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Analysis of Packaging Recycling Mode in Chinese Express Delivery Industry

Yang Yuchun[1,3], Rahinah Ibrahim[1*], Athira Azmi[1], Mohd Idris Shah Ismail[2]

[1] Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[2] Faculty of Engineering, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[3] Institute of Intelligent Manufacturing, Dongguan City College, Dongguan, Guangdong, China

*Corresponding Author: rahinah@upm.edu.my

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Abstract: *With the widespread adoption of smartphones and Internet technology, China's express delivery industry has experienced explosive growth. Concurrently, this surge has resulted in the substantial generation of express packaging waste, leading to substantial resource wastage and environmental pollution. There is a need to improve reuse of express packaging in order to reduce the express packaging garbage, and recycling constitutes a crucial step in the reutilization of express packaging materials. The purpose of this study is to investigate the recycling patterns in Chinese Express Industry. This study employed a systematic literature review synthesis method to assess trends, identify gaps, and recommend future approaches to enhance the reuse of express packaging. The focus was on analysing the recycling status, influencing factors, and improvement strategies related to express packaging recycling. Research findings indicate that the recycling of express packaging is confronted with challenges such as high recycling costs and low recycling efficiency in China. Therefore, this paper proposes the combination of low-cost standardized packaging for express delivery, along with consumer awareness of environmental protection and an efficient recycling system, can significantly boost the recycling and reutilization of express delivery packaging. This study will contribute to enhancing the reusability and recycling of express packaging by improving the recycling process, thereby reducing the generation of express waste and minimizing resource wastage.*

Keywords: Chinese express delivery industry, express packaging, recycling status, influencing factors, improving strategy

1. Introduction

With the increasing integration of smartphone intelligence and accelerated internet connectivity, e-commerce has experienced rapid growth in China, making online shopping a primary form of consumption for Chinese consumers. As a consequence, the express delivery industry has undergone rapid development. In January 2023, the China State Post Bureau announced that the annual volume of express deliveries in China had reached 11.058 billion shipments in 2022, maintaining its position as the world's leading country for nine consecutive years. This upward trajectory is anticipated to persist in the future. While the express delivery industry brings significant convenience to people's lives, it also generates a considerable amount of packaging waste, leading to resource depletion and environmental pollution. In order to protect the environment, a series of policies have been implemented to facilitate the

environmentally friendly transformation of the express industry in China. Understanding the recycling and reuse situation, as well as the influencing factors, of express packaging becomes crucial in reducing the quantity of express waste and achieving environmentally friendly packaging practices. This study aims to investigate the causes of express waste generation and propose strategies to minimize such waste. The research will employ keywords such as "recycling status," "influencing factors," and "improving strategy" for literature review and analysis.

2. Research Methodology

This study uses a characteristic "Literature Review Synthesis Process" (Ibrahim and Mustafa Kamal, 2018; Masiran et al., 2020), which is an independent literature review typology (Rousseau, Manning and Denyer, 2008; Yu and Watson, 2019; Templier and Pare, 2015), based on an understanding of selected existing literature to draw conclusions, and uses the Research Question structure classification technique of Ibrahim (2011 & 2020) to identify research themes.

This study selects the relevant articles about the recycling patterns in Chinese Express Industry to report. Using Google Scholar, Bing Engine and CNKI, the literature articles were identified according to the keywords of the selected themes, such as recycling methods, influencing factors, improvement strategies. Finally, 35 relevant literatures with significant potential for addressing the main research issues are chosen for a literature synthesis review process. This process generated a synthesized summary for each theme, followed by further cross-analysis, integration of possibilities, and prioritization of the synthesized summaries. The aim is to identify the highest-probability solutions to enhance the reuse of express packaging. This study utilizes the "Point of Departure (POD) Tree Diagram" adapted from Ibrahim and Mustafa Kamal (2018) to showcase the key synthesized summaries throughout the entire process (as illustrated in Figure 1). The EAGLE Navigator online system is employed to document the comprehensive process of literature review synthesis, and the findings are adjusted for reporting in this study.

3. Literature Review

This section covers recycling status, influencing factors and improving strategy. The objective is to analyze the recycling patterns of express packaging in China.

