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Customer Supportive, Island-wide Courier Service Platform

[1]Dilakshi Lamahewa, [2]Hettiarachchi K A P W, [3]Jayawardena K R U S, [4]Gunathilaka M A G T, [5]Dhammika De Silva, [6]Uditha Dharmakeerthi

[1,2,3,4]Department of Information Technology, Faculty of Computing, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka

[5,6]Department of Computer System Engineering, Faculty of Computing, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka

Authors E-mail: [1]it20075330@my.sliit.lk, [2]it20128654@my.sliit.lk, [3]it20230524@my.sliit.lk, [4]it20111588@my.sliit.lk, [5]dhammika.d@sliit.lk, [6]uditha.d@sliit.lk

Abstract **- This study offers a "customer-centric, island-wide courier service platform" that might transform the sector. This innovative platform improves courier efficiency and customer service. Cutting-edge technologies and complicated processes accelerate delivery, increase customer service, and maximize resource utilization. Careful cultivation and savvy administration generate a symphony of consumer, courier, and service provider interaction in this changed world. Main study principles apply to many fields. "Efficient Delivery Routing System" carefully weaves deliveries into ideal routes and optimizes resources. This new technology optimizes resource utilization and makes couriers versatile. Similarly, the "Performance Tracking System" analyses operational performance thoroughly. Data-driven insights encourage sensible decision-making and a new era of well-considered tactics. This cutting-edge canvas shines in client engagement with a semi-automated assistance system that changes help. Automation and human experience produce a rapid, responsive customer support conference that will define service excellence. This study explores unexplored waters to lead courier services into a golden age of endless opportunity. The innovative platform is more than a tech and service meeting spot; it's a magnificent testament to the rhythmic interplay between customer care, the bottom line, and individual ingenuity. Every image and data point tells a tale about how the service has changed, providing the framework for a lyrical and paradigm-shifting industry revolution.**

Keywords: groundbreaking, customer-centric, revolutionize, courier industry, efficiency, cutting-edge technologies, resource optimization, data-driven insights, semi-automated support system, paradigm-shifting industry shift.

I. INTRODUCTION

The courier service industry has experienced rapid growth, but still faces challenges such as rising costs, inefficient delivery methods, and safety concerns. A balance between customer needs and operational prowess is crucial. A platform fusion of technologies has emerged, providing instantaneous monitoring, trouble-free transactions, and customer assistance. However, security features like authentication and encryption protect sensitive information. Geographical and personal preferences guide logistics, with global positioning system analysis and Net Promoter Score playing a crucial role. Researching and analyzing customer behavior is essential for creating a safe space for clients. The platform provides prompt, efficient aid to those in need. Frugality is the best bet, with optimization codes ensuring efficient routes and inventory management, and machine learning and data analysis providing strategic insights. The creators of this future must be well-versed in logistics, data science, and related fields to create a system that combines speed, safety, island-wide reach, customer nurturing, and fiscal prudence.

Efficient Delivery Routing System

The demand for fast and efficient delivery services has increased, leading to the emergence of island-wide courier service platforms. However, optimizing delivery routes remains a challenge for courier service providers, resulting in delays, increased costs, and decreased customer satisfaction. To remain competitive, an efficient delivery routing system must be flexible, adapt to changes in schedules, reduce vehicle requirements, and reduce carbon footprint. Developing an efficient system requires advanced technology, such as machine learning and artificial intelligence, which can analyze vast amounts of data and provide real-time traffic updates. These algorithms can automatically optimize delivery routes,

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reducing delivery times, improving customer satisfaction, and reducing operating costs.

Other factors to consider include the size and capacity of delivery vehicles, the number of delivery points, and driver availability. Additionally, courier companies must consider customer needs, such as delivery time windows, package size and weight restrictions, and special handling requirements.

Performance Tracking System

One such technology is a courier service performance tracking system, which uses machine learning models and algorithms to track and predict delivery success rates and customer churn. Key features include delivery success rate prediction, delivery success rank with previous time, and customer churn prediction and rank features.

To remain competitive, courier companies must continue to innovate and invest in new technologies.

Semi-automate customer support system.

