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Circular business models for the fastmoving consumer goods industry

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Circular business models for the fastmoving consumer goods industry: Desirability, feasibility, and viability

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A R T I C L E   I N F O

A B S T R A C T

Fast-moving consumer goods (FMCGs) are products that have a short useful lifetime and are typically designed for single or limited uses followed by disposal. The disposable nature of FMCGs combined with ineffective waste recovery systems is causing global environmental problems. Various reusable packaging business models have emerged to tackle these problems; however, their influence is still low in practice. Testing the feasibility, desirability, and viability of innovative circular business models enables their implementation and scaling. In this context, this study explores the success factors, drivers, and barriers of an FMCGs reuse business model. The case company is an internationally scaling company pursuing a potentially disruptive circular business model. A mixed methods approach is used, involving semi-structured interviews with innovators on two variations of the FMCG reuse business model (in-store and e-commerce) followed by a consumer survey in the city of Berlin to test perceptions of these business models. Five success factors were identified: brand and retailer partnerships, consumer participation, operations efficiency, business model profitability, and the establishment of an ecosystem. The main driver for consumers to participate in the circular business model is the potential positive environmental impact, although there were concerns about added environmental impact related to logistics in the e-commerce model. In addition, convenience and accessibility of the reuse model are important for consumers. Costs are identified as a predominant barrier for companies to engage in reusability. Based on the research findings, recommendations for expanding FMCG reuse business models are developed.

1. Introduction

Packaging is a part of our daily lives. Whereas the global packaging industry has grown rapidly, the average useful life of packaging material has been decreasing (Berg et al., 2020). One of the main drivers of this unsustainable consumption development is the widespread usage of single-use packaging containers in the fast-moving consumer goods (FMCGs) sector (Fuhr et al., 2019). FMCGs are mass products for everyday use, including food, beverages, personal care products, household products, and pet supplies (Muranko et al., 2021). FMCGs have a short useful lifetime and are

typically designed for single or limited use and disposal. In addition, these products conveniently and temporarily satisfy customer needs before the remaining material (e.g., packaging) enters a linear resource flow at end of their life (van der Zeeuw Laan and Aurisicchio, 2019).

The FMCGs industry is characterized by multinational corporations selling packaged goods with a brand portfolio in high volumes and at low prices, usually in large supermarket chains (Ahrens, 2021; Lacy et al., 2020). In addition, a large heterogenous network of Small and Medium Sized companies (SMEs) is operating in the value chains (Eurostat, 2020). However, consumer trends are moving towards niches and online shopping spurred by new forms of working and living (Krings et al., 2016). Furthermore, there is more vertical integration and digital competition, vulnerability in value chains and tighter regulation (Krings et al., 2016). While the FMCG industry is changing due to these trends (Ma et al., 2020), this linear resource flow leads to material and, hence, value losses (Blomsma and Tennant, 2020). For example, in

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Europe, an average of 177 kg of packaging waste were produced per capita in 2019, a number that has only gone up over the years (Eurostat, 2021). The FMCGs sector is very resource-intensive, as mainly virgin materials are used for the packaging, which are not always easy to recycle (Bocken et al., 2011; Lacy et al., 2020). Ineffective waste collection and recovery systems combined with limitations in product design are the main reasons that single-use containers from FMCGs are often incinerated or end up in landfills and thus contribute to air and soil pollution as well as waste accumulation (EMF, 2013). It is estimated that around ten million tons of plastic waste, including single-use containers, end up in the world's oceans every year, threatening marine ecosystems and biodiversity (Fuhr et al., 2019).

FMCG companies are increasingly confronted with the challenge of finding solutions to solve the plastic waste problem (Bashir et al., 2020; Bocken and Allwood, 2012). Incremental changes in products and processes are not sufficient for the transition towards a sustainable circular economy (Bauwens et al., 2022). Industry efforts and targets have typically focused on lower strategies in the waste hierarchy such as recycling and recycling rates cannot outweigh the environmental damage of a growing amount of packaging (Allwood, 2014; Eurostat, 2021). Instead, a focus on absolute reductions through waste avoidance and product reuse is needed. But this requires radical new ways of designing and implementing business models (Brown et al., 2019; Santa-Maria et al., 2021). For example, in a circular model, the positioning and identify of companies might change from product manufacturer to vertically integrated service provider responsible for product sales but also take-back, refilling and reuse (Brown et al., 2019; Velter et al., 2021).

The circular economy is an alternative paradigm to the current "take-make-dispose" linear economy paradigm (Bauwens et al., 2022) and provides innovation opportunities for the FMCGs industry (Kuzmina et al., 2019). In the packaging context, reuse circular business models (CBMs) have emerged in recent years, aiming to slow down and close resource cycles (Bocken et al., 2016; Coelho et al., 2020). However, CBMs are far from mainstream in the sector and remain rather niche (EMF, 2019). Business model innovation is therefore needed. This is the process of changing existing business models in established companies or designing entirely new business models in a start-up company to create, capture and deliver value in novel ways (Osterwalder and Pigneur, 2013). Testing the feasibility, desirability, and viability (Bland and Osterwalder, 2020) of reusable packaging CBMs is a way to determine their path to implementation and a suitable scaling process.

Circular business model innovation in start-up companies is about including circular economy practices in the business model design process from the business idea stage (Guldmann and Huulgaard, 2020). In large corporations this is about transforming existing linear economy innovation processes and characterized by significant experimentation towards an ambitious circular value creation goal (Weissbrod and Bocken, 2017). In both company types, the creation of CBMs requires a systematic point of view as well as the inclusion of the company's ecosystem, which consists of multiple stakeholders, in the innovation process (Bocken et al., 2018; Konietzko et al., 2020b). CBMs are associated with high risks and uncertainties because of their radicalness compared to traditional linear business models (Antikainen and Valkokari, 2016; Weissbrod and Bocken, 2017).

Because of the lack of scaled CBMs in the FMCG industry that use reusable packaging, this paper studies a potentially disruptive industry case that has quickly gained ground to draw lessons for future scaling of CBMs in the industry. The research questions are:

1. *What are the success factors, drivers, and barriers of a reusable packaging CBM for the FMCG industry?*

2. *What is the feasibility, desirability, and viability of the associated CBM?*

We study a quickly scaling international case company involved in a reuse deposit-refund system, in the context of Berlin, Germany. Success factors, drivers, and barriers of launching CBMs were determined with a mixed-methods approach. The theory section introduces reusable packaging and circular business models and is followed by the methodology, and the discussion of results of the semi-structured interviews and the online survey. We end with recommendations for practice and research limitations.

2. Theoretical background

2.1. Circular business models for FMCG

FMCGs are everyday mass products that are bought and consumed frequently (Kuzmina et al., 2019; Muranko et al., 2021). These include food and non-food products, such as personal care and cosmetics, detergents, and cleaning products. The FMGCs industry is characterized by high sales volumes as well as low prices (Kuzmina et al., 2019; Robinson and Fornell, 1985). Furthermore, multinational corporations with a differentiated product and brand portfolio are typical for the sector. At the time of writing, the world's largest suppliers include Nestlé, Procter & Gamble, PepsiCo, and Unilever. The main distribution channels for FMCGs are large food retailers and drugstores. Next to the traditional distribution channels, the importance of e-commerce is growing steadily in the FMCGs segment. In 2020, for example, the share of FMCGs in total online retail sales in Germany grew to over 10% (Ahrens, 2021).

According to circular economy principles, FMCGs should be designed in a way that promotes the highest utility of resources (Achterberg et al., 2016; Lacy et al., 2020). To start, products should be designed using renewable and sustainable materials, with the intent to re-enter the product lifecycle as reusable packaging before eventually being recycled (EMF, 2019; Muranko et al., 2021). Stewart and Niero (2018) analyzed several corporate sustainability reports of FMCG companies and found that FMCG companies' most common circular economy related activities are increasing the share of renewable energies, improving operations, and recovering waste. Furthermore, packaging is given a prominent role. For example, companies like Unilever and Nestlé have acknowledged the need to move towards a circular economy by announcing that the plastic packaging of their products will be fully recyclable, reusable, or compostable by 2025 (Lacy et al., 2020). The FMCGs industry provides opportunities to innovate within the circular economy agenda. However, due to the uncertain nature and complexity of the sector, this is often challenging in practice (Kuzmina et al., 2019) and there are still few radical innovations.

2.2. Reusable packaging models

The recycling of packaging is the most common waste management strategy in the FMCGs industry. However, the recycling process as a lower strategy in the waste hierarchy (prevention, reuse, recycling, recovery, disposal) fails to address the overproduction and consumption of virgin resource material used for FMCGs by only managing the final stage of the product life cycle (Allwood, 2014; European Commission, 2008). Packaging is a primary user of virgin materials. For example, in Europe, around 40% of the total plastic demand is used to produce packaging for the end-use market (Plastics Europe, 2020). Furthermore, the total volume of packaging material has increased due to retail developments like the emergence of convenience products. To date, innovation activities regarding packaging in the FMCGs sector mainly focus on reducing the material per unit of packaging by

Table 1
Overview of reusable packaging frameworks for the FMCGs sector.

