

A Journey to Reusable:

Disrupting the Dominance of Disposable Packaging in the Indonesian FMCG Industry

MOT2910: Master Thesis Project
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by

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The writing of this thesis reflects my deeply ingrained passion for sustainability. I am proud to have fulfilled the promise I made in my TU Delft motivation letter by pursuing a topic closely aligned with what I envisioned before arriving here. I sincerely hope that this thesis marks the beginning of a real meaningful contribution that I can make to the betterment of environment. Yet, this work would not have come to fruition without the unwavering support of the people I care about the most.

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Executive Summary

Indonesia is facing a severe plastic waste crisis, generating nearly 9 million tons of plastic annually, of which only 11% is recycled. Sachet packaging alone contributes 16% of the country's plastic waste, much of which leaks into rivers and oceans. Despite its convenience and affordability, plastic has become the dominant packaging format due to its protective qualities, low weight, and marketing advantages. However, recycling, which has been highly praised as the one of the best solutions to the plastic crisis, has proven largely ineffective in particularly for small multi-layered packaging. This creates an urgent need for alternative systems. Reusable Packaging Systems (RPS), designed for repeated use, represent a promising contender to disrupt the dominance of disposable plastics in Indonesia's fast-moving consumer goods (FMCG) industry.

To explore the potential adoption of RPS, this study investigated the factors influencing its implementation from the perspective of FMCG firms in Indonesia. A qualitative, three-stage methodology was applied:

- A systematic literature review (PRISMA framework) identifying 115 adoption factors across peer-reviewed journals;
- Two rounds of expert interviews with six industry practitioners in packaging, operations, and corporate affairs from both multinational and national FMCG firms operating in Indonesia, resulting in the identification of 48 factors. The integration of literature and industry insights resulted in the incorporation of 163 adoption sub-factors into eight adoption factor categories
- Multi-Criteria Decision Analysis (MCDA), which specifically employed the Best-Worst Method (BWM) to rank the consolidated factors.

The analysis revealed that **Customer Social & Behavioral Drivers (CSBD)** ranked as the most critical factor (**score 0.18**), underscoring that consumer demand, price sensitivity, and convenience decisively shape firms' willingness to adopt reusable systems. **Coercive Pressure (CP)**, which scored **0.17** was identified as the second most important factor, with experts stressing the need for stronger regulatory enforcement, the role of NGO advocacy, and global headquarters mandates. Technology Quality (0.14) followed, reflecting concerns about durability, hygiene, and safety of reusable packaging. Other factors, such as **Expected Benefits & Usability (EBU)** and **Operational Feasibility & Applicability (OFA)**, were rated moderately (**0.12 each**), while **Financial Viability (0.11)**, **Normative Pressure (0.10)** ranked lower. Lastly, **Partner & Collaborative Networks (PCN)** ranked the lowest with a score of **0.07**.

These results highlight that while cost and logistics matter, consumer acceptance and regulatory frameworks are the true tipping points for adoption. Experts agreed that Indonesian consumers remain highly price-sensitive, with sachets favored for affordability, and lack widespread environmental awareness. Without regulatory enforcement and supportive incentives, FMCG firms are unlikely to do the transition to RPS voluntarily. Conversely, successful adoption depends on coordinated action between various stakeholders. Government must enforce bans or provide subsidies, firms must ensure durable and hygienic RPS design, NGOs and media must amplify awareness, and waste banks, retailers and logistics partners can provide operational support.

This thesis concludes that accelerating RPS adoption in Indonesia's FMCG sector requires aligning consumer behavior change with regulation and quality assurance. The study contributes a decision-analytic framework for stakeholders that identifies the relative importance of adoption factors. For policymakers, it emphasizes the need for clear regulations and incentives, and for firms, it highlights the importance of consumer-driven strategies and product quality.

Keywords: *Reusable Packaging System (RPS), FMCG, Best-Worst Method (BWM), Technology Adoption, Circular Economy, Standard Wars, Indonesia, Sustainability, Consumer Behavior*

*"We don't need a handful of people doing zero waste perfectly.
We need millions of people doing it imperfectly."*

– Anne-Marie Bonneau –

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Nomenclature

Abbreviations

Abbreviation	Definition
3PL	Third-party Logistics
AHP	Analytic Hierarchy Process
BFFP	Break Free From Plastic
B POM	Badan Pengawas Obat dan Makanan (Indonesian National Agency of Drug and Food Control)
BSI	British Standards Institution
CP	Coercive Pressure
CSBD	Customer Social & Behavioral Drivers
DCs	Developed Countries
EBU	Expected Benefits & Usability
EMF	Ellen MacArthur Foundation
EPR	Extended Producer's Responsibility
FMCG	Fast Moving Consumer Goods
FV	Financial Viability
GHG	Green House Gasses
ISO	International Organization for Standardization
KLHK	Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia (Ministry of Environment and Forestry, Republic of Indonesia)
KPI	Key Performance Indicator
LDCs	Less Developed Nations
MCDA	Multi-Criteria Decision Analysis
MCDM	Multi-Criteria Decision-Making
MLP	Multi-layered Packaging
MNC	Multinational Corporations
NGO	Non-Governmental Organization
NP	Normative Pressure
NPAP	National Plastic Action Partnership
NPO	Non-Profit Organization
OECD	Organisation for Economic Co-operation and Development
OFA	Operations, Feasibility & Applicability
PCN	Partner & Collaborative Network
PLA	Polylactic Acid
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
R&D	Research and Development
rPET	Recycled Polyethylene Terephthalate
RPS	Reusable Packaging System
RTD	Ready-to-Drink
SJA	Social Judgement Analysis (SJA)
TQ	Technology Quality
TSH	Thermoplastic Starch
UNEP	United Nations Environmental Program
WEF	World Economic Forum

INTRODUCTION

1.1. Background

Indonesia is grappling with a severe plastic waste crisis. The country's cities and municipalities generate about 9 million tons of plastic waste annually, of which only 11% is being recycled (BFFP, 2023), and nearly 5 million tons of which is mismanaged (World Bank, 2021). With this amount, Indonesia becomes one of the 12 countries responsible for 60% of world's mismanaged plastic waste (Perreard et al., 2025) and once placing it as the second biggest plastic polluter worldwide, just behind China (Jambeck et al., 2015). Globally, much of this volume originates from fast-moving consumer goods (FMCG) packaging, as according to BFFP, (2021), the top 10 plastic polluters on the planet are from FMCG industry such as Coca-Cola, Pepsico, Nestle, Danone and Unilever.



Figure 1.1: Indonesian Traditional Grocery Store Dominated by Products in Sachets (Source: liputan6.com)

In Indonesia, the problem is worsened as 70% of Indonesian consumers, mostly coming from the lower-income economy, prefer to buy products in sachets (van Toulon and von Rabenau, 2022). The linear,

disposable nature of sachets thrives in Indonesia as big companies are targeting the middle-lower income consumers with packaging that offers micro-portion priced incredibly cheap (Envigreen Society, 2023). These packaging, usually massively sold in traditional grocery store (*toko kelontong*), shown in Figure 1.1, typically contain personal hygiene products, detergents and seasonings (van Toulon and von Rabenau, 2022). Sachets alone amounts to 16% of the total plastic waste generated in the country (NPAP, 2020; World Bank, 2021). The small nature of sachets is making it easier for waste to leak to water bodies and harder to manage. A brand audit in 2024 done across 16 rivers in Bandung, West Java within the range of 150 days revealed that sachets account to 56% of the waste collected from the rivers (River Cleanup, 2024).

However, the reign of plastic was not always the standard when it comes to packaging of goods. Historically, the reuse of materials, particularly glass, was a standard component of packaging systems before disposability became dominant (Bruijnes et al., 2020). The widespread use of plastic is relatively recent, gaining popularity following its commercial introduction in the post–World War II era of the 1960s. At that time, a new packaging format was required to reduce food waste and extend product shelf life (Thoden van Velzen and Brouwer, 2022).

1.2. Problem Statement

1.2.1. Why Plastic as Packaging is Good – and Bad at the Same Time?

Plastic packaging offers numerous advantages, such as protecting contents from physical damage that could compromise quality and acting as a barrier against moisture, air, bacteria, and other contaminants (UNEP, 2022). Additionally, it serves marketing purposes by conveying product information, while also extending shelf life (WEF, 2016; Noëth et al., 2024) and reducing fuel consumption during transportation due to its lightweight properties (UNEP, 2022). These combined benefits have solidified its position as the dominant design within the packaging industry.



Figure 1.2: Microplastic Size in Comparison to Pencil Tip (Source: [britannica.com](https://www.britannica.com))

However, these advantages have their drawbacks, as plastic production and processing use additives and complex blend of chemical substances that potentially are dangerous to the ecosystem and human health if leaked to the environment (Perreard et al., 2025; WEF, 2016). In tropical countries such as Indonesia, leaked plastic in the environment degrades into microplastics (Figure 1.2) more rapidly, worsening threats to marine and terrestrial ecosystems as well as human health (Schulte and Busch, 2025).

1.2.2. Recycling: The False Solution to Plastic Pollution

Recycling is currently the most common response to the plastic crisis. Yet globally, recycling rates remain below 10% (OECD, 2024), making it clear that recycling alone cannot address plastic pollution. Under the current designs, 30% of plastic packaging, especially the ones made of multi-layered and composite materials, will never be reused or recycled (UNEP, 2022); (EMF, 2017). In Indonesia, the challenge is greater: only 39% of waste is collected due to limited municipal services, especially in rural areas (NPAP, 2020); (World Bank, 2021). Even when plastic is collected, most variants, such as sachets, has nearly no value in the recycling market as they are hard to process with mechanical recycling technology, chemical solvent extraction or pyrolysis (van Toulon & von Rabenau, 2022); (NPAP, 2020). In the market, a tonne of small sachets or multi-layered packaging (MLP) are only worth \$50 and it takes more than a day to collect (2020).

The R-Ladder framework, as shown in Figure 1.3 highlights how recycling ranks lowest in terms of preserving material integrity, while reuse ranks higher due to its ability to extend product lifecycles and reduce resource extraction (Bruijnes et al., 2020). Recycling also suffers from high costs and inefficiencies, including sorting errors that lower recycling rates (Vicarneltor et al., 2024). By contrast, reuse maintains material integrity, requires less virgin material, and reduces energy use (Carter, 2022).

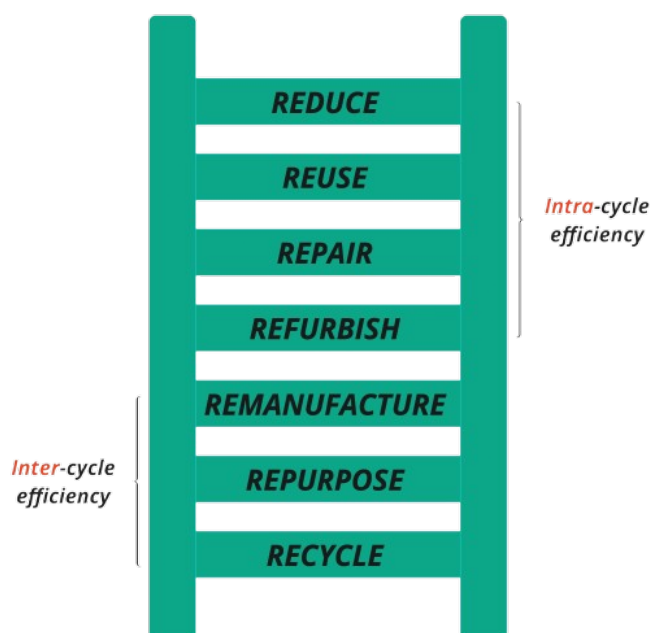


Figure 1.3: Waste Processing Methods, Ranked on the Environmental Hierarchy Based on Their Efficiency, Adapted from Bruijnes et al., (2020)

Despite existing measures, plastic production is projected to reach 13.6 million tonnes annually in Indonesia by 2040 if business continues as usual (KLHK, 2020). Indonesia's National Plan of Action for Combating Marine Debris targets a 70% reduction in marine plastic leakage by 2030 (World Bank, 2021); (van Toulon & von Rabenau, 2022), yet current policies remain insufficient. The most effective approach is then to prevent plastic from entering the environment in the first place (World Bank, 2021), while also reinventing ways for safeguarding consumer needs at the same time. Zero-waste systems, particularly reuse-based packaging models, offer a more practical and scalable solution. Successful precedents of RPS include the milkman model in Europe (Thoden van Velzen & Brouwer, 2022) and Indonesia's widespread use of 19L reusable water jugs, shown in Figure 1.4. These demonstrate

that reuse can be both scalable and commercially viable. The global zero-waste packaging market is projected to reach US\$4.1 billion by 2030 (Precedence Research, 2025).



Figure 1.4: Mineral Water Distribution in Indonesia by Using Reusable 19L Water Jug (Source:katadata.co.id)

1.2.3. Reusable Packaging as the Next Contender for Packaging Standard

One of the emerging solutions for the plastic packaging waste crisis is Reusable Packaging System (RPS), which, unlike the current dominant packaging and most of the available alternatives that mainly focuses on disposability, this system is designed for repeated use. According to European Commission, (2008) and ISO, (2013), reusable packaging is the packaging that has been designed to accomplish within its life cycle a minimum number of trips or rotations in a system for reuse. The packaging should be refilled or used for the same purpose when it was initially designed, and will become a packaging waste when it is no longer usable. Meanwhile BSI, (2017) states that reuse is an operation in which a product, component or a material can be reutilized all over again without it having to be treated in any reprocessing method. Therefore, any reusable packaging system is not to be confused with packaging that needs to be recycled at the end of its life cycle.

Various academic papers have categorized RPS into several different classifications. For example, Tassell and Aurisicchio, (2020) classifies reuse models based on the key enabling behaviors of consumers. The key difference between the two models is the added roles of consumers and providers, which reflects the operational complexity better. Another framework proposed by Muranko et al., (2021) offers a more detailed classification of reusable packaging systems, differentiating between Exclusive Reuse models, where consumers retain ownership and responsibility for cleaning, and Sequential Reuse models, where companies retain ownership and handle maintenance, redistribution, and cleaning before returning packaging to consumers.

Additional applied insights from Bocken et al., (2022) and Bashir et al., (2020) further illustrate how reuse models can be customized with modern logistics and digital tools—for example, integrating smart locks or bundling refill with grocery delivery services. Bashir et al., 2020 introduces the five models which comprises of:

1. The use of a large container or “big-bag” within the household that enables the refilling of smaller plastic containers
2. In-store refill stations that require consumers to bring back and refill their empty containers
3. Home delivery systems where products are replenished through regular delivery services
4. Integrated home cleaning services that include in-home refilling of reusable containers

For clarity and simplicity, this thesis adopts the widely cited [EMF, 2019](#), which categorizes RPS based on two key dimensions: consumer behavior (return vs. refill) and location (at home vs. on the go). This framework identifies four main models as follows:

Table 1.1: Overview of Sub-research Questions and their Corresponding Methods

RPS Type	Description	Example
Refill at home	consumers refill their own reusable containers at home with products that will be delivered to them	Siklus Refill (Indonesia)
Refill on the go	consumers bring their own reusable containers to be filled in a special refill station/store away from home	Saruga (Indonesia), Algramō (Chile), Ecopods Kiosk (USA)
Return from home	empty reusable packaging is collected from homes and replaced with a refilled package	Modern Milkman (UK), Pieter Pot (The Netherlands)
Return on the go	users return the packaging at a store or drop-off point, sometimes using a deposit system	Hepi Circle (Indonesia), Loop (UK)

Later in this study, references to RPS will vary across the different RPS alternatives as already been identified on Table ?? above. This variation arises from the diverse set of companies interviewed, which, although operating within the same industry, produce different types of products. As a result, each company may adopt/ assume the adoption of an RPS system that addresses its specific needs; which can be specific to one company and may not be relevant to others. It is important to note that the selection of a particular RPS may be a part of a broader business model or strategic decision-making process by each of the company. These last two aspects are beyond the scope of this research.

1.3. Research Objective & Questions

Previous discussions above have highlighted the significance of dominant design and even its impact to the surrounding environment. However, from the decision-makers' perspective, it might be challenging to actually make a drastic change from disposable to reusable system. This research therefore aims to determine and understand the factors that affect the adoption of Reusable Packaging System (RPS) in the consumer goods industry in Indonesia. In this research context, factors are market-specific elements that can either positively or negatively affect a technology to becoming the dominant design. Determining and understanding the factors will be derived by literature review and interviewing relevant practitioners in the industry. Theories that explain about standards, such as those written by [Madu, \(1989\)](#), [Shapiro and Varian, \(1999\)](#), and [Suarez, \(2004\)](#) are used to provide the basis of this thesis. By integrating empirical data from multiple sources and various firms within the same industry, combined with the firm theoretical background, this thesis provides comprehensive analysis of these factors. In the following section, the main research question helps guide in realizing the research objective, while

its sub-questions are specified further in relation to the main question.

Main Research Question

"What factors influence the adoption of reusable packaging systems in the consumer goods industry in Indonesia, from the perspective of firms as end-users?"

Sub-Research Questions

1. What factors influencing the adoption of reusable packaging systems are identified in the literature?

SRQ1 explores the factors that are hindering or even encouraging firms in the consumer goods industry in adopting reusable packaging systems (RPS). Moreover, in addition to the factors, the type of RPS will also be identified from literature review on this stage.

2. What factors do firms consider most critical for the adoption and successful implementation of reusable packaging systems?

SRQ2 explores the affecting factors that are experienced hands-on by business practitioners in the industry. The method of data extraction and the justification of the chosen factors will be explained further.

3. How can these factors be influenced by stakeholders (e.g. government, industry, policy makers) to promote the emergence of a dominant ecosystem?

SRQ3 explores what measures should be taken by various stakeholders as a whole integrated system to boost the possibility of industry-wide RPS adoption.

1.4. Relevance to Management of Technology (MOT)

The thesis aligns well with the program objectives of Management of Technology (MOT) by incorporating emerging technology, technology adoption, innovation and ecosystem thinking to explain why reusable-packaging systems (RPS) have yet to become an industry standard in Indonesia's FMCG sector. It investigates the adoption factors that keep RPS from scaling, showing how packaging innovations must be viewed as part of a broader complementary-product ecosystem rather than as standalone innovation.

The study also reflects the MOT focus on cross-functional collaboration. Industry experts from diverse professional backgrounds such as packaging specialist, supply-chain operations, and public relation were interviewed, highlighting the complex, multi-department decisions firms have to face when adopting new technology. Although no external regulators were interviewed, the analysis still considers external pressures such as consumer behavior, existing regulations and government directives to have in-depth understanding of the wider FMCG context in Indonesia.

Finally, the thesis illustrates MOT's data-driven approach, in which qualitative adoption factors were converted into quantitative weights using a structured MCDA method. This demonstrates that an objective approach to decision-making can assist decision-makers in making accurate, evidence-based choices about technology adoption within their organizations, a key element of the MOT program.

These are the courses of Management of Technology that are particularly relevant to this thesis:

- **Emerging and Breakthrough Technologies:** Provides tools for analysing technology-diffusion phases and the influence of complementary products and network effects, all central to understanding RPS ecosystems.

- **Technology, Strategy & Entrepreneurship:** Focuses on standardisation and strategic positioning, informing the thesis's examination of competing packaging formats and the quest for a dominant design.
- **Research Method:** Supplies the systematic-review, interview, and data-analysis techniques used to translate qualitative adoption factors into quantitative insights.
- **Technology Dynamics:** Explores technology life-cycles and its evolution within the markets, helping interpret how RPS adoption interacts with shifting consumer behavior, regulations, supply-chain capabilities and existing complementary products/services.
- **Integration Moment:** Emphasizes cross-functional alignment and the thesis mirrors this by integrating various perspectives from within the company (packaging specialist, supply chain, and public relation) to understand how firms guide their technology adoption decisions.

1.5. Report Structure

This research is structured into seven chapters. Chapter 1 introduces the thesis project, outlining its background, which elaborates on the research's relevance and importance, the problem it aims to address, and the formulated research questions it intends to answer. Chapter 2 details the theoretical background underpinning this thesis, which mainly focuses on Technology Diffusion and Adoption. The subsequent chapter, Chapter 3, elaborates on the methodology implemented to answer the primary research question and its sub-research questions, alongside the rationale for the chosen methods. Chapter 4 explores adoption factors identified in the academic literature, addressing Sub-Research Question 1 (SRQ1). It also addresses SRQ2 by first examining adoption factors highlighted by industry experts and subsequently categorizing factors derived from both methods. After categorizing the sub-factors into a bigger category of factors, they are then processed using the Best-Worst Method (BWM) analysis to determine the weight or importance of each factor. Chapter 5 discusses how various stakeholders can influence these adoption factors, directly answering SRQ3. These cumulative findings are then analyzed and discussed in detail in Chapter 6. Finally, Chapter 7 presents the research's conclusions and suggests areas for future improvement.

2

THEORETICAL BACKGROUND

This chapter provides an in-depth exploration of the concept of technological dominance and its relevance to the development of reusable packaging systems (RPS). It is divided into two parts that together form the theoretical foundation of this research. The first part examines theories of technological dominance and standards battles, focusing on how technologies compete, evolve, and eventually achieve dominance. The second part explores the theory of technology adoption in developing nations, which is particularly relevant for this study given the Indonesian context. The insights drawn from these theoretical perspectives will later be applied to interpret the empirical findings from the literature review and expert interviews.

The concept of technological dominance was first introduced by [Utterback and Abernathy, \(1975\)](#) through their formulation of the dominant design concept. They argued that a product, or in this thesis case, a system, can be considered dominant once it is widely adopted by producers and becomes the focal point of an ecosystem, encouraging complementary innovations and industry-wide integration. Building on this foundation, scholars such as [Suarez, \(2004\)](#) and [Shapiro and Varian, \(1999\)](#) have developed theories on technology dominance and standard wars, which help explain the dynamics of competition between emerging technologies. [Schilling, \(2019\)](#) further elaborates that the trajectory toward a dominant design typically progresses through three stages: the Fluid Phase (or Era of Ferment), the Transitional Phase (or Selection of a Dominant Design), and finally the Specific Phase (or Era of Incremental Change). [van de Kaa, \(n.d.\)](#) complements these perspectives by identifying measurable indicators of dominance, such as market share, network size, and user base.

While these theories are largely developed from the perspective of mature or developed markets, technology adoption in developing nations follows a somewhat different trajectory. Factors such as regulatory environments, socio-cultural norms, and institutional capacities play a more pronounced role in shaping adoption outcomes. To capture these dynamics, this thesis also incorporates the framework proposed by [Madu, \(1989\)](#), who emphasizes the importance of aligning technology transfer with national development planning in less developed countries. By combining theories of technological dominance with perspectives on adoption in developing economies, this chapter establishes a comprehensive lens through which the potential emergence of RPS as a dominant system in Indonesia can be assessed.

