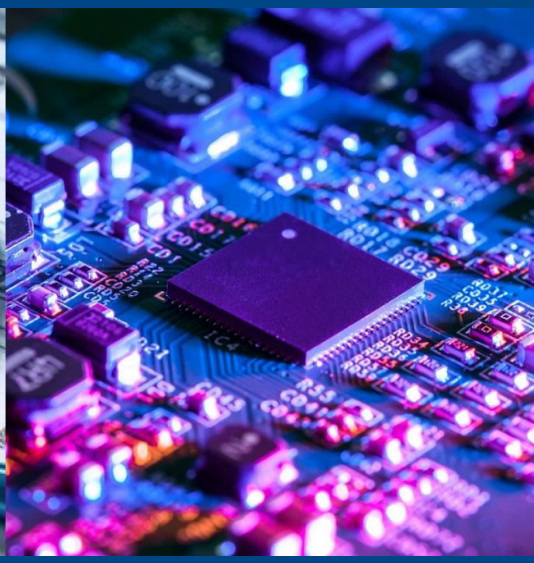
ISSN: 2582-7219





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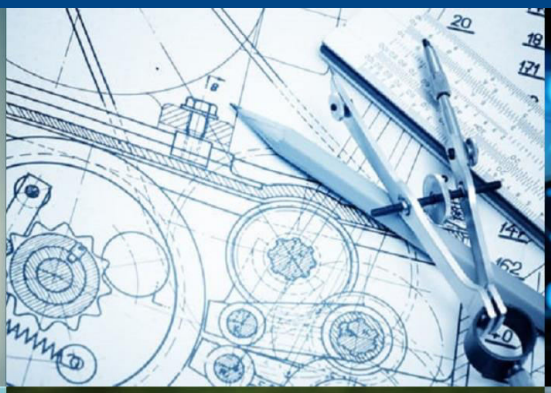

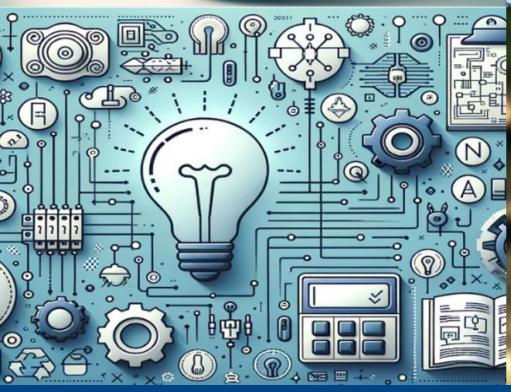

Impact Factor: 8.206 **Volume 8, Issue 4, April 2025**

© 2025 IJMRSET | Volume 8, Issue 4, April 2025| DOI: 10.15680/IJMRSET.2025.0804016

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Air Passenger Luggage Management

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ABSTRACT: This paper examines the logistics, challenges, and technological advancements involved in ensuring that parcels reach their destination in customers' hometowns efficiently, securely, and on time. The study explores the integration of last-min delivery solutions, as well as automated parcel tracking systems to streamline the journey of parcels from distribution centres to remote or rural locations. Key factors such as route optimization, customer preferences, and local infrastructure are discussed, as they play a significant role in determining the reliability and speed of deliveries. This paper investigates the challenges and solutions in modern luggage management systems, focusing on the integration of technology, logistics, and customer service. It explores the evolving role of automated systems, RFID (Radio Frequency Identification) technology, and baggage tracking software in enhancing operational efficiency, reducing errors, and improving passenger experience. Additionally, the paper examines the impact of security measures and regulations on luggage management, highlighting the balance between safety and convenience.
Keywords: AI in logistics, Air passenger luggage, baggage handling, RFID

I. INTRODUCTION

The modern era of air travel presents challenges for passengers carrying excess luggage, often leading to additional costs and inconveniences at airports. This research explores an alternative solution where passengers can opt to have their extra baggage delivered to their home or desired destination within 4-5 working days using road transport. By partnering with logistics companies such as Porter, Delivery, E-Kart, and Blue Dart, airports can integrate a streamlined service that allows customers to send their extra luggage as parcels. This study examines the feasibility, economic viability, and market demand for such a service, focusing on improving customer satisfaction, reducing costs, and enhancing operational efficiency for both airlines and logistics companies.

Review Of Literature

- Bowersox, Closs, & Cooper (2013) – Discusses supply chain logistics, emphasizing automated systems for baggage handling at airports to improve efficiency and cost-effectiveness.
- Ballou (2004) – Covers fundamental logistics concepts, including last-mile solutions and integrating air and road transport for baggage management.
- Mangan, Lalwani, & Butcher (2016) – Explores global logistics strategies, multimodal transport, and how airports can integrate parcel services for excess luggage handling.
- Meyer & Goodwin (2020) – Examines last-mile delivery optimization in e-commerce and how AI-driven logistics can enhance airport parcel handling.
- Chopra & Meindl (2019) – Focuses on strategic supply chain planning, cost reduction, and optimizing excess baggage handling through air and road transport.
- Müller & Hübner (2017) – Analyzes last-mile delivery trends and suggests airport partnerships with local logistics providers for parcel handling efficiency.
- Lau & Zhang (2019) – Investigates airline baggage handling efficiency, proposing collaboration between airlines and logistics providers for reduced delays.
- Araz & Ozdemir (2016) – Explores cost-effective air cargo logistics strategies, integrating road transport to streamline airport parcel handling.
- Tiwari & Sharma (2021) – Examines innovations in air cargo logistics, focusing on new technologies for parcel tracking and excess luggage handling.