The research aims to develop a semi-automated customer care system for an island-wide courier service platform using Natural Language Processing (NLP). The system will use rule-based and machine learning-based NLP algorithms to handle customer inquiries and complaints efficiently and accurately. The system will collect and categorize a large dataset of customer questions and complaints, train NLP algorithms to discover trends, and assess the system's accuracy, reaction speed, and customer satisfaction. The proposed method has the potential to transform courier service customer support by automating mundane processes, allowing human support personnel to focus on more complex issues, and providing 24/7 availability. This research could potentially impact other service sectors seeking to improve customer care with AI and ML.

Security, Damage Detection, and Authentication

The novel framework consists of four essential components that work together to create a concert of service excellence. The 'Courier Service Performance Tracking Component' is responsible for tracking delivery drivers' routes to catch delays in package timing and keeping everyone on schedule. It also considers factors like cargo volume, average trip duration, and customer satisfaction. Interactive Authentication Enabling is introduced, embedding QR codes in package layouts to ensure authenticity. A chatbot and support hotline is introduced, enhancing customer support through feedback and improvement. The 'Safety Fortified Packaging Stratagem' is dedicated to protecting packages using cutting-edge sentinels like image recognition and artificial intelligence. The 'Convolutional Neural Network' (CNN) is introduced to guide images and examine packages for signs of disease or tampering, ensuring clients feel safe when entrusting their valuables to these affluent arms. The 'Chronicle of Previous Orders' takes on a futuristic appearance, providing customers with a symphony of updates to silence any discord. The 'Scheduled Courier Service Platform' is at the core of the framework, combining technologies to create a safety minuet and reliability sonnet. CNN gives life to investigation and sheds light on unfolding tapestries in real time.

II. BACKGROUND STUDY AND LITERATURE SURVEY

E-commerce and online shopping have propelled the courier service industry in today's dynamic business landscape. Due to the rise of online marketplaces, reliable, customer-focused shipping options are in high demand. Courier services have grown from a logistics provider to a key enabler of customer satisfaction, helping companies connect with their customers.

E-commerce has changed the way businesses operate worldwide by eliminating distance barriers. Delivery services face opportunities and challenges as shoppers can access a wide range of global products with a click. New methods are being developed to meet customer demands for faster shipping, more secure packages, and more personalized service.

Customer-friendly, island-wide courier service platforms are a comprehensive strategy for meeting today's complex consumer needs to adapt to these changing conditions. These platforms redefine delivery logistics with a holistic ecosystem that includes delivery routing optimization, real-time performance tracking, semi-automated customer support, and cutting-edge security.

This literature review explores these emerging platforms and the developments, challenges, and technological innovations that shape modern courier services. Focus areas for our investigation include:

Delivery Routing Optimization: In order to improve service quality, customer satisfaction, and the overall efficiency of courier operations, we will examine the methods these platforms use to track and predict performance.

Performance Tracking System: In this subtopic, we'll look at how AI-powered machine learning, NLP technologies, and other cutting-edge solutions are integrated into island-wide courier service platforms to better serve customers.

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Semi-automated Customer Support System: This subtopic will investigate how Customer Supportive, Island-wide Courier Service Platforms integrate AI-powered chatbots, NLP technologies, and other innovative solutions to provide responsive and personalized customer support.

Security, Damage Detection, and Authentication: We will look at how these platforms use tools like real-time damage detection, blockchain-based authentication, and biometric security protocols to keep your packages safe during transit.

This literature review examines these subtopics to present a complete picture of Customer Supportive, Island-wide Courier Service Platforms. This research aims to illuminate the revolutionary potential of these platforms, the problems they solve, and the opportunities they offer in the quest for customer-centric excellence in the modern courier industry.

Effective shipping routing is crucial for modern courier services, as it directly affects operational success, client satisfaction, and profitability. In a punctual world, optimized routes reduce delivery times, waste, and efficiency. With the rise of e-commerce and same-day shipping, it's important to navigate congested cities without missing deliveries. Efficient routing improves the courier service's environmental and financial sustainability, dependability, and customer focus.