2.1. Theories of Technological Dominance

2.1.1. Battles for Technology Dominance: Reusable Packaging Perspective

Suarez, (2004) describes his model in a more dynamic and phase-based framework, which elaborates how technologies compete and have the possibility of dominating the market as time progresses. According to the framework, technologies can reach dominance after going through five milestones, each characterized by different dynamics; namely (1) R&D Buildup, (2) Technical Feasibility, (3) Creating the Market, (4) Decisive Battle and finally (5) Post-Dominance. Each of these dominance factors is shaped by firm- and environment-level conditions, whose relative importance varies depending on the phase of the technology lifecycle. Applying this framework helps explain why RPS have yet to achieve global adoption, including in Indonesia. According to Suarez, (2004), the steps of each phase is shown in the Figure 2.1 below and described as follows:

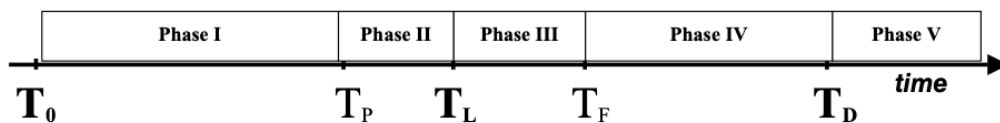


Figure 2.1: Five milestones of technological dominance process Suarez, (2004)

- **Phase I: R&D Buildup** ($T_0 \rightarrow T_P$)

This phase is marked by extensive R&D efforts made by major firms, a group of researchers from universities or early-entrants. In this phase, the aim of all the stakeholders is the development of new commercial product. The level of both the collaboration and competition is determined by the nature, size and market power of each participating actors. This effort typically sparks similar efforts made by other researchers and organizations as each are trying to develop alternative competing technological designs. Moreover, the ability for firms to progress also depends on how the firms are able to attract top talents within the technological field.

Globally, RPS has been piloted repeatedly in several countries, by big firms and startups alike. In Indonesia, early-entrants such as Siklus refill, Hepi Circle or local bulkstore like Saruga Bintaro have experimented with reuse models, while established firms like AQUA (now a part of Danone) and Teh Botol Sosro have implemented reusable systems for decades within limited product lines. Moreover, many big multinational firms that are also operating in Indonesia such as Unilever and Danone have also trialed RPS pilot projects by providing automatic dispensers to consumers that bring their own packaging to be filled with their products.

- **Phase II: Technical Feasibility** ($T_P \rightarrow T_L$)

At this stage, working prototypes demonstrate technological viability, encouraging rival firms to reassess their R&D and their firms' ability to compete in the technology battle. In this phase, a firm-level factor, which is technological superiority, has its strongest influence and can even trigger the early emergence of a winning technology. Within the field of alternative packaging, RPS shows advantages over alternatives such as bio-plastics due to its ability to better preserve product quality.

Environmental and regulatory conditions also matter. Often, innovation moves faster than regulation, limiting state influence. In Indonesia, regulatory frameworks still provide only passive oversight of plastic reduction, failing to actively support RPS adoption despite its potential role in addressing the plastic crisis. Additionally, environmental factor, in the form of regulation, also affects Phase II. More than often, technological trajectories move faster than regulation, limiting state influence. In some cases, regulatory intervention can elevate a technology to become the

dominant standard. In Indonesia, however, RPS remains a niche market due to the absence of regulations that actively support or incentivize the shift from conventional packaging. Despite the severity of the plastic waste crisis, current policies remain passive, inadequately addressing plastic reduction instead of promoting more sustainable practices such as the systemic adoption of RPS.

- **Phase III: Creating the Market** ($T_L \rightarrow T_F$)

The next milestone occurs when the first commercial product enters the market. When technology has reached this stage, the variations between competing alternatives become less significant. Instead, a firm-level factor, strategic maneuvering, has the most significant effect to the end result. Strategic maneuvering such as securing a first-mover advantage helps establish reputation, while penetration pricing has proven effective in rapidly building a large installed base. Given the limited consumer knowledge about new technologies, marketing becomes equally critical in shaping consumers' expectations. Furthermore, complementary products and services are essential to strengthen adoption and maintain competitiveness.

In Indonesia, several RPS firms such as Siklus Refill, Saruga, and Alner, have employed these strategies by collaborating with consumer goods companies to integrate their products into reuse systems. Nonetheless, the variety of complementary products and services remains limited, constraining broader market development.

- **Phase IV: Decisive Battle** ($T_F \rightarrow T_D$)

This phase is characterized by firms gaining momentum through the accumulation of an installed user base. The larger the customer base, the stronger its influence on market decisions. The strength of installed base effect is determined by the strength of network externalities. While both Phase III and Phase IV highlight the importance of the installed base, the type of adopters differs. The installed base of Phase III refers to early market adopters, often classified as "enthusiasts" or "visionaries". Whereas in the Phase IV, the installed base refers to the mainstream market consumers.

Reflecting to the reusable packaging market in Indonesia, most of the installed base is largely limited to enthusiasts or consumers with high environmental awareness. The RPS has not been successfully overcome Phase III into Phase IV, as no mainstream installed base have been amassed.

- **Phase V: Post-Dominance** (T_D onwards)

The final milestone is reached when a specific design achieves market dominance. At this stage, its large installed base, which is reinforced by strong network effects and high switching costs, becomes nearly impossible to displace. Competition then shifts away from creating new standards and instead intensifies among firms holding production rights to the established dominant technology.

2.1.2. Standard Wars: Packaging Perspective

According to [Shapiro and Varian, \(1999\)](#), standard wars can be classified into four types, depending on the adoption costs associated with competing alternatives. The first one being the **Evolution Strategy**, where a firm introduces a new technology compatible with existing ones. In this case, superior performance is the main determinant of success since consumers face little or even no switching cost. The second is the **Revolution Strategy**, where the technology is incompatible with the old one, requiring firms to deliver such remarkable innovation that consumers are willing to bear the high switching costs. When both rivaling firms are developing new technologies that are compatible with the old ones but not compatible to each other then it is called **Rival Evolutions**. Finally, in an **Evolution vs. Revolution**

Strategy, one firm is developing backward compatibility while the rival does not.

Based on the classification above, RPS can best be put under the Rival Revolution type of standard war. The current packaging standard relies heavily on disposability and linear economy, where packaging are discarded immediately after use. By contrast, RPS depends on circular economy principles, designing packaging for multiple uses and emphasizing durability. The current disposable packaging market is thereby completely incompatible to the alternative reusable system. Moreover, while disposability relies on consumer convenience, RPS requires users to return or retain packaging, creating behavioral shifts that necessitates high switching costs. These challenges illustrate the significant barriers RPS faces in achieving large-scale adoption.

		Rival Technology	
		Compatible	Incompatible
Your Technology	Compatible	Rival Evolutions	Evolution versus Revolution
	Incompatible	Revolution versus Evolution	Rival Revolutions

Figure 2.2: Types of Standard Wars [Shapiro and Varian, \(1999\)](#)

According to [Shapiro and Varian, \(1999\)](#), to successfully win the standards war, seven key assets are important to be owned by competing firms/ standards:

1. Control over an Installed Base of Users

Control over the installed base allows firms to block competitors from setting alternative standards and enforce their own. Such control also restricts rivals from developing complementary products, often forcing them to pursue the riskier Revolution Strategy rather than the safer Evolutionary Strategy.

2. Intellectual Property Rights

Patents and copyrights provide firms with the means to secure and control new technologies or interfaces, thereby putting them in a strong position within the standard wars. While different forms of intellectual property may apply depending on the product or service, patents generally offer stronger legal protection than copyrights.

3. Ability to Innovate

In addition to proprietary rights, firms must also possess the capability to further develop their technologies in order to strengthen their position within technology standard wars.

4. **First-Mover Advantage**

Firms with extensive product development experience are typically further along the technological learning curve, enabling them to innovate and introduce products more rapidly. This capability enhances their competitive advantage and increases the likelihood of securing a dominant position in standard wars.

5. **Manufacturing Capabilities**

Within the standard wars, the advantage of economies of scales or operational competence also matter and influence firms position in the competition.

6. **Strength in Complements**

Developing products that function not only independently but also as complements to other offerings in the market strengthens a firm's position as a leader in standard wars.

7. **Brand Name and Reputation**

Consumers always have expectations for the products, and a firm's reputation and brand name play a critical role in shaping trust and influencing purchasing decisions.

These assets position firms strategically to support the adoption of their technologies, though no single asset is significantly more decisive on its own than the other. Control over these assets may lie with either technology innovators or customers, depending on the context.

2.2. Technology Adoption in Developing Nations

While general theories of technology adoption can be applied broadly, adoption dynamics in less-developed countries (LDCs) often differ from those in developed nations. The fundamental principles of innovation diffusion, as outlined in Section 2.1, still provide a useful foundation. However, the realities in LDCs require additional considerations, as technology is often introduced either through direct transfer from developed countries (DCs) or via multinational corporations (MNCs) (Madu, 1989).

Framework for Decision Making in Technology Transfer and Development

In LDCs, technology transfer typically unfolds in several stages, beginning with the decision to transfer, followed by adoption, and ultimately the development of the technology, as illustrated in Figure 2.3.

The process may be initiated by governments, but in practice it is often driven by local experts, engineers, and practitioners who possess first-hand knowledge of prevailing local conditions. Their involvement ensures that decisions surrounding technology transfer are informed by context-specific expertise. The participation of diverse stakeholders also facilitates idea generation, enabling the identification of national needs and priorities while aligning them with available resources and cultural contexts. Subsequently, the scope and limitations of traditional or existing technologies must be examined to avoid undervaluing local strengths, such as human and natural resources, and to ensure the suitability of the chosen technology. The technology is then evaluated based on its appropriateness in meeting identified needs, its ease of transfer, and its ability to leverage existing capacities. Structured decision-making tools such as Social Judgement Analysis (SJA), Delphi, or the Analytic Hierarchy Process (AHP) can support this evaluation.

Once an appropriate technology is selected, negotiations with the transferring entity, often the case is with an MNC, are conducted to establish both short-term and long-term objectives. In parallel, preparatory measures such as awareness campaigns, training programs, and educational initiatives help reduce resistance to adoption, particularly in societies where change is often viewed with caution. Cultural value systems must also adapt to align with the demands of the new technology. After technology transfer, control systems should be implemented to systematically and continuously assess outcomes.

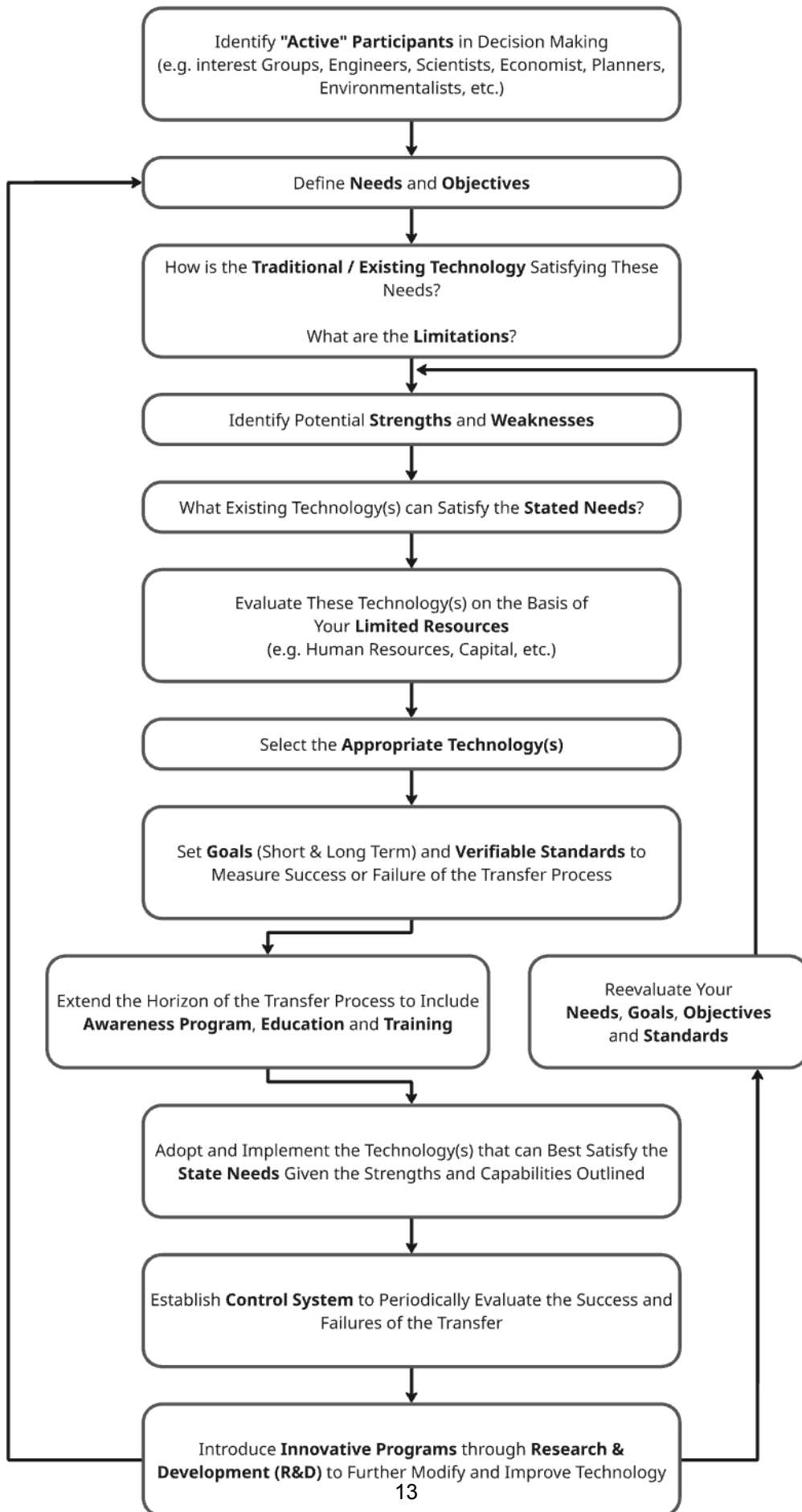


Figure 2.3: The Process of Technology Transfer According to Madu, (1989)

Failures can stem from inadequate planning, lack of standards, or incompatibility between the adopted technology and the local context. To ensure long-term success, ongoing research and development (R&D) efforts are essential to refine and advance the transferred technology.

Factors for Successful Technology Transfer

Although technology adoption has the potential to drive economic development in LDCs (Rostow, 1967), mishandling the process risks undermining national sovereignty. This would be the case especially when MNCs dominate the transfer (Amin, 1974). However, for technology transfer to generate sustained positive impacts, several critical factors must be considered:

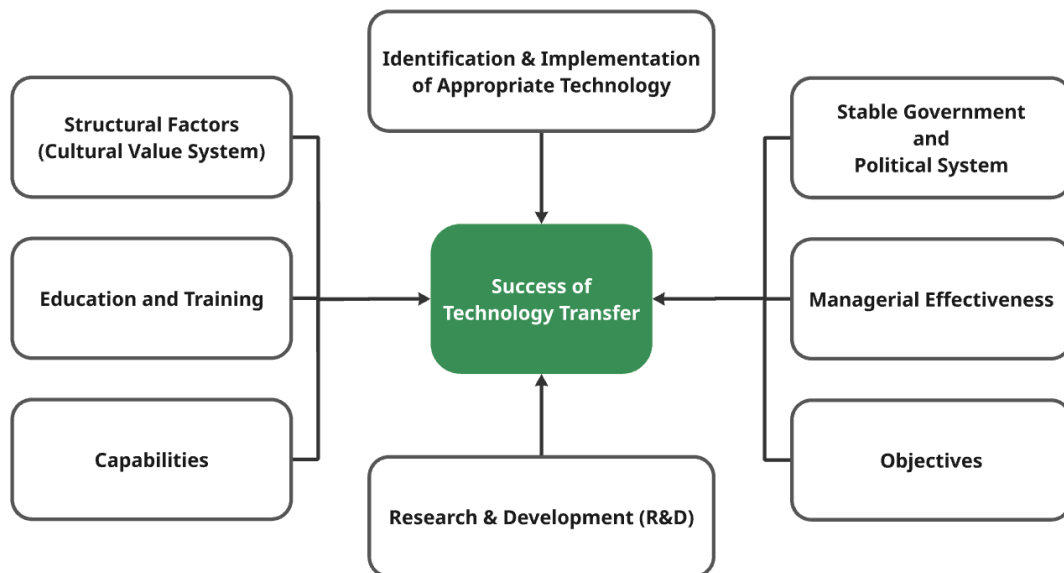


Figure 2.4: Fundamental Factors that Determine the Success of Technology Transfer Madu, (1989)

1. Needs and Objectives

Stakeholders must clearly identify the country's needs and set realistic objectives that address these needs. This ensures that implementation and evaluation remain feasible.

2. Capabilities

Each nation's capabilities, which include human capital, financial resources, natural resources, and infrastructure, must be carefully assessed alongside its limitations. A clear understanding of both strengths and weaknesses allows technology transfer to proceed more effectively and cost-efficiently.

3. Education, Training, and Research & Development

The capacity to adapt and improve technologies depends heavily on robust education and training systems. This can be supported through industrial exposure, training programs, or by sending LDC nationals abroad to gain experience.

4. Identification and Implementation of Appropriate Technology

Selecting technology that fits local needs is essential, as imported technologies are often capital intensive and misaligned with local production requirements. Ensuring appropriateness reduces the risk of wasted investments.

5. Management Process

Even when the right technology is chosen, effective implementation depends on competent managers. Managers must be innovation-oriented, capable of problem-solving, and able to influence

organizational behavior and culture

6. The Role of Public Policy

Public policy can either hinder or facilitate technology transfer. While regulatory barriers often exist, policies that replace administrative controls with market mechanisms can encourage technology inflows. Thus, MNCs must understand local governance structures, political histories, and economic conditions to ensure successful transfer

3

METHODOLOGY

3.1. Research Context

The research focuses on the adoption of Reusable Packaging Systems (RPS) within the context of consumer goods industry in Indonesia. As explained on Section 1.2.3, RPS refers to packaging solutions designed for repeated use across multiple product cycles, which aims to reduce the reliance on single-use plastic packaging by enabling return, refill, or reuse packaging schemes instead (EMF, 2019; Thoden van Velzen and Brouwer, 2022). The variations of these systems range from from refill stations, return-from-home logistics to return-deposit mechanisms. Each of these systems require co-operation and coordination with multiple stakeholders across the value chain, including those from the manufacturers, retailers, logistics providers, and the individual-level customers.

In this study, the focus is on understanding the adoption at the industry level. Accordingly, the perspective of the research will be taken from the Fast-Moving Consumer Goods (FMCG) firms' side, which act as the potential adopters of RPS within their respective business operations. The study therefore seeks to explore the adoption factors shaped by academic insights and industry perspectives, with the aim of understanding how the Indonesian FMCG industry can leverage RPS as a potential solution to reduce plastic waste pollution.

3.2. Research Approach

To identify and understand the market-specific factors influencing RPS adoption in Indonesia's consumer goods industry, this study adopts a qualitative research approach. Qualitative method is particularly suited in exploring complex, real-world phenomena that are difficult to capture quantitatively (Denzin and Lincoln, 2005; Sekaran and Bougie, 2016) and provide the flexibility to adapt and refine insights as the research unfolds.

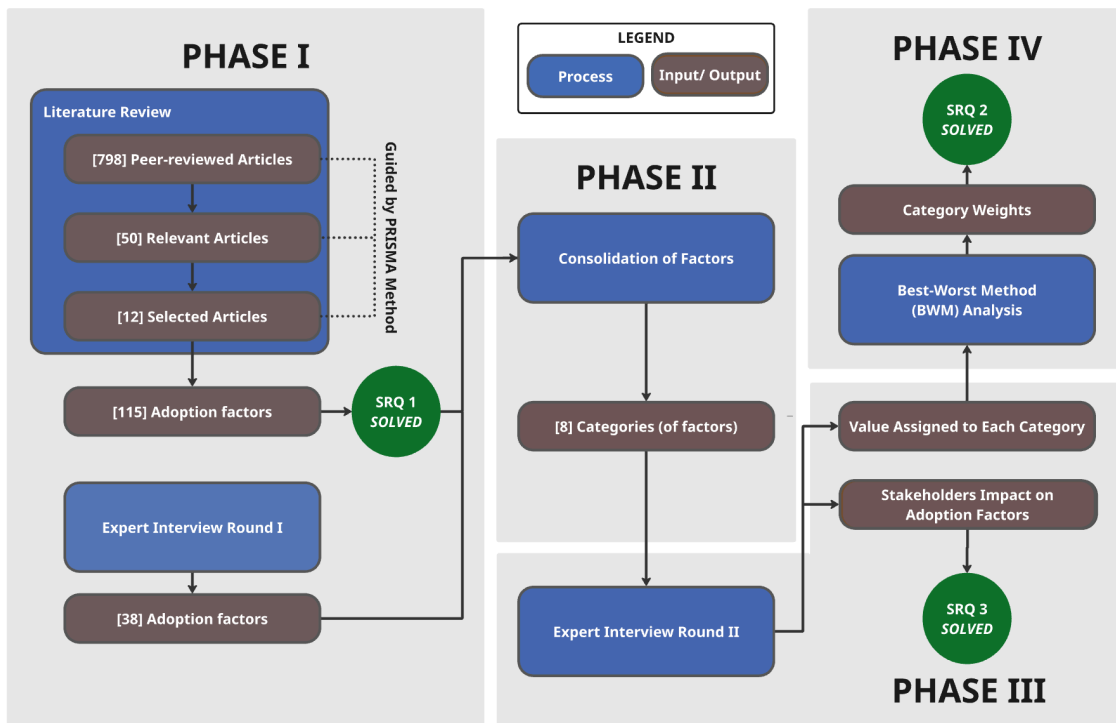


Figure 3.1: The Flow Chart of the Research

Guided by this approach, the study follows a structured four-phase methodology, which are divided into Phase I, Phase II, Phase III and Phase IV. **Phase I** explores adoption factors for RPS from both academic literature and industry practitioners, directly addressing Sub-Research Question 1 (SRQ1) while also laying the groundwork for SRQ2. **Phase II** consolidates the initial 163 identified factors into eight categories, preparing the data for further analysis. **Phase III** involves a second round of Expert interviews, aimed at: (1) ranking the importance of each factor category and (2) gathering insights on how these factors can be influenced to encourage RPS adoption, thereby addressing SRQ3. Finally, **Phase IV** completes the answer to SRQ2 by processing the scores assigned by the Experts with the Best-Worst Method (BWM). This stage helps in identifying the most and least critical adoption factors. An overview of the sub-research questions and corresponding methods is presented in Table 3.1, with detailed explanations of each phase provided in the following sections.