Reuse packaging models	Source
• Refill at home • Refill on the go • Return from home • Return on the go	Ellen McArthur Foundation (2019)
• Consumer replenishes/ reconditions • Consumer replenishes at home via service • Consumer replenishes on-the-go via service • Consumer brings and company replenishes/ reconditions via service • Company replenishes for consumer via service	Tassell and Aurisicchio (2020)
Exclusive reuse models • Exclusive reuse models • Exclusively reused products • Exclusively reused products with reuse-enabling infrastructure • Reuse-enabling infrastructure for exclusively reused products *Sequential reuse models* • Sequentially reused products with reuse-enabling infrastructure • Sequentially reused products	Muranko et al. (2021)

light-weighting, designing packaging for recycling, and eco-labeling (Kunamaneni et al., 2019). Yet, the prevention or reuse of packaging are the preferred options (Coelho et al., 2020; European Commission, 2008). Reusable packaging outperforms single-use packaging on most environmental impact measures (Greenwood et al., 2021). However, this depends on customer behavior (Ma et al., 2020) and the impact of the logistics chain and reuse chains should be designed to minimize negative rebounds (Greenwood et al., 2021). Further considerations relate to e.g., concentrating ingredients cutting the volume of packaging (Bocken et al., 2011; EMF, 2019). For example, the case of Replenish shows that by using reusable bottles and small refill pods it can cut plastic packaging by 90% and hereby also reduce its transport footprint. Durable and reusable containers increase the longevity of packaging (Ertz et al., 2017) by exploiting the residual value of products and materials after each use (Bocken et al., 2016; Vermunt et al., 2019). This helps to reduce the demand for virgin resources through reuse and ultimately recycling (Coelho et al., 2020). Furthermore, reusability presents an innovation opportunity that can change customers' perception of packaging from simply being cheap and practical to being durable, long-lasting, and high-quality (EMF, 2019). Circularity can also open up new and possibly more direct sales channels for FMCGs used to selling via retailers (Krings et al., 2016).

Currently, only very few products with reusable packaging are available in the FMCGs industry although new reusable packaging models have emerged (Muranko et al., 2021). Table 1 includes potential reuse models. The Ellen McArthur Foundation proposed four archetypes for reusable packaging models: refill at home, refill on the go, return from home, and return on the go (EMF, 2019). This framework divides reuse models between two main categories: the expected consumer behavior, i.e., either return or refill, and the location, i.e., either on the go or at home. Muranko et al. (2021) note that this framework fails to address the ownership of the packaging and the interaction of the users with the reuse infrastructure. Tassell and Aurisicchio (2020) introduced five reuse models for the FMCGs sector based on crucial reuse-enabling behaviors of providers and consumers, namely, (1) consumer replenishes/reconditions, (2) consumer replenishes at home via service, (3) consumer replenishes on-the-go via service, (4) consumer

brings and company replenishes/ reconditions via service, and (5) company replenishes for consumer via service. In the first three models, the customer keeps the packaging and is involved in replenishing (preparation for reuse) or reconditioning (recovery for reuse). The latter two models require the customer to dispose or bring back the reusable containers. This framework specifies the role of the customer and provider in the reuse process, which helps to define who performs core behaviors (Muranko et al., 2021; Tassell and Aurisicchio, 2020). Muranko et al. (2021) distinguishes between two categories of reuse models: exclusive reuse models (reusable packaging is owned and kept by customer who can control the reuse journey) and sequential reuse models (reusable packaging is owned by the company and access is offered to the customer). Both reuse options entail three operations: preparation for reuse, reuse, and recovery for reuse. Furthermore, the exclusive and sequential reuse systems are subdivided into different reuse models that require low to high consumer effort. Sequential reuse models are well suited for the FMCGs sector as the resource flow at the end of use can be controlled by providing financial incentives to customers (Muranko et al., 2021). Additionally, the effort for consumers in these reuse models can be reduced since the provider is responsible for important tasks like cleaning and refilling the packaging. Furthermore, several companies combine exclusive and sequential reuse models to provide customers with several pathways to reuse (Muranko et al., 2021). All models require a change in consumer behavior away from 'buy - consume - throw into (recycling) bin' behavior.

When comparing the different reuse frameworks, location of the reuse service and the actor's role in the reuse process appear to play an important role in distinguishing various models. Furthermore, the ownership of the packaging is crucial to determine the behavior of the actors in the reuse process. This study focuses on sequential reusable packaging models for the FMCGs industry. In these systems, the consumer uses the packaging and is responsible for returning it to the provider. The provider takes care of the packaging recovery for reuse and reintroduces it in the consumption phase. This model was chosen as it mimics existing successful deposit-refund systems (DRS) (e.g., glass beverage bottles) and could be fitted well into existing online retail networks.

In practice sequential reuse models in the Business to Consumer market are often connected to a DRS (Coelho et al., 2020). In a DRS, the customer pays an additional fee (deposit) which is added to the product price at the time of purchase. The deposit will be refunded to the customer when the packaging container is returned (Numata, 2009). In practice, DRSs are used for beverage packaging, batteries, electronics, tires, and more (Walls, 2011). DRSs are considered a desirable option to redirect waste streams from disposal to recycling and reuse (Zhou et al., 2020). They are economic instruments that aim to reduce the amount of waste while having a positive environmental impact (Numata, 2009). Furthermore, DRSs incentive customers to return empty products with low monitoring activities (Bohm, 1981). Several studies confirmed the effectiveness of DRSs in ensuring the return of packaging containers (Bohm, 1981; Farber, 1991). In Germany, the introduction of a DRS has resulted in 98% of single-use PET packaging being returned to collection sites (Zhou et al., 2020). Hence, DRS combined with a reuse model may be a viable pathway forward to slow and close resource loops.

2.3. Research gap

Despite the general interest of the private sector in the circular economy, the implementation of CBMs is still low in practice (Bocken et al., 2017). Promising business models often fail to reach the market resulting in a so-called "design-implementation gap" (Baldassarre et al., 2020). Additionally, CBMs
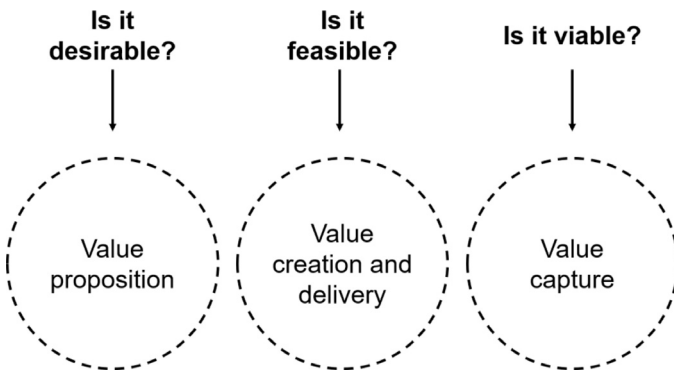
Fig. 1. *Business model testing.* Source: Bland and Osterwalder (2020).

need to achieve sufficient scale to have a social and environmental impact (Christensen et al., 2006). Scaling CBMs can be challenging because the company has to connect the value proposition for customers to a societal and environmental value proposition in a scalable manner (Bocken et al., 2018; Täuscher and Abdelkafi, 2018). CBMs rely on novel ways of value creation and logistics, which requires a broader understanding of scalability. In the CBM literature, research on scalability is still lacking (Hultberg and Pal, 2021).

In the FMCGs sector, research about reusable packaging systems has been growing, but industry practice specifically focused on packaging reuse rather than merely recycling is limited. Recent work categorizes reusable packaging models and identifies reuse system elements (Muranko et al., 2021). Coelho et al. (2020) identified several key factors that influence the viability of sequential reusable packaging systems: logistics and transportation, market volume, level of standardization, return rates of reusable containers, cleaning, and labor involved in the process. Furthermore, they identified several benefits for retailers and brands of introducing a reusable packaging system: growing consumer loyalty, building a sustainable image, and increasing variety and customization (Coelho et al., 2020). For customers, reusable packaging models provide the opportunity to reduce waste and profit from price incentives (e.g., discounts for reusing) and increased product variety (Coelho et al., 2020). Yet, Greenwood et al. (2021) found that recycling is still the preferred option for dealing with packaging for (UK) customers but argue that increased familiarity with reuse models might help uptake. We argue that Germany is a suitable location to test this assertion because a highly accepted DRS is in place for beverage packaging.