Optimization Methods Research: Delivery routing is a complex problem with many optimization methods:

Genetic algorithms, for instance. Genetic algorithms mimic natural selection to improve answers. Genetic algorithms helped Sirinukunwattana and Leelapatra [1] solve the courier routing problem by reducing the number of stops and transit time.Ant colony optimization uses iterative pheromone updates to find the shortest paths, inspired by ants' foraging behavior. Singh and Patnaik [2] optimized delivery routes using the method's ability to handle complex route networks.

Thirdly, integrating real-time traffic data allows optimization algorithms to adapt to changing road conditions. Zhou et al. [3] optimized travel times using real-time traffic data to combat urban congestion and traffic variability.

Machine learning algorithms are effective for route optimization. Le et al. [4] improved delivery routes using the random forest algorithm, showing that data-driven solutions can improve routing accuracy.

Optimizing delivery routes has been the subject of numerous academic studies and technological platforms.

When determining the best route, "Optimum Route" considers available vehicles, time windows, and traffic conditions. Resource and travel path optimization is the platform's main function.

"Swift Route" integrates data in real time and uses complex algorithms to find the best routes for unpredictable traffic. This platform emphasizes adaptive routing in dynamic cities.

"Route Master" uses genetic algorithms and machine learning to find the best routes. The platform considers volume, urgency, and traffic to improve last-mile deliveries.

These resources show that delivery route optimization is a rapidly evolving field with many approaches. Optimization methods for timely, accurate, and customer-centric deliveries are shaping courier services.

Delivery Routing Enhancements:

Effective Shipping Routing: Meaning

Modern courier services have effective delivery routes since they affect operations, client satisfaction, and profitability. In punctual societies, optimized routes decrease delivery delays and waste and boost efficiency. With e-commerce and same-day shipping, congested regions must be navigated without missing deliveries. Efficient routing improves courier service and fuel and vehicle wear.

Methods of Optimization Research:

Complex delivery routing has led to many optimization solutions. To begin, genetic algorithms Genetic algorithms optimize solutions like natural selection. Genetic algorithms saved Sirinukunwattana and Leelapatra [5] time and distance in courier routing.

Inspired by ants' foraging, ant colony optimization uses repeated pheromone updates to discover the shortest pathways. This strategy optimized delivery routes for Singh and Patnaik [6]'s complex route networks. Optimization algorithms adapt to road conditions using real-time traffic data. Zhou et al. [7] used real-time traffic data to manage urban congestion and volatility to shorten journey lengths.

Travel plans can be optimized by machine learning. Le et al. [8] upgraded delivery routes using random forest, demonstrating that data-driven strategies can improve routing accuracy.

Research Databases and Tools:

Technological platforms and academic studies have optimized delivery channels. “Optimum Route" finds the fastest routes based on trip time, automobile availability, and

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traffic using machine learning and AI. The platform optimizes travel and resources.

"Swift Route" designs dynamic traffic-optimal routes using cutting-edge algorithms and real-time data. This method promotes dynamic city adaptive routing.

Machine learning and genetic algorithms help "Route Master" choose the best routes. This tool calculates last-mile delivery efficiency based on volume, urgency, and traffic.

Semi-automated customer support:

Courier firms value fast, helpful service. Fast responses, problem-solving, and targeted contacts increase client loyalty. Customers want speedy service; thus, an adaptive support system is essential. Semi-automated customer service approaches change the game. sentiment analysis, and speech recognition improve customer service and response times.

An interactive voice response (IVR) system answers calls and directs callers to various language and help options. The system then forwards the call information and recording to the middleware, which manages the data exchange between the various components. The speech-to-text API, natural language processing (NLP) team, and backend API from Google are all interacted with by the middleware. The middleware takes the incoming IVR request, sends it on to the backend API and Google's speech recognition API, and then passes along any results from the latter to the former.

Security, authentication, and damage detection:

Tough courier security, package integrity, and identification. Authentic recipient identification and tamper-proof packaging protect delivery and customer trust. Tampering and theft require cutting-edge technology.

Courier services aim to detect and address damage or tampering in packages before they reach their intended recipients. This is achieved using advanced technology, including image recognition, to reveal even the smallest details of manipulation. This project also extends to tamper-evident packaging, using QR codes as guardians to detect any impropriety or intrusion. The goal is to ensure the package is monitored and handled with care until it reaches its intended recipient.

