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## A Centralized Visa Booking Web App for Improved Transparency and Time Efficiency Part 1: Research and Problem Analysis

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**ABSTRACT**: Visa booking systems have long been plagued by inefficiencies, lack of transparency, and reliance on third-party agents. This research proposes the development of a centralized visa booking web application that aims to reduce booking time, enhance transparency, and provide real-time status updates for applicants. The proposed solution leverages modern web technologies, including Angular for the frontend, Java for the backend, MongoDB for data storage, and REST APIs for communication between the components. By automating processes and providing a streamlined user experience, this system intends to significantly improve the visa application process. Preliminary results suggest that the implementation not only reduces processing time but also enhances the user experience by offering clear and timely updates on application status.

**KEYWORDS**: Visa Booking, Transparency, Web Application, Efficiency, MongoDB, REST APIs, Angular, Time Reduction.

#### I. INTRODUCTION

#### **Problem Statement**:

The current visa booking process is often inefficient and opaque, leading to significant delays and confusion for applicants. Many systems still rely on third-party agents, creating a lack of transparency and communication about the status of applications. Applicants often face long waiting times with little visibility into the processing stages, leading to frustration and dissatisfaction.

#### **Research Motivation**:

It is crucial to address these inefficiencies as the visa application process impacts travelers globally, creating a need for a more streamlined and transparent system. By automating processes and providing real-time updates, applicants and agencies alike can benefit from reduced processing times, improved customer satisfaction, and better resource allocation for visa authorities.

#### Research Goal:

This research aims to develop a centralized web-based visa booking system that addresses these challenges by:

- Reducing processing time through automation.
- Increasing transparency by offering real-time status updates. Improving the overall user experience for applicants by providing clear, easy-to-understand information throughout the process.

#### Scope of the Research:

The research focuses on building a visa booking system for a single country or a specific type of visa (e.g., tourist visa). The primary objective is to create a proof of concept that can be later expanded to support additional visa categories or countries. The system will be designed for online use, targeting both applicants and visa agencies.

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#### Paper Structure:

This paper is divided into two parts:

- **Part 1**: The first part of the paper focuses on the research, including the problem statement, literature review, proposed solution, and contributions to the field.
- **Part 2**: The second part discusses the implementation of the proposed solution, detailing the development process, features, and technologies used, as well as outlining the future scope of the system.

This paper is structured as follows:

- Literature Review: Reviews existing solutions and identifies gaps in current systems.
- Methodology: Describes the proposed solution, including the system architecture and technologies used.
- **Implementation**: Details the development of the system, including frontend, backend, and database design.
- **Results and Evaluation**: Discusses the results of system testing, performance, and user feedback.
- Future Scope: Explores potential enhancements and scalability of the system.
- Conclusion: Summarizes the findings and contributions of the research.

#### **II. LITERATURE REVIEW**

#### **Existing Solutions**:

Various visa booking systems are currently available, many of which rely on traditional web platforms or third-party agents to manage applications. Examples include systems such as VFS Global and TLScontact, which offer users the ability to book appointments, track application status, and manage documentation. However, these platforms still exhibit many challenges in terms of speed, accessibility, and communication between the applicants and the visa processing authorities.

In addition, some countries have government-backed systems like the U.S. ESTA (Electronic System for Travel Authorization) or the UK Visa and Immigration system, which allow users to apply online for specific visa types. While these systems improve certain aspects of the process, they often lack personalized tracking features and fail to automate all aspects of the application flow.

#### **Problems with Existing Systems**:

Despite the advancements, several key issues remain:

• **Time Delays**: Visa application processing is often slow, and applicants have limited visibility into the status of their applications, leading to frustration and unnecessary follow-ups.

• **Over-reliance on Third-Party Agents**: Many users still depend on external agents to help navigate the application process, increasing both the time and cost involved.

• **Lack of Transparency**: Applicants often face uncertainty as they are not able to track the progress of their visa applications in real-time. This lack of communication leads to confusion and delays.

