Stakeholders and Their Concerns

1. **End Users:** Seek a hassle-free, reliable, and intuitive platform for their flight-related needs. Delays, lack of information, or a challenging user interface can lead to dissatisfaction and churn.

2. **Airlines and Service Providers:** Need insights to understand market trends, user behavior, and feedback to improve their services and increase profitability.

Project Objectives

The main objectives for each feature of "ChatBot Online Booking System" project are to:

- **ChatBot:** Incorporate cutting-edge NLP[2] methods and algorithms to empower the chatbot in understanding and addressing user inquiries related to flight ticket matters, including flight booking
- **Booking System:** Connect the application with flight booking APIs to facilitate users in seamlessly browsing, booking, cancelling and updating flights directly through the chatbot interface
- **Real-Time Flight Tracking:** Integrate with reliable external flight tracking APIs to provide real-time information on flight schedules, delays and statuses, which ensures users are always informed
- **Passport Reader:** Implement an ML-driven tool to read user passport information, which reduces potential human errors from inputting wrong details
- **Review Sentiment Analysis:** Implement an ML-driven tool to evaluate user feedback and reviews, assisting in targeted service improvements
- **Data Analysis and Visualization:** Employ data analytics using Power BI to gather insights on user sentiments and flight booking patterns and trends, which helps business to make quick decisions

Expected Outcomes

The "ChatBot Online Booking System" project aims to create a reliable, user-friendly, and efficient web application that simplifies the process of tracking and booking flight tickets. The application's successful implementation will lead to increased user satisfaction, improved travel experiences, and potentially higher conversion rates in flight bookings. Moreover, employing data analytics and visualization will provide the business with comprehensive insights into market trends, user interactions, and sentiments, facilitating well-informed decision-making.

II. APPROACH AND METHODOLOGY

For "ChatBot Online Booking System" project, MetaMorph Solutions has chosen to implement Agile methodologies, specifically adopting the Scrum framework. This approach not only allows us to refine our work through frequent feedback loops but also incorporates Scrum ceremonies like Sprint Planning, Daily Stand-ups, Refinement Session, Sprint Review and Sprint Retrospective. These ceremonies promote regular communication, enable quick adaptation to changes, and ensure a collaborative environment to tackle challenges efficiently and in real-time.

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[2] NLP (Natural Language Processing) refers to the branch of artificial intelligence (AI) concerned with giving computers the ability to understand text and spoken words in much the same way human beings can

Listed below is the Agile Project lifecycle, from the initialization of the product until the post-launch and deployment.

1. **Project Initialization and Requirements Gathering**

   - *Stakeholder Workshops:* Initiate discussions with stakeholders to discern their objectives and requirements
   - *Documentation:* Record findings, crafting an initial set of functional requirements

2. **Agile Methodology Adoption with Emphasis on Incremental Deployments** [2]

   - *Scrum Framework:* Implement the Scrum framework for iterative development. Each iteration or "Sprint" focuses on a subset of features, enabling frequent releases.
   - *Benefits:* By deploying smaller features more frequently, we can adapt to feedback rapidly, ensuring alignment with stakeholder expectations. This approach is especially beneficial under time constraints, ensuring consistent progress and value delivery.
   - *Roles:* Our team will include a Product Owner, a Scrum Master, and Development Team members.
   - *Steps in Agile Scrum:*
     - Sprint Planning:
       - Review and prioritize product backlog items
       - Discuss and clarify requirements
       - Estimate the effort for each task
       - Define the sprint goal based on selected items
     - Daily Stand-ups:
       - Daily 10–15-minute meetings to discuss progress, planned work for the days and address any blockers
     - Refinement Session:
       - Review and prioritize backlog items
       - Clarify requirements and decompose larger tasks
       - Estimate effort and identify dependencies
       - Set clear acceptance criteria
       - Update the backlog if necessary
     - Sprint Review:
       - Demonstrate completed work
       - Gather some feedback from stakeholders
     - Sprint Retrospective:
       - Teams' reflection on the sprint's success and areas for improvement

We've outlined the sprint timetable for this project as shown in Figure 2. There will be four sets of sprints starting from October 16, 2023, until December 12, 2023. Each session will last for 2 weeks.

