DispatchGenius

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***Abstract* - The project, DispatchGenius, addresses the challenges encountered by international students in accessing necessities and sending gifts. Through a comprehensive approach, this project simplifies the delivery process by offering a user-friendly interface for booking deliveries, providing free delivery services, streamlining scheduling, and incorporating a robust feedback system. Our methodology involved the utilization of core object-oriented design principles such as class definition, inheritance, abstract classes, and interfaces. These principles facilitated the development of a modular and scalable system architecture, enabling seamless integration of various functionalities.**

In terms of design, this project encompasses high-level modules including core functionalities, administrative functions, user authentication, data models, package receiver functionalities, shipper functionalities, system-wide utilities, and database management. Each module is designed to cater to specific aspects of the delivery process, ensuring a cohesive and efficient user experience. The implementation phase involved the utilization of JavaFX for UI design and Eclipse IDE for development, allowing for the creation of a visually appealing and functional application.

The outcomes of the project include the successful development of DispatchGenius, a platform that addresses the unique needs of international students. DispatchGenius offers advantages such as accessibility, cost-efficiency, time management, and user feedback integration. The project also highlights the importance of collaboration and innovation in solving real-world problems. Moving forward, it also has the potential for further enhancements, such as notification services, live package tracking, and a delivery executive login page, to further improve user experience and operational efficiency.

Keywords*-*DispatchGenius, international students, deliveries, accessibility, cost-efficiency, time management, feedback system, object-oriented design, user authentication, JavaFX, Eclipse IDE, system architecture, modular design.

I. Problem Description

The fundamental backbone of DispatchGenius lies in addressing the myriad challenges encountered by international students in accessing necessities and sending gifts. These challenges stem from a confluence of factors including geographic distance, cultural unfamiliarity, time constraints, and financial limitations. As such, DispatchGenius aims to alleviate these burdens through a comprehensive delivery service tailored specifically to the needs of the student community. By providing a user-friendly platform coupled with cost-effective and efficient delivery solutions, the project seeks to enhance the overall experience of international students, allowing them to overcome logistical barriers and access essential items with ease.

At its core, DispatchGenius embodies the ethos of accessibility, offering a vibrant and intuitive interface designed to simplify the process of booking deliveries. This emphasis on user-friendliness ensures that even those unfamiliar with delivery systems can navigate the platform effortlessly, thereby democratizing access to essential goods and services. Moreover, by offering free delivery services, it mitigates the financial constraints often faced by students, making it easier for them to affordably send and receive packages, regardless of their budgetary limitations.

Central to DispatchGenius's value proposition is its commitment to streamlining the scheduling process, thereby minimizing the time and effort required to arrange shipments. Through efficient backend algorithms and intuitive user interfaces, it empowers users to schedule deliveries quickly and conveniently, freeing up valuable time that can be better utilized for academic pursuits and personal endeavors. This emphasis on time management underscores its dedication to enhancing the overall well-being and productivity of its users, ensuring that they can focus on what matters most without being encumbered by logistical hassles.

A key distinguishing feature of DispatchGenius is its robust feedback system, which enables continual service improvement based on user input. By soliciting feedback from users and incorporating their suggestions into iterative updates, DispatchGenius ensures that its platform remains responsive to the evolving needs and preferences of the student community. This commitment to user-centric design not only fosters a culture of transparency and accountability but also fosters a sense of ownership and empowerment among users, who can actively contribute to shaping the future direction of the platform.

II. Analysis (Related Work)

In reviewing the existing literature on delivery services tailored to the needs of international students, several key insights emerge. [1] Glass (1999) emphasizes the importance of user-centric design principles in shaping the delivery experience. By emphasizing accessibility, affordability, and efficiency, Glass argues that delivery services can better meet the unique needs of student communities, particularly those facing geographic, cultural, and financial barriers. This aligns closely with the core principles of DispatchGenius, which prioritizes user-friendliness and cost-effectiveness in its service offerings.