Table 3.1: Overview of Sub-research Questions and their Corresponding Methods

Sub-Research Questions	Method
What factors influencing the adoption of reusable packaging systems are identified in the literature?	Literature Review
What factors do firms consider most critical for the adoption and successful implementation of reusable packaging systems?	Semi-structured Interview & BWM Analysis
How can these factors be influenced by stakeholders (e.g., government, industry, policy makers) to promote the emergence of a dominant ecosystem?	Semi-structured Interview

3.3. Phase I: Data Collection

3.3.1. Secondary Data Sources: Academic Literature

The data collection began with a systematic literature review to identify adoption factors influencing RPS across firms and markets in the consumer goods industry. To ensure replicability and the credibility of this step, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was applied as it offers a transparent, replicable and structured approach by detailing how the referred studies are sourced, assessed, and included in this research (Page et al., 2021). PRISMA method also allows readers to evaluate the soundness of the review process. It consists of a four-phase flow diagram for screening literature and a 27-item checklist to standardize selection criteria. In this context, adoption factors are understood as key variables influencing firms' willingness and ability to implement RPS within their own line of business or across larger industrial network.

To ensure comprehensive coverage, articles were retrieved from Scopus and ScienceDirect, with complementary searches performed using Google for grey literature, publications and reports from trusted organizations such as the Ellen MacArthur Foundation, OECD, and UNEP. The search mainly targeted articles written in English and published between 2010 and 2024, although there are several relevant articles from older dates that are also considered. A structured set of keywords was developed to cover four thematic areas: (1) Reusable Packaging Concepts, (2) Business Models and Processes, (3) Standardization and Adoption, and (4) Industry Focus (see Table 3.2). Each thematic field included in it relevant synonyms and alternative terms, combined using the Boolean operator "OR". Moreover, to ensure that the results were comprehensive yet focused, only articles containing at least one term from each of the four fields were retained, using "AND" to link the search fields.

Table 3.2: Keywords Used in Exploring the Scopus Database

Search Field	Thematic Focus	Keywords / Boolean Expression
1	Reusable Packaging Concepts	"reusable packaging" OR "container packaging" OR "reusable bottle" OR "sustainable packaging" OR "circular packaging" OR "alternative packaging" OR "refillable packaging" OR "refill packaging" OR "reusable box"
2	Business Model and Process	"sustainable business model" OR "refill business model" OR "sustainable packaging" OR "alternative packaging" OR "reverse logistics" OR "reusable packaging logistics" OR "milkman system" OR "milkman delivery system"
3	Standardization/ Adoption	"standardization" OR "standard" OR "adoption" OR "market leader" OR "industry standard"
4	Industry Focus	"consumer goods" OR "FMCG" OR "packaged goods" OR "retail" OR "retail goods" OR "consumer products" OR "household product" OR "grocery retail" OR "supermarket"

The thematic areas and corresponding keywords were selected to ensure both conceptual breadth and alignment with the current academic discourse on RPS adoption. The first thematic area, **Reusable Packaging Concepts**, captures a range of terminologies used to describe RPS in different contexts and markets (EMF, 2019), recognizing that terminology such as "refillable packaging", "refillable pack-

aging” and “reusable containers” varies across literature. The second area, **Business Models and Processes**, was included to provide the operational aspects and system designs that enable RPS adoption, including historical implementation of such system in the “milkman delivery system” (Thoden van Velzen and Brouwer, 2022) and the emphasis of “reverse logistics” and “refill infrastructure” in shaping the feasibility of RPS (Bocken et al., 2022; Babader, 2019). The third area, **Standardization and Adoption**, reflects the importance of industry norms, market coordination, and regulatory alignment in driving adoption at an industrial scale (Suarez, 2004; den Uijl, 2015), recognizing that dominant designs in packaging often emerge through standard-setting processes. Finally, in the fourth area, **Industry Focus**, was included to target literature specific to the consumer goods sector, given that RPS adoption dynamics are different significantly from one industry to another (Thoden van Velzen and Brouwer, 2022). The use of synonym-rich keywords are applied to ensure comprehensive coverage of the available literature, accounting for possible terminology variations used to describe similar concepts or items.

An initial pool of 798 articles was retrieved. The results were then examined through a two-stage screening process. Titles were first reviewed to eliminate unrelated contents, and then followed by abstract reviews to ensure that the articles are aligned with the research’s objectives. Therefore, articles that discuss adoption factors of RPS but not in the consumer goods industry, such as food and beverages, automotive or e-commerce are eliminated and not read further. Furthermore, articles that discuss about packaging in the form of secondary or tertiary packaging are also eliminated as the focus is the primary packaging. The difference between the three lies in the purpose and which stakeholder come into contact with it. Primary packaging is directly get in the contact with the product and has two main purposes: (1) product protection (2) information and/or marketing as they are usually purchased by the end consumers. This is the focus of this research. Secondary packaging facilitates the handling of the main product and serves the purpose of grouping several primary packaging. Lastly, tertiary packaging or transport packaging is used to ship multiple load units and used industrially (Mahmoudi & Parvizioman, 2020).

Through the aforementioned screening process, 50 articles were pooled. Only empirical papers or reviews that explicitly discussed adoption factors for RPS in the consumer goods industry were included in the final selection, which further lower the articles to only 12 papers. This also includes the adoption factors that are influenced by both the end-consumers (individual level) and/or firms. The result of these academic paper reviews amount to 115 adoption factors, which were identified for later to be categorized along with the factors retrieved from the interview sessions. With this, Phase I is completed and also providing the answer to Sub-Research Question 1 (SRQ1).

3.3.2. Primary Data Sources: Expert Interviews Round 1

Following the literature review, which identified 115 factors, the next step was to capture perspectives from industry practitioners to complement academic insights. Semi-structured interview was chosen as the method, as it provides structure through guiding questions while also allowing flexibility to explore emerging ideas in greater depth during the discussion (Gill et al., 2008). To ensure unbiased responses, questions were carefully phrased to avoid leading participants or referencing factors identified in Phase I or by other respondents.

Once the guiding questions were prepared, expert selection process begins, guided by two main criteria. First, participants were required to have relevant experience within the Indonesian consumer goods industry, particularly in relation to reusable packaging systems (RPS) and their implications for business operations. These implications may include supply chain restructuring, branding considerations, and

operational challenges introduced by alternative packaging formats. The reasoning behind this criterion was to ensure a comprehensive understanding of how RPS is perceived across different functions within a company. Therefore, experts from roles related to branding and communication, packaging innovation, and supply chain management were selected for interviews.

The second criterion is associated to the level of professional experience. A minimum of five years of industry experience was considered essential to ensure that the respondents already holding decision-making roles and possess sufficient amount of experience and knowledge in their respective role. Participants were recruited through both the author’s personal network and professional outreach via LinkedIn. In total, six experts were interviewed in which four were obtained through personal referrals and the other two through LinkedIn connections. A summary of their profiles is presented in Table 3.3 below.

Table 3.3: Interviewed Experts Profile

Respondents	Firm Scope	Experience	Sector Expertise
Expert A	Global & Local	14 years	Mineral water, RTD beverages, packaged food
Expert B	Local	6 years	Supplement and energy drinks
Expert C	Global	7 years	RTD beverages
Expert D	Global	5 years	Personal care & pharmacy
Expert E	Global	15 years	RTD beverages, household & personal care, pharmacy
Expert F	Local	5 years	Personal care & cosmetics

These six respondents are representing seven distinct sub-sectors of FMCG industry: mineral water, ready-to-drink (RTD) beverages, packaged food, supplements and energy drinks, personal care and pharmacy, household care, and cosmetics. Each sector presents its own unique challenges, often specific to the nature of its products. Of the six experts, four had experience with global FMCG companies (either currently or previously), while the remaining two worked exclusively for national firms. Together, they offered valuable insights into the practical challenges faced in implementing sustainability initiatives in Indonesia, particularly in the context of sustainable packaging. This stage of data collection yielded 33 adoption factors, which were then combined with the 115 identified in the literature review, marking the start of Phase II.

3.4. Phase II: Categorization of Factors

Once all 158 factors had been identified from the literature review and interview sessions, Phase II involved grouping them into eight distinct categories. This reduction was necessary due to the computational limitations of the Best-Worst Method (BWM), which can only accommodate a maximum of nine criteria for valid analysis (Rezaei, 2015; Taherdoost and Madanchian, 2023). The categorization process, guided by conceptual similarities among factors and following the approach of van de Kaa, (2023), addressed the large initial pool of over 150 factors. In some cases, different terminologies were used to describe similar concepts, while others were expressed only implicitly by respondents. Categorization also ensured clarity and distinction between groups, allowing all relevant aspects of adoption factors to be comprehensively represented.

3.5. Phase III: Ranking of Factors and Stakeholder Roles in Affecting RPS Adoption Factors

The final stage of the interview process is aimed to evaluate the perceived importance of each factor category from the experts' perspective, while also examining how these categories could be influenced by relevant stakeholders. As the third step in addressing Sub-Research Question 2, the online interviews began with a presentation of the pre-categorized factors. Each category was introduced alongside its definition and its corresponding set of factors, Participants were then guided throughout the scoring process, in which they rated the importance of each category using a 9-point Likert scale. A score of 1 indicated minimal relevance or impact to the adoption, while on the other hand, a score of 9 represented high relevance and significant influence. The resulting scores reflect the perceived significance of each category as evaluated by the participating experts. Following the completion of the scoring process, the interviews were then transitioned to the second objective: identifying actions that stakeholders could take to influence these key factors and, in turn, facilitate the broader adoption of reusable packaging systems in the Indonesian FMCG industry.

3.6. Phase IV: Multi-Criteria Decision Analysis (MCDA)

The last Phase of the research will use Multi-Criteria Decision Analysis (MCDA) or also referred to as Multi-Criteria Decision Making (MCDM) to process the result of the second round of interview. Generally, MCDA aims to determine the best alternative from a decision-making process that involves more than one, often conflicting criteria (Taherdoost and Madanchian(2023)) determined by decision-maker. Unlike Cost-benefit Analysis (CBA), Cost-effective Analysis (CEA) or Financial Analysis, MCDM helps decision makers or practitioners to incorporate qualitative and quantitative factors that are not strictly tied to financial valuation (DCLG, 2009).

Historically, numerous MCDA methods have been proposed to assist decision-makers in identifying the most desirable alternatives based on their preferences and the assigned weights of a number of limited set of criteria. For example, Analytic Hierarchy Process (AHP), introduced by Saaty, (1977) which can be used for simpler or structured decisions with no existence of inter-criterion influences. Later, AHP is further developed into Analytic Network Process (ANP) (Saaty, 1996) to be used when the decision involves interrelated factors, feedback loops, or complex inter-dependencies that violate the assumptions of AHP. Both of the methods above are widely-used and employ the pairwise comparison technique, which is originally introduced by Thurstone in 1927 under the framework of the law of comparative judgment. However, Rezaei, (2015) acknowledges that there are inconsistencies in both of the methods, as the pairwise comparison is executed in an unstructured way. Therefore, he proposed a new method: Best-Worst Method (BWM) that resolves the inconsistencies occurring in the AHP and ANP method.

Best-Worst Method (BWM) Analysis

The Best-Worst Method (BWM) is a newly developed multi-criteria decision-making method developed by Rezaei, (2015) that is designed to solve MCDM problems. Similar to the previously mentioned methods, BWM also uses pairwise comparison in its calculation. The weight of each alternative is derived from pairwise comparison to determine the best (most important) and worst (least important) criteria or alternatives against others, as shown in Figure 6.1. The difference however lies in its reduced needs of comprehensive pairwise comparisons, minimal data requirements and time efficiency.

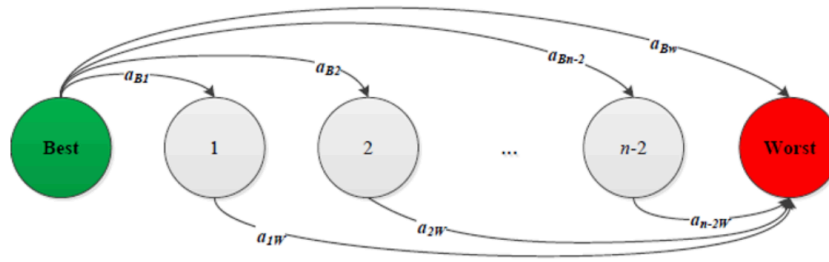


Figure 3.2: Pairwise Comparison between Factors in the Best-Worst Method

In his paper, [Rezaei, \(2015\)](#) explains how his BWM only requires $2n - 3$ comparisons, where AHP needs $n(n-1)/2$ comparisons. This suggests that when analyzing 9 criteria, AHP necessitates 36 comparisons, whereas BWM only requires 15. Hence, the process of decision-making becomes more straightforward, reducing the risk of decision-makers losing concentration due to an overwhelming number of comparisons. The reduced number of comparisons required also decreases the amount of data and time needed for decision-makers to determine the weight of each alternative or criterion. Furthermore, BWM has been shown to yield more consistent results compared to AHP, as it incorporates a consistency ratio that automatically evaluates the reliability of the calculation output. Finally, unlike AHP, BWM does not rely on fractional integers, thereby simplifying the scoring system and making it more convenient for decision-makers. Therefore, the final outcome of the calculation is a set of highly reliable and consistent weighting scores for the criteria or alternatives.

However, despite its advantages, BWM also has certain limitations. The reliability of BWM results depends heavily on individual interpretations of the relative importance of the criteria. Consequently, these variations in interpretation may result to inconsistent BWM outcomes. In addition, BWM lacks sensitivity in capturing subtle differences in criteria importance, which can present challenges in large decision models where distinguishing between the best and worst criteria becomes difficult.

Steps of BWM Analysis

To derive the weight of each criteria through BWM, decision-maker needs to go through 6 steps ([Rezaei, 2015](#)) as explained further below:

Step 1: Determine a set of criteria

In this first step of the BWM analysis, the criteria for the MCDM problem are identified in the form of $\{c_1, c_2, \dots, c_n\}$. In this thesis, the criteria are derived from literature and the first round interview. For manageability purposes, the criteria were organized into categories, with the total number restricted to a maximum of nine criteria/ factor categories.

Step 2: Determine the best and the worst criteria

The second step requires interviewees to assess which factors are perceived as most and least important. No direct comparisons are made yet, since the best and worst criteria are generally determined. In this thesis, this step is done on the second round of the interview.

Step 3: Determine the best criterion over the other criteria

In the third step, industry experts are asked to rate the importance of the best factor over all others using a 1–9 scale. The meaning of these numbers are as follows: **1** = Of equal importance; **2** = Somewhat between equal and moderate; **3** = Moderately more important than; **4** = Somewhat between moderate and strong; **5** = Strongly more important than; **6** = Somewhat between strong and very strong; **7** Very strongly more important than; **8** = Somewhat between very strong and absolute; and **9** = Absolutely more important than. The resulting Best-to-Others vector is presented as: $A_B = (a_{B1}, a_{B2}, \dots, a_{Bj})$,

where a_{Bj} indicates the preference of the best criterion B over criterion j .

Step 4: Determine the worst criterion over the other criteria

Similar to the previous step, the preference of the worst criterion over all the other criteria is also determined by rating it with a number between 1 - 9. The resulting worst-to-others vector is as follows: $A_w = (a_{1w}, a_{2w}, \dots, a_{nw})^T$ Where a_{jW} indicates the preference of criterion a_j over the worst criterion W . Thus, $a_{WW} = 1$, which indicates equal importance between criterion i and criterion j , and a rating of 9 reflects the highest importance of criterion i over j .

Step 5: Find the optimal weight

The fifth step of BWM determines the optimal weight $W = \{w_1, w_2, \dots, w_n\}$. The optimal weight for the criteria is achieved when, for each pair of w_B/w_j and w_j/w_w , we have $w_B/w_j = a_{Bj}$ and $w_j/w_w = a_{jW}$. Therefore, the maximum absolute difference among the set of $\{|w_B - a_{Bj}w_j|, |w_W - a_{jW}w_j|\}$ for all j are minimized, which can be expressed into the following min-max model:

$$\min \max_j \left\{ \left| \frac{w_B}{w_j} - a_{Bj} \right|, \left| \frac{w_j}{w_W} - a_{jW} \right| \right\} \tag{3.1}$$

subject to

$$\sum_j w_j = 1 \tag{3.2}$$

$$w_j \geq 0, \text{ for all } j \tag{3.3}$$

Equations (3.1)–(3.3) can be rewritten as the linear program:

$$\min \zeta$$

$$\left| \frac{w_B}{w_j} - a_{Bj} \right| \leq \zeta, \text{ for all } j \tag{3.4}$$

$$\left| \frac{w_j}{w_W} - a_{jW} \right| \leq \zeta, \text{ for all } j \tag{3.5}$$

Solving (3.2)–(3.5) yields the optimal weights $(W_1^*, W_2^*, \dots, W_n^*)$ and the optimal value ζ^* is obtained.

Step 6: Check the reliability of pairwise comparisons

As the value of ζ^* is now known, the consistency ratio can then be obtained by referring to Table 3.4 and Formula 3.6 below:

$$\text{Consistency Ratio} = \frac{\zeta^*}{\text{Consistency Index}} \tag{3.6}$$

Table 3.4: Consistency Index (CI) Table by Rezaei, (2015)

a_{BW}	1	2	3	4	5	6	7	8	9
Consistency Index (CI)	0.00	0.44	1.00	1.63	2.30	3.00	3.73	4.47	5.23

From the calculation above, a ζ^* value close to zero represents a higher consistency. ζ^* values below

one is considered to be sufficiently consistent. This consistency measure is important in BWM to alleviate inconsistencies in the pairwise comparison that might occur due to decision maker's preference, difficulty in assigning numerical values to qualitative criteria or lack of concentration.

4

IDENTIFICATION OF KEY FACTORS AFFECTING THE ADOPTION OF RPS

4.1. Key Factors Identified from Academic Literature Review

This section synthesizes existing academic literature to systematically identify and categorize the factors influencing the adoption of reusable packaging systems (RPS). While some factors appeared repeatedly under different terminology across studies, other factors were uniquely identified in single sources. Therefore, to ensure a comprehensive overview, all factors, including those mentioned only once, were also included in the analysis.

Since the Best-Worst Method (BWM) can only accommodate a maximum of nine variables, consolidation of the identified factors was required. Following the approach of [van de Kaa, \(2023\)](#), overlapping factors were grouped into broader categories, resulting in eight final categories for further analysis: (1) **Coercive Pressure (CP)** (Table 4.1), (2) **Customer Social & Behavioural Drivers (CSBD)** (Table 4.2), (3) **Expected Benefits & Usability (EBU)** (Table 4.3), (4) **Financial Viability (FV)** (Table 4.4), (5) **Normative Pressure (NP)** (Table 4.5), (6) **Operations, Feasibility & Applicability (OFA)** (Table 4.6), (7) **Partner & Collaborative Network (PCN)** (Table 4.7), and (8) **Technology Quality (TQ)** (Table 4.8).

The literature review of 12 peer-reviewed journals produced 123 factors, which were categorized as sub-factors under these eight categories. Redundant factors, which were described differently in some papers but carrying the same meaning, were merged into the same sub-factors to avoid duplication. Distribution of sub-factors across categories varied: CP comprised five sub-factors; FV six; NP eight; and PCN only four, the fewest overall. CSBD (21), OFA (21), EBU (33), and TQ (25) contained the largest numbers of sub-factors, reflecting the strong emphasis in the literature on consumer expectations and operational challenges in RPS adoption. This consumer-oriented focus also provides balance to the expert interviews, which primarily highlighted firm-level barriers. The tables comprising the categorized sub-factors can be seen on the following pages.