Figure 2: Schedule of the Sprints
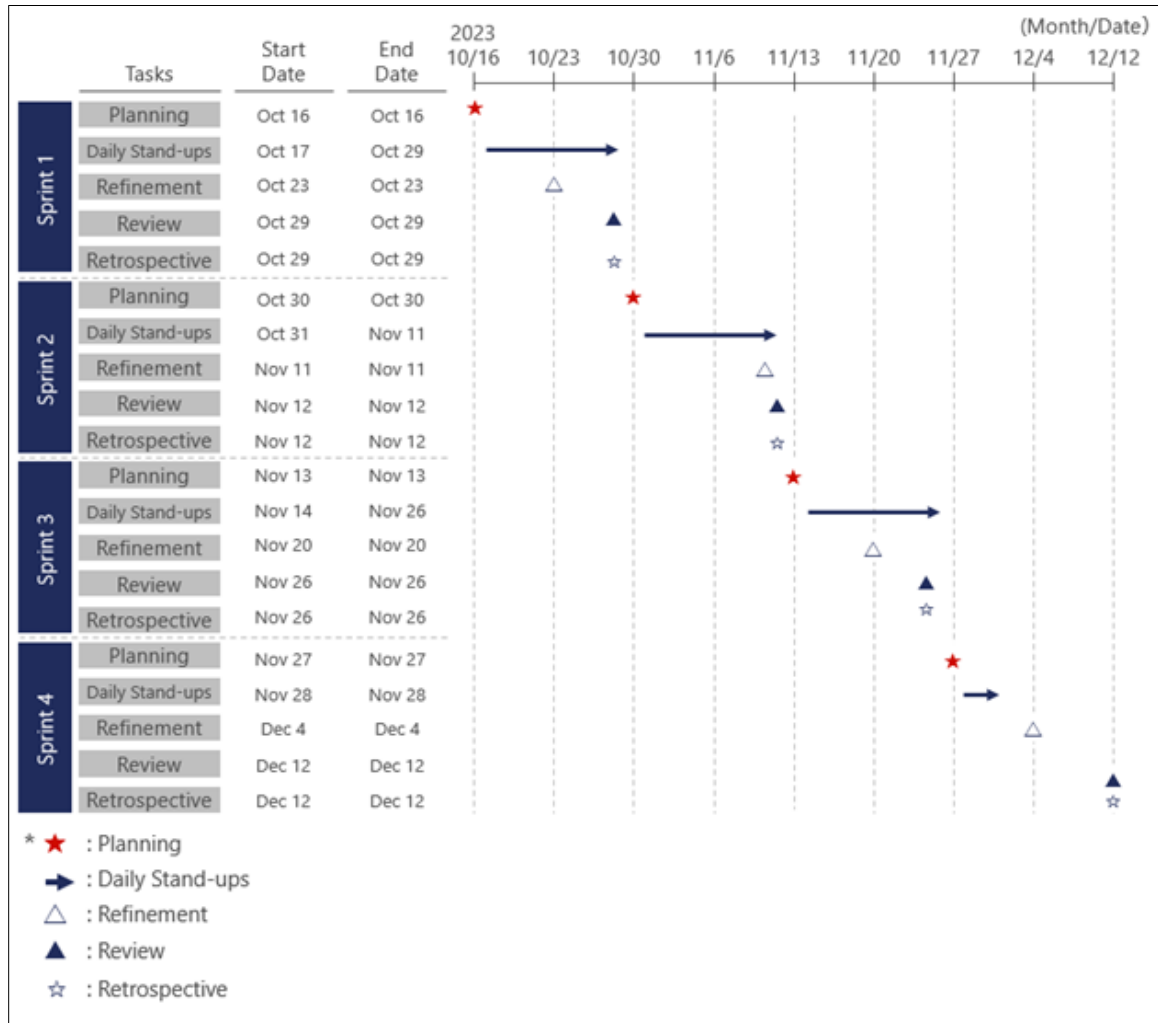
3. Technology Stack and Tools

