Developing a Unified API for Shipping and Returns Management

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***Abstract*– This research looks at how unified APIs help improve e-commerce logistics and especially optimise shipping and returns. This research examines flaws in today's systems and shows how API solutions work along with reviewing literature and practical examples. This research discovered that connecting many logistics networks through one API system reduces costs and improves delivery while making shopping better for customers. This study explains how security issues and API implementation difficulties require detailed testing and secure system setup to overcome. Research shows that more companies need API-based logistics services yet calls for future analyses on predictable data use and network scalability with blockchain for small and medium companies.**

Index Terms*– *Unified API, e-commerce logistics, shipping management, returns management, API integration, operational efficiency, customer experience, reverse logistics, API security, data analytics, market growth, parcel shipping, logistics automation, and API adoption

I. INTRODUCTION

A. Background to the Study

E-commerce growth has deeply influenced global logistics companies through their shipping and return management strategy. Research shows e-commerce market will hit 16.4% market size by 2030 with about 30% returns creating major operational and customer experience hurdles [1]. The current e-commerce setup features unrelated shipping and return systems though the business field has developed. Shoppers struggle with unpredictable shipping prices along with missed delivery dates and unclear refund standards [2]. A study shows e-commerce logistics uses 10% to 15% of total expenses but shows problems where improvements are needed [3]. A shipping and returns API system would create operational integration to make processes faster and detect mistakes more quickly while sharing real-time delivery information to boost performance and customer service [4]. This research examines the advantages of creating a single API system that fixes functional issues while making e-commerce logistics better.

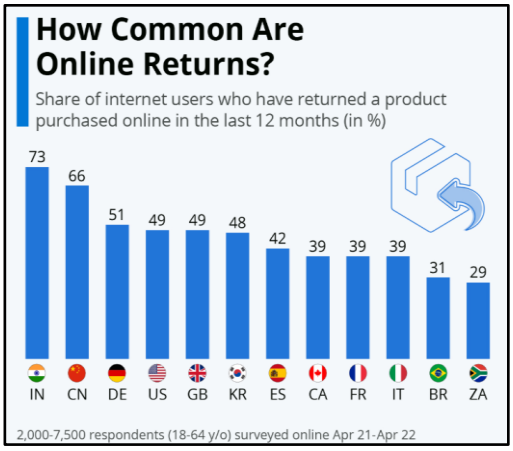

Figure 1: Online returns rate

[1]

B. Overview

This study examines the potential creation of one interface to control e-commerce shipping and return activities across different logistics systems. Today's systems operate poorly because logistics expenses make up 10 to 15% of total enterprise costs [5]. This analysis examines data from Amazon, Shopify, and DHL to show how APIs help companies work better and make their

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customers happier. The project seeks to resolve broken logistics chains and boost e-commerce effectiveness through coordinated API implementation.

C. Problem Statement

Shipping and returns logistics separation creates operational delays that add expense and disrupt customer satisfaction in e-commerce. As per the present studies, logistics challenges companies significantly in their costs necessitating immediate action to optimise performance. Poor system alignment creates processing hurdles that slow operations and make growth harder. Research tests whether a single API solution can help companies better manage their shipping and returns operations to reduce expenses and deliver better services.

D. Objectives

1) To analyse how shipping and returns management on different e-commerce marketplaces faces issues in present time. 2) To examine how e-commerce logistics would improve from an API to manage shipping and returns. 3) To research critical factors that enable systematic API integration to help operations run better and create significant customer experiences.

E. Scope and Significance

The scope of this research is to examine how a single API system can transform shipping and returns procedures in online retail stores. This fixes operational issues while linking all business areas and makes shopping better for customers. The research shows how improving logistics procedures creates easy-to-scale systems that save money and enable companies to produce better ideas for every stake in the e-commerce businesses.

II. LITERATURE REVIEW

Challenges in shipping and returns management faced by e-commerce businesses

E-commerce logistics needs significant strategies to handle shipping and returns problems effectively. According to a recent study, Slovakia experiences a 2.21% return rate and the global return rate is about 30% because consumers and logistics networks function differently between these areas [6]. Also, this has stated that China, the US and the UK are the three most prominent countries showing effective e-commerce selling successfully, and they dominantly used smart policies to manage these strategies (Referred to Figure 2). Further, a study has shown that the e-commerce logistics sector suffers from multiple issues touching order streams, inventory control and delivery speed [7]. This study has suggested that involving *Logistics 4.0 systems* with advanced technology like Artificial Intelligence and blockchain will be the most effective solution.