• User Experience: Many existing systems are not optimized for user experience, especially in terms of simplifying the complex information flow and reducing the number of steps required for application submission.

#### Technologies Used:

Existing systems typically utilize a combination of web development technologies for both the frontend and backend. For frontend development, frameworks like React, Angular, and Vue.js are often used to build dynamic user interfaces

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that are easy to navigate. On the backend, Java, Python, or PHP are common choices for handling server-side logic, while databases such as MySQL or PostgreSQL store application data.

Some modern systems have incorporated APIs to communicate with backend services or to integrate with other systems (e.g., payment gateways). However, these systems often lack the use of advanced technologies such as **REST APIs** for real-time updates and **NoSQL databases** like MongoDB, which would allow for faster data retrieval and a more scalable solution.

#### **Comparisons**:

While existing systems attempt to address some aspects of the booking process, they often fall short in several areas, particularly with regard to transparency and efficiency.

• **Our Approach**: The proposed system aims to overcome the shortcomings of existing systems by centralizing the entire booking and tracking process in a single platform. By implementing **real-time notifications** and **status tracking**, the system ensures applicants have constant updates, reducing uncertainty.

• Tech Stack: Unlike many existing solutions that use traditional relational databases, we propose the use of **MongoDB**, which is better suited for the scalability and speed required for real-time updates. Additionally, the use of **Angular** for the frontend allows us to build a highly interactive, dynamic interface, offering users an intuitive experience compared to many existing systems that still use outdated designs.

• **Automation**: Our system aims to **automate** much of the status-tracking process, reducing the reliance on agents, which is a significant pain point in current systems.

By focusing on these innovations, the proposed system provides a more efficient, transparent, and user-friendly experience compared to existing visa booking systems.

#### **III. METHODOLOGY**

#### **Proposed Solution**:

The proposed solution is a centralized, web-based visa booking system designed to streamline the application process and provide applicants with transparency and real-time status updates. Key features and functionalities of the system include:

• User Registration and Login: Applicants can create an account, manage personal details, and track their application progress.

• **Visa Type Selection**: Applicants can choose the type of visa they wish to apply for, with an integrated form to collect required documentation and details.

• **Real-time Status Tracking**: Applicants can view the current status of their visa application at any time through a user-friendly dashboard.

• **Automated Notifications**: Email or SMS notifications will alert applicants when their application status changes or when additional steps are needed.

• Admin Panel: Visa agencies or government authorities can manage applications, update status, and communicate with applicants through the system.

• Secure Payment Gateway: Integration with payment systems for visa application fees, ensuring secure transactions.

The goal is to provide applicants with a more efficient, transparent, and user-friendly visa application experience while reducing reliance on agents.

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#### System Architecture:

The system follows a **client-server architecture**, where the client (user interface) interacts with the backend (server and database) to process requests. Below is a basic overview of the system architecture:

• **Frontend**: Built with **Angular** for a dynamic, responsive user interface. This will handle user interactions, form submissions, and displaying real-time data to users.

• **Backend**: Developed using **Java**, the backend handles business logic, processes application data, and interacts with the database and APIs.

• **Database**: **MongoDB** is used to store application data, user details, and status information in a flexible, scalable way.

• **API Layer: REST APIs** will be used to facilitate communication between the frontend and backend, as well as to send notifications to users



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// User Flow for Visa Booking Platform // Start of User Journey START -> User visits the Visa Booking Platform homepage // Step 1: Choose Destination User clicks "Choose Your Destination" V User selects the destination country v System displays visa requirements for the selected country // Step 2: Fill Out Details User clicks "Start Application" User fills out personal details (name, email, passport number, etc.) User enters travel details (travel dates, purpose of travel, etc.) User uploads required documents (passport photo, itinerary, etc.) V User reviews the information and clicks "Next" // Step 3: Payment Process User is directed to the payment page V User selects a payment method (e.g., Credit Card, PayPal) V User enters payment details System processes payment V IF payment successful THEN User receives a payment confirmation ELSE User is notified of payment failure // Step 4: Application Submission User clicks "Submit Application" V System validates the application details V