On the other hand, [2] Legner and Alt (2016) present a reference architecture for service systems, integrating processes and business models. Their work sheds light on the holistic approach required in designing delivery management systems to ensure seamless integration with various business processes. DispatchGenius can benefit from such architectural insights to

optimize its service offerings and streamline its operational processes.

Furthermore, [3] Brown and Garcia (2021) delve into enhancing customer experience through innovative delivery management systems. Their study explores the utilization of artificial intelligence and machine learning algorithms to optimize delivery routes, minimize delivery times, and provide personalized services to recipients. DispatchGenius can draw valuable insights from this research to enhance its technological capabilities and further improve customer satisfaction.

Despite these valuable insights, existing delivery solutions for international students are not without their shortcomings. Many traditional delivery services are characterized by cumbersome interfaces, opaque pricing structures, and limited options for customization. This can lead to frustration and dissatisfaction among users, who may feel marginalized or overlooked by mainstream delivery providers. Additionally, the lack of tailored solutions specifically designed for the student community means that many students are forced to navigate logistical challenges on their own, exacerbating feelings of isolation and disconnection.

In response to these shortcomings, DispatchGenius seeks to redefine the delivery experience for international students by offering a comprehensive solution that addresses their unique needs and challenges. By prioritizing user-friendliness, affordability, efficiency, and continual service improvement, it aims to empower students to overcome logistical barriers and access essential items with ease. Through its innovative approach to delivery services, it aspires to foster a sense of connection and community among users, ultimately enriching the overall student experience

III. System Design

The system design of DispatchGenius revolves around addressing the challenges faced by international students in accessing necessities and sending gifts. The architecture is structured to ensure accessibility, cost-efficiency, time management, and a robust feedback system. Here's an overview of the system design components:

A. **System Architecture**: DispatchGenius follows a modular architecture consisting of high-level modules such as:
   a. app: Core functionalities and UI styling.
   b. app.admin: Administrative functions and view statistics.
   c. app.login: User authentication and management.
   d. app.model: Data models for entities.
   e. app.receiver: Package receiver functionalities.
   f. app.shipper: Functionalities for shippers.
   g. app.system: System-wide utilities.
   h. app.tools: Database and utilities.

B. **Login and User Management**:
   a. The system includes controllers and views for managing user sessions and secure access for various roles. Components include controllers and views. Functionality encompasses user authentication, registration, and password recovery.

C. **Receiver and Shipper Interaction Design**:
   a. Receiver Module: Functionality includes tracking package status, setting preferences, and rating services.
   b. Shipper Module: Functionality covers adding packages, updating shipment status, and managing appointments.

The system design ensures a user-friendly interface, streamlined processes, and effective communication channels between receivers, shippers, and administrators. It aims to enhance the overall delivery experience for international students by providing intuitive navigation, transparent tracking, and seamless interaction with delivery personnel. Additionally, the modular architecture allows for scalability and flexibility, enabling future enhancements and feature additions to meet evolving user needs and technological advancements.

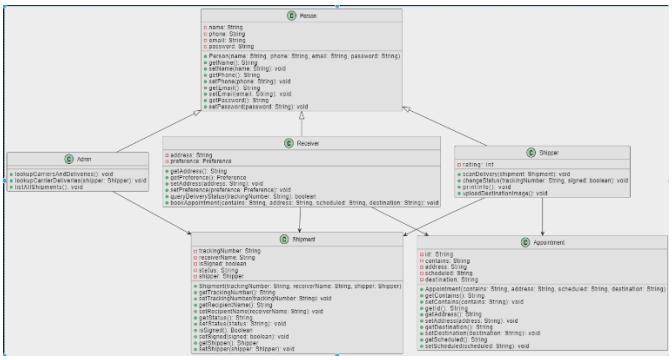

Figure 1. UML Diagram

IV. Implementation

The implementation of DispatchGenius involved several key aspects, including the utilization of external libraries, implementation of core functionalities, and integration of Service APIs. Here's a breakdown of the implementation details:

A. External Libraries:
   a. **JavaFX**: JavaFX is essentially used for UI as it provides a comprehensive toolkit for building the graphical user interface (GUI). By leveraging JavaFX, DispatchGenius can create visually appealing interfaces with interactive components, enhancing the user experience.