Table 4.1: Coercive Pressure Factors Identified in the Literature

Associated Factors	Definition	Source(s)
Absence of EMS Certification	The absence of Environmental Management System (EMS) certification, such as ISO 14001, is expected in packaging manufacturing firms of developing countries.	Gaur et al., 2025
Governmental Regulations	Policy pressure, such as bans on single-use plastics and mandatory reuse targets, acts as a strong external driver for businesses to switch to reusable models.	Bocken et al., 2022
Lack of Government Incentives and Subsidies	Limited financial incentives or subsidies provided by government bodies to adopt sustainable practices	Gaur et al., 2025
Lack of Regulatory Norms Supporting Reusable Packaging	Regulatory inconsistency across geographies in packaging norms, safety, and reuse mechanisms causes confusion and slows adoption.	Rane et al., 2025
Limiting and Conflicting Policies	Conflicting directives from different government agencies or jurisdictions and policy frameworks that lack coherence or fail to provide clear guidance for adoption.	Gaur et al., 2025

Table 4.2: Customer Social and Behavioral Driver Factors Identified in the Literature

Associated Factors	Definition	Source(s)
Additional Fees	Deposit or subscription fees for reusable containers may discourage adoption unless clearly communicated and perceived as fair by consumers	Bocken et al., 2022
Attitude	Consumers' overall positive or negative evaluation or perception towards the service or reusable packaging.	Yu et al., 2023 , Bashir et al., 2020
Consumer Unawareness	There is limited consumer awareness and a lack of clear communication about the benefits of reusability or recyclability of the packaging, which impacts the adoption of sustainable packaging by consumers.	Gaur et al., 2025
Emotional Value, Anticipated Positive Emotions	Feelings of satisfaction and social value when reducing packaging waste.	Balatsas-Lekkas et al., 2024 ; Miao et al., 2023
Environmental Concern	The extent that consumers care about sustainability and reducing packaging waste, which influences their likelihood to adopt RPS.	Yu et al., 2023
Environmental Consciousness, Environmental Value	Awareness of environmental impact and feelings of guilt from using disposable plastics and generation of food waste, which influence adoption of sustainable solutions such as to reduce both	Bashir et al., 2020 ; Miao et al., 2023
Extra Effort, Extra Time	Requires added tasks such as cleaning, planning, transporting, returning, or managing the reusable packaging.	Noëth et al., 2023 ; Miao et al., 2023
Finance	Issues related to payment options, costs, and perceived financial risks of RPS.	Long et al., 2022
Financial Benefits	Saving money by buying only the necessary portion and reducing household waste disposal costs.	Miao et al., 2023
Green Perceived Value (GPV)	The degree to which consumers perceive the service as environmentally beneficial.	Yu et al., 2023

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Associated Factors	Definition	Source(s)
Higher Costs or Deposit Schemes	Financial burden such as upfront investment, deposits for containers, or price differences that may hinder consumers from adopting reusable packaging.	Terzioğlu et al., 2023
Higher Cost to Consumers due to Reusable Packaging	Consumers face higher upfront investments and risk of return to of their deposit due to damage; low awareness and lack of incentives worsen consumers' reluctance.	Rane et al., 2025
Intention to Purchase	Likelihood of consumers adopting or consuming the reusable packaging solution when it becomes available.	Bashir et al., 2020
Lack of Awareness about Environmental Impacts	Limited knowledge or misunderstanding of how reusable packaging contributes to environmental sustainability.	Terzioğlu et al., 2023
Lack of Interest of Consumers	Consumers show low interest due to safety concerns, cost, and absence of reward schemes for participation in reusable systems.	Rane et al., 2025
Motivation	Specific reasons or benefits that encourage consumers to adopt RPS.	Long et al., 2022
Positive Attitude towards Reuse Models	Willingness to adopt RPS if product quality and price are satisfactory, preferring to refill the same container over returning it.	Miao et al., 2023
Price, Expensiveness	Perceived relative cost of the reusable packaging solution compared to other alternatives.	Bocken et al., 2022 , Noëth et al., 2023 , Bashir et al., 2020 , Babader, 2019
Resistance to Changing Habits and Behaviors	Relates to the consolidated behaviors of using single-use packaging and the difficulty of transitioning to routines that require reusable containers (e.g., remembering to bring them, washing them).	Terzioğlu et al., 2023
Social Status	Others perceiving the user of RPS to be more environmentally friendly	Heeremans et al., 2023
Time Investment	Adoption seen as requiring more time for handling and returning packaging.	Noëth et al., 2023

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Associated Factors	Definition	Source(s)
Upfront Financial Investment and Willingness to Pay	Costs of buying or placing deposits on containers, with limited willingness to pay extra.	Miao et al., 2023
Willingness to Change	Degree to which consumers are ready to alter their consumption habits to support environmental goals.	Bashir et al., 2020

Table 4.3: Expected Benefits & Usability Factors Identified in the Literature

Associated Factors	Definition	Source(s)
Accessibility	Easiness in how consumers can reach/ find stores offering RPS services and products, enabling greater convenience and the expansion into more diverse consumer segments (particularly in the in-store RPS models).	Bocken et al., 2022
Availability of Support or Services	Support services (refill machines, refurbishment, cleaning) should be available to enhance reuse and adoption.	Babader, 2019
Cleanability	Reusable packaging should be easy to clean without leaving odor or residue.	Babader, 2019
Complexity of Using a New System	Initial difficulty in understanding and operating the RPS, especially digital instructions and manual control of product flow.	Miao et al., 2023
Concerns about Product Safety & Quality	Concerns over product safety (such as expiration dates, freshness, allergens, inadequate product information), handling practices, and potential contamination from packaging materials, becoming significant barriers to the adoption of reusable packaging	Rane et al., 2025
Contamination Risks and Hygiene Concerns	Worries about cleanliness and the potential for contamination especially after witnessing others' improper use, spillage, or unclear cleaning cues of containers in reused containers, especially when shared or inadequately cleaned.	Bocken et al., 2022 ; Long et al., 2022 ; Miao et al., 2023 ; Noëth et al., 2023 ; Terzioğlu et al., 2023
Convenience, Convenience of Use, Inconvenience	Perceived effort and complexity required from consumers to adopt and use the solution (e.g., needing to carry containers, return packaging, or difficulty in storage at home)	Bashir et al., 2020 ; Bocken et al., 2022 ; Babader, 2019 ; Terzioğlu et al., 2023 ; Heeremans et al., 2023
Easy to Disinfect	Packaging should be easy to disinfect and safe for cleaning, reducing risks of contamination.	Babader, 2019

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Associated Factors	Definition	Source(s)
Environmental Friendliness, Environmental Impact	Perceived degree to which the solution is environmentally beneficial compared to alternatives and environmental impact is a top reason customers are motivated to use such systems, particularly by reducing waste and pollution.	Bashir et al., 2020 , Bocken et al., 2022
Familiarity with Reuse Practices	Previous habits like using reusable bags or transferring products to personal containers ease adoption.	Miao et al., 2023
Functional and Performance Limitations	Shortcomings in the packaging's ability to store, preserve, or protect contents as effectively as single-use options.	Terzioğlu et al., 2023
Functionality Risk	Perceived risk regarding whether the solution is practical and easy to use.	Bashir et al., 2020
Hold Contents Safety	Reusable packaging must securely contain contents over multiple uses, protecting from leakage or damage.	Babader, 2019
Incentives/ Rewards for Reuse	Packaging should communicate rewards for reuse, such as cost savings or environmental benefits.	2019 ; Heeremans et al., 2023
Limitation in Brand Differentiation	Reusable packaging restricts use of distinct branding on packaging, raising concerns about losing brand identity and customer loyalty.	Rane et al., 2025
Limited Availability and Variety	A lack of diverse or sufficient options for reusable packaging in the market, limiting users' ability to find suitable solutions.	Miao et al., 2023 ; Terzioğlu et al., 2023
Meet Consumers' Needs	Packaging should meet consumer requirements and encourage participation in reuse activities.	Babader, 2019
Not as Easy to Use	Viewed as less practical or convenient than single-use packaging.	Noëth et al., 2023
Overall Perceived Advantage	Extent to which the solution is seen as advantageous compared to existing products.	Bashir et al., 2020

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Associated Factors	Definition	Source(s)
Perceived Ease of Use (PEOU)	Extent to which consumers believe the reusable packaging service offers convenience, time savings, and improved product availability.	Yu et al., 2023
Perceived Usefulness	The extent that consumers believe that using the RPS will enhance their daily life.	Yu et al., 2023
Privacy Risk	Perceived risks to personal or household privacy associated with adopting the solution (especially when it comes to refill-at-home RPS service)	Bashir et al., 2020
Product Assortment	A wide assortment of products available in reusable formats increases appeal and relevance to more customer segments.	Bocken et al., 2022 , Noëth et al., 2023
Product Safety Risk	Perceived safety of the solution in terms of health, hygiene, and security for households.	Bashir et al., 2020
Reassurance	RPS is available/ compatible with existing trusted brands	Heeremans et al., 2023
Reduced Brand Experience	Concern that reuse reduces brand differentiation and identity.	Noëth et al., 2023
Reduced Conservation Time	Fear that reusable packaging shortens shelf life compared to disposables.	Noëth et al., 2023
Reduced Shopping Experience	Fear that reuse limits variety and lowers the in-store shopping appeal.	Noëth et al., 2023
Reliability of Hygienic Standards	Trust in the system's sealed, professional cleaning process compared to traditional bulk buying.	Miao et al., 2023
Reseal-ability	Packaging that can be resealed is more likely to be reused as it preserves the contents securely.	Babader, 2019
Skepticism about Environmental Impacts	Doubts about RPSs' true sustainability compared to recycling or considering plastic as unsustainable.	Miao et al., 2023
Trust (Lack of it)	Confidence in the service of RPS regarding reliability, hygiene, and product quality which could hinder adoption	Terzioğlu et al., 2023 ; Yu et al., 2023

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Associated Factors	Definition	Source(s)
Usability	Degree to which RPS are convenient and easy to use for consumers.	Long et al., 2022

Table 4.4: Financial Viability Factors Identified in the Literature

Associated Factors	Definition	Source(s)
Expensive Green Packaging Solutions	Adopting green alternatives for packaging materials incorporates increased costs of sourcing sustainable materials, more investment in production processes, and higher costs for innovative solutions.	Gaur et al., 2025
High Capital Investment	Shifting toward a sustainable business model increases investment costs because sustainable solutions for packaging materials productions require higher setup or investment costs than traditional ones.	Gaur et al., 2025
High Investment in Waste Disposal	Disposing of packaging waste, which consists of hazardous waste, requires a high investment because maintenance in inventory can cause a high economic loss for industries.	Gaur et al., 2025
Institutional Funding Crisis	Organizations do not get adequate government or private bank funding to implement initiatives of sustainable solutions.	Gaur et al., 2025
Sales and Profit	Reusable packaging models can drive sales growth and profitability by fostering customer loyalty, repeat purchases, and differentiation from competitors.	Bocken et al., 2022
Upfront Investments in New Reusable Packaging System	Adopting reusable packaging requires high upfront investments from producers and distributors due to lack of existing reverse logistics systems.	Rane et al., 2025

Table 4.5: Normative Pressure Factors Identified in the Literature

Associated Factors	Definition	Source(s)
Environmental Consciousness	Rising awareness among both consumers and companies about sustainability issues supports the desirability of circular packaging solutions.	Bashir et al., 2020 ; Bocken et al., 2022
Lack of Support from Top Management	Effective and efficient top management support is needed in industries to strategically plan, allocate resources, and facilitate sustainable initiatives that are competitively viable and acquire long-term market benefits.	Gaur et al., 2025
Negative Attitude toward Sustainability	The mindset of small- and medium-sized packaging industries in developing economies is still in the transition zone toward the implementation of sustainable and eco-friendly infrastructure.	Gaur et al., 2025
Normative Influence	Adopting reusable systems enhances corporate reputation and public image, portraying the business as environmentally responsible and forward-thinking.	Bashir et al., 2020 ; Bocken et al., 2022
Reducing the Environmental Footprint	Businesses are motivated to adopt reusable packaging as a strategy to reduce their ecological impact, aligning with internal sustainability goals and external expectations.	Bocken et al., 2022
Resistance to Change	Many packaging industries hesitate to implement sustainable solutions in their supply chains due to the risk of losing potential market share.	Gaur et al., 2025
Reputation and Image	Adopting reusable systems enhances corporate reputation and public image, portraying the business as environmentally responsible and forward-thinking.	Bashir et al., 2020 ; Bocken et al., 2022
Sustainability Awareness	Rising awareness among both consumers and companies about sustainability issues supports the desirability of circular packaging solutions.	Bashir et al., 2020 ; Bocken et al., 2022

Table 4.6: Operations, Feasibility & Applicability Factors Found in the Literature

Associated Factors	Definition	Source(s)
Complex Reverse Logistics	Reverse logistics is complicated due to involvement of multiple stakeholders and becomes more complex in case of reusable packaging as continuous traceability for product protection becomes crucial.	Rane et al., 2025
Convenient Business Model	Reusable packaging is more feasible when it fits within an existing or easy-to-implement operational model, requiring minimal disruption to logistics or systems.	Bocken et al., 2022
Inadequate Infrastructure	Many industries lack the necessary infrastructure to adopt greener packaging alternatives and to overcome challenges related to packaging recovery, reuse, recycling, and reverse logistics.	Gaur et al., 2025
Lack of Infrastructure for Reusable Packaging	Current infrastructure mostly supports single-use packaging; lack of ICT systems, inspection, and refurbishment processes also reduce reusable packaging adoption.	Rane et al., 2025
Need for Re-organization of Supply Chains	Reusable packaging requires re-organization of supply chains to incorporate reverse logistics, minimize cost and delay, and ensure packaging return and reuse.	Rane et al., 2025
Operational and Maintenance Concerns	Operational and maintenance issues faced by the firms during the production process include minimum wastage and usage of raw material, as well as minimum maintenance requirements for the final packaging product.	Gaur et al., 2025
Shortage of Competent Workforce	Ineffective training and skills development for sustainable practices are not provided by institutes, which creates a shortage of competent workforce and obstructs the firms from achieving sustainable goals.	Gaur et al., 2025
Supplier's Substandard Reverse Packaging Quality	Due to supplier's inadequate quality of materials for packaging processes, manufacturing firms face obstacles.	Gaur et al., 2025

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Associated Factors	Definition	Source(s)
Sustainable Design Gap in Supply Chain	The absence or insufficient integration of sustainable solutions within the supply chain or packaging design hinders industries from achieving sustainability.	Gaur et al., 2025
Vagueness in Return Liquidity	Packaging firms lack clarity or confidence regarding the financial benefits of investing in sustainable practices. It increases uncertainty about the long-term profitability, economic value quantification, and concerns about the upfront costs of sustainable processes.	Gaur et al., 2025
Return Rates and Time Required for Packaging of New Cycle	Variation in reuse cycles and time needed for cleaning, sorting, maintenance reduces efficiency and hinders adoption in just-in-time systems.	Rane et al., 2025

Table 4.7: Partner & Collaborative Network Factors Found in the Literature

Associated Factors	Definition	Source(s)
Lack of Information Exchange	Due to a lack of information exchange and unfair business practices between packaging partners, the commitment toward sustainable initiatives is not fulfilled.	Gaur et al., 2025
Minimal Stakeholder Cohesion	Minimal stakeholder cohesion involves limited communication between suppliers, manufacturers, distributors, and retailers, leading to inefficiencies, delays, and missed opportunities for implementing sustainable practices.	Gaur et al., 2025
Pre-existing Partnerships	Companies with existing partnerships across the supply chain can more easily adopt reusable models by leveraging these relationships for collection, cleaning, and redistribution.	Bocken et al., 2022

Table 4.8: Technology Quality Factors Found in the Literature

Associated Factors	Definition	Source(s)
Design Complexities in Reuse and Recyclability	The design complexities in the reuse and recyclability of packaging are critical challenges faced by the research and development teams and engineers to make it sustainable.	Gaur et al., 2025
Design of the Dispenser	Includes elements like novelty, naturalness, transparency, and sensory interactions that affect consumer evaluation and experience.	Miao et al., 2023
Design of the Reusable Container	Aesthetic appeal, transparency, stackability, secure lids, and material qualities (e.g., food-safe, lightweight, recyclable) are important.	Miao et al., 2023
Difficulty in Managing Package Shelf Life and Biodegradation	Success of reusable packaging depends on material's compatibility, stability, and ability to biodegrade appropriately, which affects shelf life and sustainability.	Rane et al., 2025
Easy to Open and Re-close	Ease of opening and closing increases attractiveness for reuse; systems should be convenient and usable by all, including disabled or elderly users.	Noëth et al., 2023
Endurance	Reusable packaging should be strong enough to protect contents during multiple uses, transport, and storage, providing resistance against shocks and wear.	Babader, 2019
Environmental Communication	Reusable packaging should provide clear, simple instructions on reuse, recycling, or composting to guide consumers.	Babader, 2019
Insufficiency of High-quality Raw Materials	Insufficiency of high-quality raw materials in packaging production generates more wastage and carbon emissions, and packaging manufacturing firms do not meet desired packaging quality standards.	Gaur et al., 2025

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Associated Factors	Definition	Source(s)
Intricate Material Compositions and Structures	Intricate material compositions and structures used in packaging design create obstacles to packaging reprocessing facilities in order to reduce carbon footprints and minimize waste.	Gaur et al., 2025
Less Waste	Reusable packaging should minimize waste generation throughout its life cycle.	Babader, Babader, 2019
Materials Type	Innovative design and use of materials (glass, metal, plastic, cardboard) should make packaging reusable.	Babader, 2019
Packaging Characteristics	Includes color and print quality that attract consumers at the point of sale and influence reuse.	Babader, 2019
Packaging Design and Materials Type	Innovative design and use of materials (glass, metal, plastic, cardboard) should make packaging reusable.	Babader, 2019
Packaging Handle Shape	Safe and ergonomic handle design (e.g., avoiding sharp edges) increases satisfaction and safety when reusing packaging.	Babader, 2019
Packaging Mass & Shape	Reusable packaging should be strong enough to protect contents during multiple uses, transport, and storage, providing resistance against shocks and wear.	Babader, 2019
Packaging Wear and Tear	Perceptions of diminished quality due to scratches, dents, or damage on reusable packaging, which may also trigger hygiene concerns	Miao et al., 2023 ; Terzioğlu et al., 2023
Portability	Packaging that is light and easy to carry or handle is more desirable for reuse, with design considering optimum weight and accessibility for all users.	Babader, 2019
Post-consumer Recycling	Packaging should allow recycling after reuse, with symbols and clear information provided to consumers.	Babader, 2019

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Associated Factors	Definition	Source(s)
Product Quality	High-quality, durable, and well-designed packaging influences perceived value and willingness to adopt reusable systems, especially when it preserves product integrity.	Bocken et al., 2022
Quality and Value of Packaging	High-quality packaging that is durable and valuable encourages reuse and longer lifespan.	Babader, 2019
Recycling Contents	Packaging should be designed with recyclable contents to reduce waste after reuse.	Babader, 2019
Refill-ability, Refill-ability with Other Products	Packaging should be able to be refilled with the same product or other items desired by consumers (e.g., food, clothes, jewelry).	Babader, 2019
Restore-ability	Packaging that takes up less space and can be reused for storage encourages reuse; design should optimize size and usability.	Babader, 2019
Safe Materials	Materials must be hygienic, non-contaminating during use, and safe for the environment during disposal or recovery.	Babader, 2019
Technology Quality	Innovative design and use of materials (glass, metal, plastic, cardboard) should make packaging reusable.	Babader, 2019

4.2. Key Factors Identified from the Perspective of Consumers (FMCG Firms)

The first round of interviews with experts focused on capturing their perspectives regarding the factors influencing the adoption of RPS. The questions were carefully phrased to avoid suggesting factors already identified through the literature review or in previous interview sessions. The results of the interviews with 6 Experts are summarized as follows:

4.2.1. Expert A: Packaging Specialist, National FMCG Firm

Expert A has nearly 14 years of professional experience in the field of packaging. His career began as a packaging specialist at a multinational FMCG company, followed by a position at a national mineral water company, before settling into his current role at another national FMCG firm, where he has worked at for almost a decade. During his employment at the mineral water company, he was involved in the distribution of drinking water using large refillable gallons, a solution several Indonesian mineral water companies have developed in response to the country's lack of centralized tap water system.

In his role, he was responsible for the quality control of these gallons, which were designed for reuse of up to 70 times. However, he revealed that during routine inspections, some gallons became unusable after only 20 cycles. He concluded that environmental exposure, especially prolonged contact with direct sunlight during transportation is one of the reasons for this early degradation. Nonetheless, such inspections were not routinely conducted, raising concerns that many gallons continued to be used even after they have surpassed their recommended lifespan. The situation is further complicated by consumer behavior, as not few individuals choose to refill gallons at unofficial water stations that offer lower-priced drinking water. This practice makes it increasingly difficult to monitor and manage the packaging's life-cycle effectively.

Currently, Expert A is employed at a company that produces a range of consumer goods variations, including instant noodles, ready-to-drink (RTD) beverages, and seasonings. He identified that instant noodle packaging is the most problematic in terms of sustainability, rather than bottled water. Most of the instant noodle packaging is made of non-recyclable plastic and is often contaminated with food residue, further complicating the waste management process. He emphasized that while RTD packaging certainly requires sustainable solutions, addressing waste generated by products such as instant noodles packaging is more urgent.

In addition to his corporate responsibilities, Expert A serves as a part-time lecturer at a university in Indonesia and holds an important position in the Packaging Development Federation (PDF), a non-profit organization (NPO) dedicated to the advancement of packaging technology in the country. Currently, the federation has also initiated discussions on sustainable packaging practices. One of their long-term goals is to establish national packaging standards that can be used across industries and to develop an academic discipline specifically focused on packaging design, materials, and life-cycle analysis.

Drawing from his extensive industry experience, he observed that most professionals in packaging development come from backgrounds in industrial engineering, industrial design, or visual communication design. Although these educational backgrounds are important for the industry as a whole, he proposes for a dedicated academic program that focuses comprehensively on packaging, including its materials, performance, environmental impact, among other things. He was mainly inspired by China, as he observed a high volume of academic publications dedicated specifically to packaging, many of which originate from Chinese academic institutions. However, establishing such program in Indonesia, along with PDF's ambition to introduce a national industry standard for packaging remains the long

term objective. In the meantime, the federation supports the industry by organizing workshops, expert talks, and collaborative sessions with universities across the country.

4.2.2. Expert B: Packaging Specialist, National FMCG Firm

The second participant has six years of experience in the national FMCG industry, working as a packaging specialist. Based on his professional insights, he emphasized that implementing RPS within his company would present several crucial challenges. One of the primary obstacles is the company's centralized production model, operating from a single manufacturing facility while the distribution of the products is nationwide. Although similar logistical challenges were also noted by Expert A and Expert C, the company affiliated with these experts had already developed a comprehensive logistics infrastructure, including reverse logistics capabilities. In contrast, in the case of the Expert B's company, such facilities to collect empty packaging is not yet available. Therefore, implementing a new reverse logistics would result in substantial operational costs.

He further emphasized the complexity of applying RPS to products packaged in sachets, which is a small unit of packaging containing approximately 14 to 25 grams of powdered beverage concentrate. According to him, this packaging format caters perfectly to the purchasing power and habits of many Indonesian consumers, who prefer small quantities per transaction due to economical constraints (with one sachet costing only less than € 0.10). Consequently, transitioning such products to reusable packaging formats would likely face resistance and reduced consumer outreach into the company's primary customer base.

Rather than adopting RPS, the participant suggested that partnering with local *Bank Sampah* (waste banks) could serve as a more feasible alternative for improving packaging sustainability. *Bank Sampah* represents a community-driven waste management initiative that operates informally within Indonesian neighborhoods. Although these waste banks typically serve only a limited number of households and do not possess the capacity to convert recyclable plastics into new raw materials (e.g., recycled plastic pellets), they still play a meaningful role in waste separation and re-purposing. In many cases, they transform even non-recyclable plastic waste into usable items such as crafts, furniture, and name tags.

The company has actively collaborated with such initiatives to manage the waste generated from sachet packaging, positioning such effort as part of its extended producer responsibility. According to Expert B, this initiative was partly driven by government directives that encourages the company to take accountability for its plastic waste, particularly sachet waste. However, he noted that while existing regulations assign responsibility to producers for waste management, they do not explicitly mandate or recommend the development or adoption of alternatives to plastic packaging. As a result, the company is not obligated to alter its sachet packaging format.

4.2.3. Expert C: Warehouse Operation Specialist, Multinational FMCG Firm

Expert C currently works at the Indonesian branch of a global FMCG company and has six years of experience in warehouse operations and inventory management. As part of a multinational corporation, the Indonesian division is obligated to implement sustainability measures which aligns with the directives from its global headquarters. These include reducing water usage, minimizing carbon emissions, and addressing other related environmental impacts. However, the implementation of such measures proved to be unsuccessful in some cases.

Indonesia has previously had prior success with bottle return systems, however the actual return rate of the glass bottles during implementation was declining over the years. Expert C identified several key challenges that were causing this to happen. Additionally, these bottles are considered company

assets due to their relatively high economic value, which complicates their management. In practice, informal waste collectors (pemulung) often resell the bottles for profit, preventing traditional grocery retailers from returning them to the company as intended.

Furthermore, the use of glass bottles entails significant operational demands. They must be thoroughly cleaned, requiring both water and energy. The company is bound by internal performance indicators, including Water Usage Ratio and Energy Usage Ratio, which are negatively affected by the resource-intensive cleaning process. The reusable system also necessitates additional handling and labor, which contributes to rising operational costs.