Big publications and services have enhanced security and authentication. Unusually, "Safe Cargo" alerts of potential risks in real time using impact and temperature sensors. Cryptography in "Guardianship" follows packages permanently on Blockchain. For tamper-proof ownership transfers, "Secure Delivery" uses biometric authentication.

With these advancements, the courier sector shows its commitment to safety, reliability, and efficacy in changing times. Parcels may arrive securely thanks to security innovations.

Prospective Trends and Strategies:

New courier service trends and technologies will transform the industry, affecting businesses across the island. Constant monitoring using IoT devices is a key advance. Smart sensors and GPS trackers will give clients and delivery services unmatched package tracking.

AI and ML will also boost infrastructure performance. With AI-powered predictive analytics, businesses can adjust their services and offerings to customers' demands. Furthermore, machine learning algorithms will adapt routing optimization models to traffic patterns, weather conditions, and client behavior, improving delivery operations.

Biometric package access control is vital for future planning. As the technology advances, biometrics like fingerprint or facial identification will ensure handoff safety. Blockchain will also be used to provide a visible, tamper-proof, and decentralized record of every delivery stage, ensuring package authenticity and integrity.

Super-personalization is the future of customer service. AI chatbots will realistically mimic human discussions thanks to advanced natural language processing. Sentiment analysis can predict customer contentment, allowing for appropriate interventions to correct negative factors. Voice recognition will be more natural and seamless when it can pick up subtleties.

Conclusion:

Conclusion: The literature review illuminated the changing landscape of island-wide courier service platforms that emphasize consumer needs. Modern technology improves delivery routing, performance monitoring, customer service automation, and security. To meet customer needs, optimize operations, and ensure safe deliveries, these cutting-edge technologies are being adopted.

The courier sector's difficulties must be addressed holistically, according to the poll. Automation and platforms that enable cross-departmental integration are the keys to great customer service and increased efficiency. Unmatched reliability, safety, and customer service set courier services apart and build loyalty.

As a result, customer-friendly island-wide courier service systems are both a technology and commercial essential for long-term success in a dynamic market. Businesses need these

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innovations to meet client wants, exceed expectations, and thrive in today's competitive market.

III. METHODOLOGY

This research aims to develop an efficient delivery routing system for an island-wide courier service platform, addressing the current inefficient system.

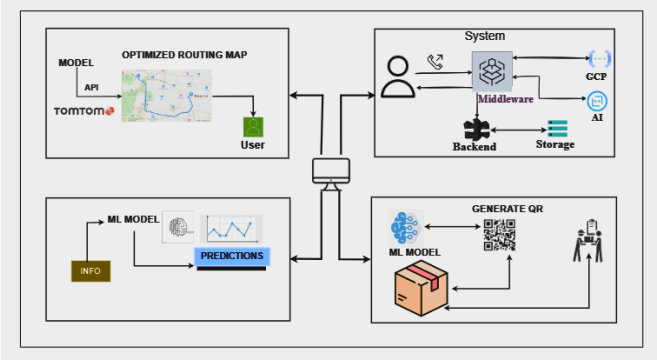

Figure 1: Overall System Diagram

Delivery Routing Optimization

Effective delivery routes require careful control of traffic, delivery times, and vehicle movements. Research on heuristics and machine learning has provided valuable insights, but more work is needed to create a reliable and extensible system. Integration of real-time traffic and user preferences is crucial for optimizing the process. Feature selection, which can be improved through correlation analysis or domain expertise, is essential for enhancing precision and productivity. Oversampling and under sampling can be used to equalize data sets, and empirical studies can identify the most effective methods for resolving imbalances. Data partitioning into training, validation, and test subsets is crucial for reliable delivery routing systems. Time-based, stratified, and random sampling methods improve precision by identifying patterns and avoiding overfitting. A 1D-Convolutional Neural Network and a Long Short-Term Memory (LSTM) neural network are used to maximize efficiency while minimizing costs and time. Probabilistic simulated annealing is a technique for optimizing complex systems. Model accuracy and reliability can be assessed in several ways. Recall is the frequency of correct identification, while precision and accuracy indicate prediction accuracy. F1 scores combine accuracy and recall, making them beneficial for unbalanced data sets.