The study supports regional policy adjustments to match global practices while another study proposes complete process optimisation with smart route technology and data insights to solve issues. Research shows that sample biases and regional market conditions explain lower return rates [6]. However, another study recommends putting resources into collaborative logistics and automation to manage expanding industry operations [7].

These empirical researches have revealed return logistic issues with provide practical solutions that benefit global market competition. Both studies reinforce the urgent requirement for technology-based logistics systems that handle e-commerce operations better.

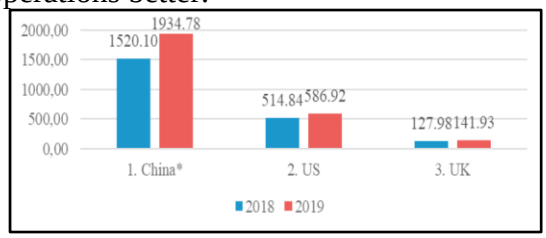

Figure 2: Highest e-commerce selling countries

[6]

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Benefits of implementing a unified API for shipping and returns

E-commerce logistics benefits from using one universal API despite differing opinions about its advantages and problems. A present study linking e-commerce data with logistics systems creates operational benefits and boosts customer satisfaction. Through their case study, the research shows how API-enabled return systems make it easier to assess performance while giving users better access to data [8]. Their study requires expansion to other companies before its results become universally applicable.

On the other hand, further, a study has shown that APIs bring cost savings and better integration tools for business operations and enhance SMEs' capability by letting them access live data, as referred to in Figure 3 [9]. Their research shows that SMEs face major challenges when adopting APIs including expensive deployment expenses and technical limitations. The integration of APIs faces obstacles across multiple logistics systems because they have not successfully connected to older existing platforms. Research needs to study how both technical and organisational barriers limit the effective use of APIs for e-commerce logistics development.

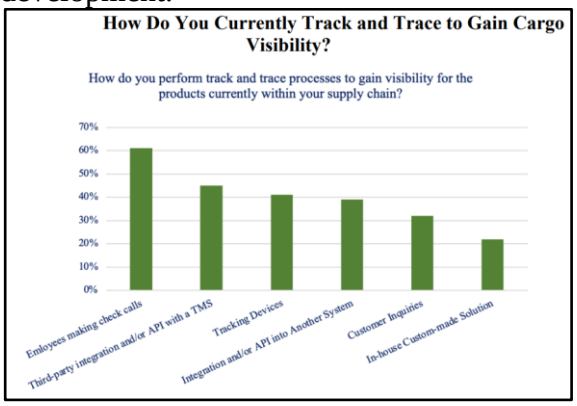

Figure 3: Benefits of API

[9]

Factors influencing the adoption and effectiveness of a unified API

Unified APIs help different industries improve digital connectivity but their success depends on establishing trust and privacy standards alongside making them easy to handle. Recent research has shown how *Perceived Privacy* and *Perceived Trust* help TAM work better for Open APIs and better customer satisfaction in the FinTech industry, referred to in Figure 4 [10]. Similarly, another study conducted by Kar, 2021, showing *trust* and *private information security* impact user satisfaction equally when exploring mobile payment systems. *Privacy feelings* directly influence the adoption process when systems process delicate user data as per this study.

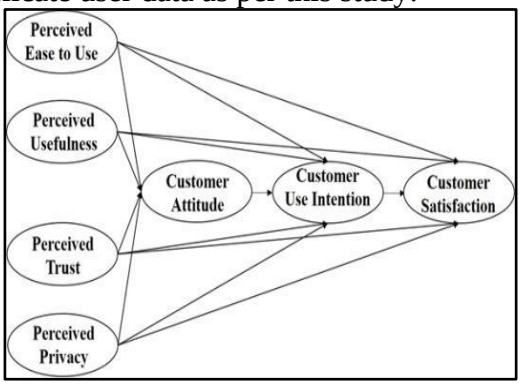

Figure 4: Modified Technology Acceptance Model (TAM) for the API integration

(Source: Wang, 2023)

The figure show that different factors receive different levels of emphasis. A study finds privacy and safety controls dominate since payments handle private money [10]. On the other hand, further study reveal less impact for ease-of-use and dependability in advanced systems used by tech-savvy users [11]. This study has developed the DSUSM model showing that user satisfaction results mainly from cost and response speed together with social pressure. An additive model of TAM shows how user adoption responds to concerns about privacy and usefulness [10].