Building the "ChatBot Online Booking Flight" application requires a thoughtfully curated technology stack, ensuring reliability, scalability, and a user-friendly interface. This stack encompasses a combination of programming languages, frameworks, and tools tailored to meet the specific needs of the application. Figure 4 illustrates the web application architecture for project.

Figure 3: *"ChatBot Online Flight Booking" Architecture*
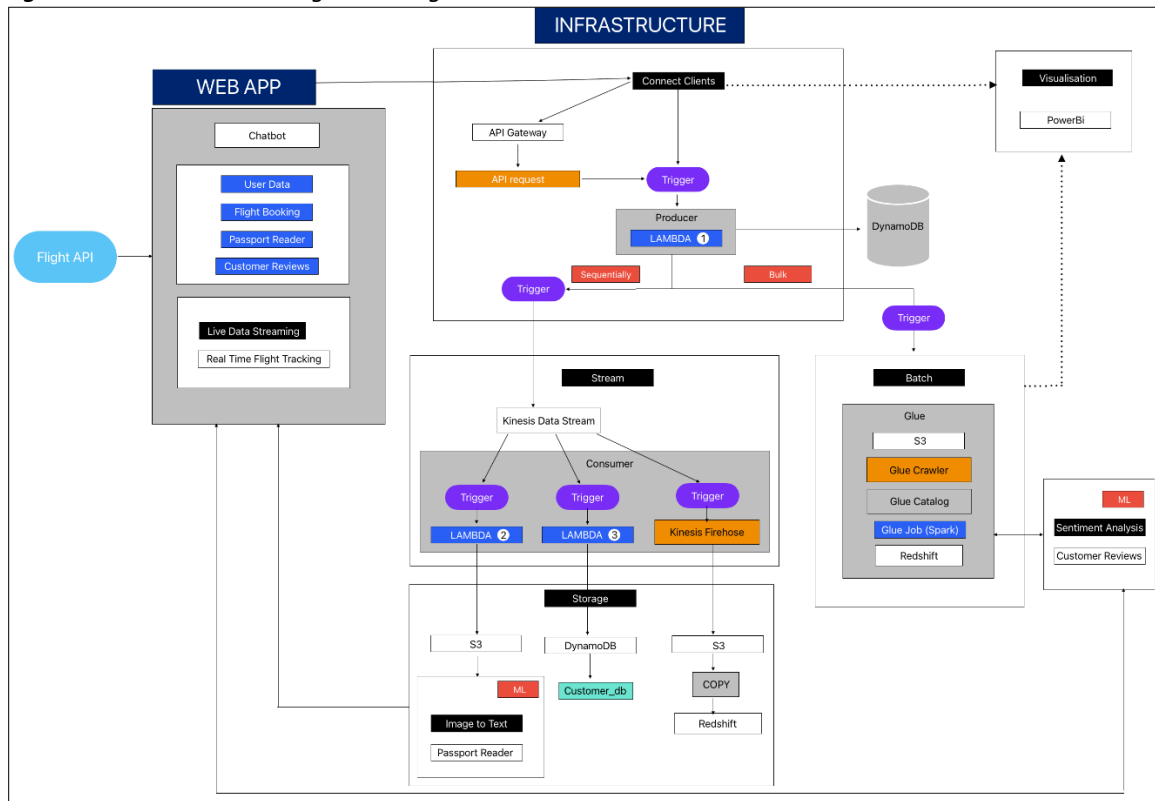
Here, we outline the technology stack and tools for developing an intuitive and responsive online flight booking chatbot.