   b. **Scene Builder**: It complements JavaFX by simplifying the design process of UI components through its drag-and-drop interface. The project utilizes Scene Builder to efficiently create complex UI layouts, reducing development time and effort.

   c. **Random library**: The java.util.Random class, is utilized in DispatchGenius to introduce randomness into certain aspects of the application. By generating random numbers, the project can implement features such as unique tracking number generation, adding variability and unpredictability to the system.

d. **Util library**: The java.util package, offers a wide range of utility classes and interfaces for common programming tasks. The project leverages classes from this package for tasks like date and time manipulation, collection management, and input/output operations, improving code efficiency and readability.

B. Core Functionalities:

a. **User Authentication and Management**: Implemented login and registration functionalities to authenticate users and manage their sessions securely. This involved validating user credentials, managing user sessions, and providing password recovery mechanisms.

b. **Package Booking and Tracking**: Developed features for users to book package deliveries, track their shipment by updating the status, and provide feedback on delivery services.

c. **Administrative Functions**: Implemented administrative functionalities to view statistics.

C. Service APIs:

For the APIs implemented in DispatchGenius, CRUD operations are applied to two main functionalities: package management and user management.

a. Create: The API endpoint scans new packages and creates them in the system, assigning unique tracking numbers. Users can register new accounts through this API endpoint, providing necessary information such as username, email, and password.

b. Update: This endpoint is used to update the status of packages, reflecting changes such as package delivery or arrival. Users can update their details, including password changes, through this endpoint.

c. Read: Whenever users track the status of a package, the read operation retrieves the status information from the HashMap. Authentication checks are performed using this endpoint whenever users log in or access secured areas of the application.

d. Delete: When a shipment needs to be canceled, the delete operation removes the package from the system. In case a user decides to delete their account from the application, the delete operation removes their user data from the system.

V. EVALUATION

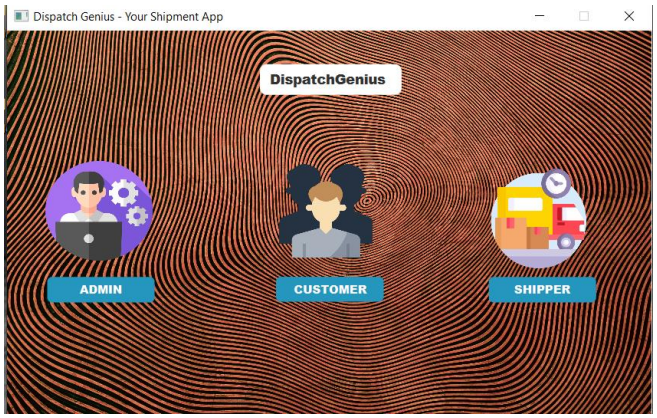

Figure 2: Main Dashboard

A. User Registration and Login: A new user registers on the platform by providing their email and password. They then log in to access the main dashboard.