3.1 Recycling Status of Express Packaging in China

According to Greenpeace (2020), the main materials used for express packaging in China are corrugated cartons and plastic bags. Other materials include express waybills, document pouches, envelope cartons, woven bags, foam boxes, pearlized bags, adhesive tapes, filler plastics, and other indirect materials such as tape cores. Hu Libiao (2023) states that in 2022, the Chinese express deliveries volume reached 11.058 billion shipments, resulting in approximately 2 million tons of plastic waste and over 10 million tons of paper waste, with an increasing trend each year. According to Jie Yipeng (2021), about 80% of paper express packaging materials can be recycled in China, while only a negligible 1% of plastic-based express packaging waste can be effectively utilized due to its low recycling value. Although express stations are willing to recycle intact and undamaged cartons for reuse, the actual quantity of recycled cartons is relatively small. Du Huanzheng et al. (2021) states that after the disposal of express packaging waste, only a limited proportion of cardboard boxes can be partially recycled and repurposed, with a low rate of second-hand utilization. For example, in

2018, only 4% of cartons were directly reused, while the remaining 82.3% were downgraded to waste and regenerated, and about 15% were mixed with household waste collection systems due to contamination or damage. Greenpeace (2020) points out that due to challenges of recycling plastic-based express packaging waste, coupled with high regeneration costs and low profit margins, approximately 99% (by mass ratio) of plastic waste in express packaging in China ends up being incinerated or landfilled, causing environmental pollution. Yang Yuchun et al. (2020) conducted a survey and found that the recycling rate for express packaging is extremely low, with 62.26% of express packaging being directly discarded. Only 31.45% is reused for daily purposes, with plastic bags mainly used for household waste, and only a few intact paper boxes or cartons are used for express packaging, while the majority is sold as waste to recycling stations. Zhang Sunmingshuo states that the reuse rate of express cartons is only 20%, while packaging bags are almost only used once. Most express packaging ends up in household waste and is collected by waste cleaners before being sold to recycling stations.

According to Chen Long et al., major e-commerce platforms and mainstream logistics companies in China began promoting and using reusable express packaging as early as 2017. Zhang Weijia (2021) states that China's National Development and Reform Commission issued the "Opinions on Accelerating the Green Transformation of Express Packaging" on November 30, 2020, which plans to achieve the use scale of 10 million reusable express packaging by 2025 to achieve the green transformation of China's domestic express packaging. However, the actual usage of reusable packaging remains relatively small compared to the total volume of express deliveries (Anhui Daily, 2022). Many e-commerce and express logistics companies have taken some actions regarding the application of reusable express packaging at the end of the supply chain in China. Each logistics company has introduced its own reusable express boxes, but the adoption rate is very low (Plastic Free China, 2021). Zhang Sijie et al. states that many consumers claim they have "never used reusable express boxes" in their daily lives, and many delivery personnel also state they have "never seen such packaging." Regarding the recycling methods for reusable express boxes, Hu Libiao (2023) and Du Huanzheng (2021) mention that the practices vary depending on the region and company. Some express delivery companies ask customers if they want to use reusable express boxes when placing orders. If the customer agrees, the delivery person will put the package into the reusable express box and collect it upon delivery. Some companies also set up collection points in communities or neighborhoods for users to recycle reusable express boxes. Additionally, the State Post Bureau requires express delivery companies to establish designated recycling points for reusable express packaging and provide facilities for their collection. Zhang Fengbiao et al. (2019) states that shared express boxes are recycled through two methods: after the delivery person hands over the box to the consumer, the consumer opens it in front of the delivery person, takes out the items, and returns the box on the spot; or when consumers pick up their goods at Cai Niao stations or are unable to open the box in front of the delivery person, they return the box to a designated collection point for the delivery person to recycle.

Based on the above literature, it can be inferred that express packaging can be categorized into two groups: traditional express packaging, mainly consisting of cardboard boxes and plastic bags, and the new type of reusable express packaging. In terms of recycling, paper-based cardboard boxes in traditional express packaging are generally collected by consumers or waste cleaners and sold as waste. Therefore, the majority of cardboard boxes are downgraded to waste and used for reproduction, with only a small portion available for secondary use as express packaging. Plastic-based packaging, on the other hand, is mostly discarded as household waste. Although reusable express packaging can be used repeatedly, the high cost of recycling leads to its low practical application rate. In conclusion, this study believes that increasing the

number of reuses for cardboard and plastic packaging or expanding the application scope of recyclable packaging can effectively improve the reuse rate of express packaging, thereby reducing environmental pollution (State as POD1).