- **External API:** FlightAPI[3]
    - o Offers APIs for monitoring flight statuses, retrieving airline routes, and obtaining pricing information for flight tickets
- **Programming Language:** Python
    - o A high-level programming language known for its simplicity, readability and flexibility
    - o Offers an extensive range of libraries catering to data science and artificial intelligence, crucial for our machine learning functionalities
        - ▪ *NLTK (Natural Language Tool Kit)* - a Python library that will be used for sentiment analysis on customer reviews
        - ▪ *OpenCV (Open Computer Vision)* - a Python library that will be used passport text reader
- **Front-end Framework:** Streamlit
    - o An opensource app framework for building custom web applications for machine learning and data science projects

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[3] Appendix C: FlightAPI Documentation

- **Backend Framework:** Flask
  - A lightweight and flexible web framework for Python, which is designed to make it easy to build web applications quickly and with minimal overhead
- **Infrastructure:** AWS (Amazon Web Computing)
  - *API Gateway* acts as a gateway that allows to connect "ChatBot Online Flight Booking" application to backend services, enabling them to communicate with each other.
  - *Lambda Functions* allows to run code in response to events without having to manage servers or infrastructure; use for producer and consumer of streaming data, and for machine learning codes.
  - *Kinesis* is a real-time streaming platform of data coming from the chatbot web application.
  - *S3 (Simple Storage Service)* is an object storage service for passports
  - *DynamoDB* is a NoSQL database service where user data and flight bookings will be stored.
  - *Redshift* is a cloud-based data warehousing service, designed for online analytic processing (OLAP), which will be used for sentiment analysis, data analysis and visualization.
- **Business Analytics Tool:** Microsoft Power BI
  - Enables users to visualize and analyze data, share insights, and make informed business decisions
- **Version Control:** GitHub
  - A collaborative platform for developers, allowing them to work together on projects and manage their own code repositories

4. **Quality Assurance & Deployment**
- *Manual Testing:* Conduct manual functional and regression testing to ensure functionality and user experience
- *Incremental Deployments:* Following the Agile principle of frequent, incremental releases, deploy ready features at anytime within the Sprint. This approach ensures stakeholders see regular progress, facilitates early feedback, and allows for rapid adjustments.

5. **Post-launch Activities & Support**
- *Monitoring & Maintenance:* Monitor the deployed system, conducting maintenance Sprints as necessary.
- *Feedback-driven Improvements:* Continue the Agile methodology post-launch, iterating based on user feedback and system performance.

By combining the strengths of the selected tools with the flexibility of Agile methodologies, this approach ensures a dynamic, responsive, and effective development process, especially under tight time constraints.

III. TIMELINE AND DELIVERABLES

This section outlines the projected timeline for the execution of the proposed project, along with the list of tasks and expected deliverables at different key milestones. This timeline serves as a structured roadmap, allowing for effective planning, monitoring, and assessment of project progress. Figure 5 illustrates the three distinct workstreams within the "ChatBot Online Flight Booking" application — Infrastructure, Web Application, and Machine Learning & Data Analysis — with their respective tasks being completed in parallel. Additionally, it outlines the specific deliverables expected at each milestone.

- *Infrastructure* refers to the foundational components, resources, and services (such as servers, databases, networks, etc.) provided by Amazon Web Services to support the operation and scalability of the web application.
- *Web Application* is a Python-based platform housing the chatbot for assisting users in tasks like flight searches, booking, and cancellations, along with providing real-time flight tracking. Additionally, it includes a feature for requesting customer reviews.
- *Machine Learning & Data Analysis* section involves building ML models for tasks like segmentation analysis and passport reading using Python, along with performing data analysis and visualization using Power BI.