In contrast, packaging formats such as rPET bottles pose fewer logistical and operational challenges. Unlike glass bottles, rPET containers are not treated as company assets and therefore do not require return or refill processes. Consequently, rPET systems involve lower energy and water consumption and eliminate the need for reverse logistics infrastructure. The company currently collaborates with recycling firms to convert PET waste into rPET materials, aligning with its broader sustainability goals.

Expert C also highlighted behavioral barriers among Indonesian consumers. Many are unfamiliar with the purpose and benefits of reusable packaging, and environmental awareness remains relatively low. As a result, the glass-bottled products tend to be less popular than their disposable plastic counterparts, which are perceived as more convenient because they do not require return. Moreover, the company did not implement any consumer incentives—such as the *statiegeld* deposit system used in the Netherlands—which could have encouraged return behavior. The absence of such mechanisms, coupled with widespread littering practices, further hindered the effectiveness of the reuse initiative.

The complexity of reverse logistics was particularly evident for small-volume products, as the company's sales extend to remote regions across Indonesia, where transportation infrastructure remains uneven and underdeveloped. Although Expert C could not provide an exact figure for the return rate of the glass bottles during the implementation period, the low effectiveness of the system was significant enough that the company has since reverted to using disposable plastic bottles. This, in addition to the glass bottles that are inherently fragile and require special crates for safe transportation.

From a business perspective, Expert C noted that refillable systems, while environmentally motivated, carry higher logistical and financial burdens. In cases where packaging is refilled directly by consumers—as in bulk dispensing models—the lack of quality control poses reputational risks to the brand. In contrast, returnable packaging systems allow for centralized quality management, but they require strong operational coordination, consumer compliance, and regulatory support.

Despite government encouragement for producers to manage plastic waste, Expert C explained that central regulations have had limited influence on actual implementation. Ultimately, decisions regarding reusable packaging adoption are determined by each company's internal business strategy rather than external policy mandates.

4.2.4. Expert D: Packaging Specialist, Multinational FMCG Firm

Expert D has five years of experience in the global packaging industry, with a primary focus on personal care and pharmaceutical products. Similar to previous experts, she emphasized the significant influence of mandates issued by the company's global headquarters. While reusable packaging is not currently feasible for all of the company's product lines, the head office has set a target for all packaging to be either fully recyclable or reusable by 2030. However, she acknowledged that the implementation of this target must be adapted to local conditions, including consumer behavior, economic realities, and national regulations.

In the Indonesian context, these global goals often require localization. One such adaptation has been the reduction in product serving sizes. Specifically, packaging that previously contained 10 tablets of medicine has been downsized to packs of 4 tablets. This decision was driven by the demographic and financial characteristics of the local consumer base. Although the medication is highly effective and in high demand, its cost remains unaffordable for many. Reducing the quantity per package makes the product more accessible across various market segments. As Expert D noted, the original packaging was more expensive than a kilogram of rice in Indonesia, which further incentivized this change. However, she also recognized that this trade-off leads to increased packaging waste and a larger environmental footprint.

Similar to Expert C, Expert D also emphasized that implementing RPS within the company presents various challenges, especially that Expert D's company is in the pharmaceutical sector. Pharmaceutical products are subject to stricter regulatory standards in comparison to beverage products, particularly concerning hygiene, safety, and traceability. In her view, RPS implementation might be more viable if it involved manual refilling outside the manufacturing environment, for example, through controlled distribution centers or pharmacies. However, this approach raises concerns about maintaining quality control.

To ensure consistent product quality and safety, Expert D suggested that any RPS initiative would ideally need to be managed within the manufacturing facility. This would allow the company to maintain monitoring of both the packaging and the product refilling process. However, such an approach would necessitate the establishment of a robust reverse logistics system to return used packaging to the plant for cleaning and refilling. Resembling earlier experts, she highlighted the significant logistical and operational barriers associated with setting up reverse logistics operation, particularly in the Indonesian context, where infrastructure and consumer practices pose additional constraints.

4.2.5. Expert E: Corporate Affairs, Multinational FMCG Firm

Expert E brings over 15 years of experience in communication, marketing, and corporate affairs across four multinational consumer goods companies. One of the companies he was working in focused on home care and personal care products such as soaps, detergents, and floor cleaners. During his time in this company, he managed to collaborate with Siklus Refill, a reusable packaging start-up based in Indonesia. While the initiative initially showed promise, it was ultimately halted following an inspection by Indonesia's National Agency of Drug and Food Control (BPOM/*Badan Pengawas Obat dan Makanan*) due to product quality, safety and hygiene concerns.

BPOM's primary objection centered on the risk of contamination during the manual transfer of liquid products between containers, especially for goods that come into direct contact with the skin. Siklus aims to reduce packaging waste by offering refill services to end-consumers by providing various mainstream FMCG products. However, these FMCG firms, including the one Expert E was affiliated with, did not provide products in large bulk volumes. Instead, on average, the firms supplied refills in packaging at the maximum amount of 1 liter, while Siklus refill stations typically required 3–5 liter jerry cans. This difference in volume resulted in multiple manual refill sessions per container, thereby increasing the risk of contamination.

Further exacerbating the issue, end-consumers were allowed to use any type of container for the refills, regardless of its material quality or its cleanliness. These containers were typically not subject to inspection or proper sanitation by Siklus personnel, increasing the risk of product degradation and potential health hazards. According to Expert E, such practices concluded that Indonesia's ecosystem for reusable packaging is not yet ready, particularly due to risks associated with double handling, prod-

uct quality degradation and insufficient hygiene safeguards. These risks would certainly be even more critical if applied in the food and beverage products.

In reflecting on the broader sustainability landscape, Expert E expressed skepticism regarding the level of commitment among Indonesian FMCG firms. He observed that only a small portion of companies prioritize sustainability or plastic waste reduction. Most businesses remain focused on expanding market reach by catering to lower-income consumers, which typically requires offering affordable, small-sized packaged goods. This economic priority works against the scaling of RPS models, which often require higher up-front investment and infrastructure by the company, as well as buying products in bulk by end-consumers.

Expert E also highlighted how the industry in Indonesia moves faster than the regulation made by government. For example, he noted that even though the government has introduced various regulations, such as anti-littering laws and waste management policies, these are rarely enforced effectively. Recycling facilities in Indonesia are still limited in capacity and often rely on manual sorting, with few facilities capable of conducting the entirety of plastic waste recycling process. He criticized the government for placing the burden of compliance and innovation primarily on the private sector, without offering necessary support or incentives for companies that comply with or exceed regulatory expectations.

Surprisingly, Expert E also emphasized the influential role of non-governmental organizations (NGOs) in shaping corporate behavior through public advocacy. In one of his former roles, an international NGO launched a campaign against the company after uncovering evidence that it was indirectly sourcing unsustainable palm oil through its supply chain. The backlash from consumers then prompted the company to cut ties with the supplier in question and to collaborate with the NGO to repair its brand reputation and rebuild consumer trust.

Consistent with the perspective shared by Expert D, Expert E also pointed out the financial limitations of many Indonesian consumers, especially those in suburban and rural areas. These consumers often purchase only what they can afford on a daily basis, making larger format packaging, especially the refillable format, impractical for mainstream use. In fact, his company had experienced a shift toward reducing the volume of product in each package, which is in contrast to the goals of packaging efficiency. This was driven by consumer affordability. As such, while Expert E believes that reusable packaging systems could be viable in Indonesia, he maintains that they are currently only feasible for niche market segments.

4.2.6. Expert F: Packaging Specialist, National FMCG Firm

The final respondent, Expert F, has five years of experience working in the packaging innovation department of a national body care company that specializes in skincare and cosmetics products for the Indonesian market. The company primarily targets younger consumers.

Throughout her professional experience, Expert F has observed a notable difference in consumer behavior between skincare and cosmetic products. She noted that consumers tend to indicate higher brand loyalty when it comes to skincare, since such products are often highly associated with individual skin sensitivities. On the contrary, younger Indonesian consumers typically show lower loyalty toward cosmetic products, frequently switching between brands to explore new variations and trends. This behavioral distinction has significant implications for the company's approach to how they develop the product, including its packaging and potential sustainability factors that could be applied into it. This also includes the potential for making the packaging recyclable, bio-degradable or potentially applying the concept of reusable packaging systems (RPS).

One of the products she identified as having potential for RPS application is the cushion compact. The structural design of this product allows itself to be refillable or to be reused. However, given the low brand loyalty observed in cosmetic product segments like cushion compacts, Expert F expressed concern that investing in a reusable system for such products could be financially risky and may not yield the intended benefits in terms of reuse or return rates.

In contrast, she explained that implementing RPS for products such as facial cleansers (e.g., face wash) presents a different set of challenges. Most consumers are accustomed to the traditional tube format for such products, which relies on a specialized factory filling process. Transitioning to reusable packaging would require a fundamental redesign of the product's packaging format (e.g. switching to a pump dispenser). However, modifying the established packaging format could influence consumer behavior and potentially lead them to switch to competing products that maintain the conventional, more familiar designs.

As a packaging innovation specialist, Expert F also emphasized the importance of material selection and design attributes, such as product information label, color, and shape in consumer-facing products like skincare and cosmetics. She argued that these visual and functional elements play a critical role in attracting and retaining consumers and must therefore be preserved or adapted thoughtfully when developing reusable packaging. In her view, if RPS is to be successfully implemented in this industry segment, it must not compromise the visual appeal or user experience that consumers have come to expect. According to her, failing to consider these factors could result in packaging that fails to resonate with the target market. This will ultimately lead to potential poor adoption and wasted investment. The packaging's shelf-life is also a concern that she addressed when discussing the possibility of applying RPS system in her company line of business.

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From the interview, each of these Experts equally find that regulation plays a part in the adoption of RPS. Most agree that Indonesia is still lagging behind in terms of waste management in general, as not only the government lacked the regulation for proper waste management but also from the application of the regulation related to the waste management. Other than that,

From the conducted interviews sessions, the data were synthesized to extract several key factors. These factors were identified both explicitly through the experts' direct statements and implicitly through their detailed accounts. While certain similarities were observed, the factors encountered by business practitioners in their daily operations were found to diverge slightly from those identified in the existing literature. The factors derived from the interviews with the six participants are presented below:

Table 4.9: Adoption Factors Obtained from Interviews with Industry Experts

Adoption Factors	Mentioned by
Access	1 Expert
Advocacy Pressure	1 Expert
Asset Investment	1 Expert
Awareness	2 Experts
Brand Loyalty	1 Expert
Business Partners	2 Experts
Cleaning Process	1 Expert
Consumer Behavior	4 Experts
Consumer Demography	1 Expert
Consumer Culture	1 Expert
Consumer Habit	1 Expert
Container Material	1 Expert
Cost to Business	3 Experts
Cost to Customers	4 Experts
Costs	5 Experts
Delivery Options	1 Expert
Demand	1 Expert
Distance	1 Expert
Double Handling	1 Expert
Environmental Impact	1 Expert
External Partner	3 Experts
Facility	1 Expert
Format Packaging	1 Expert
Frequent Deliveries	1 Expert
Global Headquarter's Mandate	2 Experts
Handling	1 Expert
Investment Cost Price	1 Expert
Local Consumption Culture	3 Experts
Local Regulations	2 Experts
Location	1 Expert
Logistics	3 Experts
Manufacturing Alignment	1 Expert
Market Readiness	1 Expert
Other Industries	1 Expert
Packaging Material	1 Expert
Partner	1 Expert
Price	1 Expert
Product Variance	2 Experts
Quality of Packaging	3 Experts
Quality of Product	1 Expert
Regulation	6 Experts
Return Rate	1 Expert
Reverse Logistics	5 Experts
Similar Firms	2 Experts
Suppliers	1 Expert
Supplier Capabilities	1 Expert
Sustainability	3 Experts
Third-party Logistics (3PL)	2 Experts

4.3. Combined Adoption Factors

From the two data collection methods, a comprehensive set of 163 sub-factors was identified, comprising 115 from the literature review and 48 from the expert interviews. A summary of these consolidated categories, derived from both data sources, is presented in Table 4.10.

Table 4.10: Combined Adoption Factors taken from Literature Review and Expert Interview Sessions

Category	Associated Sub-factors	Brief Description
Coercive Pressures (CP)	Absence of EMS Certification, Advocacy Pressure, Global Headquarter's Mandate, Governmental Regulations, Lack of Government Incentives and Subsidies, Lack of Regulatory Norms Supporting Reusable Packaging, Limiting and Conflicting Policies, Local Regulations	Regulatory pressure typically taking form in formal regulations and compliance requirements set by external actors (e.g. governments, firm's global headquarter, parent company) that oblige firms to reduce its environmental impact by shifting to reusable packaging formats
Customer Social & Behavioural Drivers (CSBD)	Additional Fees, Attitude, Awareness, Brand Loyalty, Consumer Behavior, Consumer Culture, Consumer Demography, Consumer Habit, Consumer Unawareness, Demand, Emotional Value and Anticipated Positive Emotions, Environmental Concern, Environmental Consciousness, Environmental Value, Extra Effort and Extra Time, Finance, Financial Benefits, Green Perceived Value (GPV), Higher Costs or Deposit Schemes, Higher Cost to Consumers due to Reusable Packaging, Intention to Purchase, Lack of Awareness about Environmental Impacts, Lack of Interest of Consumers, Local Consumption Culture, Market Readiness, Motivation, Positive Attitude towards Reuse Models, Price, Expensiveness, Resistance to Changing Habits and Behaviors, Sustainability, Time Investment, Upfront Financial Investment and Willingness to Pay, Willingness to Change	End-market attitude driven by customers that motivate FMCG firms to offer alternative packaging such as RPS instead of disposables

Continued on next page

Category	Associated Sub-factors	Brief Description
Expected Benefits & Usability (EBU)	Access, Accessibility, Availability of Support or Services, Clean-ability, Complexity of Using a New System, Concerns about Product Safety & Quality, Contamination Risks and Hygiene Concerns, Convenience, Convenience of Use, Inconvenience, Easy to Disinfect, Environmental Friendliness, Environmental Impact, Familiarity with Reuse Practices, Functional and Performance Limitations, Functionality Risk, Hold Contents Safety, Incentives/Rewards for Reuse, Limitation in Brand Differentiation, Limited Availability and Variety, Meet Consumers' Needs, Not as Easy to Use, Overall Perceived Advantage, Perceived Ease of Use (PEOU), Perceived Usefulness, Privacy Risk, Product Assortment, Product Safety Risk, Product Variance, Reduced Brand Experience, Reduced Conservation Time, Reduced Shopping Experience, Reliability of Hygienic Standards, Reseal-ability, Skepticism about Environmental Impacts, Trust (Lack of it), Usability	Functional and experiential values that FMCG firms believe their customers expect from the RPS
Financial Viability (FV)	Asset Investment, Costs, Cost to Business, Cost to Consumers, Expensive Green Packaging Solutions, High Capital Investment, High Investment in Waste Disposal, Institutional Funding Crisis, Investment Cost Price, Sales and Profit, Upfront Investments in New Reusable Packaging System	The economic evaluation and consideration that a firm must undertake prior to adopting RPS within its operations, with the expectation that the system will provide a competitive advantage over existing packaging solutions
Normative Pressure (NP)	Environmental Consciousness, Environmental Impact, Lack of Support from Top Management, Negative Attitude toward Sustainability, Normative Influence, Reducing the Environmental Footprint, Resistance to Change, Reputation and Image, Sustainability Awareness	Strategic intent within the company that triggers it to pursue the switch to a more sustainable type of packaging that could also relate to its reputational expectations that shape how the firm wishes to be seen by customers, society and similar firms that influence its adoption of RPS

Continued on next page

Category	Associated Sub-factors	Brief Description
Operations, Feasibility & Applicability (OFA)	Cleaning Process, Complex Reverse Logistics, Convenient Business Model, Delivery Options, Distance, Double Handling, Facility, Frequent Deliveries, Handling, Inadequate Infrastructure, Lack of Infrastructure for Reusable Packaging, Location, Manufacturing Alignment, Need for Re-organization of Supply Chains, Operational and Maintenance Concerns, Return Rates and Time Required for Packaging of New Cycle, Reverse Logistics, Shopping Efficiency, Short Distribution Distances, Shortage of Competent Workforce, Supplier's Substandard Reverse Packaging Quality, Sustainable Design Gap in Supply Chain, Vagueness in Return Liquidity	Practical fit of RPS within the existing logistics and manufacturing of packaging and FMCG supply chain that determine whether reuse can be feasibly scaled
Partner & Collaborative Network (PCN)	Business Partners, External Partner, Lack of Information Exchange, Minimal Stakeholder Cohesion, Other Industries, Pre-existing Partnerships, Similar Firms, Suppliers, Supplier Capabilities, Third-party Logistics (3PL)	Presence of collaborative networks of the firm that enhances the effectiveness of RPS adoption and provides complementary assets within the new system
Technology Quality (TQ)	Container Material, Design Complexities in Reuse and Recyclability, Design of the Dispenser, Design of the Reusable Container, Difficulty in Managing Package Shelf Life and Biodegradation, Easy to Open and Re-close, Endurance, Environmental Communication, Insufficiency of High-quality Raw Materials, Intricate Material Compositions and Structures, Less Waste, Materials Type, Packaging Characteristics, Packaging Design and Materials Type, Packaging Handle Shape, Packaging Mass & Shape, Packaging Wear and Tear, Portability, Post-consumer Recycling, Product Quality, Quality & Value of Packaging, Refill-ability, Refill-ability with Other Products, Restore-ability, Safe Materials, Technology Quality	Technical standards that are necessary for the reusable system/ product/ service need to perform to ensure reliability in the eyes of customers

4.3.1. Coercive Pressure (CP)

Factors: *Absence of EMS Certification, Advocacy Pressure, Global Headquarter’s Mandate, Governmental Regulations, Lack of Government Incentives and Subsidies, Lack of Regulatory Norms Supporting Reusable Packaging, Limiting and Conflicting Policies, Local Regulations*

According to DiMaggio, (1983), coercive pressures refer to formal or informal forces exerted on organizations by entities upon which they are dependent, as well as by the cultural expectations embedded within the broader society in which they operate. Based on the definition above, pressures exerted on the FMCG firms can take in multiple form such as advocacy pressure, governmental regulations, global headquarter’s mandate and local regulations. These compliance requirements set the guide to operate in which the FMCG firms should follow.

Government rules set the broad environmental standards every firm is expected to meet. In Indonesia, there are already several laws that govern about waste management in general and even some specifically govern waste management of industries. These Indonesian waste management laws can be seen on Figure 4.1. Although there are some regulations that specifically govern about single-use plastic, there are no regulations that specifically state that disposable packaging of FMCG firms are not allowed, nor there are guidelines.

	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="width: 20px; height: 10px; background-color: #c8e6c9; border: 1px solid black;"></div> Ministry of Environmental and Forestry <div style="width: 20px; height: 10px; background-color: #bbdefb; border: 1px solid black;"></div> Ministry of Public Works <div style="width: 20px; height: 10px; background-color: #dcedc8; border: 1px solid black;"></div> Ministry of Trade <div style="width: 20px; height: 10px; background-color: #fff9c4; border: 1px solid black;"></div> Ministry of Industry </div>				
National Law	UU No. 18 / 2008 Law on Solid Waste Management	UU No. 32/2009 Law on Environmental Protection and Management			
Government Regulation	PP No. 81/2012 Government Regulation on Management of Household and Household-like Waste	PP No. 101/2014 Government Regulation on Hazardous Waste Management	DRAFT Government Regulation on Excise on Plastic	DRAFT Government Regulation on Specific Waste Management	
Presidential Regulation	Perpres No. 97/2017 Presidential Regulation on National Policy and Management Strategy of Household Waste and Household-like Waste	Perpres No. 83/2018 Presidential Regulation on Marine Debris Management	Perpres No. 18/2015 Presidential Regulation on Income Tax Facilities for Investment in Certain Business Fields and/or in Certain Regions	Perpres No. 15/2018 Presidential Regulation on Acceleration of Damage and Pollution Control on Citarum River Basin	Perpres No. 35/2018 Presidential Regulation on Acceleration of Waste-to-Energy Installation using Environmentally-sound Technology
Presidential Decree	Keppres No. 61/1993 and No. 47/2005 Presidential Decree on Ratification of the Basel Convention on the Control of the Transboundary Movement of Hazardous Waste and Their Disposal				
Ministerial Regulation	Ministry of Trade Regulation No. 31/2016 on Non-Hazardous Waste Import	Ministry of Public Works Regulation No. 3/2013 on Implementation of Solid Waste Infrastructure and Facilities	Ministry of Environment and Forestry Regulation No. P.75/2019 on Roadmap to Waste Reduction by Producers	DRAFT Ministerial Regulation (MoEF) on Shopping Plastic Bag Reduction	
	Ministry of Trade Regulation No. 48/2015 on General Provisions in the Import Sector	Ministry of Trade Regulation No. 70/2015 on Importer Identification Number	Ministry of Industry Regulation No. 48/2015 on Requirements for Income Tax Facilities Implementation		
Regional/Local Regulation	Regional/Local Regulations on Single-use Plastics Ban: - Pergub Bali No. 97/2018	- Perwali Denpasar 36/2018 - Perwali Bogor 61/2018 - Perwali Banjarmasin 18/2016	- Perwali Balikpapan 8/2018 - Perwali Padang 36/2018 - Perda Purwokarta 37/2016		

Figure 4.1: Compilations of Indonesian Laws Governing Environmental Protection & Waste Management (KLHK,2020)

In addition, these governmental regulations often do not work as expected, as have been expressed by some of the experts. Experts also stated that the regulations are not enforced effectively because they perceive that the governments are lacking in the power to exert these regulations. When that happens, NGO advocacy can fill in the gap, as experienced by Expert E in one of the companies he used to work with. In another separate case, Bali gave an example where advocacy pressures can give more effect than governmental rules. Back in 2010s, various local NGOs campaigned for years against single-use plastics. Their efforts, which was popularized by, Bye Bye Plastic Bag (BBPB), helped drive the writing

and implementation of Governor Regulation 97/2018, which bans plastic bags, straws, and polystyrene food boxes on the island. Follow-up studies by [Plasticdiet.id](https://plasticdiet.id/), (2023) show the ban cut plastic-straw use by about 70 percent, plastic-bag use by 57 percent, and styrofoam use by 80 percent.

Aside from these two pressures, head-office mandates also form another layer of pressure. Multinational FMCG firms often adopt additional EPR that covers water usage, packaging requirements, or carbon targets that local subsidiaries must meet, even if national law lags behind. While the adoptions are often adapted to Indonesian conditions, the direction is set by headquarters to which the local teams would implement gradually.