These studies collectively illustrate a nuanced understanding that the early-stage technology sectors need privacy protection but the adoption of new products changes

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value considerations to reflect customer trust in their systems.

III. METHODOLOGY

A. Research Design

Explanatory Research Design studies relationships between factors to reveal why certain events happen and what is its consequences. This design investigates the reasons behind events and explains their mechanics through critical analysis [12]. This present research has followed ***an explanatory design*** to reveal issues and benefits related to shipping and returns in online shops. The research design examines real-world e-commerce operations to understand what factors cause operational problems and how unified APIs transform logistics performance to enhance customer experiences and smooth business operations. In order to generate valid outcomes this study focuses on the core relationships between causes and effects that impact these industry issues.

B. Data Collection

This research uses both ***qualitative and quantitative processes*** based on ***Secondary research data*** to develop a complete understanding of this subject. This study evaluates real-world e-commerce data from credible sources that demonstrate how companies handle their logistics, shipping and returns operations. The case studies show how companies handle real-world problems in supply chains today, this is considered qualitative data. Also, this study has reviewed numerical shipping and returns performance results obtained from reliable websites along with industry publications and secondary records for the qualitative data [13]. This integrated approach gives complete knowledge by combining real-world experiences.

C. Case Studies/Examples

Case Study 1: AfterShip's Unified Tracking and Returns Management

Through a single platform, AfterShip connects to 1,100 global shipping services such as UPS FedEx and DHL [14]. Through this integration retailers get tracking information for multiple carriers in one place. Hence, they can show this data on their website and monitor delivery performance over time. The system simplifies shipping tracking and returns management through automated tools which boost business performance and improve how customers are treated.

Case Study 2: Returnless Refunds by Major Retailers

Major US-based retailers, like, Amazon, Walmart and Target now provide *"returnless refunds,"* without making them send back unwanted items. This method lowers shipping costs and decreases both the processing time and total expenses involved in return processing. When customers return easy-to-discard low-cost goods or specific expensive items some retailers honour their refund request without needing a physical return [15]. This refund method protects against fraud cases. Systems use purchase and return information to select eligible customers. Retailers find that offering returnless refunds builds stronger relationships with customers.

Case Study 3: Automated Returns Management by eDesk

The e-commerce support solution eDesk applies automation and data analytics technology to simplify how businesses handle returns. Through its platform integrations, eDesk helps companies handle refunds and returns more effectively which enhances customer satisfaction and customer returns [16]. They train their staff to process return and refund requests effectively while empowering them to support customers better. Businesses use return data analysis to strengthen their return handling system practices.

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IV. RESULTS

A. Data presentation

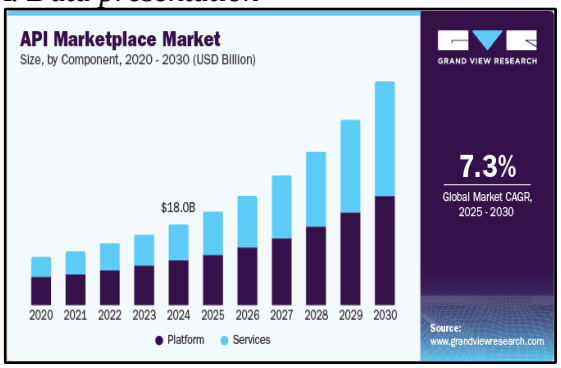

Figure 5: API growing market demands [17]

The chart shows that API Marketplace revenue will increase by 7.3% each year from 2023 to 2030 according to forecast data. The marketplace segment will grow to $18.0 billion in business by 2030. The graph breaks down the market into two components; Platform and Services. The Services segment will show faster growth than the Platform segment enabling Services to take over more market share by 2030 [17].