Few studies have comprehensively addressed the potential of reusable packaging CBMs. There is a lack of knowledge about barriers, drivers, and success factors. Furthermore, barriers and success factors differ significantly depending on the sector and type of business model (Vermunt et al., 2019). To the best of the researchers' knowledge, there are no comprehensive studies on success factors and barriers of continuous packaging reuse models in the FMCGs industry to date. To address this gap, case-specific research in the FMCGs industry is needed (Vermunt et al., 2019). Coelho et al. (2020) emphasize that future research should be done in collaboration with stakeholders (e.g., producers, customers, and retail companies) to get insights from the perspective of various actors.

Bland and Osterwalder (2020) developed a business model testing framework (Fig. 1), which guide the research in this study. The framework includes the aspects of desirability, feasibility, and viability, also commonly used in sustainable business model design (e.g., Baldassarre et al., 2020; Calabretta et al., 2016). From a business model perspective, desirability is a property of value proposition (How desirable is the value proposition for the customer?),

feasibility is a property of value creation and delivery (How feasible is it to organize resources needed to create and deliver the value proposition?) and viability is a property of value capture (Is the business model profitable?) (Bland and Osterwalder, 2020).

3. Method

This study investigates a quickly scaling international case company operating a reusable packaging CBM and collaborating with dominant FMCGs and retailers in different markets. The case company chose to be anonymized for competitive reasons.

This research uses a mixed methods case study design (Plano Clark et al., 2018), including semi-structured interviews and an online survey, based on a start-up company's reuse business model for FMCGs. Mixed methods are appropriate for various reasons. First, it facilitated the inclusion of multiple stakeholders in the research process and resulted in a greater diversity of data. Second, it allowed the researchers to choose between methods that best address the research questions. Findings from the interviews were also used to develop the customer survey (e.g., the explanation of the reuse systems). In addition, the use of mixed methods enhanced the results and improved the research data's accuracy and validity (Saunders et al., 2019). While the interviews covered all three aspects of feasibility, desirability, and viability regarding the case company's CBM, the survey was conducted to gain further insights into customer desirability of the reuse system. Thus, the focus on a specific aspect was made possible by using mixed methods (Saunders et al., 2019).

3.1. The case company

Choosing the case and its boundaries is critical for conducting a case study (Saunders et al., 2019). This study focuses on a start-up company and its reusable packaging CBM for FMCGs. The company was chosen because of its unique CBM regarding reusable branded packaging for FMCGs made from durable but also recyclable materials (e.g., hard plastics, glass, and metal). The company is proposing a potentially disruptive model that realigns the position of companies in the FMCG value chain (Brown et al., 2019; Velter et al., 2021) and pushes them to start new reusable packaging and refilling production lines. So far, the company has successfully engaged with major brands in the FMCG and retail sectors. By successfully bringing together major established brands, it is in a unique position to disrupt the market and, hence, an interesting case to investigate.

The company is trialing its new CBM in different geographies and currently plans to expand to Germany in the upcoming years. In the CBM, a sequential reuse model, the consumer uses the packaging and returns it to the case company which then takes care of the packaging recovery (Muranko et al., 2021). The data collection took place between May and August 2021 in the German capital Berlin. Berlin was chosen as a focus as it is a typical city where innovative CBMs are being trialed (Bocken, 2021) and the capital of a country with a high customer acceptance of DRS.

As for the different types of CBMs, the case company developed an e-commerce and an in-store deposit-refund system for reusable packaging in the FMCGs industry. The case company partners up with existing brands and retailers in the FMCGs sector and integrates them into a reuse network by offering their products in reusable packaging. The price of the reusable items consists of the product price and a refundable deposit that customers pay at purchase and get back when they return the packaging. The reuse system is currently available in four markets: US, Canada, UK, and France. The CBM depends on the markets. For example, the company has its own e-commerce website in the US, Canada, and the UK. Consumers can order products on the case company's website

through the online DRS and get them delivered to their doorstep in a reusable shipping box. When the products are used up, a pick-up service collects the empty packaging containers. The case company is responsible for cleaning the empty containers. Afterwards, they are sent to the manufacturers to refill. In France, the case company started the integration of their CBM into retail channels:the reuse system is available in a small number of in-store retail locations and through the retailers' e-commerce platforms. Perusing the in-store model in all global markets, the consumer buys and returns the products with reusable packaging in the shop. Similarly to the e-commerce model, the case company collects and cleans empty containers. Furthermore, it is responsible for restocking the refilled FMCG products in the store. The case company is at the core of the interaction between the consumer, FMCG brand, and retailer. It manages the deposit exchange, e.g., in the in-store model, the consumer pays the deposit to the retailer and receives it back from the case company when returning the packaging. The brand then pays back the case company. Furthermore, a main component of the CBM is the provision of the reverse supply chain, including the collection, the cleaning, and the logistics between the partners.

3.2. Interviews

In the first phase of the research, seven semi-structured interviews were conducted with employees from the case company and the FMCGs industry. Semi-structured interviews provide important contextual information and present an opportunity to speak to key actors to receive valuable insights (Saunders et al., 2019). The interviews aimed to get insights into the reuse system's feasibility, viability, and desirability (Bland and Osterwalder, 2020) and identify barriers, drivers, and success factors. In preparation of the interviews, information was gathered about the start-up company and its CBM by reviewing official documents, reports, interviews, press releases, and user reviews. The goal of the desk research phase was to obtain initial information about the CBM and the actors involved to best prepare the interview questions and the design of a later second research phase customer survey.

The interviews were organized around a predefined interview guide (Appendix A) and based on the two research questions. Further questions arose during the conversation between the interviewer and the interviewees (Dicicco-Bloom and Crabtree, 2006). This allowed for a flexible conversation flow in which the interviewer could deviate from the guide to collect additional research data, e.g., by asking follow-up questions. In addition, mainly open questions were asked, which facilitated the clarification of responses and allowed the participants to explain complex issues. One-to-one interviews only were conducted.

The interviewees were contacted via the social media platform LinkedIn and through e-mail. We reached out to employees who work for the case company or employees from the case's partner brands in the FMCGs industry who work for the sustainability or packaging department. In total, over 60 people and 10 companies were contacted via LinkedIn and through e-mail. Overall, seven in-depth interviews have been conducted in the time frame between May and July 2021. On average, each interview lasted between 26 and 38 min. Due to the global COVID-19 pandemic and the location of the participants, the interviews were carried out using online video communication tools like Zoom and Google Meets. All interviews were audio-recorded and transcribed for the data analysis.

Table 2 gives an overview of the interviewees. Five interviews were completed with employees from different departments of the case company and two interviews with employees from FMCGs companies. The sample size was limited by the project scope, time constraints, and finding suitable interviewees willing to participate in the study. However, despite the limited num-

ber of interview partners, saturation effects were achieved. Indeed, Guest et al. (2020) found that through 6, 7 interviews the majority of themes can be captured and that with just 6 interviews, 80% data saturation can be reached. The participants were selected because they had several years of working experience in their current companies. In addition, they had different job profiles and were located in the US, UK, France, and the Netherlands, which enabled the inclusion of various perspectives on DRS and CBMs in the research.

3.3. Survey

In the second phase of the study, a web-based survey was conducted. The survey was targeted at potential customers of the reusable packaging CBM in Berlin. The aim of the survey was to assess the desirability (perception) of the business model from the consumer's perspective (Bland and Osterwalder, 2020). Pressure from consumers on FMCGs to reduce plastic in packaging has been found to be the most critical factor for FMCGs to act on this issue (Ma et al., 2020), hence the second phase of the study ensured to capture consumer input. The survey can be found in Appendix B.

The survey was conducted with the software Qualtics. An online survey can be distributed conveniently through multiple channels like social media and e-mail, making this method especially suitable for the ongoing Covid-19 pandemic and an effective research strategy (Denscombe, 2014). Responses in the survey were possible using single choices, multiple choices, and free text fields. A 5-point Likert scale was used for most multiple-choice questions (Joshi et al., 2015).

At the beginning of the study, a brief introduction to the research topic was given. In addition, the term DRS for reusable packaging was explained. Next, the participants were asked if they currently live in Berlin. Afterward, they answered various questions about the e-commerce and in-store reuse model. First, the survey participants were shown two figures (see Fig. 2) to explain how the reuse systems work. Then, the respondents were asked how likely they were to try out the reuse models. A 5-point Likert scale measured the participants' degree of agreement to statements about the two systems regarding perceived convenience, environmental friendliness, ease of usage, and accessibility. In addition, the scale from Sparks and Shepherd (1992),later adapted by Ertz et al. (2017) for reusable packaging, was used to determine the participants' attitude towards the reuse systems.