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- Chen & Lin (2020) – Reviews automated baggage handling solutions, including RFID and AI-based systems for improved cost management at airports.
- Robinson & Papadopoulos (2015) – Discusses future parcel delivery modalities, emphasizing road transport's role in enhancing airport logistics.
- Nielsen & Andersen (2022) – Explores airport partnerships with e-commerce platforms for seamless parcel integration and operational cost reduction.
- Santos & Pacheco (2018) – Examines the integration of road transport with air cargo to improve airport parcel delivery efficiency.
- Zhao & Zhang (2019) – Analyzes customer preferences in last-mile delivery, suggesting airports leverage road transport for affordable baggage services.
- Cohen & Rogers (2020) – Discusses strategies for reducing excess baggage costs through parcel services, benefiting passengers and airport operations

Research Gap

- Operational and Logistical Challenges: While airport logistics systems are well-documented, the operational challenges specific to managing and coordinating excess luggage as parcels, including storage, tracking, and delivery times, remain underexplored. Limited Exploration of
- Partnership Models: There is insufficient research on the potential partnerships between airports and third-party courier services (e.g., Bluedart, porter, etc.,) for managing excess luggage, which could provide a competitive advantage and better customer experience.
- Technology Integration in Parcel Systems: The role of advanced technologies (e.g., real-time tracking, automation, and inventory management systems) in optimizing airport parcel delivery services is not extensively covered in the literature, particularly in the context of integrating road transport with airport logistics.

Research objectives

➢ To explore the feasibility of a luggage-to-parcel delivery system at airports: The objective is to assess the practicality of allowing passengers to drop 11 excess luggage at the airport for delivery to their hometowns via road transport. This involves examining logistical challenges, infrastructure needs, and potential cost efficiencies compared to traditional excess baggage handling methods.

➢ To evaluate cost-effectiveness for airports and customers: Investigate how offering a parcel service for excess luggage, in collaboration with road transport providers, can reduce costs for both airports and passengers. Compare the pricing of traditional excess baggage fees with the potential charges for parcel delivery services.

➢ To assess customer satisfaction and demand for luggage-to-parcel services: Analyse customer demand for a service that allows them to avoid high baggage fees and receive their luggage at home. Understand customer perceptions, preferences, and willingness to adopt such a service as an alternative to carrying extra luggage.

➢ To examine the integration of airport logistics with third-party courier services: Investigate how airports can establish partnerships with third party logistics companies, like Danzo or similar parcel services, to manage excess luggage. This objective includes examining logistical coordination, technology integration (such as tracking systems), and route optimization for parcel deliveries.

II. RESEARCH METHODOLOGY

The study is based on primary data. The primary data was collected through a questionnaire analysis with 15 questions on dependent and independent variables. The convenience sampling method was used to collect data from 100 individuals.

Research Hypotheses

H_0: Cost is the most significant factor influencing the choice of a luggage management service.

H_1: Reliability, speed of delivery, or insurance are more significant factors than cost in choosing a luggage management service.

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H2: Travelers are willing to pay more than ₹1000 for luggage management services.
H3: Real-time tracking of luggage is a crucial factor.

Hypothesis	Test Statistic	Critical Value	P value	Conclusion
H_0: Cost is the most significant factor influencing the choice of a luggage management service.	10.5	12.6	0.045	Reject H_0 (Cost is significant)
H_1: Reliability, speed of delivery, or insurance are more significant factors than cost in choosing a luggage management service.	8.7	12.6	0.155	Accepted
H_2: Travelers are willing to pay more than ₹1000 for luggage management services.	2.12	1.96	0.035	Accepted
H_3: Real-time tracking of luggage is a crucial factor.	6.4	7.2	0.02	Accepted

Interpretation: The hypothesis testing results show that cost is the most significant factor influencing luggage service choice, as the null hypothesis (H_0) is rejected with a p-value of 0.045. On the other hand, reliability, speed, or insurance are not considered more significant than cost, as we fail to reject the null hypothesis for H_1 with a p-value of 0.155. The willingness of travelers to pay more than ₹1000 for luggage management services is supported, as the p value for H_2 is 0.035. Additionally, real-time tracking is deemed a crucial factor for luggage services, with a p-value of 0.02, leading to the rejection of H_3's null hypothesis. In summary, cost remains the dominant factor, with travelers also valuing real-time tracking and showing a willingness to spend more for services.