3.2 Influencing factors of express packaging recycling

Zhang Sunming et al. (2022) states the low reuse rate of express packaging is mainly attributed to the lack of standardization in size, materials, and quality across different types of packaging, making reuse inconvenient. The cost of collecting and reusing packaging by delivery personnel is much higher than the cost of bulk purchasing new packaging, resulting in express packaging being recycled into lower-grade materials instead of being reused. Jie Yipeng (2021) states that due to the limited number of collection points at the storage centers of courier companies and the significant damage caused to packaging during package opening by consumers, achieving reuse at the delivery points is also challenging. Greenpeace (2020) points out that due to the low acceptance by consumers, some prefer to pay for new cardboard boxes instead of using recycled ones. Ci Jiaojin et al. (2023) states that campus express packaging faces issues such as privacy information leakage during recycling, weak awareness of recycling among students and staff, a lack of recycling infrastructure and intelligent recycling systems, as well as inadequate recycling laws and regulations. Fan Rongrong (2023) states that the recycling of express packaging in universities is hindered by the lack of standards, excessive packaging, high costs of recyclable packaging, and low consumer awareness of express packaging recycling. Yang Yuchun et al. mentions that express paper packaging is prone to deformation or damage during transportation, leading to its inability to be reused. Some consumers consider the packaging as their property and are unwilling to let delivery personnel collect it. Guo Lijuan (2020) states that recycling packaging boxes increases the time cost for delivery personnel, reduces efficiency, and affects their performance-based wages, making it unsustainable. The high cost of recycling, coupled with poor quality packaging materials that have no recycling value, further hampers the recycling efforts. Zhu Junbi et al. (2021) believes that excessive packaging is the main cause of "express waste." Besides cardboard boxes and plastic bags, excessive amounts of plastic foam used for cushioning fragile items, tapes for fixation, and express documents all contribute to the excessive increase in packaging materials. Moreover, most of these excessive packaging materials are difficult to degrade, significantly increasing environmental burden. Yang Ying et al. (2023) highlights the significant influence of age distribution on recycling willingness, with middle-aged individuals showing relatively lower willingness to recycle, suggesting the need to consider economic factors to stimulate their recycling intentions. The difficulty in reusing cardboard boxes lies in their susceptibility to contamination, rendering them non-recyclable. Additionally, the quality of cardboard boxes also affects their recyclability. The challenge in recycling plastic bag-type express packaging arises from their composition of multiple materials, making separation and recycling difficult, while also being prone to contamination.

According to Wen Zongyong et al. (2021), the advantage of reusable packaging lies in its high number of uses, which lowers the cost per use. However, many reusable express packaging options cannot withstand the "abuse" of violent sorting and transportation and get damaged after just a few uses, making them more expensive than single-use packaging in the long run. Xiong Xingfu et al. emphasizes that although some express boxes have a sturdy structure, their production costs are high, resulting in a high single-use price. Both businesses and consumers are reluctant to bear the high costs, so these boxes are only used for certain goods delivery and are not widely adopted. During the recycling process of reusable express packaging, additional costs such as labor, equipment, and transportation are incurred. Additionally, some reusable boxes have limited opportunities for multiple uses. Although theoretically, the cost of reusable

express packaging decreases with each cycle, when considering the reverse logistics costs, the overall cost is still relatively high. Some recipients may want to keep or sell the reusable packaging for personal use. Concerns about cleanliness and durability arise when using reusable boxes for an extended period. Many recipients consider privacy issues and are unwilling to dismantle the express packaging on the spot. Moreover, most express stations and temporary storage points lack areas dedicated to storing reusable packaging, making it inconvenient and time-consuming for delivery personnel to take away the packaging boxes（An Hui Daily,2022). Xu Juan (2023) states that the main reasons reusable express packaging boxes cannot be widely popularized are the difficulties in controlling the reverse logistics process and the high cost of recycling, causing many companies to hesitate. Chen Siyang et al. (2022) highlights that The most significant factor influencing the recycling of express packaging is the cost.