The next part of the questionnaire dealt with the consumers' reuse behavior. For example, one question tested how much the respondents were willing to pay for reusable packaging products. Furthermore, the participants were asked what kind of FMCGs they would buy in reusable containers. Another question explored whether the participants had ever tried a reusable system (e.g., for coffee cups) or a deposit-refund system (e.g., for bottles) and how often they are currently used it to ensure the data analysis could test for attitude-behavior gap and normalize for that.

Questions on socio-demographic data such as age, gender, and occupation were asked at the end, as sensitive information could lead to possible dropouts at the beginning of the survey (Fietz and Friedrichs, 2014). Furthermore, the participants had the opportunity to leave feedback on the questionnaire in an open text field. The researcher's contact information was provided in case the participants had further questions or were interested in the results. Before publishing, the questionnaire was tested with several participants to minimize social bias, and the findings from the testing resulted in changing the order of the questions for the final version of the survey.

The survey included 26 questions and was run between 24 June and 4 August 2021. A link to the questionnaire was distributed over the researchers' personal networks and followed a snowball

Table 2
Overview of interviewees.

Interview number	Company	Department	Interview length
Interview 1	Case company	PR	30 min
Interview 2	Case company	Business development	33 min
Interview 3	Case company	Operations & logistics	31 min
Interview 4	Case company	Brand & retail partnerships	26 min
Interview 5	Case company	Customer insights	30 min
Interview 6	FMCGs company	Packaging lead	35 min
Interview 7	FMCGs company	CEO	38 min

Fig. 2. E-commerce and in-store reuse model from the consumer perspective.

Table 3
Example of coding the interview transcripts.

Theme	Category	Codes	Frequency	Interviewee
Key success factor	Brand and retailer partnership	Retail partnership	5	2, 3
		Pre-existing partnerships	2	1, 3
		Brand partnerships	5	1, 4, 3
		New partners	3	2, 3

sampling approach. Furthermore, the link was shared on the social media platform LinkedIn and was posted in several Facebook groups for people living in Berlin. The questionnaire was targeted at potential customers of the case company's reuse model in Berlin. However, people who did not live in Berlin were also able to participate in the survey. According to the interviewed employees from the case company, the target group of the reusable packaging system is 'everyone', which is why there were no pre-conditions for the selection of participants. On average, the participants took around 10 min to complete the questionnaire.

3.4. Interview analysis

The interviews were coded (Bell et al., 2019) using the qualitative data and research software Atlas.ti and Excel. Furthermore, the data was coded in two coding cycles.

In the first cycle, the coding methods included attribute coding, structural coding, *in-vivo* and descriptive coding (Saldaña, 2013). The coding process started with attribute coding in which the general descriptive information of the interview and the interviewees was collected, e.g., participants demographics, data format, and time frame. In the next step, the researchers used structural coding to get an overview of the data content (Saldaña, 2013). This coding created a sound basis for an in-depth analysis (Guest and MacQueen, 2008).

In the second coding cycle, pattern coding was used to identify broad themes and categories. Pattern codes are so-called "meta-codes" that combine various data units to discover overarching themes and constructs (Saldaña, 2013). This step was helpful for the analysis of the data items as large numbers of descriptive and *in-vivo* codes were merged into broad themes, which facilitated the assignment of the findings to the research questions at a later stage.

Table 3 illustrates how different codes were grouped and assigned to a theme. Furthermore, Table 3 indicates how often the codes were used and in which interviews the codes were applied.

3.5. Survey analysis

190 people started to answer the survey. However, since not all respondents filled it out completely, the data from 125 participants were considered for the analysis ($n = 125$ or 65.8%). Most of the surveyed people were 30 years old or younger (63.2%) and female (54.5%) (Table 4). Students and full-time employees make up the large majority of the sample. Students may be more susceptible to social pressures when it comes to adopting sustainable behaviors (Kormos et al., 2015; White et al., 2019), therefore this data sample is a fair indication of actual displayed behavior rather than stated intent.

The survey questions were evaluated both quantitatively and qualitatively. The multiple-choice questions were analyzed with Excel, and the open text field questions were coded with the qualitative data research software Atlas.ti. Similar to the interviews, the responses from the open questions were coded in two coding cycles. Descriptive and *in-vivo* coding was used for the first cycle to determine the most critical aspects of the survey responses. For the second cycle, pattern coding was applied to identify broad themes

Table 4
Survey sample.

Total survey participants: 125		Absolute	In%
Gender	Female	68	54.4%
	Male	55	44%
	Non-binary	2	1.6%
Age	15–20	1	0.8%
	21–25	48	38.4%
	26–30	30	24%
	31–35	19	15.2%
	36–40	12	9.6%
	41–45	7	5.6%
	45–50	0	0%
	51–55	4	3.2%
	56–60	1	0.8%
	61 and older	3	2.4%
Job	Students	52	41.6%
	Full-time employee	49	39.2%
	Part-time employee	10	8%
	Unemployed looking for work	8	6.4%
	Unemployed not looking for work	0	0
	Retired	2	1.6%
	Unable to work	0	0
	Other	4	3.2%
Place of residence	Berlin	58	46.4%
	Other	67	53.6%

Table 5
Example of coding the open-field survey questions.

Theme	Category	Code	Frequency
Motivation	Positive environmental impact	Environmentally friendly	18
		Less waste	14
		Reduction of packaging waste	9
		Zero-waste	4
		Less-raw material	5
		More sustainable	11

and categories (Saldaña, 2013). Table 5 shows an example of the coding process of the open text box survey questions.

4. Results

4.1. Results interviews

Table 6 provides an overview of the interview findings for research question one "What are the success factors, drivers, and barriers of a reusable packaging CBM for FMCGs?". Five success factors have been identified for the case company's CBM: retail and brand partnerships, consumer participation, operations efficiency, profitability, and establishment of an ecosystem. Furthermore, for each of the success factors, barriers were identified. During the interviews, the participants also mentioned a few drivers. Generally, all interviewees agreed that Berlin is a potential market for the reusable packaging business model of the case company.

In the following, the success factors and related barriers and drivers are explained in more detail.

4.1.1. Customer participation

All interview participants identified consumer participation as a success factor for the reuse CBM of the case company (In-

Table 6
Overview of success factors, barriers, and drivers.

Success factors	Barriers	Drivers
Consumer participation	• Behavioral change/ educating consumers • High prices (price sensitivity) and additional costs • Inconvenience • Negative environmental impact of DRS • No accessibility • Low quality and design of packaging • Bad product assortment • Hygiene concerns	• Positive environmental impact of DRS • Convenience • High quality and durable design of packaging • Accessibility • Low prices and financial incentives • Good product assortment • Existing DRS • Rising awareness of sustainability
Brand and retailer partnerships	• Costs • Scaling the production process • Consumer behavior	• Reducing the environmental footprint • Sales and profit • Reputation and Image • Sustainability awareness • Governmental regulations • Convenient business model • Pre-existing partnerships
CBM profitability	• Single-use packaging • Profitability for the actors in the value chain	
Operation efficiency	• Logistical costs • Complexity of operations	• Short transportation routes • Density
Establishment of a reuse ecosystem	• Time	• Successful management of the growth cadence • New partnerships/ locations

terviews 1–7). The consumers participate by purchasing products in reusable packaging and interacting with the in-store or e-commerce DRS. According to the case company's employees, the overall goal is to make reusability attractive and accessible for everyone. Currently, the e-commerce DRS is mainly used by those already interested in sustainability and had heard of the case company's reuse concept on the media. The in-store concept attracts a broader target group as it is more visible and accessible for consumers who did not know about the model before (Interviews 2, 5).

The following barriers and drivers to customer participation were identified in the interviews.

First, most interviewees considered changing the customers' mindsets and habits as a barrier (Interview 5). Consumers are used to the convenience of disposability and the linear economy. Buying and returning FMCGs according to the in-store or e-commerce model requires a change in consumer behavior which some of the interviewees described as "tricky" (Interviews 6, 7). According to the CEO of a partner brand, this requires customers to question the status quo and decide to adapt their routines. This engagement takes time and effort, which can be a barrier for customers to change their habits (Interview 7). Furthermore, teaching consumers how to correctly use the DRS's infrastructures can be a challenge in the beginning (Interviews 2, 3).

Second, consumers are often sensitive to prices (Interview 2). Since the case company currently operates at pilot-stage, the product prices are either similar or slightly higher than single-use alternatives. This is because manufacturers initially start to produce the products with reusable packaging in small volumes, which is usually more expensive (Interview 3). According to the interviewees, higher prices can reduce customer participation, especially when the reusable and single-use product options do not differ significantly (Interviews 2, 4). In general, the participants found that consumers are only to a limited extent willing to pay a premium for sustainable products (Interviews 2, 5).