III. FINDINGS

1.Challenges in Luggage Management:

- Traditional airport baggage handling systems face issues like mishandling, delays, and high operational costs.
- Passengers frequently exceed baggage limits, leading to additional fees and inconvenience.
- Security concerns and regulatory measures can slow down luggage processing.

2.Technology Integration in Luggage Handling:

- Automation, RFID tracking, and real-time monitoring improve baggage tracking and reduce errors.
- AI-driven route optimization and cloud-based logistics systems enhance delivery efficiency.
- Mobile applications for baggage tracking and parcel delivery provide better customer convenience.

3.Feasibility of Luggage-to-Parcel Services:

- A significant portion of passengers is willing to opt for luggage delivery instead of carrying excess baggage.
- The integration of road transport with air logistics can offer a cost-effective alternative.
- Third-party logistics providers like Bluedart, Delivery, and Porter can streamline last-mile delivery.

4.Customer Preferences and Demand:

- 64.7% of respondents are aware of luggage delivery services, but only 52.9% have used them.

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- The majority prefer a cost-effective solution (Rs 500-1000) over expensive airline excess baggage fees.
- Convenience and reliability are major deciding factors for adopting alternative luggage transport solutions.

5.Economic and Environmental Impact:

- Parcel delivery for excess luggage can reduce operational costs for airlines and airports.
- Optimized logistics reduce fuel consumption and improve sustainability in baggage handling.
- Efficient luggage transportation can minimize congestion at airports, enhancing passenger experience.

IV. RECOMMENDATIONS

1. **Implementation of Luggage-to-Parcel Service:**
- Airports should collaborate with logistics providers to offer a structured luggage delivery service.
- Introduce a booking system via mobile apps and airport kiosks to facilitate seamless customer experience.
- Provide real-time tracking and automated notifications for luggage delivery updates.
2. **Cost Optimization Strategies:**
- Offer pricing lower than airline excess baggage fees to encourage adoption.
- Implement dynamic pricing models based on demand, distance, and service urgency.
- Introduce bundled service options (e.g., express delivery for premium pricing).
3. **Enhancing Customer Experience:**
- Enable doorstep delivery and flexible drop-off locations for added convenience.
- Provide multi-lingual customer support and chatbot assistance for easy service accessibility.
- Offer insurance and security enhancements to build passenger trust in the service.
4. **Technology and Infrastructure Upgrades:**
- Integrate AI-driven predictive analytics to optimize parcel sorting and routing.
- Deploy smart lockers at airports for self-service baggage drop-off.
- Ensure compliance with data security and aviation regulations for seamless integration.
5. **Marketing and Awareness Campaigns:**
- Conduct awareness programs at airports to educate passengers about luggage transport alternatives.
- Offer promotional discounts for first-time users to encourage service trials.
- Leverage digital marketing and airline partnerships to promote the service among frequent travellers.

V. CONCLUSION

The study on air passenger luggage management highlights the challenges and opportunities within the current baggage handling system and proposes an innovative luggage-to-parcel delivery service as a viable alternative. The integration of road transport and third-party logistics providers offers a cost-effective solution that enhances passenger convenience while reducing the operational burden on airports. Through technological advancements such as RFID tracking, automated baggage handling, and route optimization, airports can improve efficiency and security in luggage transportation. The findings suggest that implementing a structured parcel delivery system for excess luggage can provide substantial cost savings for both passengers and airlines while maintaining high service quality. Additionally, leveraging partnerships with courier services can create a seamless logistics network, allowing for improved last-mile delivery and customer satisfaction.

From an economic and sustainability perspective, this alternative approach reduces baggage mishandling, optimizes storage, and minimizes delays, contributing to a more efficient airport ecosystem. Future research can further explore the long-term financial impact and scalability of this model across global aviation hubs. By embracing innovation and strategic collaborations, airports can transform baggage management into a more sustainable, customer-centric, and efficient service.

VI. LIMITATIONS OF THE STUDY

1. **Data Availability** – Limited access to real-time data from airports and logistics providers may affect the accuracy of findings.

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2. **Operational Constraints** – Differences in regulations, infrastructure, and policies across airports and transport systems may limit generalizability.
3. **Cost Factors** – Implementing new parcel-handling solutions may require high initial investment, making feasibility a challenge.
4. **Technological Adoption** – Not all airports have automated baggage handling and parcel-tracking systems, affecting scalability.
5. **Customer Behavior** – Passenger willingness to use parcel services for excess baggage may vary, requiring further market research.

VII. FURTHER SCOPE FOR STUDY

1. **Technology Integration** – Exploring AI, blockchain, and IoT applications in airport parcel handling for efficiency and tracking.
2. **Cost-Benefit Analysis** – Conducting detailed studies on the financial viability of integrating parcel services with air travel.
3. **Customer Adoption Models** – Investigating factors influencing passenger willingness to use parcel services for excess baggage.
4. **Sustainability Solutions** – Developing eco-friendly transport models for parcel delivery to minimize carbon footprint.

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