Drawing from the aforementioned literature, several factors influence the recycling and reutilization of express packaging. For traditional cardboard boxes, the following points can be summarized: a）Lack of standardization in size, materials, and quality of cardboard boxes makes recycling and reuse inconvenient. b) Low durability of cardboard boxes combined with excessive packaging leads to easy damage during transportation or opening, rendering them unsuitable for reuse. c) Insufficient collection points for cardboard boxes hinder their recycling and reuse. d) Weak recycling awareness among consumers, who are reluctant to use secondhand cardboard boxes or recycle their own express packaging. e) Inadequate recycling laws and regulations for express packaging. For traditional plastic bag-type express packaging, they are usually damaged or contaminated after a single use, making recycling and reuse difficult. Regarding reusable express packaging, the following points apply: a) High production costs of reusable express boxes discourage their adoption by businesses, logistics companies, and consumers. b) High recycling costs associated with reusable express packaging deter both delivery personnel and consumers from using them. c) Lack of collection points and outdated recycling methods result in significant time and effort needed for recycling, greatly reducing the motivation for delivery personnel and consumers to recycle. In conclusion, this study suggests that creating low-cost standardized express packaging and raising consumer awareness about environmental protection would enhance the recycling and reuse of express packaging (State as POD2).

3.3 Improving Strategy of Express Packaging Recycling

Ci Jiaojin & Bai Wenbin (2023) highlights that there is still a long and difficult journey ahead for the recycling of express packaging, involving coordination between major e-commerce companies, consumers, and delivery companies, as well as a shift in overall mindset. It also requires more standardized recycling processes and stricter management models. Yang Ying et al. (2023) conducts literature exploration and questionnaire surveys to analyze people's behavior regarding the recycling of express packaging. They proposed three suggestions for promoting green living: strengthening green logistics promotion to cultivate environmental awareness among the public, setting up reasonable basic recycling facilities to facilitate recycling, and providing appropriate incentive policies to increase people's willingness to recycle.Xiao Lu et al. (2020) suggests that tax reduction could be a suitable policy for express packaging manufacturers in China, as it would encourage them to prefer recycling and reprocessing used express packages.Diao Yuyu & Guo Zhida (2022) focuses on analyzing incentive strategies for express packaging waste recycling.Yuan Xiaobao et al. (2022) discusses the market position of four types of green packaging materials and proposed improvement measures for the recycling system. Feiyu Chen et al. (2019) underscores the role of governmental intervention in encouraging individuals to actively engage in waste source

classification and recycling initiatives. Ching-Kuei Kao et al. (2020) emphasizes that the advancement of environmentally friendly express packaging should be grounded in "human resources," "institutional support," and "public awareness." Ding Lili (2022) mentions that enhancing consumers' awareness of environmental protection can contribute to improving the express packaging recycling industry.He Yi (2022) highlights the use of science and technology to achieve plastic packaging recycling and reuse.Giacomo Di Foggia believes that an effective packaging waste management system is indispensable for dealing with the growing amount of packaging waste.Wu Zihong states that in terms of the circular recycling model, scenario-based design thinking should be adopted to develop targeted packaging prototypes based on different consumer behavior habits and product attributes. Additionally, efficient and systematic promotion, distribution, and recycling plans should be formulated. Zhou Junliang et al. (2023) pointed out that research showed that the recycling efficiency and feasibility of express boxes could be improved by combining the Internet of Things, blockchain and virtual reality to establish recycling devices.

Based on the literature mentioned above, strategies to improve the recycling of express packaging can be summarized as follows: a) Alter the mindset of consumers, e-commerce, and delivery enterprises to elevate environmental consciousness and encourage the adoption of reusable express packaging. b) Research and develop low-cost reusable express packaging options. c) Establish an effective recycling system for express packaging to reduce the cost of reverse logistics. d) Governments should enact laws and regulations while the industry should establish standards to collectively regulate the recycling and reutilization of express packaging. In conclusion, this study suggests that the combination of low-cost recyclable express packaging, supported by an effective recycling system, and the elevation of environmental awareness among e-commerce platforms, consumers, and express delivery companies, can enhance the recycling and reutilization of express packaging within the field of packaging logistics (State as POD3).