Third, interview partners stated that European customers are generally more interested in sustainability and the environment. Therefore, they tend to be more receptive to sustainable product offerings (Interview 2). Another aspect mentioned is that con-

sumers are more sensitive to prices in Germany (Interviews 5, 6). Two employees from the case company provided an example about their previous experience with customers in Europe compared with customers in the US regarding the reuse DRS. They found that European customers tend to be more interested in the reuse model but are not willing to pay a higher price for the products. It was the other way round for customers in the US (Interviews 2, 5). Moreover, most participants agreed that the existing DRS for plastic and glass bottles in Berlin might be beneficial for implementing and scaling the reusable packaging model as consumers are already used to returning packaging (Interviews 5 and 6). Consumers are aware that these DRS exist and have already overcome the behavioral change (Interviews 3, 4).

4.1.2. Retail and brand partnerships

Case company employees identified retail and brand partnerships as a success factor for implementing and scaling the reusable packaging model (Interviews 1–5) in order to move away from single-use plastic packaging. The interview partners stated that retail partnerships are essential when launching in a new region to make reusable products accessible for customers on various distribution channels (Interview 5). In addition, collaborating with brands is crucial to provide a wide variety of products to customers (Interviews 4, 5). Furthermore, the interviewees agreed that partnerships are necessary for scaling the CBM (Interview 4). One reason is that the inclusion of new brands expands the product assortment. Additionally, new retail partners support the development of a reuse ecosystem by increasing the number of locations and distribution channels where consumers can access the DRS (Interview 2). Mainly big brands and retailers drive the scaling process to reach high volumes, increase the accessibility of the system, and reduce costs (Interview 4). Two interview partners mentioned that the parent company of the case company has an office in Berlin, which could be an advantage for the expansion to Germany (Interviews 1, 2).

4.1.3. CBM profitability

Designing the case company's CBM from an economic standpoint was identified as a success factor by several interviewees (In-

terviews 2, 3, 5, 6, 7). However, creating a reuse model that guarantees profitability for every actor in the value chain (manufacturer, cleaner, retailer, brand, etc.) was also considered a challenge (Interview 7). For the reuse system to be financially attractive for supply chain partners, it would have to generate more turnover, e.g., the manufacturers have to make more profit than before, the retailers have to sell more reusable products than other items in the store, and the cleaners have to make more money than with their usual cleaning orders (Interview 5). In addition, being competitive with single-use packaging was identified as a challenge by multiple interview partners (Interviews 3, 5). One of the main reasons is that the production process of single-use packaging has been optimized over several years to become very efficient and cheap, which makes it hard for reusable packaging to beat turns in particular when the case company's CBM is still at pilot-stage with low volumes and comparably high product prices (Interviews 3, 5).

4.1.4. Operation efficiency

According to a few interview partners, operation efficiency is a key success factor in implementing and scaling the business model of the case company. However, an operation manager of the case company mentioned that logistical efficiency is also a challenge because logistical costs need to be reduced significantly. Particularly, when launching in a new region with a low density of stores, the challenge is to reduce the logistical costs by minimizing transportation distances for cleaning and distributing the packaging. In addition, some interviewees stated that it is essential to design the operation more efficiently, so that costs for partner brands and retailers remain competitive when scaling the business model. Beside that, the operations get more complex when scaling the reuse model. However, the operation manager mentioned that a dense reuse ecosystem could also reduce logistical costs (Interviews 2, 3).

4.1.5. Establishment of an ecosystem

According to the interviewees, the establishment of a dense reuse network is the goal of the scaling process (Interviews 1–5). The process of building this ecosystem depends on the other four success factors: customer participation, retail and brand partnerships, business model profitability, and operation efficiency. Furthermore, the successful management of the CBM's growth was identified as an important factor by two interviewees (Interviews 2, 3). According to the case company's business development and operation managers, this includes optimizing brand selection and creating a dense collection network (e.g. launching in geographical hubs) (Interviews 2, 3). Furthermore, managing the interchangeability of the drop-off locations to increase customers' convenience is an essential aspect of the reuse experience (Interview 1). In addition, new types of partnerships, e.g., with municipalities, restaurants, and office buildings, would support the expansion of the reuse network (Interview 2). However, one interviewee mentioned that this scaling process takes time because brands need to develop new products and retailers have to implement the DRS in their current distribution channels. Therefore, time can be considered a barrier to the establishment of a dense reuse ecosystem (Interview 2).

4.2. Results survey

The responses for the e-commerce model are presented first, followed by the results for the in-store model. We end with the survey respondents' overall perspectives on reuse.

4.2.1. E-commerce reusable packaging DRS

The e-commerce model is evaluated according to the overall attitude towards the model, different aspects (e.g., convenience, environmental friendliness), and driver and barriers, discussed next.

First, the participants' attitude regarding the reuse model was measured with a scale developed by Sparks & Shepherd (1992). To calculate the attitude, a value (1–5) was assigned to each value dimension (e.g., extremely unfavorable to extremely favourable). Then the average response of all items from the scale was calculated. The higher the number, the better the participants' attitude towards the e-commerce reuse model. The average attitude of the respondents towards the e-commerce reuse DRS was 3.8. In addition, the Cronbach's alpha value was determined to check the reliability of the items used to measure the attitude (Janssen and Laatz, 2017). Including all seven items of the scale results in a value of α=0.848. An alpha value above 0.70 indicates good reliability of the items for the overall scale (Krebs and Menold, 2014).

Second most survey participants were positive about trying the system: 80.8% answered the question, "how likely are you to try out this online reusable packaging system?" with "extremely likely" or "somewhat likely". Only 8% responded with "somewhat unlikely" or "extremely unlikely". Furthermore, a significant part of the respondents (61.6%) perceived the e-commerce model as convenient. 76.8% of the participants "strongly agreed" or "agreed" to the following statement "the online reusable packaging system seems to be accessible", while 15.2% "disagreed" or "strongly disagreed". A total of 93 respondents (73.6%) perceived the reuse model easy to use. Beside, many participants (59.2%) "strongly agreed" or "agreed" with the statement "the online reusable packaging system seems to be environmentally friendly". Table 7 illustrates the results in more detail.

Third, several motivations and barriers concerning the e-commerce reusable packaging model have been identified using two open text-box questions in the survey ("what would motivate you to buy products according to the online reusable packaging system?" and "what would be the potential barriers for you to buy products according to the online reusable packaging system?"). The most cited drivers and barriers are summarised in Table 8.

Firstly, the *drivers* of the e-commerce system are explained.

Positive environmental impact. Around half of the participants (50.4%) reported that the positive environmental impact would motivate them to use the online reusable packing system. For example, the reduction of single-use waste was often mentioned. Furthermore, some respondents stated that they perceive reusable packaging as a more sustainable alternative to single-use packaging.

Convenience. About 19% of the participants stated that the online reuse system should be easy to use and not require a lot of effort for them to use it. In addition, 16% reported that fast and flexible delivery and pick-up times would motivate them to use the online system. Beside, 15 respondents (12%) mentioned that they perceive the delivery and collection of the reusable products at their doorstep as convenient.

High quality and durable design of packaging. Around 13% of the participants reported that high-quality and durable packaging design would motivate them to use the online reuse system. A few participants mentioned that the packaging design should be practical and easy to transport. Furthermore, according to some respondents the packaging should not be damaged or look too "used".

Low prices and financial incentives. Almost 11% of the participants stated that low prices of the products with reusable packaging would motivate them to use the reuse system. In addition, a few respondents mentioned economic incentives such as discounts and no shipping costs as motivations.

Variety of products. Nine participants (7.2%) mentioned that a product assortment with a variety of brands to choose from would be a motivation for them. In this context, some respondents stated that they would like to buy the products they already use in reusable packaging.

Table 7

Results survey statements regarding e-commerce reuse model.

	"Strongly agree" and "agree"	"Neither agree nor disagree"	"Strongly disagree" and "disagree"
The ONLINE reusable packaging system seems to be convenient.	77 (61.6%)	29 (23.2%)	19 (15.2%)
The ONLINE reusable packaging system seems to be accessible.	96 (76.8%)	21 (16.8%)	8 (6.4%)
The ONLINE reusable packaging system seems to be easy to use.	92 (73.6%)	21 (16.8%)	12 (9.6%)
The ONLINE reusable packaging system seems to be environmentally friendly.	74 (59.2%)	30 (24%)	21 (16.8%)

Table 8

Drivers and barriers for the e-commerce reusable packaging DRS from the consumer's perspective and percentage of times factor was mentioned.

E-commerce reuse DRS

Drivers	Barriers
• Positive environmental impact (50.4%)	• Negative environmental impact (24%)
• Convenience (19%)	• High prices and additional fees (20%)
• High quality and durable design of packaging (13%)	• Inconvenience (12%)
• Low prices and financial incentives	• No product variety (11.2%)
• Product variety (7.2%)	• Preference to buy in-store (4.8%)

The identified *barriers* that could prevent consumers from using the e-commerce reusable packaging system are demonstrated in the following.