Figure 4: Project Milestones and Timeline
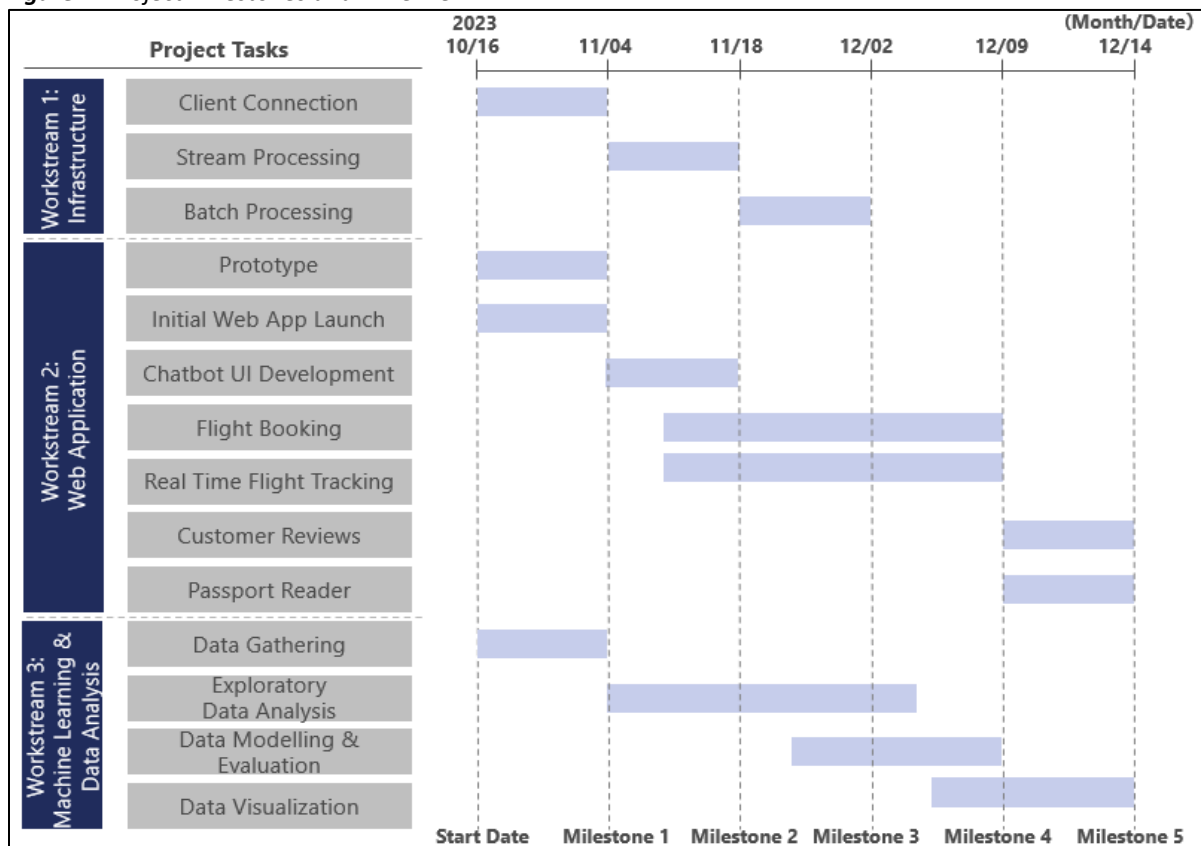
The expected deliverables per milestone are as follows:

- **Milestone 1**
  - Initial setup of AWS infrastructure with configured API gateway
  - Initial launch of the web application, with properly configured API for testing connectivity with AWS
  - Prototype of different features of web application
  - Completed Data Gathering stage for both ML models
    - 200MB size of customer reviews for sentiment analysis
    - 1000 different types of sample passports or text image for passport reader
- **Milestone 2**
  - Completed setting up AWS configurations for data streaming, including the establishment of connections to all associated storage and/or databases
  - Partially functional ChatBot user interface
- **Milestone 3**
  - Completed setting up AWS configurations for data batch processing, including the establishment of connections to all associated storage and/or databases
- **Milestone 4**
  - Fully functional flight booking feature, which includes flight searches, ticket booking and cancellation
  - Real-time Flight Tracking with UI showing the movement of the planes
  - Completed the Exploratory Data Analysis stage for both ML models
  - Completed the Data Modeling & Evaluation stage for both ML models
- **Milestone 5**
  - Customer Reviews section on web application, which includes the integration with segmentation analysis model
  - Passport Reader section on web application, which includes the integration with image-to-text reader model
  - Data visualization that represents insights uncovered from sentiment analysis based on customer reviews data, and flight booking trends and patterns

As we progress through the project, regular assessments will be conducted to ensure adherence to this timeline and the quality of deliverables. This structured approach will ultimately lead to the timely completion of the project, meeting all specified objectives.

IV. BUDGET AND PRICING

Based on the scope and features MetaMorph Solutions has outlined, we propose a budget of CAD 100,000 to cover the entire project's estimated expenses. This budget includes all

research, development, integration, testing and deployment to complete the project. Please refer to the summarized breakdown provided in Table 1 for further details.

Table 1: Budget Allocation Breakdown

Cost Category	Description	Budget Allocation
Research	Costs associated with research on the most suitable tools and approach to implement in the project	CAD 10,000
Development & Integration	Costs associated with system design, development and integration	CAD 50,000
Software Testing	Costs associated with quality assurance such as system verification and defect testing	CAD 10,000
Deployment & Support	Costs related to system launch and post-launch technical support [4]	CAD 20,000
Miscellaneous Cost	Costs associated with other expenses such as data acquisition, tools, trainings, and other miscellaneous expenses	CAD 10,000
TOTAL		**CAD 100,000**

V. QUALIFICATIONS AND EXPERIENCE

The team of MetaMorph Solutions brings diverse expertise and a strong professional and academic foundation to this project. Comprising graduates from STEM[5] fields, mostly in IT-related disciplines, we are all in our final year of postgraduate studies in Big Data Analytics at Lambton College in Ontario, Canada. What sets us apart is our collective professional experience in the IT industry, spanning over five years, across diverse sectors including banking and financial services, marketing research, IT service providers, and consulting firms. Our extensive experience provides us with a deep understanding of the industry's complexities and best practices. Our team boasts a rich blend of skills including full-stack development, quality assurance, business and data analytics proficiency, adept project management and stakeholder engagement capabilities.[6]

This solid academic foundation complements our practical expertise, demonstrated by our successful implementation of complex, multi-phase projects that have yielded measurable and quality results.

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[4] Warranty and Support under Section IX: Terms and Conditions
[5] STEM (Science, Technology, Engineering and Mathematics)
[6] Appendix C: MetaMorph Solutions' team members (LinkedIn profile and expertise)

VI. TEAM MEMBERS

The team who will be developing the "Chatbot Flight Booking System" is composed of highly skilled and experienced professionals. Each member of the team brings their unique expertise to ensure the success and timely delivery of the projects. Table 2 lists the key team members, along with their respective roles and contact information.

Table 2: *Project Team Members and Roles*

Name	Role	Email
Auradee Castro	Developer / Project Manager	c0866821@mylambton.ca
Bhumika Rajendra Babu	Developer / Math Specialist	c0867081@mylambton.ca
Miraj Sinya	Developer / Product Owner	c0863371@mylambton.ca
Olivia Deguit	Developer / QA / Scrum Master	c0878491@mylambton.ca
Roger Mais	Developer / Technical Lead	c0863147@mylambton.ca

VII. PRIOR RELEVANT PROJECTS

MetaMorph Solutions' foundation lies in the collaborative projects we undertook during our academic journey. While these projects were conducted in a school setting, they serve as testament to our team's passion for innovation and problem-solving.