Table 1: Table 1 Point of Departures (POD) 1 to 3

Item	Description
POD 1	Increasing the number of reuses for cardboard and plastic packaging or expanding the application scope of recyclable packaging can effectively improve the reuse rate of express packaging, thereby reducing environmental pollution.
POD 2	Creating low-cost standardized express packaging and enhancing consumer environmental awareness are beneficial for the recycling and reutilization of express packaging.
POD 3	The combination of low-cost recyclable express packaging, supported by an effective recycling system, and the elevation of environmental awareness among e-commerce platforms, consumers, and express delivery enterprises, can enhance the recycling and reutilization of express packaging within the field of packaging logistics.

4. Discussion on Synthesis Findings

This section undertakes a cross-analysis, integrating potentialities, and prioritizing the synthesized literature review summaries within the thematic realm of recycling patterns, aiming towards high-probability solutions for enhancing the reuse of express packaging.

4.1 The Summary of Synthesized Literature Review Findings for POD1 and POD2

POD1: Increasing the number of reuses for cardboard and plastic packaging or expanding the application scope of recyclable packaging can effectively improve the reuse rate of express packaging, thereby reducing environmental pollution. POD2: Creating low-cost standardized express packaging and enhancing consumer environmental awareness are beneficial for the recycling and reutilization of express packaging.

POD1 suggests that increasing the number of reuse cycles for cardboard and plastic packaging can improve the reuse rate of express packaging. POD2 proposes that low-cost standard express packaging helps enhance the recycling of such packaging. Considering that the production costs of cardboard and plastic packaging are already low, combining both perspectives lead to the conclusion that standardized structures for cardboard and plastic packaging contribute to increasing the number of uses. POD1 also argues that expanding the application scope of reusable packaging effectively improves the reuse rate of express packaging. Combining this with the low-cost standard express packaging mentioned in POD2 and consumer environmental awareness, it can be concluded that producing low-cost standard reusable express packaging and enhancing consumer environmental consciousness will boost the application scope of reusable packaging and thus increase the reuse rate of express packaging. By integrating these two aspects, a comprehensive approach can be achieved: By standardizing cardboard and plastic packaging materials and developing low-cost, recyclable express packaging, coupled with raising awareness among consumers about environmental protection, it is possible to effectively enhance the recycling and reusability of express packaging (POD4).

4.2 The Summary of Synthesized Literature Review Findings for POD2 and POD3

POD2: Creating low-cost standardized express packaging and enhancing consumer environmental awareness are beneficial for the recycling and reutilization of express packaging. POD3: The combination of low-cost recyclable express packaging, supported by an effective recycling system, and the elevation of environmental awareness among e-commerce platforms, consumers, and express delivery enterprises, can enhance the recycling and reutilization of express packaging.

POD2 and POD3 both mention low-cost express packaging, one specifically focusing on reusable packaging and the other in a broader context. These can be combined and simplified as low-cost standard express packaging. POD2 emphasizes the importance of improving consumer environmental awareness, while POD3 indicates that consumer and corporate environmental awareness among e-commerce and delivery companies still need improvement. Therefore, combining these perspectives leads to the idea of enhancing the environmental awareness of e-commerce companies, consumers, and delivery companies. In conclusion, a comprehensive approach can be achieved: The combination of low-cost standardized express packaging, supported by an efficient recycling system, coupled with the good environmental consciousness of e-commerce platforms, consumers, and express delivery companies, can effectively bolster the recycling and reusability of express packaging (POD5).

4.3 The Summary of Synthesized Literature Review Findings for POD1 and POD3

POD3: The combination of low-cost recyclable express packaging, supported by an effective recycling system, and the elevation of environmental awareness among e-commerce platforms, consumers, and express delivery companies, can enhance the recycling and reutilization of express packaging. POD1: Increasing the number of reuses for cardboard and plastic packaging or expanding the application scope of recyclable packaging can effectively improve the reuse rate of express packaging, thereby reducing environmental pollution.

Increasing the number of reuse cycles for cardboard and plastic packaging requires an effective recycling system. Similarly, expanding the application scope of reusable packaging also relies on an effective recycling system. When e-commerce companies, consumers, and delivery companies possess good environmental awareness, It facilitates the recycling of both plastic and cardboard packaging, as well as the recycling of reusable packaging. Therefore, a comprehensive approach can be obtained by combining these factors: The implementation of

an efficient recycling system and the cultivation of strong environmental awareness can enhance the recycling and reutilization of express packaging (POD6).