4.3.2. Customer Social & Behavioural Drivers (CSBD)

Factors: *Additional Fees, Attitude, Awareness, Brand Loyalty, Consumer Behavior, Consumer Culture, Consumer Demography, Consumer Habit, Consumer Unawareness, Demand, Emotional Value and Anticipated Positive Emotions, Environmental Concern, Environmental Consciousness, Environmental Value, Extra Effort and Extra Time, Finance, Financial Benefits, Green Perceived Value (GPV), Higher Costs or Deposit Schemes, Higher Cost to Consumers due to Reusable Packaging, Intention to Purchase, Lack of Awareness about Environmental Impacts, Lack of Interest of Consumers, Local Consumption Culture, Market Readiness, Motivation, Positive Attitude towards Reuse Models, Price, Expensiveness, Resistance to Changing Habits and Behaviors, Sustainability, Time Investment, Up-front Financial Investment and Willingness to Pay, Willingness to Change*

This category captures market realities that drives the demands in Indonesia, which is reflected from customers condition, values, needs and capabilities. This end-market attitude then drives FMCG firms in Indonesia to adjust innovation in accordance to their consumer needs. In this case, managers must judge whether to stay with business-as-usual disposables or risk switching to more sustainable, yet often costlier RPS.

The interviewed Experts still notice that the environmental concern, an attitude, recognition, and response associated with public awareness of ecological problems ([Weigel & Weigel, 1978](#)), of Indonesian consumers is still lacking. Price, convenience, and habit usually outrank sustainability, especially in the consumer goods industry, as Experts mentioned. In addition, littering unfortunately also remains common, which undermines any reuse scheme that relies on customers returning empty packs. Because RPS appeals most to consumers who are already eco-conscious and willing to pay a bit extra, today's Indonesian market offers only a small early-adopter segment.

Given the reality, firms therefore need to adapt to these prevailing behaviors. Expert D noted that even the global brand with strict plastic-reduction targets which she is working in, had to downsize some of the products' pack volumes to stay competitive, which contradictorily increased plastic per unit of product. Similarly, Expert B reported a comparable shift to sachets for price sensitive categories within his company.

However, this consumer behavior has also undergone shifts, despite being in a different industry. For instance, Expert A observed that young urban customers increasingly bring reusable tumblers to coffee shops. As he noticed, this practice is driven less by cost savings and more by the emotional value and identity signaling associated with 'doing the right thing.' While this remains a niche behavior, such patterns suggest the potential for evolving consumer attitudes, which could eventually create opportunities for broader adoption of RPS.

Reusable-packaging initiatives ultimately succeed or fail at the point of purchase, making end-market attitudes a decisive external stimulus for fast-moving consumer-goods (FMCG) firms. The Customer

Social & Behavioural Drivers category therefore groups those factors that arise directly from how people in a given market think, feel and act toward packaging. It differs from Coercive Pressure, which is imposed by formal authorities, and from Firm Motivation, which is internally generated. Instead, these drivers originate in the lived practices and values of the consumer base and, as such, shape the commercial attractiveness of any shift toward reusable formats.

4.3.3. Expected Benefits & Usability (EBU)

Factors: *Access, Accessibility, Availability of Support or Services, Clean-ability, Complexity of Using a New System, Concerns about Product Safety & Quality, Contamination Risks and Hygiene Concerns, Convenience, Convenience of Use, Inconvenience, Easy to Disinfect, Environmental Friendliness, Environmental Impact, Familiarity with Reuse Practices, Functional and Performance Limitations, Functionality Risk, Hold Contents Safety, Incentives/Rewards for Reuse, Limitation in Brand Differentiation, Limited Availability and Variety, Meet Consumers' Needs, Not as Easy to Use, Overall Perceived Advantage, Perceived Ease of Use (PEOU), Perceived Usefulness, Privacy Risk, Product Assortment, Product Safety Risk, Product Variance, Reduced Brand Experience, Reduced Conservation Time, Reduced Shopping Experience, Reliability of Hygienic Standards, Reseal-ability, Skepticism about Environmental Impacts, Trust (Lack of it), Usability*

As a new system that is not yet familiar, consumers have expectations set to the new packaging before choosing to switch. One of the most critical expectations consumers hold toward reusable packaging systems is that they remain reliable and hygienic throughout repeated use. Trust plays a foundational role in this context. Defined by [Hart and Saunders, \(1997\)](#) as the confidence that another party will behave as expected, trust is essential in service-oriented systems, especially relatively new system like RPS. With trust, it helps reduce perceived complexity and risk, reassuring consumers that the service will perform consistently and safely ([Dabbous et al., 2020](#); [Yuen et al., 2018](#)). To foster this trust, companies must show to their consumers about high standards of hygiene management. Although hygiene is not always cited as the top concern ([Noëth et al., 2023](#)), it remains a non-negotiable factor in the decision-making of end consumer. This is typically the case especially when said packaging comes into direct contact with food.

Other than hygiene, consumers also consider the practical functionality of reusable packaging in their daily routines. Convenience plays a central role in the consideration, whether the packaging is easy to carry, return, or refill—along during its entire life cycle. Similarly, perceived usefulness is another key determinant, which determines whether the refill offers cost savings in the long run or preserves product freshness as good as conventional packaging. Additionally, product range coverage also influences adoption, as consumers expect that the reusable packaging can be compatible with various products. Some interviewed Experts also stated that for the RPS to work successfully, there should be at least equal amount of product range with reusable packaging in comparison to the conventional ones. This should be done so that consumers do not always go back to the product with old packaging format.

4.3.4. Financial Viability (FV)

Factors: *Asset Investment, Costs, Cost to Business, Cost to Consumers, Expensive Green Packaging Solutions, High Capital Investment, High Investment in Waste Disposal, Institutional Funding Crisis, Investment Cost Price, Sales and Profit, Upfront Investments in New Reusable Packaging System*

Similar to other industry, FMCG industry also prioritize cost-related factors that play a crucial role in consumer adoption of RPS. For FMCG firms, the decision to scale a reusable-packaging system is based on whether or not the new innovation will be successful commercially. On top of that, transitioning

from single-use PET or multilayer sachets to glass bottles or other form of returnable packaging requires investment cost. Experts stated that changing packaging requires investment such as new machine with updated moulds, additional facilities for the refill stations reverse-logistics capabilities. These high initial investments are heavily considered by brand owners as they will struggle to maintain target profit margins. To balance this initial investment and maintain the target profit margins, consumers might have to pay the burden as the end product might become more expensive.

However, as proven by literature and further approved by Experts, Indonesian shoppers are highly price-sensitive. Many consumers buy single-use sachets precisely because each purchase costs less than IDR 2,000 (about €0.11). If a reusable-packaging system shifts that spending to a bigger upfront deposit or to a higher-priced refill, sales can drop unless customers clearly see the value—better product freshness, a prestige feel, or real savings over several uses. Research by [Van Loon and Van Wassenhove, \(2020\)](#) confirms that low prices, simple financial incentives, and well-known deposit-return schemes make consumers far more willing to try reuse. Because RPS is still new, buyers often fear it will cost more, and their preference for a deposit versus a subscription model depends on which option feels safer for their wallets. They also expect the product itself to be cheaper once the packaging is reused, so any business model that misses this point runs the risk of slow uptake.

4.3.5. Normative Pressure (NP)

Factors: *Environmental Consciousness, Environmental Impact, Lack of Support from Top Management, Negative Attitude toward Sustainability, Normative Influence, Reducing the Environmental Footprint, Resistance to Change, Reputation and Image, Sustainability Awareness*

According to [van de Kaa, \(2023\)](#), normative pressure is represents to what measure firms are willing to adopt a standard due to the firms' internal motivation. That internal drive may come from wanting to boost brand image through a higher green-perceived value or from a deeper commitment to cutting the company's environmental footprint.

In the interviews, four out of the six Experts listed sustainability as their companies' priority, and among them, three worked for multinationals with clear head-office mandates. Expert C said her plant's KPIs now include strict limits on water and electricity use. Experts A and E reported company targets that require more than half of their product packaging needs to be recyclable or reusable by 2030. Expert F added that her firm is redesigning existing packs to use mono-material packaging that increases significantly the recycle-ability of the material after usage. While none of these measures forces an immediate switch to full reusable packaging systems, they show that internal sustainability goals are steering the companies in that direction.

4.3.6. Operations, Feasibility & Applicability (OFA)

Factors: *Cleaning Process, Complex Reverse Logistics, Convenient Business Model, Delivery Options, Distance, Double Handling, Facility, Frequent Deliveries, Handling, Inadequate Infrastructure, Lack of Infrastructure for Reusable Packaging, Location, Manufacturing Alignment, Need for Re-organization of Supply Chains, Operational and Maintenance Concerns, Return Rates and Time Required for Packaging of New Cycle, Reverse Logistics, Shopping Efficiency, Short Distribution Distances, Shortage of Competent Workforce, Supplier's Substandard Reverse Packaging Quality, Sustainable Design Gap in Supply Chain, Vagueness in Return Liquidity*

The feasibility and applicability of implementing a RPS not only dependent on the readiness of the company but also logistical and consumer-oriented factors. For example, short distribution distances and frequent deliveries can enhance the practicality of RPS by ensuring timely return. Other than making

it more effective, the redistribution of reusable containers is also becoming more feasible. Additionally, the availability of company-owned vehicles offers greater control over the reverse logistics process, which is critical for maintaining efficiency and hygiene in reusable systems.

External aspects, such as the the consumer-facing side, factors such as shopping efficiency, in-store services, and store atmosphere play a key role in shaping the overall user experience. Consumers are more likely to have a more acceptable behavior and consistency in using RPS when it integrates seamlessly into their existing shopping routines. It would be an added value if the company offers flexible delivery options. The location of the stores also influence the convenience of shoppers, therefore more retailers are adopting the RPS, the network affect will become more apparent.

4.3.7. Partner & Collaborative Network (PCN)

Factors: *Business Partners, External Partner, Lack of Information Exchange, Minimal Stakeholder Cohesion, Other Industries, Pre-existing Partnerships, Similar Firms, Suppliers, Supplier Capabilities, Third-party Logistics (3PL)*

Adopting a reusable-packaging system is rarely a solo effort; it depends on a reliable network of partners. For example, brand owners need suppliers that can source or mould durable containers, 3PL providers that can collect empties and bring them back for cleaning, and retailers willing to host return points or refill stations. Moreover, Experts also point out that similar firms that even sometimes considered as direct competitors can be important in the first few stages of RPS implementation. These similar firms can help by sharing standard pack designs or pooled logistics, lowering costs for everyone. In practice, the stronger and more aligned this partner network is, the smoother the roll-out of an RPS will be.

4.3.8. Technology Quality (TQ)

Factors: *Container Material, Design Complexities in Reuse and Recyclability, Design of the Dispenser, Design of the Reusable Container, Difficulty in Managing Package Shelf Life and Biodegradation, Easy to Open and Re-close, Endurance, Environmental Communication, Insufficiency of High-quality Raw Materials, Intricate Material Compositions and Structures, Less Waste, Materials Type, Packaging Characteristics, Packaging Design and Materials Type, Packaging Handle Shape, Packaging Mass & Shape, Packaging Wear and Tear, Portability, Post-consumer Recycling, Product Quality, Quality & Value of Packaging, Refill-ability, Refill-ability with Other Products, Restore-ability, Safe Materials, Technology Quality*

In designing reusable packaging, several key characteristics must be carefully considered to ensure consumer acceptance and repeated use. First, visual appeal, including color and print quality, plays a significant role in attracting customers at the point of sale, helping to differentiate sustainable products from conventional alternatives. Additionally, ergonomic considerations are essential, as packaging should have a safe shape and suitable design features, such as rounded edges or a draft angle, to facilitate safe movement, comfortable carrying, and convenient handling. To maximize functionality, packaging must be designed to occupy minimal space, enabling easy storage and encouraging repeated use; this consideration should also extend to accommodating the needs of elderly or disabled users. Furthermore, reusable packaging should possess sufficient durability and structural integrity to reliably protect and preserve contents during transport, storage, and handling. In designing reusable packaging, several key characteristics must be carefully considered to ensure consumer acceptance and repeated use. First, visual appeal, including color and print quality, plays a significant role in attracting customers at the point of sale, helping to differentiate sustainable products from conventional

alternatives.

4.4. Weighting of Factors using Best-Worst Method Analysis

As previously elaborated in the Chapter 3, the next step after all of the factors were gathered from Literature Review and the Expert Interview sessions is to measure and analyze the score of each factor by using Best-Worst Method (BWM). BWM helps in ranking the factors based on its importance, helping decision-makers in understanding which adoption factors to reusable packaging system is the most important and requires most attention to penetrate the market and achieve dominance.

The scores used in the BWM calculation were retrieved in the second round of the interview. In this round, Experts were tasked to assign value from 1 to 9 to each factor, with 1 being the least important/ relevant and 9 as most important/ relevant. The value is then recorded and put into the BWM calculator, from which the weight of each factor can be acquired. The detailed weight of each of the factor is shown on the Table 4.11 below.

Table 4.11: Adoption Factor Weights Assigned by Experts

Respondents	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Expert A	0.12	0.22	0.12	0.08	0.05	0.12	0.06	0.22
Expert B	0.29	0.17	0.08	0.11	0.05	0.11	0.08	0.11
Expert C	0.19	0.06	0.19	0.10	0.19	0.10	0.07	0.10
Expert D	0.15	0.15	0.05	0.15	0.15	0.15	0.05	0.15
Expert E	0.08	0.25	0.13	0.13	0.09	0.09	0.09	0.13
Expert F	0.20	0.24	0.12	0.08	0.06	0.12	0.04	0.12

Legend: CP: Coercive Pressure; CSBD: Customer Social & Behavioural Drivers; EBU: Expected Benefits & Usability; FV: Financial Viability; NP: Normative Pressure; OFA: Operations, Feasibility & Applicability; PCN: Partner & Collaborative Network; TQ: Technology Quality.

The weight of each factor from previous page is then averaged, the new score is shown in Table 4.12 below:

Table 4.12: Adoption Factor Average Weights

	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Average Weight	0.17	0.18	0.12	0.11	0.10	0.12	0.07	0.14

Based on the average score results shown on Table 4.12, **Customer Social & Behavioral Drivers (CSBD)** is considered as the most important factor with a score of 0.18. Experts understand that when innovating with their products, they need to ensure that consumers are still willing to buy their products, as creating products without any demands for it will only be disadvantageous to the firms. Experts notice that the current Indonesian consumption culture still has low awareness regarding the impact to environment and still prefers price above all the other factors. Moreover, with all the convenience provided by disposable packaging, on top of the cheap price, consumer willingness to change is still low and less likely to change within a short period of time.

Coercive Pressure (CP) ranks as the second most important factor by experts scoring 0.17 on the BWM calculation. Experts believe that both internal and external pressures have significant impact to push companies or even a certain industry to behave in a certain way. However, Experts still see that currently the Indonesian government is still not directing the firms to do the shift to reusable packaging. Moreover, Experts also notice that advocacy pressures by local NGOs are mainly advocating about

unsustainable extraction practice of some natural resources and not yet focused on plastic overusage, although both are equally important. However, Experts think that global HeadQuarter mandate is has significant impact in how the local branch behave. But Experts notice that CP can influence any other factor, and can help shape the RPS ecosystem to be more conducive, hence the high score for this factor.

The next factor is **Technology Quality (TQ)**, ranked as the third most important factor with the score of 0.14. Experts are highly concerned about the degradation of their products if they are being packaged in reusable packaging and not the conventional ones. Some Experts argued that some products require specific packaging method that are not yet readily available or compatible when done on a reusable format. Moreover, reusable packaging will be set to be as the company's assets that need to be maintained and returned every time. Hence, they believe that it is important that the quality of the packaging needs to be the best and meant to be durable enough for multiple usage.

The fourth in rank are both **Expected Benefits & Usability (EBU)** and **Operations, Feasibility & Applicability (OFA)** which both have the same score of 0.12. As a new innovation, consumers need to gain trust for the whole reusable ecosystem. Therefore, firms need to ensure that the new packaging system will be reliable all the time and maintain consumers expectation and satisfaction with the new format. The supply chain of the reusable packaging will also be different to the conventional packaging format, as some Experts clarified, especially the reverse-logistics technicalities. However, the ecosystem does not necessarily need to be built from scratch as some national and multinational companies are already operating in a reusable packaging manner, providing both possible knowledge transfer and infrastructure for the new entrants to the market.

Although issues regarding financial usually becomes the main focus of companies, in this study **Financial Viability (FV)** is ranked fifth, scoring 0.11 in the BWM calculation. Although vital, but many Experts believe that with the right condition, incentive, goal and pressure, companies are mostly willing to invest in a risky innovation, despite the high initial cost.

The sixth is in rank is **Normative Pressure (NP)**, with average score of 0.10. Although NP can be the main internal driving factor for companies to change into a more sustainable practice, Experts notice that in Indonesia NP can easily be overcome by other factors such as Consumer Behavior or Coercive Pressure. Especially, many major companies operating in Indonesia are not prioritizing sustainability within their line of business, as the consumers are not necessarily aware as well regarding the issue. The firms' brand image is not always shaped by sustainability, hence the lack of NP to innovate to a more sustainable practices.

Lastly, **Partner & Collaborative Network (PCN)** is ranked as the least important with BWM score of 0.07. Experts argued that although important within their business line, business partners such as suppliers or 3PL are easily interchangeable. Moreover, Experts stated that most of their business partners will adhere to the same standard, unless the firm is becoming the first mover. Therefore, the shift in the industry will be followed almost instantly and by everyone at the same time, hence the lower priority by Experts in this aspect.

Consistency Checking

Table 4.13: Consistency Ratio of the Results Based on the Input-Based Consistency Ratio & Associated Threshold

Respondents	Input-Based Consistency Ratio	Associated Threshold
Expert A	0.1667	0.2577
Expert B	0.2000	0.2844
Expert C	0.1667	0.1670
Expert D	0.001	0.1667
Expert E	0.1667	0.1670
Expert F	0.2000	0.2844

To ensure the consistency of Experts' scoring on each factor, a consistency checking is done, a method also provided by the Best-Worst Method itself. Consistency ratio, which can be found by dividing ζ^* with Consistency Index from Table 3.4, represents that the smaller the number is from the threshold, the more consistent the Expert was in determining their preference. As can be seen from Table 4.13, all of the Experts showed that their preferences were consistent and thus the BWM result can be deemed reliable.

5

ENABLING REUSABLE PACKAGING SYSTEM (RPS) ADOPTION THROUGH MULTI-STAKEHOLDER COLLABORATION

This chapter presents expert perspectives on the critical roles of various stakeholders and the significance of their collaboration in facilitating the adoption of Reusable Packaging Systems (RPS) within the Indonesian Fast-Moving Consumer Goods (FMCG) industry. Accordingly, this chapter addresses Sub-Research Question 3: *"How can these factors be influenced by stakeholders (e.g., government, industry, policymakers) to promote the emergence of a dominant ecosystem?"* The following discussion will elaborate on these findings, differentiating between internal and external stakeholders from the perspective of an FMCG firm.

According to discussions with various experts with different company backgrounds and various experience years, the experts all agreed that the problem in Indonesia regarding its waste and sustainability measures remain a deeply structural issue. Most Indonesians are not ready with the behavioral change that is required in terms of maintaining sustainability in Indonesia. The following are arguments made by the all the interviewed Experts about what should be done to each of the factor to encourage the implementation of RPS within the Indonesian FMCG industry.

5.1. Coercive Pressure (CP)

The interviewed experts observed that numerous regulations already exist to oversee plastic usage, as elaborated in Chapter 4. However, they emphasized that the main challenge lies in Indonesia's lack of strict enforcement. Both Expert A and Expert E highlighted that issuing regulations alone is insufficient unless accompanied by clear implementation guidelines and timelines to monitor compliance. In addition, Expert E suggested that the government could consider adopting a mechanism similar to the sugar tax but applied to plastic usage in the packaging industry, specifically targeting products that use excessive amounts of plastic. As he explained, the sugar tax increases the price of products contain-

ing excessive sugar, thereby encouraging consumers to opt for alternatives with lower sugar content. A comparable approach could be applied to plastic packaging, gradually steering consumers toward more sustainable solutions and raising awareness of packaging choices. Beyond taxation, Experts also emphasized that the government could play a more active role by banning disposable plastics outright, while simultaneously introducing incentive schemes and penalties to encourage compliance.

In parallel, firms, especially multinational corporations (MNCs), were seen as having a strong influence in driving adoption. As one Expert explained, MNCs often set Key Performance Indicators (KPIs) and sustainability plans for their national branches, which are then extended down to divisions/ departments and even individual employees. Such directives, she noted, typically generate a “regionalization effect”, creating healthy competition among branches that motivates them to outperform one another, whether in terms of brand reputation or sustainability performance.

Furthermore, Expert E also highlighted the important role of NGOs, both as watchdogs and solution providers. NGOs, with their access to media platforms, can amplify messages that highlight positive measures or expose corporate misconduct. He noted that organizations such as Greenpeace have successfully pressured companies to abandon harmful practices, citing the case of an international consumer goods company whose best-selling product was found to use palm oil sourced from illegal plantations. NGOs could similarly influence regulatory implementation regarding plastic usage, as demonstrated by the BBPB initiative in Bali, discussed in Chapter 4.

5.2. Customer Social & Behavioral Drivers (CSBD)

Experts emphasized that even when companies demonstrate a willingness to reduce plastic usage, the success of such efforts depends almost entirely on consumer behavior. Among all six interviewees, shifting consumer habits was consistently ranked as the most critical factor. According to the experts, this shift can be encouraged primarily through education, awareness campaigns, and price incentives, which can be implemented by either central or local government (as noted by Expert D). Firms also play a central role by shaping lifestyle trends—first campaigning and creating awareness around new consumption habits, and only later introducing products that align with these cultural shifts. NGOs can act as initiators of such trends, which are then adopted and operationalized by firms, while media serves as an amplifier, communicating these messages widely and supporting both NGOs and firms in influencing consumer behavior.

Despite these potential drivers, Experts also observed that environmental awareness among Indonesian consumers remains relatively low. Littering is still a common practice, raising concerns that consumers may be reluctant to return or reuse packaging under RPS schemes. For example, Expert C recalled her company’s earlier attempt to promote reusable glass bottles, which initially gained traction but declined significantly once plastic packaging became more widespread. To counter this, government as regulator, NGOs as advocates, and academia through formal education all have important roles to play in raising awareness and encouraging cultural change.

Several experts also highlighted the role of local communities in addressing these behavioral challenges. Expert B, in particular, pointed to the importance of waste banks, which often step in where municipal waste management fails to meet community needs. Traditionally serving as neighborhood-level recycling hubs, waste banks could also help foster habits of returning packaging. Expert B further suggested that FMCG companies could collaborate with these initiatives as part of their CSR programs, thereby raising consumer awareness while simultaneously implementing reuse practices within communities. Over time, waste banks could evolve beyond recycling centers to serve as drop-off points or even cleaning stations within a future RPS ecosystem.