One of our notable initiatives involved the development of "Video Game Recommendation System"[7], which required a deep understanding of various supervised and unsupervised machine learning algorithms for building a robust recommendation system. Additionally, we created "Video Game Trend Analysis"[8] using Power BI tool to gain meaningful insights on sales and demand on various game genres, showcasing our proficiency in both data analysis and algorithm development.

These endeavors, though rooted in academia, have equipped us with a solid technical foundation and a keen eye for user-centric solutions. We are eager to apply these skills to real-world challenges and contribute meaningfully to industry advancements.

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[7] Appendix A: Video Game Recommendation System using Python
[8] Appendix B: Video Game Trend Analysis using Power BI

VIII. RISK ASSESSMENT AND MITIGATION

This section outlines the potential risks and challenges associated with the "Chatbot Flight Booking System" project and presents comprehensive mitigation strategies. By proactively identifying and planning for these potential hurdles, MetaMorph Solutions aims to ensure the smooth progression of the project and the successful attainment of the objectives.

Risk 1: Time Constraints

Due to strict project timelines, there's limited flexibility to incorporate significant changes to the initial requirements.

Mitigation Plan: All changes proposed will undergo a thorough review. Any adjustments to the project scope will be prioritized based on their criticality and overall impact on the project. In situations where changes are deemed essential, we might consider extending phases or reallocating resources to ensure that the project stays on track while accommodating the most critical features.

Risk 2: Front-end Integration

The integration of a fully functional front-end is a desired enhancement planned for the second phase. Should time constraints arise, the project's initial release might be deployed partially completed features.

Mitigation Plan: Continuous monitoring of the project timeline and milestones will be established. If potential delays are detected, stakeholders will be informed in advance, and a decision will be made regarding the prioritization of features. While the front-end integration is valuable, delivering a stable and functional initial version remains the priority. Subsequent updates can then focus on integration.

Risk 3: Tool and Technology Flexibility

While we possess the expertise to deliver the solution, the tools and technologies listed are not exhaustive. Depending on various factors such as cost-efficiency, performance, and advancements in technology, the tools chosen for implementation might undergo changes.

Mitigation Plan: Regular technology assessment sessions will be conducted to ensure that we are using the best tools for the job. Stakeholders will be kept in the loop regarding any significant tool or technology shifts. A cost-benefit analysis will be conducted before any switch to ensure that it aligns with the project's goals and budget.

Risk 4: Data Quality and Model Dependency

Our model is heavily dependent on data. While we endeavor to source and utilize the most reliable data, there is always a possibility of data discrepancies, incompleteness, imbalance or inconsistency. Quality of data directly impacts the output and overall success of any project.

Mitigation Plan: To address potential data issues, we will conduct regular data audits ensuring accuracy. A model evaluation will be in place for promptly identifying and rectifying data underfitting and overfitting. Before processing, data will be validated against set benchmarks. Stakeholders will be kept informed of any data quality issues, and when necessary, we will source and integrate trusted data to enhance the model's reliability.

Risk 5: Third-Party Dependency

The project partially depends on the Flight API, an external third-party application that offers APIs for flight tracking, airline routes, and ticket pricing. There is a possibility of delays or quality issues if the API experiences downtimes or undergoes feature enhancements without prior notice.

Mitigation Plan: We will closely follow the API provider's official communication channels for any announcements or updates. This proactive approach will enable us to swiftly adjust our operations and minimize any potential impact on the project timeline. Furthermore, we will explore alternative APIs or backup solutions to ensure seamless continuity of our services in case of extended downtimes.

IX. TERMS AND CONDITIONS

This Agreement ("Agreement") is entered into by and between MetaMorph Solutions, hereinafter referred to as the "Service Provider," and Capstones Technologies, hereinafter referred to as the "Client."