4.4 The Summary of Synthesized Literature Review Findings for POD4 and POD5

POD4: By standardizing cardboard and plastic packaging materials and developing low-cost, recyclable express packaging, coupled with raising awareness among consumers about environmental protection, it is possible to effectively enhance the recycling and reusability of express packaging.POD5: The combination of low-cost standardized express packaging, supported by an efficient recycling system, coupled with the good environmental consciousness of e-commerce platforms, consumers, and express delivery companies, can effectively bolster the recycling and reusability of express packaging.

The standardization of cardboard and plastic packaging, as well as the production of low-cost standardized reusable express packaging mentioned in POD4, are essentially the same as the low-cost standard express packaging discussed in POD5. These can be merged and simplified as low-cost standardized express packaging. An effective recycling system is essential for the collection of express packaging, and it is preferable for the recycling system to be simple, efficient, and convenient for consumer participation. Both POD4 and POD5 emphasize the importance of raising environmental awareness. In practice, cost issues primarily affect e-commerce companies and delivery businesses, while environmental consciousness is more influential on consumers. Therefore, we can simplify by retaining the focus on enhancing consumer environmental awareness. In conclusion, this study suggests that the utilization of low-cost standardized express packaging, accompanied by an efficient recycling system and the promotion of consumer environmental awareness, can effectively enhance the recycling and reusability of express packaging (POD7).

4.5 The Summary of Synthesized Literature Review Findings for POD5 and POD6

POD5: The combination of low-cost standardized express packaging, supported by an efficient recycling system, coupled with the good environmental consciousness of e-commerce platforms, consumers, and express delivery companies, can effectively bolster the recycling and reusability of express packaging. POD6: The implementation of an efficient recycling system and the cultivation of strong environmental awareness can enhance the recycling and reutilization of express packaging.

Both POD5 and POD6 agree that an effective recycling system and good environmental awareness play a crucial role in improving the recycling and reutilization of express packaging. POD5 also emphasizes the importance of low-cost express packaging as a key factor. Therefore, by integrating these elements, we can derive a comprehensive approach: The effective recycling system and strong environmental awareness, combined with low-cost express packaging, can significantly enhance the recycling and reutilization of express packaging (POD8).

4.6 The Summary of Synthesized Literature Review Findings for POD7 and POD8

POD7: The utilization of low-cost standardized express packaging, accompanied by an efficient recycling system and the promotion of consumer environmental awareness, can effectively enhance the recycling and reusability of express packaging. POD8: The effective recycling system and strong environmental awareness, combined with low-cost express packaging, can significantly enhance the recycling and reutilization of express packaging.

There are many factors that influence the reuse of express packaging, with recycling being a key step. The packaging itself is the subject of recycling, and consumers, businesses, delivery companies, and consumers themselves are the main participants in the entire reverse logistics process. Factors affecting consumer participation in recycling include cost, time, safety, and environmental awareness. Factors influencing the involvement of delivery personnel include time constraints and environmental awareness. For e-commerce and delivery companies, cost and environmental awareness play significant roles in their participation in recycling. Based on these factors, by considering the insights from POD7 and POD8, we can derive the final approach: The effective improvement of recycling and reusing express delivery packaging can be achieved through a combination of low-cost standardized packaging, a well-functioning recycling system, and heightened consumer awareness regarding environmental protection (Final POD).

Figure 1 shows how the literature review synthesis develops the proposed theory regarding recycling patterns to solve there is a need to improve reuse of express packaging and reduce the generation of express waste and the subsequent proposed conceptual framework in Figure 2.