Performance Tracking

A performance tracking system requires analyzing island-wide courier service platform study papers. Delivery progress and client preferences are revealed by this analysis. Historical delivery, customer, and courier data enhance performance tracking. Customer data predicts customer attrition and preferences, whereas previous delivery data reveals courier behavioral patterns. In parallel, courier data shows high-performing couriers and places that need training or support. Consumer behavior and courier efficacy are identified through surveys and data mining.

Preparing historical delivery data requires numerous steps. After removing duplicates, adjusting values, and converting formats, data can be analyzed. Courier data, including delivery locations and timestamps, must be preprocessed, and cleansed for delivery success prediction and customer churn models. Time periods or courier IDs can categories data, and duplications and errors are rigorously deleted to assure correctness.

Table I: Accuracy for delivery success prediction

	Accuracy	Recall	Precision	F1_score
SVC	0.930	1.0	0.925926	0.962963
Randomforest	0.965	1.0	0.961538	0.980392
Logistic Regression	0.965	1.0	0.961538	0.980392

Engineers and feature choices optimise courier service performance tracking. Features that reflect delivery success and customer attrition are selected using statistical methods and subject experience. The moniker implies that feature engineering enhances accuracy and efficiency. Orchestration reveals patterns and trends, facilitating tracking.

Correcting dataset imbalances and creating a balanced and representative sample prevents biassed models and poor results. This field usually oversamples well. The method improves model efficiency and delivery routing. The sample technique's usefulness depends on dataset quality and the complex problem environment, so empirical investigation is needed to build the suitable imbalance mitigation framework for courier service performance tracking.

Data preparation must include significant or independent factors. This stage normalises data within limitations, indirectly speeding processing. A reliable courier service tracking system requires model selection. Random Forests train on specific datasets and evaluate accuracy, precision, recall, and F1-score. Metrics determine optimum model. This top-rated algorithm predicts delivery and customer turnover rates and ranks prior performance. Thus, courier efficiency and administration improve greatly.

The goal of several strategies is to determine the best accurate extrapolation model. Precision and accuracy measure the model's ability to predict overall and true positives. Recall

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measures how well the model predicts good outcomes from positive data. Accuracy, precision, recall, and F1-score assess model performance. The F1-score balances accuracy and recall for uneven datasets.

Semi-automate customer support system

Natural language processing (NLP) is crucial for improving the quality of service in domestic courier services. Managing a call center can be time-consuming, and implementing strategies to address this issue is essential. A proposed solution includes an Interactive Voice Response (IVR)-based call management system, middleware tools that facilitate communication between IVR and NLU, a web-based app for customer support reps to understand system responses, and a part of the online app for users to contact support with inquiries.

Communication with customers is facilitated via SMS, email, or phone call systems. NLP-based models are used to identify customer questions and convert voice-based inquiries into text-based language. The system then analyzes these communications for opportunities to offer support and directs information requiring external support to the most suitable channels.

When a customer calls, an IVR system answers the call and directs them to the most relevant department based on their preferences. The system records tracking numbers and allows clients to contribute necessary information for subsequent operations. The recorded audio clips are altered using an NLP model and textual queries, indicating search terms needed for support results..

Safety Secured Damage Detection packaging System

The proposed courier service platform focuses on optimizing operational efficiency by integrating dynamic tracking, real-time monitoring, and performance metrics such as delivery volume, average delivery time, and customer issue volume. It also incorporates interactive authentication through QR codes, allowing customers to scan them for package legitimacy verification. The third component focuses on customer satisfaction through adept customer support, incorporating tools like chatbots for immediate query response, a helpdesk system for issue documentation, and a mechanism for gathering feedback and enhancement suggestions.

The Safety Secured Packaging Strategy component ensures secure and unaltered package delivery using advanced technologies like image recognition and machine learning to identify potential damage or tampering during transit. The platform also incorporates order tracking technology, allowing customers to monitor previous orders and trace real-time progress, providing swift updates on deliveries and prompt resolution of issues. The platform aims to redefine industry standards and achieve heightened excellence in the courier service sector by harnessing CNN for damage detection and real-time tracking technologies. This innovative approach aims to enhance the safety and reliability of the delivery process in the courier service sector.