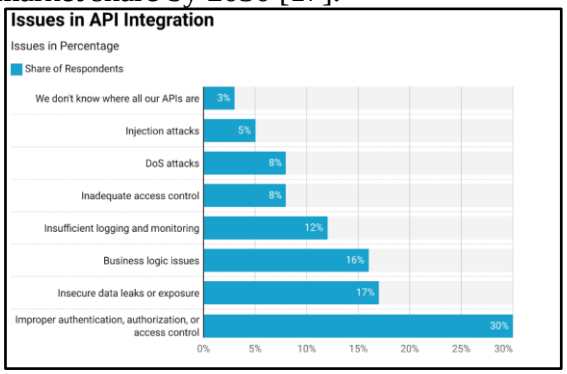

Figure 6: Potential challenges faced to primarily integrated API [18]

This visual presentation shows the main problems designers frequently encounter when connecting APIs. Inadequate user verification measures account for 30% of security issues and insecure data leakages represent 17%. Most API integration problems involve business logic mistakes and failure to provide enough logging information (12%) along with Distributed Denial of Service attacks and vulnerabilities representing 8% and 5% [18]. This shows that good API security needs strong access restrictions with complete tests during API integration.

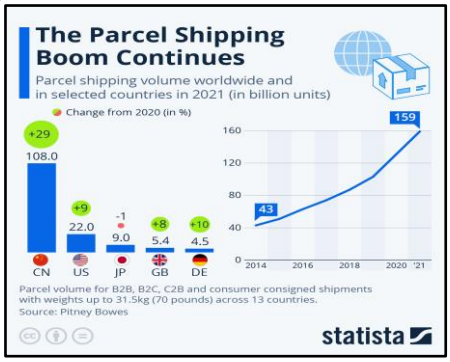

Figure 7: Increased Parcel Shipping Rate [19]

The graph demonstrates global shipping package use reached 159 billion units in 2021 after expanding steadily from 2014 to 2021. China ships 108 billion parcels yearly with 22 billion handled by the United States. The international package shipment numbers surged by 29% in 2021 and rose sharply in Germany by 10% and the UK by 8%. The visualisation shows that the digital shopping boom leads to more shipping activities [19].

B. Findings

The visual presentations help achieve research goals by showcasing important shipping and return management challenges in API systems. The research confirms how good security systems and well-established API business logic prevent issues in this area and help achieve. Thus, meet the goal of discovering what makes systematic integration work. The growing API market forecasts show that API solutions remain vital in logistics as companies search for new ways to use API technology effectively. New API solutions must be developed to support both shipping operations and e-commerce logistics because of the significant number of parcels people ship globally.

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C. Case study outcomes

Case Study	Key Outcomes	Relevance to Present Research
AfterShip's Unified API for Tracking and Returns	AfterShip enables e-commerce businesses to integrate multiple shipping carriers through a single API, automating tracking and return management. The unified API improves operational efficiency, and customer experience, and reduces errors in tracking shipments [14].	Demonstrates how a unified API can streamline the e-commerce logistics process, improving both shipping and returns management. It supports the idea of reducing operational complexities while enhancing customer service.
Returnless Refunds by Major Retailers	Retailers like Amazon, Walmart, and Target implemented returnless refunds, cutting costs and improving customer loyalty. The use of algorithms to assess eligibility for returnless refunds reduces friction in the return's process [15].	Highlights how innovative approaches to returns management (like automated eligibility) can be integrated through APIs to streamline returns. This supports the research focus on reducing logistical bottlenecks in e-commerce.
Automated Returns Management by eDesk	eDesk automates returns processes, integrating with e-commerce platforms to handle refunds efficiently. Data analytics are used to optimise return strategies, ensuring higher customer retention and improved efficiency [16].	Demonstrates the importance of automation in returns management, which aligns with the research goal of using APIs to optimise shipping and returns management in e-commerce.

Table 1: Case Study Analysis
(Source: Self-Created)

The case study analysis shows that connecting all business elements through APIs helps e-commerce companies better handle online deliveries and return items. AfterShip connects multiple shipping companies through one API interface to help

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businesses run processes faster and avoid mistakes. Major retailers use returnless refunds to show how automation improves return processing effectiveness and decreases costs while making customers satisfied. eDesks automated returns system supports data-based strategies to optimise returns handling. Reviewing these cases reveals how an organised API interface improves business operations and delivers improved customer interactions to improve online shopping logistics.