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IF validation successful THEN System sends application for processing User receives a confirmation email with application details ELSE System displays error messages for missing or incorrect fields // Step 5: Application Review System assigns the application to a human expert for review Expert checks the application for accuracy V IF application is accurate THEN System sends approval notification to user ELSE System sends rejection notification with reasons for rejection // Step 6: Visa Delivery User receives visa approval email with download link (if digital) OR User receives visa document via mail (if physical) V User can track application status on the user dashboard // End of User Journey END

#### Tools and Technologies:

• **Angular**: Chosen for its powerful data-binding features and ability to create a highly interactive and dynamic single-page application (SPA). It is well-suited for building complex web interfaces that are easy to navigate.

• **MongoDB**: Selected for its flexibility and scalability. As a NoSQL database, MongoDB is ideal for handling dynamic data such as application statuses and user profiles, which can change frequently and unpredictably.

• **REST APIs**: Chosen for their simplicity and efficiency in enabling communication between the frontend and backend. REST APIs are lightweight, easy to scale, and provide flexibility in integrating additional services (e.g., SMS notifications, payment gateways).

• **Java**: Used for the backend to handle business logic and manage API requests. Java's stability, scalability, and extensive libraries make it an excellent choice for processing large amounts of data securely

• **Deployment Tools**: Tools such as **AWS** or **Docker** will be used for hosting and scaling the system, ensuring high availability and performance.

These technologies ensure that the system is scalable, efficient, and user-friendly, aligning with the goals of improving the visa application process.

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#### **IV. RESEARCH**

#### Design:

The research process involved analyzing existing visa booking systems, identifying key issues, and designing a solution to address those problems. The methodology involved the following steps:

• **Literature Review**: Reviewed existing research and systems in the field of visa booking to understand the challenges and gaps in the current process.

• **Surveys/Interviews**: Conducted surveys and interviews with users (visa applicants) and agencies to gather insights on pain points, expectations, and required features.

• **Solution Design**: Based on the findings from the literature review and user feedback, the system was designed to meet the needs of both applicants and visa authorities.

• **Prototype Development**: A prototype of the system was developed using the chosen technology stack, with a focus on user experience and system efficiency.

• **Testing and Evaluation**: The prototype was tested for functionality, performance, and user satisfaction. Feedback was gathered to make improvements in subsequent versions of the system.

#### **V. CONCLUSION**

#### Summary of Findings:

The research revealed several significant challenges in the current visa booking process, primarily concerning inefficiencies, lack of transparency, and over-reliance on third-party agents. Existing systems often fail to provide applicants with real-time status updates, leading to uncertainty and delays. The review of existing literature and systems highlighted that although some improvements have been made, such as online forms and appointment booking, there is still considerable room for enhancement in terms of automation, user experience, and system transparency.

#### **Contribution to the Field**:

The proposed solution makes several key contributions to the field of visa booking systems:

• **Centralized System**: Unlike existing solutions that still rely on external agents, our system centralizes the entire process, reducing dependency on third parties.

• **Real-time Status Updates**: The ability to track the application status in real-time offers applicants transparency, a feature often lacking in current systems.

• **Automation**: By automating status updates and notifications, the system significantly reduces human error and processing delays, improving overall efficiency.

• **User-Centric Design**: The system's user-friendly interface, built with Angular, ensures a seamless experience for applicants, making the process more intuitive compared to the complex systems often used today.

Overall, the proposed system provides a more transparent, efficient, and automated solution for visa applications, addressing key gaps identified in the existing systems.

This research has addressed the challenges in the visa booking process and proposed a centralized web-based solution to improve transparency and efficiency. The findings contribute to the field by offering a system that reduces reliance on agents and provides real-time status updates to applicants. For a detailed description of the system's implementation, features, and future scope, please refer to **Part 2** of this paper.

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