Negative environmental impact. 24% of the respondents mentioned that they doubt that the reusable online model is environmentally friendly. The most common reason was that delivering and picking up reusable containers can cause emissions due to increased transportation routes. In addition, some of the participants (14.4%) stated that they would like to receive more information and transparency on the environmental benefits of the reuse model.

High prices and additional fees. Around 20% of the participants responded that high prices for the products in reusable packaging would be a barrier for them to use the e-commerce model. Beside, additional fees (in particular shipping costs) were perceived as a barrier for 14.4%.

Inconvenience. The perceived inconvenience of the e-commerce reuse model was considered a barrier for 12% of the participants. Another 14% stated that the lack of flexibility is a disadvantage because spontaneous purchases are not possible. Furthermore, for 10% of the respondents' further potential barriers included long delivery times, storing the reusable packaging at home until it's picked up, and the additional effort of returning the packaging.

No product variety. 11.2% of the respondents mentioned that another potential barrier would be no product variety on the reuse platform. In addition, some survey-takers were not willing to use the system if their favourite products would not be offered in reusable packaging.

Low quality of packaging. Another concern for some participants (11.2%) was that the reusable packaging might be low quality and damaged if it's reused multiple times.

Preference to buy in-store. A small percentage of respondents (4.8%) mentioned that they do not like to order FMCGs online but prefer to buy products in the store. Therefore, for those participants, the fact that the model is taking place online was a barrier.

4.2.2. In-store reusable packaging DRS

The instore model is again evaluated according to the overall attitude towards the model, different aspects, and driver and barriers.

First, the attitude, again calculated by the seven items of the scale developed by Sparks and Shepherd (1992), was 4.08. The Cronbach's alpha value of the scale was $\alpha = 0.918$ and showed very good reliability of the items for measuring the attitude towards the in-store reuse DRS.

Second, 92.8% of participants indicated that they would either "extremely likely" or "somewhat likely" try out the in-store reuse model, while 4% answered with "somewhat unlikely". No responses were reported for "extremely unlikely". Most participants agreed that the in-store reusable packaging system is convenient, while 34.4% neither agreed nor disagreed. Furthermore, 78.4% of the respondents perceived the in-store model accessible. Additionally, 105 survey-takers (84%) indicated that the reuse model is easy to use. Most participants (92%) agreed with the statement "the in-store reusable packaging system seems to be environmentally friendly", while 1.6% disagreed. Table 9 illustrates the results in more detail.

Third, several motivations and barriers concerning the in-store reusable packaging model have been identified through the open survey questions. The most mentioned drivers and barriers are summarised in Table 10.

The identified *drivers* of the in-store reuse model are as follows.

Positive environmental impact. Most of the survey-takers (64.8%) indicated that the positive environmental impact would motivate them to use the in-store reusable packaging system, especially the reduction of packaging waste.

Convenience. Several participants pointed out that they would be willing to use the system if it's convenient and easy to use. In addition, 17.6% of the respondents stated that they appreciate the possibility of buying and returning the products in-store.

High quality and durable design of packaging. 12.8% of the respondents indicated that the packaging's high quality and durable design would motivate them to engage with the in-store reuse model.

Accessibility. The accessibility of the in-store reuse system was important for several survey-takers (12.8%). They mentioned that they would prefer if the reuse model was available at the store where they always purchase their products. Another aspect introduced by participants was the availability of many close-by drop-off points to return the empty packaging.

Low prices and financial incentives. Low prices and financial incentives, such as discounts, would motivate 12% of the participants to buy products in reusable packaging in-store.

Variety of products. For 8% of the respondents, the varied product assortment is an important aspect that would motivate them to interact with the in-store reuse infrastructure. Similar to the findings of the online system, some participants stated that they would like to buy the products they already use in reusable packaging.

The following *barriers* were identified in the survey for the in-store reusable packaging system from the consumers' perspective.

No accessibility. For almost 37% of the participants, a barrier would be the difficult accessibility of the in-store reuse model. For instance, some stated that a limited number or a long distance to the drop-off locations would be potential barriers. Beside, some

Table 9

Results survey statements regarding in-store reuse model.

	"Strongly agree" and "agree"	"Neither agree nor disagree"	"Strongly disagree" and "disagree"
The IN-STORE reusable packaging system seems to be convenient.	64 (51.2%)	43 (34.4%)	18 (14.4%)
The IN-STORE reusable packaging system seems to be accessible.	98 (78.4%)	24 (19.2%)	3 (2.4%)
The IN-STORE reusable packaging system seems to be easy to use.	105 (84%)	15 (12%)	5 (4%)
The IN-STORE reusable packaging system seems to be environmentally friendly.	115 (92%)	8 (6.4%)	2 (1.6%)

Table 10

Drivers and barriers for the in-store reusable packaging DRS from the consumer's perspective.

In-store reuse DRS

Drivers	Barriers
• Positive environmental impact (64.8%) • Convenience (17.6%) • High quality and durable design of packaging (12.8%) • Accessibility (12.8%) • Low prices and financial incentives (12%) • Variety of products (8%)	• No accessibility (37%) • Inconvenience (18.4%) • Low quality of packaging (9%) • No product variety (6.4%) • Hygiene concerns (3.2%)

Table 11

Factors that influence consumer participation in the in-store and e-commerce CBM the most.

	E-commerce model	Instore reuse model
Environmental impact	X	X
Convenience	X	X
Quality and design of packaging	X	X
Price	X	X
Product assortment	X	X
Additional fees	X	
Accessibility		X
Hygiene		X

participants mentioned that another disadvantage would be if the reuse system is available in a limited number of stores. A few respondents stated that if reusable products are not available in the store where they usually go, they probably will not use the reuse model.

Inconvenience. Several survey-takers (18.4%) mentioned inconvenience as a barrier to the in-store reuse model. For example, almost 20% of the participants stated that returning the packaging to the store is inconvenient. Furthermore, around 10% of the respondents mentioned that the heavy weight of the reusable containers would be a potential barrier because transportation is more challenging. Another 15.2% pointed out that they consider it inconvenient to collect and store the packaging at home until the next shopping trip.

Low quality of packaging. The low quality of the reusable packaging would be another barrier for 9% of the participants. Beside, another aspect introduced by the survey-takers was damaged packaging .

No product variety. Similar to the online reuse system results, 6.4% of the participants indicated that another barrier would be the lack of product variety or if the products they usually buy are not integrated into the in-store reuse system.

Hygiene concerns. A small percentage of survey respondents (3.2%) stated that they have concerns regarding the hygiene of reusable packaging. Their main worry was that the containers are not cleaned properly.

4.2.3. Reuse behavior: viability

Towards the end of the questionnaire (Appendix B), several questions were asked the general reuse behavior of the participants were asked. 105 survey participants (84%) indicated that they already used reusable packaging or DRSs. Of these respondents, 3.2% use reusable or deposit refund models "always", 17.6% "often", 31.2% "sometimes, 27.2% "rarely", and 4.8% "never". In addition, many participants stated that they already tried reusable coffee cups, zero-waste stores, and DRSs for plastic and glass bottles. This indicates a propensity to avoid single-use plastic packaging.

The questionnaire also included one question about what consumers would be willing to pay for a shampoo in reusable packaging if the single-use alternative cost five euros. Most participants

(64.8%) responded that they would buy the shampoo for five euros plus a refundable deposit. 18.4% said they would be willing to spend more than five euros, while 16% would spend less. Survey-takers were also asked if there were any products they would not buy in reusable packaging. The majority answered "no". However, the most mentioned products here were hygiene products (e.g., skincare, oral care, sanitary products), fresh food (e.g., fish, meat), and medical products.

5. Discussion

The case study was conducted to contribute to a better understanding of the success factors, drivers, and barriers for reusable packaging CBMs in the FMCGs sector.

5.1. Success factors, drivers, and barriers for a reuse CBM

This study aimed to identify success factors, drivers, and barriers for a reuse CBM in Berlin. In total, five success factors were identified for the case company's DRS: brand and retailer partnerships, consumer participation, CBM profitability, operation efficiency, and establishment of a reuse ecosystem (Table 5). In addition, the success factors were each accompanied by the drivers and barriers identified in the interviews and the online survey.

The customer's perception was measured via a survey and found that consumers were favourable towards both types of reuse CBMs (in store and e-commerce). This was demonstrated by the fact that many participants were willing to try out both systems. In addition, the respondents' attitudes towards the reuse models were quite positive. The web-based survey identified several factors that motivate or prevent consumers from using the in-store and e-commerce DRS. The most frequently mentioned drivers and barriers have been combined into general factors that influence consumer participation. Table 11 includes the most indicated factors aspects for both the e-commerce and the in-store models.