Purpose and Scope

i. The Service Provider agrees to develop and provide the "Chatbot Flight Booking System" (the "Application"), as described in Section I (Project Overview), attached hereto and incorporated by reference.
ii. The Client agrees to provide all necessary information, materials, and cooperation as may be reasonably required for the successful development and deployment of the Application.

Development Process

i. The Service Provider will follow an iterative development process, providing the Client with regular updates and opportunities for feedback.
ii. The Client agrees to review and provide feedback on each milestone or deliverable within a reasonable timeframe (typically within 1-2 business days).
iii. The Client acknowledges that delays in providing feedback may affect the project timeline and may result in additional costs.

Intellectual Property Rights

i. The Service Provider shall retain all intellectual property rights, including but not limited to copyright, patent, and trademark rights, in and to the Application.
ii. Upon receipt of full payment, the Service Provider grants the Client a non-exclusive, non-transferable license to use the Application for its intended purpose.

Payment Terms

i. The Client agrees to pay the Service Provider in accordance with the payment schedule outlined in Section IV (Budget and Pricing).
ii. All fees are exclusive of any applicable taxes, which shall be the responsibility of the Client.

Confidentiality

i. Both parties agree to keep confidential any proprietary or sensitive information disclosed during the course of this Agreement.
ii. This confidentiality obligation shall survive the termination of this Agreement.

Warranty and Support

i. The Service Provider warrants that the Application will function as described in Section III (Timeline and Deliverables) for a period of 3 months from the date of final acceptance.
ii. The Service Provider will provide reasonable technical support and maintenance services during the warranty period.

Termination

i. Either party may terminate this Agreement with written notice in the event of a material breach by the other party, subject to a 5-day cure period.
ii. Upon termination, the Client shall pay the Service Provider for all work completed up to the date of termination.

Miscellaneous

i. This Agreement contains the entire understanding of the parties and supersedes all prior agreements and understandings.
ii. Any modification or amendment of this Agreement must be in writing and signed by both parties.
iii. This Agreement shall be governed by the laws of Ontario, Canada without regard to its conflicts of laws principles.

X.   CONTACT INFORMATION

For any additional inquiries, further details, or to discuss any aspect of this proposal, please do not hesitate to reach out to us. We value open communication and look forward to the opportunity to address any questions or concerns you may have.

Company Name: MetaMorph Solutions
Address: 121 Brunel Road, Mississauga ON L4Z 3E9
Email Address: partnership@metamorphsolutions.ca
Contact Number: (+1) 123 456 7890

XI. REFERENCES

1. Think with Google. (n.d.). Trip cancellation and rebooking statistics. *Think with Google.* https://www.thinkwithgoogle.com/future-of-marketing/management-and-culture/trip-cancellation-rebooking-statistics/
2. Schwaber, K. & Sutherland, J. (2020, November). *The Scrum Guide*. https://scrumguides.org/docs/scrumguide/v2020/2020-Scrum-Guide-US.pdf

XII.   APPENDICES

Appendix	Item	Location
A	Video Game Recommendation System using Python	Code available on link
B	Video Game Trend Analysis using Power BI	Data visualization available on link
C	FlightAPI Documentation	Documentation available on link
D	MetaMorph's Solutions team members Auradee Castro - LinkedIn: ca.linkedin.com/in/auradeecastro - Expertise: Software Engineering, DevOps, Data Analyst Bhumika Rajendra Babu - LinkedIn: ca.linkedin.com/in/bhumika0103 - Expertise: Math Specialist, Data Analyst Miraj Sinya - LinkedIn: ca.linkedin.com/in/mirajsinya - Expertise: Business Analysis, Data Analyst Olivia Deguit - LinkedIn: ca.linkedin.com/in/ovdeguit - Expertise: Project Management, Test Management, Scrum Master, Data Analyst Roger Mais - LinkedIn: jm.linkedin.com/in/roger-mais-55b1ba128 Expertise: Fullstack Developer, Data Engineering	