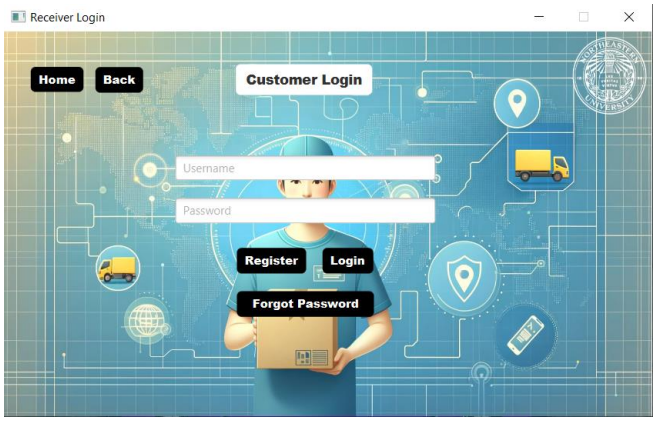

Figure 3: Customer Login

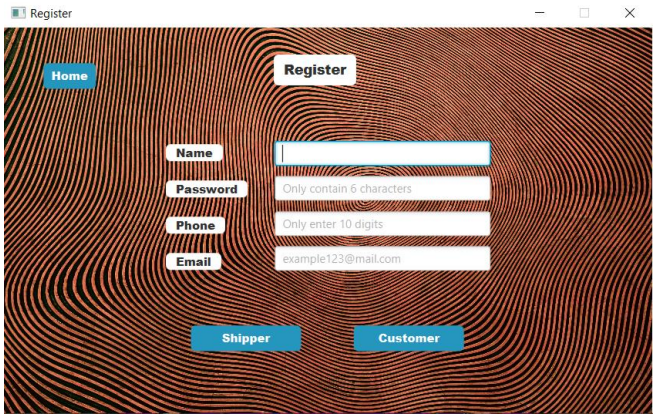

Figure 4: Register Panel

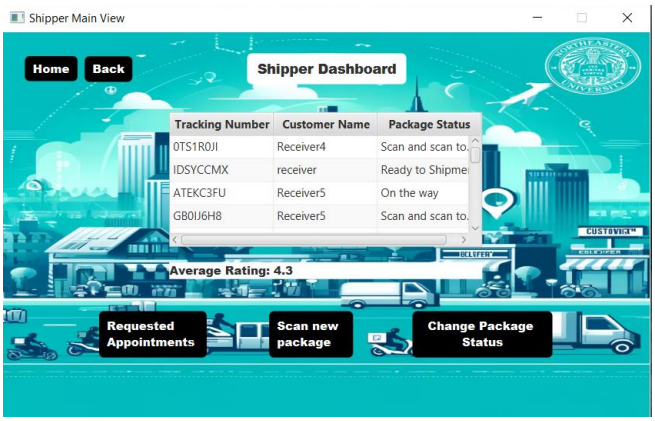

Figure 5: Shipper Dashboard

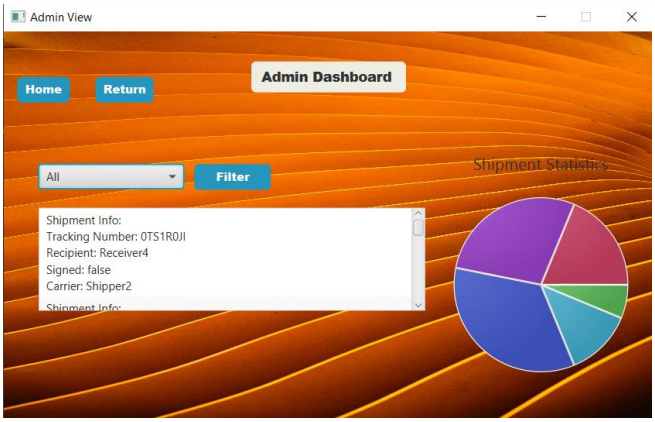

Figure 6: Admin Dashboard

B. Package Booking: The user books a package delivery by entering the recipient's details and selecting the delivery date. They receive a confirmation message upon successful booking.

C. Package Tracking: The user tracks their package using the provided tracking number. They can view the status of their shipment, such as "In Transit" or "Delivered."

D. Feedback System: After receiving their package, the user provides feedback and a rating for the delivery service. This feedback is recorded and used to improve future services.

VII. Discussion (Reflection)

The web application oxffers a user-friendly registration process for both customers and shippers, allowing them to input their details securely. Once registered, customers can book appointments, rate their experiences, track scanned packages, and provide feedback, while shippers can track appointments, scan shipments, update shipment statuses, and view customer ratings. The admin dashboard provides comprehensive analytics, enabling the monitoring of key metrics such as appointment volumes, customer feedback, and shipment statuses.