First, the positive environmental impact of the reuse DRS was a commonly mentioned factor motivating customers to engage in the reuse models. However, this finding might be influenced by the fact that most of the survey participants were under the age of 30. Previous studies addressed the relationship between sustainability awareness and age and found that

the younger generation tends to have increased awareness regarding sustainability issues (Johnstone and Lindh, 2018). Interestingly, the participants perceived the in-store DRS as more environmentally friendly compared to the e-commerce model. A study by Shahmohammadi et al. (2020) confirms that purchasing FMCGs online via a parcel delivery service often results in higher greenhouse gas emissions than buying FMCGs the traditional way at a retail store. In addition, some participants indicated that they would like to receive more information on the environmental benefits of the reuse model.

A second major aspect that the survey participants commonly mentioned was the convenience of the reuse DRS:including convenience regarding transporting, returning, and storing of products. The participants agreed that both models should be easy to understand and use. Compared to the in-store model, the survey participants perceived the e-commerce system as more convenient because of its delivery and pick-up service. In addition, the pricing of the products played a role for the participants. In the e-commerce model, for example, high additional fees like shipping costs were perceived as unfavorable. Furthermore, some of the participants indicated that financial incentives like discounts would motivate them to try out the reuse DRSs. The price sensitivity of consumers was also identified as a potential barrier in the interviews. The relatively young student dominated sample may have amplified this price sensitivity because of lower incomes.

Finally, other aspects mentioned by the participants were the quality and design of the packaging and the product assortment. Unsurprisingly, accessibility was particularly necessary to the participants for the in-store reuse model,including the availability of the products and drop-off locations in close-by stores. Concerns regarding the hygiene of reusable packaging were relatively low in both models. The Covid-19 pandemic, therefore, does not seem to have had a major impact on participants' willingness to reuse packaging. However, hygiene concerns were expressed slightly more often in the in-store DRS.

A high degree of overlap can be noticed when comparing these findings with the barriers identified by Coelho et al. (2020), who reviewed trends in reusable packaging. For instance, they also identified inconvenience, unavailability, and a bad pricing policy as barriers to reusable packaging models. Further similarities can be found with the study from Roca I Puigvert et al. (2020), who found that the perceived convenience influences the consumers' willingness to use a DRS, albeit in a Spanish context and with a slightly older sample of stakeholders (on average 43.5 years old). Yet, these similarities indicate that the findings from this research are perhaps not context-specific but can be applied more broadly outside of Berlin.

5.2. Circular business model experimentation

CBM experimentation helps determine whether an innovative business model has the potential to succeed in practice (Antikainen and Bocken, 2019; Konietzko et al., 2020a). The case study involved various stakeholders of the case company's CBM to identify success factors and barriers for its establishment in Berlin.

Fig. 3 displays the success factors classified according to the framework by Bland and Osterwalder (2020). First, "retail and brand partnerships" relate to the "feasibility" of the CBM. Collaborations with retailers and FMCGs brands are essential for the CBM of the case company to deliver the value proposition (products in reusable packaging) to the customer. Second, the efficiency of the operations is important for the "feasibility" and "viability" of the CBM. On the one hand, operations are a major cost factor, which is why effective management is a prerequisite for financial competitiveness. On the other hand, operating the logistics of the reuse model is a key activity that requires access to several resources

and logistics partners. Furthermore, the "CBM profitability" can be linked to "viability" as it deals with the development of successful revenue streams. Finally, the desirability of the CBM determines consumer participation in the reuse DRS. The success factor "establishment of an ecosystem" deals with the scaling process of the CBM. For that reason, the aspect of "scalability" was added as another dimension to the framework. For the case company to establish a reuse ecosystem, their CBM needs to be feasible, desirable, and viable. Finally, the success factors reinforce each other. For example, if more brands offer their products in reusable packaging, more consumers will be addressed and vice versa. Furthermore, operations efficiency, retail and brand partnerships, and consumer participation are essential factors for profitability.

What is lacking here is the environmental dimension prominent in other studies (e.g., Baldassarre et al., 2020). Confirming earlier studies, the focus in CBM is very much on desirability, feasibility, and viability (Bland and Osterwalder, 2020), before testing sustainability or circularity (Bocken et al., 2021). This is an important source for future work when more CBMs are being trialed and launched in practice.

5.3. Recommendations for practice

Based on the research findings, the following section provides recommendations on establishing a reuse CBM for FMCGs with focus on Berlin.

Firstly, it is essential to find retailers and brands that are willing to partner up with a reusable packaging company and experiment with offering their products to reduce single-use plastic packaging. Ideally, a collaboration between a reusable packaging company and a well-known FMCG brands with a large customer base would be created to help to increase the visibility of the CBM. Integrating the reuse model into retail distribution channels expands the accessibility of reusable products for customers in Berlin, contributing to the convenience of the reuse experience. In addition, it presents an opportunity to target various customer segments through the in-store locations. This also fit with earlier findings that familiarity with the system could help uptake (Greenwood et al., 2021).

Secondly, it is recommended to start implementing the reuse CBM in a small number of retail locations within close geographical proximity. Launching in geographical hubs offers the possibility of organizing operations efficiently, reducing logistical costs, and providing consumers with various close-by options to access the DRS infrastructures. The local neighborhood needs to have a dense network of retail shops and a population that is interested in the system. Conducting in-depth market research is needed to identify a suitable area in the city to implement the CBM.

Thirdly, a trial phase for the reuse DRS in Berlin can help to develop strategies to target consumers better and address their concerns. Furthermore, ambassadors of a reusable packaging company could interact with customers in the retail stores and demonstrate reuse infrastructures in the trial phase. In addition, the research findings suggest that financial incentives motivate customers to use the DRS. As a result, the researcher recommends introducing special promotions like discounts or free shipping to decrease the initial barrier for consumers to try out the reuse CBM.

Fourthly, the results from our survey indicated that participants requested more information about the environmental consequences of the CBM. In this context, a marketing campaign to launch the service could also be used a tool to educate consumers about possible sustainable benefits of the reuse DRS. Yet, simultaneously, it requires of the reusable packaging company to do 'environmental due diligence' to understand the impacts of the new CBM across the product life cycle, including logistics, to avoid greenwashing (Siano et al., 2017).
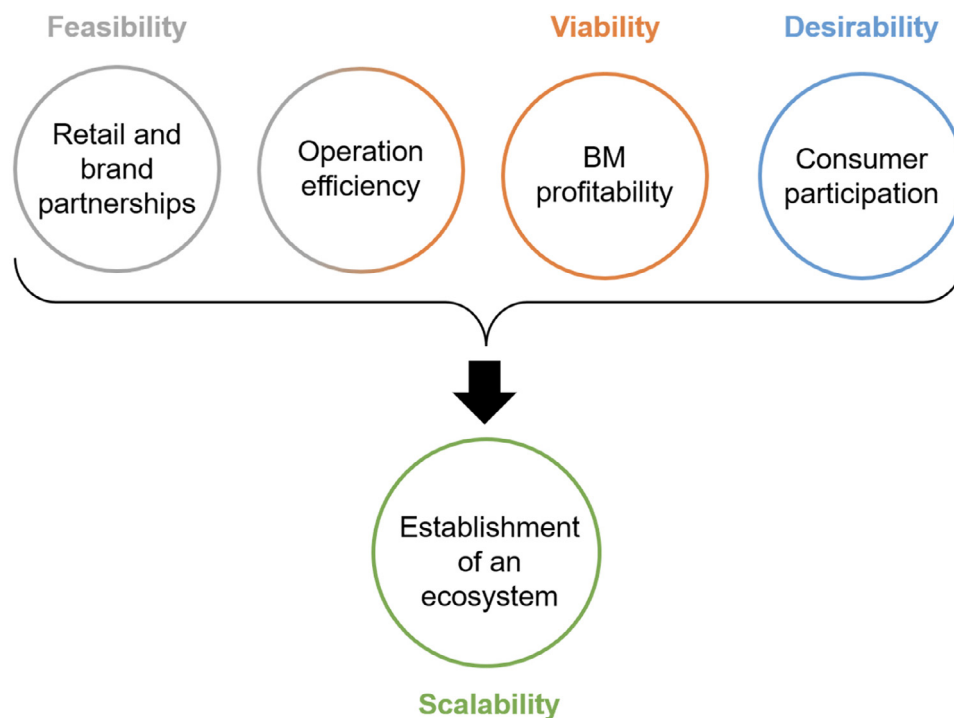
Fig. 3. Summarizing framework.

5.4. Limitations and future research

Despite the careful selection and application of the research methods, this study has some limitations.