D. Comparative analysis

Authors	**Focus**	**Key Findings**	**Gaps**
[6]	Return logistics in Slovakian e-commerce.	Identifies inefficiencies in return logistics and highlights the importance of reverse logistics management for customer satisfaction and cost control.	Limited focus on technological enablers like unified APIs for streamlining return logistics.
[7]	Challenges and opportunities in e-commerce logistics.	Highlights operational challenges in e-commerce logistics, including last-mile delivery and reverse logistics, alongside opportunities like automation.	Does not address how APIs could address highlighted logistical challenges.
[8]	Data analysis in e-commerce return processes.	Emphasises the role of data analytics in optimising return processes and reducing inefficiencies in reverse logistics.	Lacks focus on integration of APIs for seamless data sharing and real-time tracking.
[9]	APIs in digital connectivity for SMEs in logistics.	Explores how APIs can improve connectivity between SMEs and logistics providers, enhancing efficiency and reducing costs.	Limited exploration of barriers to API adoption for small and medium-sized enterprises.

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[10]	Customer satisfaction and adoption of Open APIs in FinTech.	Privacy and trust are critical for user adoption; emphasise "perceived usefulness" and "ease of use" in driving customer satisfaction.	Focuses on FinTech, leaving broader applicability in logistics and other domains underexplored.
[11]	Satisfaction factors in mobile payments using the Digital Service Usage Satisfaction Model (DSUSM).	Identifies cost, trust, and information privacy as key determinants of satisfaction in digital services.	Does not address API-specific challenges or their role in improving satisfaction for logistics.

Table 2: Comparative analysis of literature

(Source: Self-Created)

The analysis shows that e-commerce logistics suffers from major performance problems because different shipping and return systems do not work together efficiently. Marketplace unification API systems can solve these problems by letting data flow freely between networks and making return processes easier to handle. Businesses use APIs best when these tools prove affordable, easy to employ, protect personal information and inspire customer confidence for better service quality and operational success. Despite these challenges from small businesses and technology that limit API use, there can be improved logistics and customer experiences by mitigating these obstacles.

V. DISCUSSION

A. Interpretation of results

This research explores how unified APIs can help E-Commerce companies manage shipping and returns better. This shows that API solutions are becoming more popular while market data predicts API will generate $18 billion in revenue by 2030 with 7.3% annual growth [17]. Visual presentation highlights the security and data protection problems that hinder successful API integration. Through real-world examples such as AfterShip and eDesk plus major retailer refund processes retailers show how API-powered solutions improve efficiency decrease spending and satisfy customers. Despite e-commerce logistics research highlighting its performance gaps usually neglects to explore how API integration enhances operations. This research shows that API integration should be integrated to solve system fragmentation issues by creating better data movement and work process flow. Implementing solutions to existing technology hurdles and expenses will make supply chain systems better while creating positive e-commerce shopping experiences.

B. Practical Implications

The study provides useful guidance for online shops that want better shipping and return handling processes. A single API platform helps businesses work better while saving money and making their customers happier. Businesses that use API technology can link multiple logistics networks while managing product returns better and tracking delivery progress in real-time. By addressing security problems and making API linking easier businesses will encounter fewer adoption

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obstacles while creating new logistics solutions globally.

C. Challenges and Limitations

The main problem of this research is that it depends on secondary data that might not show recent industry changes or unique business operations effectively [20]. Additionally, this qualitative research of case studies depends on subjective insights and the method to directly involve stakeholders has limited practical use in real-world settings.

D. Recommendations

Further research needs to gather direct information from industry participants through face-to-face interviews and survey questions to reveal field-based perspectives. Testing AI-based APIs and deploying the solution across online stores provides robust evidence to support the unified shipping and returns API.

VI. CONCLUSION AND FUTURE WORK

***Conclusion*–** This study shows how unified APIs can change e-commerce logistics by making shipping and returns better. Through examinations of specific situations and present market patterns this research shows how combining APIs helps companies run better operations at lower expense while serving their customers better. Research shows that reliable and safe APIs must exist to handle business error problems and digital threats. Significant increases in parcel deliveries and total API market use highlight because APIs matter to logistics efficiency and how they meet customer expectations.

***Future Work*–** Further research can create better machine-learning techniques to forecast information in API logistics systems. Combining blockchain techniques with APIs helps improve how data stays safe and transparent. By studying problem areas small businesses experience while adopting APIs and creating low-cost solutions there can help more e-commerce platforms use this technology.

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