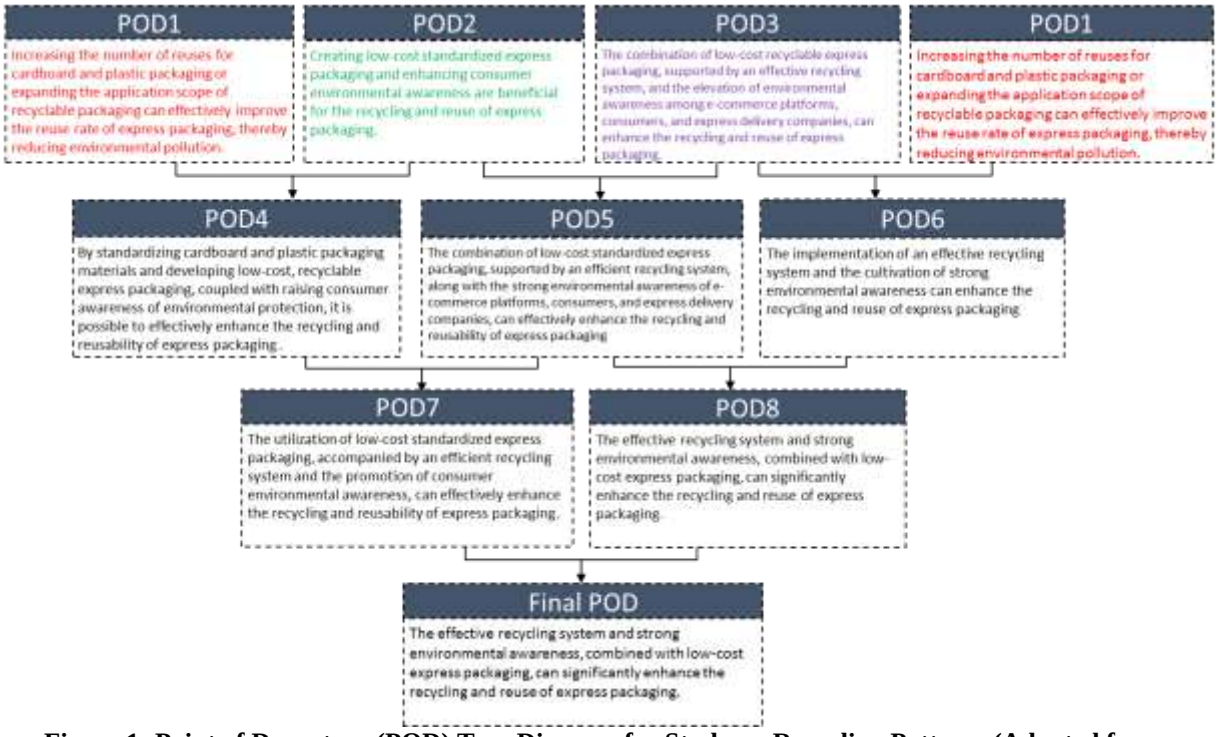

Figure 1: Point of Departure (POD) Tree Diagram for Study on Recycling Patterns (Adapted from Ibrahim & Mustafa Kamal, 2018)

Figure 2: Proposed Conceptual Framework Based on the Influencing factors and Solutions of Recycling Patterns (Adapted from Ibrahim & Mustafa Kamal, 2018)

5. Conclusion

The aim of this paper is to understand the main recycling patterns in Chinese Express Industry. This paper documents the results a systematic literature review synthesis process under the thematic theme of recycling patterns. For recycling status of express packaging in China, the study found that increasing the number of reuses for cardboard and plastic packaging or expanding the application scope of recyclable packaging can effectively improve the reuse rate of express packaging, thereby reducing environmental pollution. For influencing factors of express packaging recycling, the study found that creating low-cost standardized express packaging and enhancing consumer environmental awareness are beneficial for the recycling and reutilization of express packaging. For improving Strategy of express packaging recycling, the study found that the combination of low-cost recyclable express packaging, supported by an effective recycling system, and the elevation of environmental awareness among e-commerce platforms, consumers, and express delivery enterprises, can enhance the recycling and reutilization of express packaging within the field of packaging logistics. Through further cross-analysis of the above conclusions, this study believes that the effective improvement of recycling and reusing express delivery packaging can be achieved through a combination of low-cost standardized packaging, a well-functioning recycling system, and heightened consumer awareness regarding environmental protection.

The findings hold significance as they contribute to identifying deficient variables in recycling patterns within the Chinese Express Industry. Furthermore, they propose an enhanced theoretical framework for recycling patterns and delineate their potential benefits for the Chinese express delivery industry. Further study is recommended for conducting a meta-analysis exercise on the literature supporting the proposed theoretical proposition. In addition,

future study is recommended for incorporating the results into develop new methods and approaches for environmental protection research. This study will help improve the recycling of express packaging by improving the recycling mode of express packaging, thereby reducing the generation of express waste and reducing resource waste.

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