First, the Covid-19 pandemic presented a limitation on how the research was executed. The data collection took place entirely on-line to ensure the safety of the participants. Therefore, only people with internet access could participate in the survey because street canvassing and other personal interactions were impossible. Second, the sample size of the interviews was small ($n = 7$) due a lack of available participants that were willing or able to take part in this study. While the involvement of various interview partners from different departments was beneficial to get a broad overview of the success factors, drivers and barriers, further studies could delve deeper into specific aspects of the CBM to provide more detailed findings. For example, the interviewees did not provide any drivers for the success factor profitability, perhaps because this is an obvious prerequisite for starting the CBM, but this could be explored further in future research. Third, the survey's sample ($n = 125$) overrepresented students (41.6%), and over half of them were based outside Berlin. The sample composition may have been influenced by time (open text field questions require more effort from participants; Wagner-Schelewsky and Hering, 2019) and internet access. The sample is much broader than the intended Berlin context of analysis, which for the company (whose target customer is 'everyone') is perhaps not problematic, but it gives a less pure insight on the Berlin context. Moreover, the online survey used graphics to describe the e-commerce and in-store reuse DRSs. Although the comprehensibility of the models was tested before the survey was published, there could have been misunderstandings which could impact the findings. This risk was minimized by providing participants the opportunity to leave feedback at the end of the questionnaire. Finally, with topics related to sustainability, participants tend to give socially acceptable answers. Depending on the research method, there are different options to address this issue (Grimm, 2010). Informing the participants that their data will be treated anonymously (as we did in the survey)

can reduce the bias. However, in semi-structured interviews, social desirability is usually more challenging to address.

Future research could use focus groups or more action-oriented workshops with collaborators in a value chain which offer the possibility of providing in-depth information about the research topic and answering follow-up questions, while working towards possible solutions. These allow the researcher to bring sample products in reusable packaging so that participants can get a better idea of the DRS. Field studies and experimental research with retailers where the DRS has already been implemented would also be conceivable for future research. Furthermore, as our sample was relatively young, it would be valuable to extend studies to broader contexts (older populations, those with disabilities, different education levels) to gauge the social interest in and adoption of new circular business models by the wider population, beyond a relatively young, healthy, and well-educated niche. Finally, future research should focus on the important element of environmental impact and sustainability of such new models (see e.g., Baldassarre et al., 2020). While there is still a high focus on business testing desirability, feasibility, and viability of CBMs (Bland and Osterwalder, 2020; Bocken et al., 2018), environmental sustainability needs to be more thoroughly assessed during the experimentation phases to avoid negative rebound effects (Das et al., 2022).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Interview guides

Research question: "What are the success factors and barriers for a reusable packaging CBM in Berlin?"	
Context	Interview question
Introduction question	How long have you been working for *company X* and what is your current position?
Introduction question	According to which criteria are brands and retailer selected for business cooperation?
Context for **RQ1**	How does the implementation process of *company X's* business model take place when expanding to a new city? Are there any business model experiments or piloting projects involved? Are there any location specific factors according to which cities are selected for expansion?
Context for **RQ2**	What is (are) the main target group(s) of *company X* products and services?
RQ1: What are the success factors, drivers, and barriers of a reusable packaging CBM for FMCGs in Berlin?	What success factors, drivers and barriers do you expect to encounter when expanding to Berlin?
RQ1: What are the success factors, drivers, and barriers of a reusable packaging CBM for FMCGs in Berlin?	In your opinion, is the city Berlin (or country Germany) suitable for the establishment of a reusable packaging system for fast-moving consumer goods?

Research question: "What are the success factors and barriers for a reusable packaging CBM in Berlin?"	
Context	Interview question
Introduction question	How long have you been working for *company Y* and what is your current position?
Introduction question	What is (are) the target group(s) of *company Y* products?
RQ2: What is the perception of customers regarding reusable packaging CBM?	What is (are) the main reason(s) that *company Y* decided to offer products in reusable packaging? Why is *company Y* collaborating with *company X*?
Context for **RQ2**	What is the process like to switch from single-use to reusable packaging? Which internal processes had to be changed/adapted to enable the reuse of packaging?
RQ2: What is the perception of customers regarding reusable packaging CBM?	How are the products with reusable packaging received by *company Y* customers?
RQ1: What are the success factors, drivers, and barriers of a reusable packaging CBM for FMCGs in Berlin?	From your perspective, what is the potential of a deposit-refund reusable packaging system in Berlin?
RQ1: What are the success factors, drivers, and barriers of a reusable packaging CBM for FMCGs in Berlin?	What are potential success factors, drivers and barriers for implementing and scaling such a reusable packaging system?

.

Appendix B. Survey design

Part 1: Introduction
1. Do you live in Berlin?
(Scale: Yes; No)
Part 2: E-commerce deposit refund system
2. How likely would you try out this online reusable packaging system?
(5-point Likert scale: Extremely likely; Somewhat likely; Neither likely nor unlikely; Somewhat unlikely; Extremely unlikely)
3. How do you perceive the online reusable packaging system?
(5-point Likert scales:

Extremely foolish/Extremely wise;
Extremely bad/Extremely good;
Extremely harmful/Extremely beneficial;
Extremely unenjoyable/Extremely enjoyable;
Extremely unpleasant/ Extremely pleasant;
Extremely unfavorable/Extremely favourable;
Extremely negative/Extremely positive)

4. To which degree do you agree with the following statements about the online reusable packaging system?

4.1. The online reusable packaging system seems to be convenient.

4.2. The online reusable packaging system seems to be accessible.

4.3. The online reusable packaging system seems to be easy to use.

4.4. The online reusable packaging system seems to be environmentally friendly.

(5-point Likert scale: Strongly disagree; Disagree; Neither disagree nor agree; Agree; Strongly agree)
5. What would motivate you to buy products according to the online reusable packaging system?
(Open text box question)
6. What would be the potential barriers for you to buy products according to the online reusable packaging system?
(Open text box question)
Part 3: In-store deposit refund system
7. How likely would you try out this in-store reusable packaging system?
(5-point Likert scale: Extremely likely; Somewhat likely; Neither likely nor unlikely; Extremely unlikely)
8. How do you perceive the in-store reusable packaging system?
(5-point Likert scales:

Extremely foolish/Extremely wise;
Extremely bad/Extremely good;
Extremely harmful/Extremely beneficial;
Extremely unenjoyable/Extremely enjoyable;

Extremely unpleasant/ Extremely pleasant;
Extremely unfavorable/Extremely favourable;
Extremely negative/Extremely positive).

9. To which degree do you agree with the following statements about the online reusable packaging system?

9.1. The in-store reusable packaging system seems to be convenient.

9.2. The in-store reusable packaging system seems to be accessible.

9.3. The in-store reusable packaging system seems to be easy to use.

9.4. The in-store reusable packaging system seems to be environmentally friendly.

(5-point Likert scale: Strongly disagree; Disagree; Neither disagree nor agree; Agree; Strongly agree)

10. What would motivate you to buy products according to the in-store reusable packaging system?

(Open text box question)

11. What would be the potential barriers for you to buy products according to the in-store reusable packaging system?

(Open text box question)

Part 4: Reuse behavior

12. What kind of products would you buy in a reusable container?

(Scale: Beverages; Frozen food (e.g. ice cream); Pantry (e.g. pasta, spreads, cookies); Cleaning products (e.g. dish wash); Laundry products (e.g. laundry detergent); Skincare products (e.g. body lotion, face cream); Bath and shower products (e.g. shampoo); Other, namely; None of the above)

13. Are there any products that you cannot imagine buying in a reusable container?

(Open text box question)

14. Example: If a shampoo with single-use packaging costs 5€ what would you be willing to pay for the same shampoo with reusable packaging in the deposit-refund system?

(Scale: 5€ (+refundable deposit); More than 5€ (+refundable deposit); Less than 5€ (+refundable deposit); I do not want to buy products in reusable packaging)

15. Have you already tried a reusable packaging system before?
(Scale: Yes; No)

16. How often are you currently using reusable packaging systems?

(5-point Likert scale: Always; Often; Sometimes; Rarely; Never)

17. What reusable packaging systems have you already tried?
(Open text box question)

Part 4: Participant's demographics

18. How old are you?

(Scale: 15–20 years old; 21–25 years old; 26–30 years old; 31–35 years old; 36–40 years old; 41–45 years old; 51–55 years old; 56–60 years old; 61 and older)

19. Which gender do you identify with?

(Scale: Male; Female; Non-binary/third gender; Prefer not to say)

20. Which of the following categories best describe your employment status?

(Scale: Employed full time; Employed part time; Unemployed looking for work; Unemployed not looking for work; Retired; Student Unable to work; Other, namely)

Part 5: Conclusion

21. Is there anything else you want to share about reusable packaging systems or do you have feedback on this survey?

(Open text box question)

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