Finally, Experts agreed that affordability and convenience strongly influence consumer choices. Experts B, D, and E noted that their companies often introduced smaller product sizes to make goods more affordable for price-sensitive consumers. This suggests that consumers are more likely to adopt new systems if these provide both cost savings and greater convenience compared to existing options. Expert E illustrated this with the case of Siklus Refill, which combines lower prices with convenience in grocery shopping. Despite its limited product range, Siklus's ability to align with consumer needs has made it one of the leading pioneers of RPS in Indonesia. Furthermore, Expert C highlighted the potential role of financial incentives, suggesting that consumers could be rewarded for returning packaging. This mechanism resembles the Dutch *statiegeld* system, though Expert C stressed that it should be tailored specifically for reusable rather than recyclable packaging. Together, these insights demonstrate that firms, NGOs, media, government, and local communities all have pivotal roles in shaping consumer habits and creating the conditions for RPS adoption, particularly when measures make reusable packaging both attractive and practical.

5.3. Expected Benefits & Usability (EBU)

When exploring new innovations such as RPS, experts emphasized that consumers approach them with specific expectations that must be met. If these expectations are not fulfilled, consumers are unlikely to return and engage with the innovation again.

To attract and retain consumers, firms may invest in large-scale marketing campaigns. However, these campaigns must remain authentic to the innovation's core purpose rather than opportunistically 'piggy-backing' on sustainability trends without delivering real change. Expert E raised concerns about this issue, pointing to a case in the Indonesian cosmetics industry where one major player introduced a limited reusable packaging scheme. He argued that, because the initiative was not implemented across the company's entire operations, it risked being perceived as 'greenwashing'; a public relations stunt rather than a genuine step toward sustainability.

To avoid such pitfalls, Expert A suggested that firms complement education and product communication with transparent, science-based evidence. He stressed that today's consumers are increasingly attentive to the products they use and therefore expect credible proof of any marketing claims; including sustainability claims. Collaborating with independent research organizations such as SGS or Intertek, he argued, can help companies verify their claims and build trust. This is particularly critical for RPS, where the whole packaging ecosystem, the quality of packaging and the product it contains must meet high standards.

Moreover, Expert B added that external actors such as local waste banks could play an important role in supporting companies, particularly in managing the cleaning of reusable packaging. While he acknowledged that the cleaning process would occur outside the company's direct control, he argued that waste banks often have more practical experience and are better equipped than alternative cleaning depots. Nevertheless, Expert A cautioned that the responsibility for cleanliness also lies with consumers. Drawing on his experience in the mineral water sector, he observed that consumers often cleaned reusable water jugs independently or at unofficial refill stations. Such practices not only accelerated degradation of the containers but also complicated quality monitoring. If degraded jugs were mistakenly circulated back to new consumers, their perceived reliability would be compromised.

Finally, consistent with earlier concerns, Expert E underscored that consumer trust in RPS depends not only on packaging safety but also on the integrity of the product itself. This is especially critical in bulk or refill-at-home systems, such as Siklus Refill. He argued that the intervention of BPOM was necessary to ensure that products transferred from Siklus agents to consumers' containers remained

uncontaminated. However, he also emphasized that BPOM's regulatory framework remains incomplete. A more comprehensive set of regulations that covers not only household and personal care products but also food and beverage categories, is essential for ensuring product safety and enabling RPS to scale effectively in Indonesia.

5.4. Financial Viability (FV)

The interviewed experts have all agreed that one of the most important roles of government is to provide incentives that stimulate industry-wide adoption of RPS. Implementing innovations in any industry, particularly in emerging areas such as RPS, carries significant risks and often faces the likelihood of consumer resistance. To overcome this barrier, firms need targeted support in the form of subsidies or other financial stimuli that reduce the burden of being first movers and encourage them to integrate RPS into their value chains.

Expert C shared an example from her company, where her global headquarters issued directives to reduce water and energy use at the local branch. Each year, the local branch that demonstrates the most efficient resource use is rewarded at the corporate level. Experts C and E argued that a similar approach could be implemented at the national scale. Governments could introduce penalties for companies that continue to rely excessively on plastic and resist adopting RPS, while simultaneously rewarding firms that comply with plastic-reduction policies. Such a combination of sanctions and incentives could foster stronger industry commitment, enabling firms to absorb the high switching costs and, in turn, offer consumers more affordable reusable packaging alternatives.

Beyond financial incentives, Experts also emphasized the importance of developing a broader ecosystem to support RPS adoption. A key challenge lies in reverse logistics, which is one of the most resource-intensive and costly components of reusable packaging systems. For an individual company, establishing a reverse logistics mechanism from the ground up would require substantial investment. A more effective strategy would be to leverage existing supply chain networks that already incorporate reverse logistics. For instance, as Expert A noted, companies in the local mineral water industry could extend their existing collection and distribution systems to support other firms, creating opportunities for shared cost reduction while generating potential additional financial benefits to supporting firms.

5.5. Normative Pressure (NP)

Expert A argued that Normative Pressure can be shaped by both external and internal influences that determine how firms perceive and integrate sustainability within their value chains. Externally, consumer demand plays a critical role, as companies are more likely to adopt RPS when customers increasingly ask for sustainable or environmentally responsible products. Internally, change initiated by top management can also diffuse throughout the organization, influencing overall behavior and decision-making.

Expert C illustrated this with her experience in a multinational company, where global headquarters encouraged its branches, including Indonesia, to monitor and reduce energy and water consumption during production. This initiative was coupled with a shift toward more recyclable materials for bottles. Although she acknowledged that the company had moved away from reusable bottles, she emphasized that sustainability efforts are still being pursued, despite from a different angle.

Normative Pressure is also reinforced by the broader competitive environment. Competitor actions can exert significant influence, as companies often feel compelled to respond when rivals commit to sustainability. NGOs further shape this dynamic by influencing corporate reputation, which in turn pressures

firms to align their practices with societal expectations. Business communities and industry associations also play a strong role, as their agendas often create binding expectations for member firms. This not only establishes collective direction but also generates peer pressure among companies. For instance, Expert D recalled her company presenting an idea in an industry forum that was subsequently adopted across the association, demonstrating how collective norms can accelerate adoption.

Similarly, Expert F emphasized the influence of peer firms in shaping Normative Pressure. She argued that companies are more likely to shift when competitors in the same industry are also making visible commitments to sustainability. While firms often seek first-mover advantages, she highlighted that transitioning to reusable packaging formats remains financially challenging. This difficulty is compounded by the fact that sustainability values have yet to become mainstream in Indonesia, a reality that is also reflected in the strategies of companies operating in the country.

5.6. Operations, Feasibility & Applicability (OFA)

All experts expressed concern that the consumer experience with RPS would differ significantly from that of conventional products. Key uncertainties remain around reverse logistics and the mechanisms for returning packaging—specifically where, how, and by whom this process should be managed.

Drawing from his experience in the mineral water industry, Expert A highlighted that there is currently no reliable mechanism to ensure that every reusable water jug is returned to the company, whether for refilling, quality inspection, or recycling once it reaches the end of its lifecycle.

Expert B identified a major barrier for his company in adopting RPS: its centralized production model. Operating from a single manufacturing facility while distributing products nationwide makes the organization of reverse logistics particularly costly and complex. While similar logistical challenges were also mentioned by Experts A and C, the companies associated with them had already developed more comprehensive logistics infrastructures, including reverse logistics capabilities. To address this gap, Expert B suggested that collaborating with local communities through waste banks could support the pooling of reusable packaging. This, he argued, could ease the logistical burden not only for his company but also for other firms seeking to experiment with the RPS model.

Expert C reaffirmed this idea but extended it to include cooperation with informal waste pickers (*pemulung*). She noted that one of the reasons her company abandoned reusable bottles was that many were diverted by *pemulung* into recycling markets, given the high resale value of glass bottles. She proposed that if companies could establish partnerships with *pemulung*, possibly facilitated by waste banks as intermediaries, they could incentivize these collectors to return the bottles to firms rather than sell them elsewhere. According to her, this would allow companies to recover their assets for reuse more effectively. However, she regretted that such schemes had not been extended to end-consumers. In her view, providing financial incentives directly to consumers would significantly increase their willingness to return packaging, whereas the current system relies largely on voluntary action rather than integrating returns into the transaction process.

Finally, Expert C emphasized that adopting new packaging formats also entails operational changes. Based on her experience, her company's current production lines rely on cold-filling processes, which are both efficient and effective in maintaining product quality. While the company had previously used reusable glass bottles, production has since been optimized for cold-filling disposable bottles. To transition fully to reusable formats, firms would need to partner with machinery suppliers capable of providing customized equipment suited to the new requirements.

5.7. Partner & Collaborative Network (PCN)

Drawing from his experience collaborating with waste banks, Expert B argued that such initiatives could serve as valuable partners in building a reusable packaging ecosystem. He observed that for his company to participate in RPS, it would require the establishment of an entire supply chain infrastructure, including the necessary reverse logistics. One of the main challenges, he explained, lies in pooling the used packaging at a centralized location before transporting it back to the factory for cleaning and refilling. Expert B argued that this is an area where waste banks could play a crucial role. Retailers can also support this process by helping to collect reusable packaging and by dedicating in-store space to RPS, thereby increasing its visibility to consumers and normalizing reuse practices.

Expert F, on the other hand, highlighted the opportunities for RPS within the cosmetics industry. She noted that cosmetic products are typically packaged in high-quality materials that are well-suited for reuse. However, she stressed that implementation would need to be gradual, allowing consumers time to adjust to the new packaging formats. While she sees strong potential for her company to become a first mover in adopting RPS within the local cosmetics sector, she emphasized that no firm can act alone. Without broader industry adoption, consumers would simply switch to alternative products packaged conventionally, undermining the effort.

Meanwhile, Expert C emphasized that RPS adoption would also necessitate new forms of packaging, which in turn would require specialized machinery for both production and filling. This creates a need for new business partnerships, either through the emergence of dedicated machine suppliers or through the adaptation of existing suppliers to the new requirements. In this regard, experts argued that government could play a critical role in ensuring that supporting industries develop and comply with standardized packaging requirements. Beyond this, government intervention through tax incentives, subsidies, and Public–Private Partnerships (PPPs) was seen as another pathway to accelerate adoption, easing the financial burden for firms while promoting systemic collaboration across stakeholders.

5.8. Technology Quality (TQ)

The experts consistently emphasized that government and NGOs exert the greatest influence on adoption factors, including Technology Quality. They argued that prior to implementing RPS, a clear set of standardized rules should be established, potentially through the Indonesian National Standard (SNI). Experts A, C, and E further noted that industry associations, such as the Indonesian Packaging Federation (IPF/Packindo) or the Asian Packaging Federation (APF), could play an important role in defining and enforcing such standards within the industry.

Drawing from his past experience, Expert A recalled how unequal degradation of reusable packaging occurred in his previous company. He argued that stronger monitoring mechanisms enforced by government or industry associations mentioned before could have prevented such quality inconsistencies. Penalties for non-compliance, he suggested, would incentivize firms to maintain stricter inventory management. This is particularly important since degraded packaging can release harmful substances, such as microplastics, into the products it contains. Complementing this perspective, Expert C emphasized the importance of careful material selection in reusable packaging design to ensure durability across repeated cycles of cleaning, transportation, and refilling.

Expert A also highlighted the double-edged role of intellectual property. She pointed to a case in Indonesia where a company patented its sealing technology, enabling superior protection against contamination and thereby improving product quality. While the patent secured a competitive advantage for the firm, it simultaneously prevented competitors from accessing the innovation. Consequently,

the broader industry could not benefit from this advancement, underscoring how intellectual property can both support and constrain technological progress. In this context, knowledge sharing becomes vital, as the experts stressed, to ensure that innovations can be more widely adopted and effectively implemented.

Finally, Expert A proposed education as a more holistic approach to ensuring Technology Quality. Through his involvement with the Packaging Development Federation (PDF), he aims to strengthen the packaging sector by promoting knowledge exchange among professionals and fostering academic programs at universities. He argued that building expertise within the industry, while also cultivating awareness at the educational level, represents one of the most effective ways to uphold quality standards consistently across the sector. Reinforcing this view, Expert F emphasized that the advancement of packaging technology also requires a deep understanding of consumer behavior. Such insights, she argued, can be developed not only through industry practice but also through academic initiatives of the kind Expert A proposed.

6

DISCUSSION

6.1. Literature Reflection

Technology Dominance Battle in RPS Adoption

[Suarez, \(2004\)](#) outlined that a technology achieves dominance by progressing through five distinct phases, with specific factors influencing outcomes at each stage. In the case of Indonesia, the development of RPS can be positioned in Phase III, with early signs of transition toward Phase IV. At present, several firms have begun offering RPS-based services and products, each displaying some form of technological advantage. These players are not limited to early entrants as established firms in Indonesia have also experimented with RPS, though primarily within niche segments.

As emphasized by the Experts during the interview sessions, however, these start-ups still face a critical challenge: limited consumer uptake. Early entrants, in particular, struggle to build a substantial customer base. While larger, established companies have achieved significant market reach, their adoption of RPS remains confined to narrow sectors (most notably the mineral water industry), making it unlikely that their current models can be easily replicated across other consumer goods categories. For newer entrants, the path forward lies in expanding awareness and strengthening their reputation among untapped consumers. To achieve this, firms must balance targeted marketing efforts with competitive pricing strategies, all while ensuring consistent product and service quality. Such measures are essential for building mainstream acceptance and accelerating the transition of RPS into the broader market.

This transitional stage also underscores the competitive struggle between RPS and conventional plastic packaging, reflecting the dynamics of standard wars described by [Shapiro and Varian, \(1999\)](#). At the same time, the Indonesian case highlights the unique adoption challenges of less-developed countries, as theorized by [Madu, \(1989\)](#), where local resources, consumer behavior, and government influence play decisive roles in shaping the trajectory of new technologies.

Standard Wars Theory in RPS Adoption

Reflecting on the theory of Standard Wars by [Shapiro and Varian, \(1999\)](#), RPS in Indonesia continues to face significant challenges. The system positions itself as a **Rival Revolutions** strategy, attempting to disrupt the dominance of single-use plastics by not only reducing waste but also by fundamentally reshaping consumer behavior and shifting the economy from a linear to a circular model. Such a

transformation represents one of the most difficult battlegrounds for standard competition. For RPS to succeed in replacing plastic as the dominant design, much progress remains to be made, as the current ecosystem still lacks many of the seven key assets outlined by Shapiro.

At present, RPS adoption in Indonesia remains niche, with a limited installed base. From the perspective of intellectual property, at least one local firm has patented innovations related to RPS, securing a competitive edge; however, other players in the industry have yet to develop similar assets. Nevertheless, many firms have demonstrated strong innovative capabilities. Their ability to remain viable despite low environmental awareness among Indonesian consumers highlights how innovation has been essential for survival. Saruga, for instance, pioneered in-store refilling and has since expanded to multiple outlets nationwide, while Siklus Refill has become the first retailer to combine reusable packaging concept with home delivery, implementing refill-at-home strategy while also achieving strong brand recognition, particularly in West Java.

Despite these achievements, RPS firms still face gaps in manufacturing capacity and complementary products. These firms are either relying on self-made or improvised reusable packaging or not yet able to supply consumers with standardized refill containers. Likewise, the range of mainstream consumer products designed to be compatible with reusable systems remains limited. One intermediate step in this direction is the sale of large refill pouches, typically containing 1L of household products, which are commonly provided through retail stores. Although these pouches remain disposable, they encourage bulk purchasing and represent an incremental shift toward reducing plastic consumption. Finally, while RPS brands have built reputations as innovative, unique, and reliable, these assets alone are insufficient for dominance. Taken together, the Indonesian RPS ecosystem currently holds only three of the seven critical assets, underscoring how far it still has to go in competing against the dominant plastic packaging.

Technology Adoption Theory from the Perspective of Developing Nations

According to [Madu, \(1989\)](#), technology adoption follows slightly different dynamics in less-developed nations such as Indonesia. The theory suggests that government plays a critical and comprehensive role in facilitating adoption, although the initial adopters of new technologies do not necessarily have to be government institutions. Instead, early adoption can also be initiated by industry experts or pioneering firms. These first movers are expected to adapt innovations to local contexts, ensuring that implementation not only addresses national challenges but also aligns with available resources and cultural norms. This is reflected in the Indonesian RPS ecosystem, where several firms have attempted to introduce reusable packaging systems as an alternative to the dominant single-use format, leveraging consumer habits that prioritize convenience and affordability.

For technology transfer to succeed, however, developing nations must also account for the eight adoption factors outlined in Section 2.2. In Indonesia, some firms have recognized the plastic waste crisis and adopted RPS as a solution, managing its implementation effectively and gradually building consumer acceptance despite slow and modest growth. Nevertheless, as [Madu, \(1989\)](#) emphasizes, the role of public policy remains underdeveloped. This lack of strong policy support continues to limit RPS adoption, preventing it from becoming a mainstream practice within the Indonesian packaging sector.

6.1.1. Additional Findings

Beyond the primary research scope, several additional findings emerged during the study. These findings primarily concern the interconnections between factors, illustrating how they influence and depend on one another for RPS to achieve successful market adoption. The correlations are explained as follows:

The Dominating Influence of Coercive Pressure

Although not ranked as the most important factor among Experts, CP displays a dominant and overarching influence on the other adoption factors of RPS. Experts agreed that a proactive governmental role, which can be given through clear regulations, incentives, and enforcement, would greatly open the opportunity of RPS implementation within FMCG industry. While CSBD was generally acknowledged by the Experts as the most important adoption factor, its influence was perceived as less immediate than CP.

Experts A, B, and E linked CP directly to the strengthening of CSBD. Specifically, Experts E emphasized that spreading awareness, particularly through environmental campaigns and workshops by NGOs is essential for shifting consumer behavior towards a more sustainable packaging choices. Moreover, stricter regulation by the government together with stricter implementation can encourage consumer to reduce disposable packaging usage and encourage the switch. Both advocacy pressure and governmental regulation generate a mutually enforcing outcomes in influencing consumer behavior. For example, in Bali, the local environmental movements, popularized by “Bye Bye Plastic Bag”, successfully lobbied the provincial government to ban single-use plastic bags. With the regulation in place and actively enforced, usage dropped by 70% within three years.

This demonstrates how CP can accelerate the transformation of CSBD by aligning policy, advocacy, and public behavior.

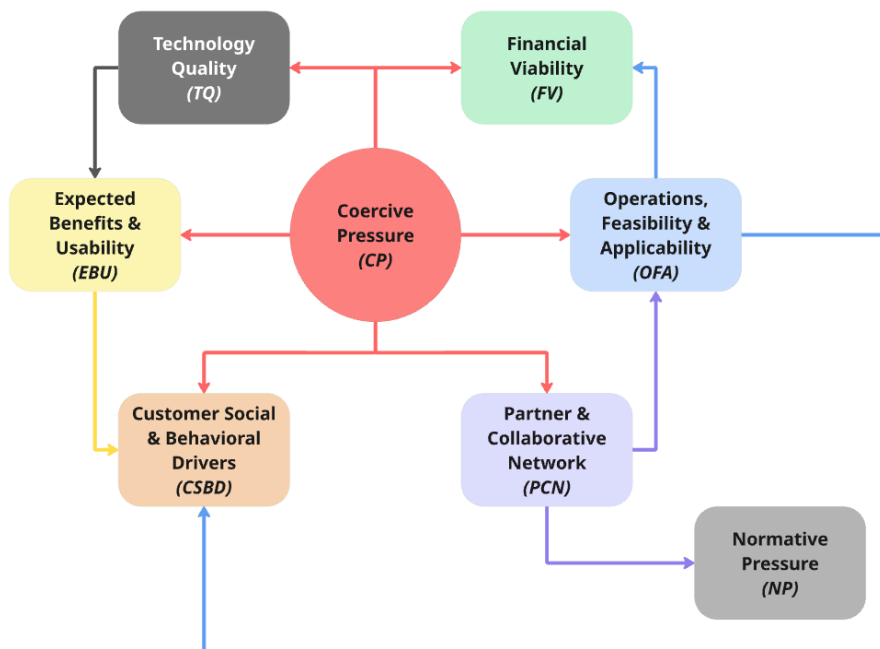


Figure 6.1: Interrelationships between RPS Adoption Factors

CP was also seen as an enabler for other adoption factors beyond CSBD. Experts C and E pointed to the proposed implementation of a “plastic tax” in Indonesia, noting that such a policy could significantly improve FV for RPS adoption by making traditional single-use packaging comparatively more expensive. This can also act in a different manner, subsidizing firms that are using RPS and thereby reducing their overall production or investment cost. Furthermore, based on his experience with the unequal degradation periods of mineral water gallons in his previous company, Expert A emphasized that government regulations could play a pivotal role in establishing mandatory packaging standards for

companies to adhere to. Therefore, the quality (TQ) of every single reusable packaging in circulation can be reliably upheld.

In short, CP operates not merely as one adoption factor among many but also acts as a structure that could shape, reinforce, and even unlock the potential of other adoption factors, including CSBD, FV, and TQ. Its capacity to both enforce compliance and facilitate complementary drivers suggests that in developing market contexts, successful RPS adoption will likely depend on a regulatory environment that is both well-designed and consistently enforced.

The Influence of Partner & Collaborative Network

As Expert B noted, when key stakeholders such as business partners, similar firms, suppliers, and logistics providers are actively cooperating, the operational infrastructure supporting RPS adoption becomes more robust and efficient. Increased collaboration can reduce reverse-logistics costs through shared investment in facilities such as cleaning stations, packaging pooling systems, and dedicated pooling points. This collective infrastructure reduces duplication, optimizes resource allocation, and lowers operational barriers for individual firms. The Indonesian mineral water and glass-bottled beverage industries demonstrate how this effect. As experienced by Experts A and C, these sectors already operate within a semi-shared ecosystem supported by specialized reverse-logistics capabilities and third-party logistics (3PL) providers equipped with dedicated transportation assets such as crates, racks, and modified trucks, for reusable containers. The existence of such an ecosystem reduces the marginal cost of RPS adoption for new entrants, thereby improving FV by lowering both operational expenses and upfront capital investment requirements.

In parallel, partnerships also facilitate greater consumer accessibility, thereby influencing CSBD. As more FMCG companies transition to RPS, convenience stores, supermarkets, and delivery platforms such as SIKLUS refill are incentivized to offer reusable packaging options as part of their standard service. This increased availability normalizes reusable systems and expands complementary service providers, into mainstream consumer choices. Over time, as reusable packaging becomes more common and accessible in both online and offline retail channels, consumer expectations and purchasing habits begin to shift. This shift is further amplified when operational efficiencies from shared partnerships translate into competitive pricing and enhanced user convenience, making RPS not only an environmentally preferable option but also a practical and attractive one for everyday use.