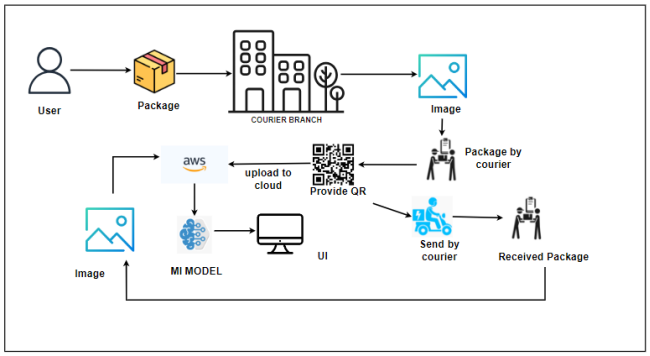

Figure 5: Safety Secured packaging System

IV. FINAL RESULT

This research project aimed to create a cutting-edge web-based application for courier firm personnel, focusing on improving courier service. The application integrated various components, including a sophisticated delivery routing system, smart performance tracking, automated customer support, and failsafe, damage-detection packing. The system used algorithms and real-time data to optimize route planning, enhance resource allocation, and improve delivery times. A predictive analytics and machine learning performance tracking system was also integrated, revealing customer attrition and delivery success patterns. This proactive strategy led to increased customer satisfaction and brand loyalty.

The semi-automated customer assistance ecosystem demonstrated technological capability, handling customer questions, complaints, and support requests using artificial intelligence and natural language processing. This resulted in faster response times, fewer errors, and higher customer engagement. The integration of a security-oriented, damage-detection packaging system changed the paradigm, detecting transportation dangers and reducing product damage due to real-time alarms. This integration improved consumer trust, reduced product impairment-related economic losses, and boosted the courier company's commitment to safe delivery.

The web-based tool enables courier firm workers to simplify workflows, make data-driven decisions, and provide outstanding customer service. Technology and automation change client expectations while optimizing corporate operations and resource stewardship in the courier industry.

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V. FUTURE WORK

This study has many areas for improvement that could greatly expand its scope and depth. This study covers some ground in the courier service framework, but there are likely many other subtleties that could be improved. We focus on delivery routing, a crucial underpinning that requires careful consideration and technical finesse.

Dynamic Scheduling is an attractive way to improve the scheduling infrastructure and make it more flexible to meet delivery requirements and constraints. This dynamic framework improves operational efficacy by adapting schedules to avoid bottlenecks and maximize resources.

Benchmarking introduces a new comparative paradigm for assessing the platform's efficacy in this context. This analytical journey compares performance data to industry norms to find success and improvement areas. The conclusions of this work illuminate development and guide strategic recalibration and improvement.

Adding machine learning techniques could revivify automated responses with cyclical fervor. These algorithms surpass automation by synthesizing learned knowledge from previous interactions to become adaptive beings with their own intelligence.

Blockchain technology, which promises total transparency and record accuracy, is then discussed. Blockchain in delivery records protects integrity, eliminates discrepancies, and gives all parties unshakeable confidence in record veracity.

In conclusion, this study suggests a symphony of evolution with room for technical improvement. Dynamic scheduling, benchmarking, machine learning, and the blockchain's impenetrability make delivery routing a laboratory. As the investigation continues, these nuances will form a rich tapestry of technical excellence, creating a courier service platform on the verge of brilliant innovation.

VI. CONCLUTION

Our research focused on four key components: the development of an efficient delivery routing system, the implementation of a performance tracking system using customer churn and delivery success prediction, the creation of a semi-automated customer support system, and the integration of a safety-secured damage detection packaging system.

By leveraging advanced algorithms and real-time data, our research demonstrates the ability to achieve optimal route planning considering various factors such as traffic conditions, delivery priorities, and customer preferences.

This system provides faster response times, reduces human errors, and streamlines customer communication, ultimately improving customer satisfaction and alleviating the workload of customer support agents.

By utilizing advanced sensor technologies, such as impact and temperature sensors, our research enables the real-time detection of potential risks during product transit.

Through the development of an efficient delivery routing system, implementation of a performance tracking system using customer churn and delivery success prediction, creation of a semi-automated customer support system, and integration of a safety-secured damage detection packaging system, the courier service industry can achieve enhanced operational efficiency, service quality, and customer satisfaction.

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