The outcomes of the project reveal several key insights:

a. Enhanced Customer Experience: The web application simplifies the logistics process for customers, allowing them to conveniently book appointments, track packages, and provide feedback, thereby improving overall satisfaction and loyalty.

b. Increased Operational Efficiency: Shippers benefit from streamlined processes for tracking appointments, scanning shipments, and updating statuses, leading to improved efficiency and productivity in logistics operations.

c. Data-Driven Decision Making: The admin dashboard offers valuable insights into customer behavior, shipment trends, and operational performance, empowering decision-makers to make informed decisions and optimize logistics strategies.

d. Improved Communication and Transparency: By facilitating real-time updates and notifications, the web application fosters transparent communication between customers and shippers, reducing misunderstandings and enhancing trust.

In conclusion, the development and analysis of the web application demonstrate its effectiveness in enhancing logistics management processes for both customers and shippers. Through features such as appointment booking, package tracking, and feedback submission, the application improves customer satisfaction, operational efficiency, and decision-making capabilities. Moving forward, further research and refinement of the application could lead to even greater advancements in the logistics industry.

VIII. Conclusions and Future Work

A. Conclusion

a. **Ease of Use**: DispatchGenius provides a user-friendly interface that simplifies the process of booking deliveries, making it accessible to users of all backgrounds and technical expertise.

b. **Cost-Efficiency**: With free delivery services, project alleviates financial burdens for students and other users, making it an attractive option for shipping needs.

c. **Time Management**: The streamlined scheduling process minimizes the time spent arranging shipments, allowing users to focus on other tasks and responsibilities.

d. **Feedback System**: DispatchGenius also incorporates a robust rating system that enables continual service improvement based on user feedback, ensuring a high level of customer satisfaction and service quality.

B. Challenges encountered:

a. **Integration of Pie Chart**: Implementing a pie chart in the admin panel to accurately display data for each shipper posed technical challenges due to compatibility issues and data visualization complexities.

b. **Dynamic Table Design**: Designing and populating a dynamic table in the Shipper dashboard proved challenging, requiring careful consideration of data structures and UI design principles.
c. **JavaFX Event Handling**: Resolving mismatches between action listeners and component IDs in the JavaFX environment required meticulous debugging and troubleshooting to ensure proper functionality.
d. **User Interface Design**: Creating a user-friendly, interactive rating panel with star ratings necessitated extensive design iterations and UI testing to achieve optimal usability and visual appeal.

C. Future work:

a. **Notification Services**: Implementing email and SMS notifications to keep users informed about their delivery status, enhancing communication and user engagement.
b. **Live Package Tracking**: Enabling real-time tracking for packages to provide accurate and timely location updates, improving transparency and convenience for users.
c. **Delivery Executive Portal**: Developing a secure login portal for delivery personnel to access and share delivery details, enhancing operational efficiency and customer service.

In conclusion, DispatchGenius offers a comprehensive solution to address the challenges of shipping and delivery, with a focus on accessibility, cost-efficiency, time management, and user feedback. Despite encountered challenges, the project demonstrates potential for further enhancements and improvements to deliver an even more seamless and efficient shipping experience for users.

IX. JOB ASSIGNMENT

The individual contributions of team members, the breakdown is as follows:

A. Abhishek Sagar Sanda:

a. Developed the receiver module, including functionalities for package tracking and feedback/rating system.
b. Contributed to the creation of the project report, providing analysis and insights into the implementation.
c. Played a role in refining and improving the overall system design and functionality.

B. Rohan:

a. Focused on UI design and implementation, ensuringa visually appealing and user-friendly interface.
b. Implemented admin functionality, including statistical analysis and management features.
c. Prepared the project presentation, effectively communicating the project's objectives, methods, and outcomes.

C. Tirdesh:

a. Led the development of the Shipper module, including functionalities for managing shipments and appointments.
b. Responsible for designing the login system and creating UML diagrams to visualize the project architecture.
c. Contributed to the overall project design and planning, ensuring coherence and efficiency in implementation.

Each team member's contributions played a crucial role in the successful completion of the project, covering key aspects such as module development, UI design, system architecture, and documentation.

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[3] Brown, M., & Garcia, J. (2021). Enhancing Customer Experience through Innovative Delivery Management Systems. Journal of Business Logistics.