The Influence of Technology Quality

As previously discussed, Indonesia already has established examples of RPS, particularly in the mineral water industry through the use of large polycarbonate water jugs. However, recent research has raised concerns over the safety and durability of these jugs, citing the presence of bisphenol A (BPA) and the potential for material degradation, which can release harmful microplastics into the water. Expert A reaffirmed this concern, sharing from his previous industry experience that such water jugs often degrade much faster than their intended lifespan. This deterioration not only undermines consumer trust but also diminishes the benefits (EB&U) that consumers associated with reusable packaging, such as health safety, durability, and consistent product quality.

These shortcomings in Technology Quality (TQ) have tangible consequences for market adoption. One notable example is a competing mineral water company that capitalized on the growing safety concerns by introducing disposable water jugs. Although environmentally regressive, the disposables were perceived by some consumers as a much safer and more reliable alternative, effectively reversing progress toward RPS adoption. This case illustrates how substandard technology quality can erode perceived benefits and shift consumer behavior away from reuse models, even in markets already familiar with

RPS.

Conversely, if RPS technology quality is improved—through higher-grade materials, stricter manufacturing standards, and robust quality control—consumer perceptions of reliability and safety can be significantly strengthened. High-quality standards would ensure that RPS consistently delivers on its promised benefits, reinforcing positive consumer experiences and building trust in the system. In turn, the enhancement of EB&U would increase consumer willingness to adopt and maintain RPS habits (CSBD) over the long term.

6.2. Thesis Contribution

6.2.1. Academic Contribution

This master's thesis contributes to the broader literature on technological dominance, including perspectives specific to developing nations, by validating its relevance within the packaging practices of Indonesia's FMCG industry. In particular, it examines the adoption factors influencing the implementation of reusable packaging systems (RPS) in this sector. To analyze these factors, the study applied the Best-Worst Method (BWM), recognized as one of the most reliable Multi-Criteria Decision Analysis (MCDA) tools. BWM proved to be both practical and user-friendly for the researcher and interviewees. Its structured scoring approach enabled Experts to easily assign values to the identified adoption factors during the interview sessions. Meanwhile, the ranking results were easily generated through the BWM calculator interface. Furthermore, the built-in consistency ratio enhanced the credibility of the findings by allowing straightforward validation of the results.

6.2.2. Societal & Practical Contribution

This study also gives a practical contribution to the industry of packaging and FMCG sector in Indonesia, as this study was mainly done from a technological perspective. Every related stakeholders, could benefit from the insights from this study on how breakthrough technology can be adopted in the developing nations and possibly achieve dominance in the market. Although, for this RPS technology to be adopted completely within the industry, active roles by the government is needed. According to the results, Coercive Pressure specifically the ones exerted by government significantly influence other adoption factors, further encouraging adoption when regulations are in place to support and strengthen the ecosystem.

7

CONCLUSION & RECOMMENDATIONS

7.1. Conclusion

Understanding the adoption factors of reusable packaging systems (RPS) within Indonesia's consumer goods industry was the central objective of this thesis. To address this topic, one main research question and three additional sub-research questions were formulated to guide the thesis writing and ensure a structured analysis. In support of this, a brief overview of existing reusable packaging models was provided, alongside with a discussion of relevant theories of technology adoption. Empirical insights were derived from two sources: (1) a literature review of 12 peer-reviewed journal articles on RPS adoption in the consumer goods sector, and (2) interviews with six industry experts.

The first round of interviews focused on identifying adoption factors perceived as critical by the Experts, complementing the factors extracted from the literature. These factors were then combined by categorizing and streamlining them to fit within the Best-Worst Method (BWM) limitation, which limits the analysis to a maximum of nine factors. In the second round of interviews, Experts were asked to evaluate and assign weights to the factors, while also providing insights into how these factors could be influenced to increase RPS adoption rates. The resulting scores were subsequently processed using the BWM calculator, producing a ranked list of adoption factors.

7.1.1. Answers to Research Questions

The following main research question guided the study:

"What factors influence the adoption of reusable packaging systems in the consumer goods industry in Indonesia, from the perspective of firms as end-users?"

To answer this comprehensive question, several sub-research questions were developed and addressed accordingly as follows:

"What factors influencing the adoption of reusable packaging systems are identified in the literature?"

1. **Coercive Pressure:** regulatory requirements imposed by external actors (e.g., government, global headquarters, parent companies) that obliges firms to reduce environmental impact by adopting reusable packaging

2. **Consumer Social & Behavioral Drivers:** consumer attitudes and behaviors that motivate firms to adopt RPS as alternatives to disposable packaging.
3. **Expected Benefits & Usability:** functional and experiential values that firms believe customers expect from RPS.
4. **Financial Viability:** the economic calculations undertaken by firms to assess whether RPS can provide a competitive advantage over existing packaging.
5. **Normative Pressure:** strategic intent and reputational considerations that influence firms to adopt sustainable packaging solutions.
6. **Operations, Feasibility & Applicability:** practical compatibility of RPS with existing logistics and manufacturing systems.
7. **Partner & Collaborative Network:** the role of collaboration and complementary networks in enabling effective RPS adoption
8. **Technology Quality:** clear technical standards that is necessary to guarantee that reusable systems, products, or services operate reliably and maintain customer trust.

What factors do firms consider most critical for the adoption and successful implementation of reusable packaging systems?

The results show that **Consumer Social & Behavioral Drivers (CSBD)** ranked the highest (0.18). Experts consistently emphasized that profit generation, which is the central objective of firms, depends highly on consumer demand. Consequently, consumer behavior plays a decisive role in determining whether new innovations such as RPS can succeed. The second most important factor is **Coercive Pressure (CP)** (0.17). Experts noted that without clear regulatory enforcement and government support, RPS adoption in Indonesia would be extremely difficult to achieve. **Technology Quality (TQ)** ranked third (0.14), reflecting the importance of durability, safety, and reliability in building consumer trust. Experts argued that if reusable packaging fails to deliver consistent quality, consumers are unlikely to adopt it.

Table 7.1: Adoption Factors Ranking

Rank	Factors	Score
#1	Customer Social & Behavioral Drivers (CSBD)	0.18
#2	Coercive Pressure (CP)	0.17
#3	Technology Quality (TQ)	0.14
#4 (<i>tie</i>)	Expected Benefits & Usability (EBU)	0.12
#4 (<i>tie</i>)	Operations, Feasibility & Applicability (OFA)	0.12
#5	Financial Viability (FV)	0.11
#6	Normative Pressure (NP)	0.10
#7	Partner & Collaborative Network (PCN)	0.07

Expected Benefits & Usability (EBU) and **Operations, Feasibility & Applicability (OFA)** were both scored 0.12, indicating equal importance. Experts highlighted that consumer satisfaction must be safeguarded when introducing new packaging formats, while firms must also evaluate whether RPS can be integrated into existing supply chains or require entirely new infrastructure. **Financial Viability (FV)** ranked slightly lower (0.11). Although cost is typically a critical factor, experts believed that under the right conditions—such as regulatory incentives or strategic goals, firms might be willing to pay the high initial investments to adopt RPS. **Normative Pressure (NP)** (0.10) was considered less influential, as

sustainability is not yet a mainstream priority among Indonesian consumers. As a result, firms are less likely to adopt RPS purely for reputational purposes. Finally, **Partner & Collaborative Network (PCN)** ranked lowest (0.07). Experts argued that once RPS reaches mainstream adoption, stakeholders will inevitably build the necessary networks, making this factor less critical in the early stages.

“How can these factors be influenced by stakeholders (e.g. government, industry, policy makers) to promote the emergence of a dominant ecosystem?”

- **Coercive Pressure**

Experts emphasized that while Indonesia already has numerous regulations on plastic usage, weak enforcement remains the main barrier. They argued that stronger measures that could be exerted by government, such as taxation schemes on excessive plastic use, could steer consumer behavior toward sustainable alternatives. In addition, NGOs play a critical role as watchdogs and solution providers, amplifying public pressure and ensuring accountability in both corporate practices and regulatory implementation.

- **Consumer Social & Behavioral Drivers**

Experts consistently identified consumer behavior as the most critical factor for RPS adoption, emphasizing the need for education, awareness campaigns, and financial incentives (e.g. government-led pricing schemes or company-driven reward systems) to drive behavioral change. Local initiatives like waste banks, supported by FMCG firms through CSR programs, could also serve as community-based enablers by fostering return habits and potentially evolving into drop-off or cleaning hubs in the long run. Eventually, many stakeholders such as firms, government, NGOs, and local communities all play complementary roles in ensuring that reusable packaging becomes both attractive and practical for consumers.

- **Expected Benefits & Usability**

Experts emphasized that consumer expectations, particularly around safety and hygiene, are central to the adoption of RPS. Firms must avoid superficial ‘greenwashing’ campaigns and instead build trust through credible evidence, transparent communication, and partnerships with external actors such as independent research bodies or waste banks. At the same time, government agencies like BPOM must strengthen regulations to ensure product and packaging safety, as only then can RPS gain consumer confidence and achieve large-scale adoption in Indonesia.

- **Financial Viability**

The Experts agreed that government incentives are critical to overcoming the high risks and costs associated with RPS adoption, particularly for first movers. They suggested that a balanced approach of penalties for excessive plastic use and rewards for compliance in plastic reduction could drive stronger industry commitment. Beyond financial support, Experts emphasized the need for a broader RPS ecosystem, highlighting reverse logistics as a major challenge. Leveraging existing supply chain networks, such as those already established in the mineral water industry, was seen as a more efficient path forward, enabling shared cost reductions while encouraging wider adoption.

- **Normative Pressure**

Experts noted that Normative Pressure is shaped not only by internal leadership but also by consumer demand and competitive dynamics within the industry. Examples from multinational firms and peer influence illustrate how these forces can encourage sustainability initiatives. Yet, the transition to reusable packaging in Indonesia remains challenging, as sustainability values are not yet mainstream.

- **Operations, Feasibility & Applicability**

Experts highlighted that the main challenge of RPS lies in reverse logistics, with no reliable mechanism to ensure packaging returns under current systems. They suggested leveraging waste banks, collaborating with informal waste pickers, and providing consumer incentives to improve return rates. Additionally, firms must adapt their operations, including investing in new machinery, to fully accommodate the new reusable formats.

- **Partner & Collaborative Network**

Experts emphasized that waste banks could help ease reverse logistics by pooling used packaging, while in cosmetics industry, gradual adoption and broader industry participation are needed to secure consumer acceptance. Experts also stressed that specialized machinery and government support in standardizing packaging will be critical to developing a functional RPS ecosystem.

- **Technology Quality**

Experts agreed that government, NGOs, and industry associations play a central role in ensuring Technology Quality by establishing clear standards, enforcing monitoring mechanisms, and incentivizing compliance. While careful material selection and intellectual property can enhance quality, patents risk limiting wider industry access, making knowledge sharing essential. Complementing these measures, education and academic collaboration were highlighted as long-term strategies to build industry expertise and integrate consumer behavior insights into packaging innovation.

7.2. Limitations & Recommendations

This thesis is written with full acknowledgment of its limitations and area for improvement. While the findings provide a useful foundation of RPS adoption factors in Indonesia, specifically within the FMCG industry, they should be viewed as an initial stage in developing a more thorough understanding of the topic. Future research could build upon this work through the following recommendations:

1. **Increase the Amount of Interview Sessions**

In this research, semi-structured interviews were used to address the Sub-Research Questions (SRQs). Although there were three SRQs, the interviews were conducted in only two sessions. The second session, which combined SRQ2 and SRQ3, could have been divided into two separate interviews, each focusing on one question, to generate deeper insights for both.

2. **Increase the Amount of Interviewed Experts**

Due to constraints in time and resources, this study was limited to interviews with only six experts. Expanding the number of participants and ensuring a balanced representation across different stakeholder groups would strengthen the robustness of the findings and provide a more comprehensive understanding of RPS adoption factors within the industry.

3. **Broaden the Geographical Representations of Experts**

All experts in this study were based in Jakarta, which is Indonesia's primary business hub. While Jakarta offers access to major FMCG operations, experts located there may face consumer-related challenges that are only specific to urban markets dominated by upper-middle class consumers. Including Experts from other regions might be able to reveal different adoption barriers and operational realities, thus enriching the analysis.

4. **Narrow the Research Scope to a Specific FMCG Subsector**

This research analyzed the FMCG industry in Indonesia as a whole, covering beverages, health-care, household, and personal care products. However, the FMCG sector is broad and future studies could focus exclusively on a single sub-sector to conduct a more in-depth analysis of

its unique challenges. For instance, the quality control requirements in healthcare packaging may differ significantly from those in the beverage sector, or the material quality needed for RPS adoption in F&B sector might be different from e-commerce.

5. Adopt a Single-Company Case Study Approach

This thesis interviewed experts from multiple companies within the Indonesian FMCG industry, offering a cross-company view. An alternative approach would be to focus specifically on one company, interviewing experts across various departments (e.g. supply chain, packaging R&D, and corporate affairs) to assess specific organization adoption barriers and enablers in more detail.

6. Focus on a Single Functional Perspective

While the current study captured viewpoints from various roles across different companies, future research could concentrate on a single functional area (e.g. supply chain, packaging R&D, or marketing) and compare readiness across firms. This focused perspective could result in deeper insights into role-specific challenges and strategies.

7. Examine the Readiness of National Companies

Although studying the companies located in Indonesia, this study is analyzing the approach of both multinational and local FMCG firms. A dedicated study focusing exclusively on national companies would provide a clearer picture of local Indonesian companies readiness for RPS adoption and the unique challenges they face compared to FMCG firms with internal global influence.

8. Explore RPS Application Beyond Primary Packaging

This thesis examined the potential for RPS in primary packaging, which comes in direct contact with the product and consumers. Future research could investigate secondary and tertiary packaging, which also play critical roles in product protection and logistics but may have different feasibility aspects for RPS implementation.

9. Expand the Research Beyond the FMCG Sector

Packaging is crucial to numerous industries beyond FMCG, many of which remain heavily reliant on disposable formats. Extending research to other sectors such as e-commerce, food & beverages, or automotive could provide a cross-industry perspective on RPS readiness and scalability potential.

10. Understanding the Rank of Each Factors within Category

Factors that were found both from Literature Review and Expert Interview sessions were grouped into eight categories to cater to the BWM limited calculation power. Each of these factors were then treated equally within the category. However, one factor might have a higher level of importance than the other factor despite being in the same category. Further research in exploring each factor ranking within the category can then be done.

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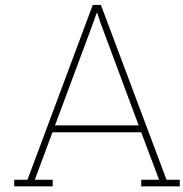
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BWM Results from All of the Interviewed Experts

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Select the Best	CSBD							
Select the Worst	NP							
Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CSBD	2	1	2	3	4	2	4	1
Others to the Worst	6							
CP	3							
CSBD	4							
EBU	3							
FV	2							
NP	1							
OFA	3							
PCN	1							
TQ	4							
Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.12	0.22	0.12	0.08	0.05	0.12	0.06	0.22
Input-Based CR	0.17	The pairwise comparison consistency level is acceptable						
Associated Threshold	0.26							

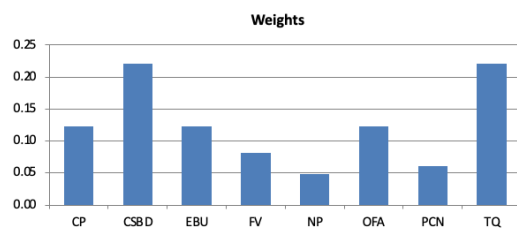


Figure A.1: BWM Result from Expert A

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Select the Best	CP							
Select the Worst	NP							
Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CP	1	2	4	3	5	3	4	3
	5							
Others to the Worst	NP							
CP	5							
CSBD	4							
EBU	2							
FV	3							
NP	1							
OFA	3							
PCN	2							
TQ	3							
Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.29	0.17	0.08	0.11	0.05	0.11	0.08	0.11
Input-Based CR	0.20	The pairwise comparison consistency level is acceptable						
Associated Threshold	0.28							

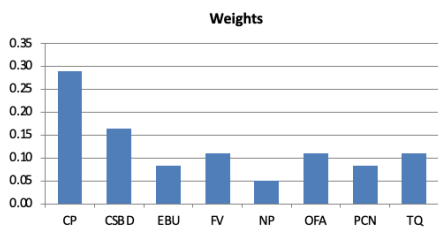


Figure A.2: BWM Result from Expert B

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Select the Best	CP							
Select the Worst	PCN							
Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CP	1	3	1	2	1	2	3	2
	7							
Others to the Worst	PCN							
CP	3							
CSBD	1							
EBU	3							
FV	2							
NP	3							
OFA	2							
PCN	1							
TQ	2							
Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.19	0.06	0.19	0.10	0.19	0.10	0.07	0.10
Input-Based CR	0.17	The pairwise comparison consistency level is acceptable						
Associated Threshold	0.17							

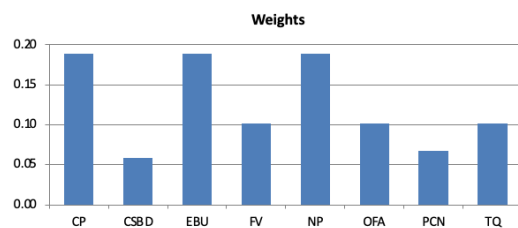


Figure A.3: BWM Result from Expert C

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Select the Best	CSBD							
Select the Worst	EBU							
Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CSBD	1	1	3	1	1	1	3	1
Others to the Worst	EBU							
CP	3							
CSBD	3							
EBU	1							
FV	3							
NP	3							
OFA	3							
PCN	1							
TQ	3							
Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.15	0.15	0.05	0.15	0.15	0.15	0.05	0.15
Input-Based CR	0.0000							
Associated Threshold	0.17							

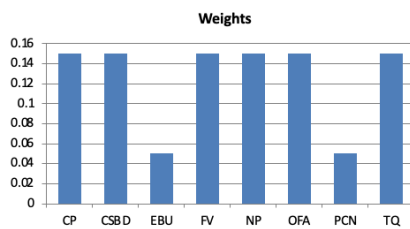


Figure A.4: BWM Result from Expert D

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
Select the Best	CSBD							
Select the Worst	PCN							
Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CSBD	3	1	2	2	3	3	3	2
Others to the Worst	PCN							
CP	1							
CSBD	3							
EBU	2							
FV	2							
NP	1							
OFA	1							
PCN	1							
TQ	2							
Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.08	0.25	0.13	0.13	0.09	0.09	0.09	0.13
Input-Based CR	0.17							
Associated Threshold	0.17							

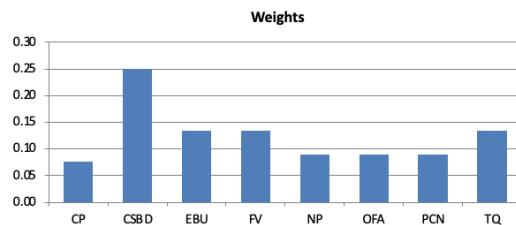


Figure A.5: BWM Result from Expert E

Criteria Number = 8	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Names of Criteria	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ

Select the Best	CSBD
-----------------	------

Select the Worst	PCN
------------------	-----

Best to Others	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
CSBD	1	1	2	3	4	2	5	2

Others to the Worst	PCN
CP	4
CSBD	5
EBU	4
FV	3
NP	2
OFA	4
PCN	1
TQ	4

Weights	CP	CSBD	EBU	FV	NP	OFA	PCN	TQ
	0.20	0.24	0.12	0.08	0.06	0.12	0.04	0.12

Input-Based CR	0.20	The pairwise comparison consistency level is acceptable
Associated Threshold	0.28	

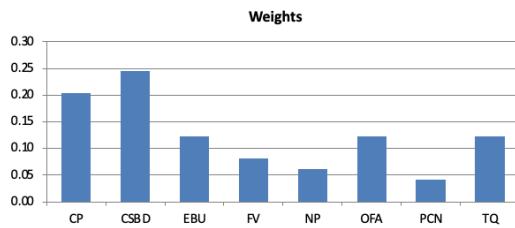


Figure A.6: BWM Result from Expert F

B

First Round of Interview Guiding Questions

General Questions

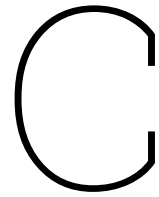
1. Can you please once again describe your current company?
2. Can I confirm your expertise and role in your current company?
3. Do you confirm your consent in participating in the interview session, as per the Consent Form document sent earlier?
4. Do you have any questions before the interview begins?

Exploration Questions I: Familiarity with Reusable Packaging Concept its Adoption Factors

1. Can you briefly describe the current packaging standard that your company mainly use for its product?
2. Can you briefly describe the concept of reusable packaging system (RPS) from your own understanding?
3. From what you have described earlier, have your company ever used or planning to use RPS within its value chain in the near future?

Exploration Questions II: RPS Adoption Factors

1. What do you think are the factors that are hindering the adoption of reusable packaging in the Indonesian FMCG industry?
2. Can you explain the reason why do you think that those factors are hindering the adoption of RPS?
3. What do you think are the factors that are promoting the adoption of reusable packaging in the Indonesian FMCG industry?
4. Can you explain the reason why do you think that those factors are promoting the adoption of RPS?
5. Can you think of any other adoption factors of RPS other than the ones you have mentioned before?



Second Round of Interview Guiding Questions

First Session: Scoring of Identified Adoption Factors

1. Which factor do you think has the most significant effect to the adoption of RPS in the FMCG industry?
2. Can you please elaborate why do you think that adoption factor has the most significant effect?
3. Which factor do you think has the least significant effect to the adoption of RPS in the FMCG industry?
4. Can you please elaborate why do you think that adoption factor has the least significant effect?

Second Session: Exploring Stakeholders' Roles in Affecting the RPS Adoption

1. How do you think various stakeholders can affect Coercive Pressure so that RPS can be adopted by your company/ the FMCG industry in general?
2. How do you think various stakeholders can affect Consumer Social & Behavioral Drivers so that RPS can be adopted by your company/ the FMCG industry in general?
3. How do you think various stakeholders can affect Expected Benefits & Usability so that RPS can be adopted by your company/ the FMCG industry in general?
4. How do you think various stakeholders can affect Financial Viability so that RPS can be adopted by your company/ the FMCG industry in general?
5. How do you think various stakeholders can affect Normative Pressure so that RPS can be adopted by your company/ the FMCG industry in general?
6. How do you think various stakeholders can affect Operations, Feasibility & Applicability so that RPS can be adopted by your company/ the FMCG industry in general?
7. How do you think various stakeholders can affect Partner and Collaborative Network so that RPS can be adopted by your company/ the FMCG industry in general?
8. How do you think various stakeholders can affect Technology Quality so that RPS can be adopted by your company/ the FMCG industry in general?